The Nautical Almanac 2026



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The Nautical Almanac

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fair winds, clear skies & following seas
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Acknowledgment and Credits

Dr. Enno Rodegerdts

The Nautical Almanac *Daily Pages* and Sun Almanacs found on our site were originally created from PyAlmanac written by the great Norwegian sailor Enno Rodegerdts. PyAlmanac used PyEphem to generate the almanacs and LaTex provided the final formatting. Visit Dr. Rodegerdts site and learn of his voyages at https://sv-inua.net/

Without his work TheNauticalAlmanac.com wouldn't exist

Andrew Bauer

Mr. Bauer has taken the initial work of Dr. Rodegerdts and improved it to the excellence found in the following Daily Pages. Attending foremost to the accuracy of data and then formatting Mr. Bauer created SkyAlmanac which draws from Brandon Rhodes work *Ephem* and *Skyfield* and provides a clear arrangement of figures required for celestial navigation. He has also created the separate *Declination of the Sun and Planets* and *Local Mean Time of Meridian Passage* you'll find near the end of this almanac.

His work was determined, tireless and efficient. In our mutual writing across many lines of longitude he has always been pleasant, friendly and most affable.

As he has said, *"The art of celestial navigation should be promoted, not discouraged, even in the modern day".*

To both of these men we all owe a large debt of gratitude and thanks

Disclaimer and Warning

Prior to use verify the accuracy of The Nautical Almanac or data you download from our site. They SHOULD NOT and MUST NOT be relied upon for celestial navigation work of any sorts or any purpose whatsoever. You use them at your own risk or peril.

Errors & Corrections

Contact us if you find any significant errors and describe the correction that should be made.



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2026

January

wk	Su	M	Tu	W	Th	F	Sa
1					1	2	3
2	4	5	6	7	8	9	10
3	11	12	13	14	15	16	17
4	18	19	20	21	22	23	24
5	25	26	27	28	29	30	31

February

wk	Su	M	Tu	W	Th	F	Sa
6	1	2	3	4	5	6	7
7	8	9	10	11	12	13	14
8	15	16	17	18	19	20	21
9	22	23	24	25	26	27	28

March

wk	Su	M	Tu	W	Th	F	Sa
10	1	2	3	4	5	6	7
11	8	9	10	11	12	13	14
12	15	16	17	18	19	20	21
13	22	23	24	25	26	27	28
14	29	30	31				

April

wk	Su	M	Tu	W	Th	F	Sa
14				1	2	3	4
15	5	6	7	8	9	10	11
16	12	13	14	15	16	17	18
17	19	20	21	22	23	24	25
18	26	27	28	29	30		

May

wk	Su	M	Tu	W	Th	F	Sa
18						1	2
19	3	4	5	6	7	8	9
20	10	11	12	13	14	15	16
21	17	18	19	20	21	22	23
22	24	25	26	27	28	29	30
23	31						

June

wk	Su	M	Tu	W	Th	F	Sa
23		1	2	3	4	5	6
24	7	8	9	10	11	12	13
25	14	15	16	17	18	19	20
26	21	22	23	24	25	26	27
27	28	29	30				

July

wk	Su	M	Tu	W	Th	F	Sa
27				1	2	3	4
28	5	6	7	8	9	10	11
29	12	13	14	15	16	17	18
30	19	20	21	22	23	24	25
31	26	27	28	29	30	31	

August

wk	Su	M	Tu	W	Th	F	Sa
31							1
32	2	3	4	5	6	7	8
33	9	10	11	12	13	14	15
34	16	17	18	19	20	21	22
35	23	24	25	26	27	28	29
36	30	31					

September

wk	Su	M	Tu	W	Th	F	Sa
36			1	2	3	4	5
37	6	7	8	9	10	11	12
38	13	14	15	16	17	18	19
39	20	21	22	23	24	25	26
40	27	28	29	30			

October

wk	Su	M	Tu	W	Th	F	Sa
40					1	2	3
41	4	5	6	7	8	9	10
42	11	12	13	14	15	16	17
43	18	19	20	21	22	23	24
44	25	26	27	28	29	30	31

November

wk	Su	M	Tu	W	Th	F	Sa
45	1	2	3	4	5	6	7
46	8	9	10	11	12	13	14
47	15	16	17	18	19	20	21
48	22	23	24	25	26	27	28
49	29	30					

December

wk	Su	M	Tu	W	Th	F	Sa
49			1	2	3	4	5
50	6	7	8	9	10	11	12
51	13	14	15	16	17	18	19
52	20	21	22	23	24	25	26
1	27	28	29	30	31		

2026

Day of Week, Week Number, Day of Year, Remaining Days of Year

Day of Month	1 January			
	Day of Week	Day of Year	Days remaining	Week number
1	Thu	1	364	1
2	Fri	2	363	
3	Sat	3	362	
4	Sun	4	361	2
5	Mon	5	360	
6	Tue	6	359	
7	Wed	7	358	
8	Thu	8	357	
9	Fri	9	356	
10	Sat	10	355	
11	Sun	11	354	3
12	Mon	12	353	
13	Tue	13	352	
14	Wed	14	351	
15	Thu	15	350	
16	Fri	16	349	
17	Sat	17	348	
18	Sun	18	347	4
19	Mon	19	346	
20	Tue	20	345	
21	Wed	21	344	
22	Thu	22	343	
23	Fri	23	342	
24	Sat	24	341	
25	Sun	25	340	5
26	Mon	26	339	
27	Tue	27	338	
28	Wed	28	337	
29	Thu	29	336	
30	Fri	30	335	
31	Sat	31	334	

Day of Month	2 February			
	Day of Week	Day of Year	Days remaining	Week number
1	Sun	32	333	6
2	Mon	33	332	
3	Tue	34	331	
4	Wed	35	330	
5	Thu	36	329	
6	Fri	37	328	
7	Sat	38	327	
8	Sun	39	326	7
9	Mon	40	325	
10	Tue	41	324	
11	Wed	42	323	
12	Thu	43	322	
13	Fri	44	321	
14	Sat	45	320	
15	Sun	46	319	8
16	Mon	47	318	
17	Tue	48	317	
18	Wed	49	316	
19	Thu	50	315	
20	Fri	51	314	
21	Sat	52	313	
22	Sun	53	312	9
23	Mon	54	311	
24	Tue	55	310	
25	Wed	56	309	
26	Thu	57	308	
27	Fri	58	307	
28	Sat	59	306	

Day of Month	3 March			
	Day of Week	Day of Year	Days remaining	Week number
1	Sun	60	305	10
2	Mon	61	304	
3	Tue	62	303	
4	Wed	63	302	
5	Thu	64	301	
6	Fri	65	300	
7	Sat	66	299	
8	Sun	67	298	11
9	Mon	68	297	
10	Tue	69	296	
11	Wed	70	295	
12	Thu	71	294	
13	Fri	72	293	
14	Sat	73	292	
15	Sun	74	291	12
16	Mon	75	290	
17	Tue	76	289	
18	Wed	77	288	
19	Thu	78	287	
20	Fri	79	286	
21	Sat	80	285	
22	Sun	81	284	13
23	Mon	82	283	
24	Tue	83	282	
25	Wed	84	281	
26	Thu	85	280	
27	Fri	86	279	
28	Sat	87	278	
29	Sun	88	277	14
30	Mon	89	276	
31	Tue	90	275	

Day of Month	4 April			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	91	274	14
2	Thu	92	273	
3	Fri	93	272	
4	Sat	94	271	
5	Sun	95	270	15
6	Mon	96	269	
7	Tue	97	268	
8	Wed	98	267	
9	Thu	99	266	
10	Fri	100	265	
11	Sat	101	264	
12	Sun	102	263	16
13	Mon	103	262	
14	Tue	104	261	
15	Wed	105	260	
16	Thu	106	259	
17	Fri	107	258	
18	Sat	108	257	
19	Sun	109	256	17
20	Mon	110	255	
21	Tue	111	254	
22	Wed	112	253	
23	Thu	113	252	
24	Fri	114	251	
25	Sat	115	250	
26	Sun	116	249	18
27	Mon	117	248	
28	Tue	118	247	
29	Wed	119	246	
30	Thu	120	245	

Day of Month	5 May			
	Day of Week	Day of Year	Days remaining	Week number
1	Fri	121	244	18
2	Sat	122	243	
3	Sun	123	242	19
4	Mon	124	241	
5	Tue	125	240	
6	Wed	126	239	
7	Thu	127	238	
8	Fri	128	237	
9	Sat	129	236	
10	Sun	130	235	20
11	Mon	131	234	
12	Tue	132	233	
13	Wed	133	232	
14	Thu	134	231	
15	Fri	135	230	
16	Sat	136	229	
17	Sun	137	228	21
18	Mon	138	227	
19	Tue	139	226	
20	Wed	140	225	
21	Thu	141	224	
22	Fri	142	223	
23	Sat	143	222	
24	Sun	144	221	22
25	Mon	145	220	
26	Tue	146	219	
27	Wed	147	218	
28	Thu	148	217	
29	Fri	149	216	
30	Sat	150	215	
31	Sun	151	214	23

Day of Month	6 June			
	Day of Week	Day of Year	Days remaining	Week number
1	Mon	152	213	23
2	Tue	153	212	
3	Wed	154	211	
4	Thu	155	210	
5	Fri	156	209	
6	Sat	157	208	
7	Sun	158	207	24
8	Mon	159	206	
9	Tue	160	205	
10	Wed	161	204	
11	Thu	162	203	
12	Fri	163	202	
13	Sat	164	201	
14	Sun	165	200	25
15	Mon	166	199	
16	Tue	167	198	
17	Wed	168	197	
18	Thu	169	196	
19	Fri	170	195	
20	Sat	171	194	
21	Sun	172	193	26
22	Mon	173	192	
23	Tue	174	191	
24	Wed	175	190	
25	Thu	176	189	
26	Fri	177	188	
27	Sat	178	187	
28	Sun	179	186	27
29	Mon	180	185	
30	Tue	181	184	

Day of Week, Week Number, Day of Year, Remaining Days of Year

Day of Month	7 July			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	182	183	27
2	Thu	183	182	
3	Fri	184	181	
4	Sat	185	180	
5	Sun	186	179	28
6	Mon	187	178	
7	Tue	188	177	
8	Wed	189	176	
9	Thu	190	175	
10	Fri	191	174	
11	Sat	192	173	
12	Sun	193	172	29
13	Mon	194	171	
14	Tue	195	170	
15	Wed	196	169	
16	Thu	197	168	
17	Fri	198	167	
18	Sat	199	166	
19	Sun	200	165	30
20	Mon	201	164	
21	Tue	202	163	
22	Wed	203	162	
23	Thu	204	161	
24	Fri	205	160	
25	Sat	206	159	
26	Sun	207	158	31
27	Mon	208	157	
28	Tue	209	156	
29	Wed	210	155	
30	Thu	211	154	
31	Fri	212	153	

Day of Month	8 August			
	Day of Week	Day of Year	Days remaining	Week number
1	Sat	213	152	31
2	Sun	214	151	32
3	Mon	215	150	
4	Tue	216	149	
5	Wed	217	148	
6	Thu	218	147	
7	Fri	219	146	
8	Sat	220	145	
9	Sun	221	144	33
10	Mon	222	143	
11	Tue	223	142	
12	Wed	224	141	
13	Thu	225	140	
14	Fri	226	139	
15	Sat	227	138	
16	Sun	228	137	34
17	Mon	229	136	
18	Tue	230	135	
19	Wed	231	134	
20	Thu	232	133	
21	Fri	233	132	
22	Sat	234	131	
23	Sun	235	130	35
24	Mon	236	129	
25	Tue	237	128	
26	Wed	238	127	
27	Thu	239	126	
28	Fri	240	125	
29	Sat	241	124	
30	Sun	242	123	36
31	Mon	243	122	

Day of Month	9 September			
	Day of Week	Day of Year	Days remaining	Week number
1	Tue	244	121	36
2	Wed	245	120	
3	Thu	246	119	
4	Fri	247	118	
5	Sat	248	117	
6	Sun	249	116	37
7	Mon	250	115	
8	Tue	251	114	
9	Wed	252	113	
10	Thu	253	112	
11	Fri	254	111	
12	Sat	255	110	
13	Sun	256	109	38
14	Mon	257	108	
15	Tue	258	107	
16	Wed	259	106	
17	Thu	260	105	
18	Fri	261	104	
19	Sat	262	103	
20	Sun	263	102	39
21	Mon	264	101	
22	Tue	265	100	
23	Wed	266	99	
24	Thu	267	98	
25	Fri	268	97	
26	Sat	269	96	
27	Sun	270	95	40
28	Mon	271	94	
29	Tue	272	93	
30	Wed	273	92	

Day of Month	10 October			
	Day of Week	Day of Year	Days remaining	Week number
1	Thu	274	91	40
2	Fri	275	90	
3	Sat	276	89	
4	Sun	277	88	41
5	Mon	278	87	
6	Tue	279	86	
7	Wed	280	85	
8	Thu	281	84	
9	Fri	282	83	
10	Sat	283	82	
11	Sun	284	81	42
12	Mon	285	80	
13	Tue	286	79	
14	Wed	287	78	
15	Thu	288	77	
16	Fri	289	76	
17	Sat	290	75	
18	Sun	291	74	43
19	Mon	292	73	
20	Tue	293	72	
21	Wed	294	71	
22	Thu	295	70	
23	Fri	296	69	
24	Sat	297	68	
25	Sun	298	67	44
26	Mon	299	66	
27	Tue	300	65	
28	Wed	301	64	
29	Thu	302	63	
30	Fri	303	62	
31	Sat	304	61	

Day of Month	11 November			
	Day of Week	Day of Year	Days remaining	Week number
1	Sun	305	60	45
2	Mon	306	59	
3	Tue	307	58	
4	Wed	308	57	
5	Thu	309	56	
6	Fri	310	55	
7	Sat	311	54	
8	Sun	312	53	46
9	Mon	313	52	
10	Tue	314	51	
11	Wed	315	50	
12	Thu	316	49	
13	Fri	317	48	
14	Sat	318	47	
15	Sun	319	46	47
16	Mon	320	45	
17	Tue	321	44	
18	Wed	322	43	
19	Thu	323	42	
20	Fri	324	41	
21	Sat	325	40	
22	Sun	326	39	48
23	Mon	327	38	
24	Tue	328	37	
25	Wed	329	36	
26	Thu	330	35	
27	Fri	331	34	
28	Sat	332	33	
29	Sun	333	32	49
30	Mon	334	31	

Day of Month	12 December			
	Day of Week	Day of Year	Days remaining	Week number
1	Tue	335	30	49
2	Wed	336	29	
3	Thu	337	28	
4	Fri	338	27	
5	Sat	339	26	
6	Sun	340	25	50
7	Mon	341	24	
8	Tue	342	23	
9	Wed	343	22	
10	Thu	344	21	
11	Fri	345	20	
12	Sat	346	19	
13	Sun	347	18	51
14	Mon	348	17	
15	Tue	349	16	
16	Wed	350	15	
17	Thu	351	14	
18	Fri	352	13	
19	Sat	353	12	
20	Sun	354	11	52
21	Mon	355	10	
22	Tue	356	9	
23	Wed	357	8	
24	Thu	358	7	
25	Fri	359	6	
26	Sat	360	5	
27	Sun	361	4	1
28	Mon	362	3	
29	Tue	363	2	
30	Wed	364	1	
31	Thu	365	0	

Thirty days hath September, April, June, and November; February has twenty-eight alone, All the rest have thirty-one,
Excepting leap-year, that's the time when February's days are twenty-nine.

Useful Information

Time Signals- by telephone

WWV 303-499-7111 **WWVH** 808-335-4363

CHU **English:** 613-745-1576 (CHU provides only Eastern time announcements)
French: 613-745-9426

Time signals- by Radio

WWV (Fort Collins, Colorado)	2.5, 5, 10, 15, 20 MHz (male voice)
WWVH (Kauai, Hawaii)	2.5, 5, 10, 15 MHz (female voice)
CHU (Ottawa, Canada)	3330, 7850, and 14,670 kHz (USB)

Bowditch *2024- The American Practical Navigator*

https://TheNauticalAlmanac.com/2024_Bowditch-_American_Practical_Navigator.html

Organized in a convenient and useful manner. Download the Chapters, Parts or Tables you want or the entire work.

Sight Reduction Tables

Pub. No. 249 Download individual Latitudes or Volumes

Epoch 2025 https://thenauticalalmanac.com/Pub_No_249_Epoch_2025.html

Epoch 2020 https://www.thenauticalalmanac.com/Pub_No_249_Epoch_2020.html

Pub. No. 229 Download individual Volumes covering a range of Latitudes

https://TheNauticalAlmanac.com/Pub_No_229.html

Sight Reduction Forms & Methods

https://www.TheNauticalAlmanac.com/Methods.html

Celestial Navigation

useful Formulas

About Calculators

The Casio *fx-300ES Plus* is an inexpensive calculator at about 11 USD. It features *natural input* so you enter a formula just as it would be written on paper. Entering degrees, minutes and seconds is very simple. The Casio *fx-300ES Plus* has 9 memory locations and you can review many of the previous entries you make using a special key on the calculator.

Determine Hc using a calculator

The formula

Hc = asin[sin(**Declination**)*sin(**Latitude**) + cos(**Latitude**)*cos(**Declination**)*cos(**LHA**)]

As it would be entered into the Casio calculator Note- Sin^{-1} is the arc-sin key

Sin^{-1}(Sin(**Ap Latitude**) x Sin(**Declination**) + Cos(**Ap Latitude)** x Cos(**Declination**) x Cos(**LHA**)

Declination is the declination of the Celestial body you're observing. When the heavenly body's declination is *Contrary name* to your Ap Latitude enter a negative sign before it.

Latitude "The AP latitude is chosen to be the nearest whole degree in latitude to the DR latitude." *from Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310* Consider this to be where you are, think you are or where you would like to determine Hc for. Typically, you'll be using an *Assumed position Latitude* or *Ap Latitude* as it's called. *See Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310*

About LHA determination

Assumed Position longitude (***a* λ**) "The AP longitude is that nearest the DR longitude resulting in a whole degree of LHA for the observed body." *From Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310*

In Western Longitudes *see Bowditch 2019 Vol. 1 Chapter 19 section 1905 p. 313*

LHA is the Local Hour Angle derived by subtracting your Assumed Longitude (***a* λ**) whole degree value from the whole degree ***GHA*** (Greenwich Hour Angle) value. If GHA is less than the ***a* λ** than the add 360° to it then subtract the ***a* λ.** *Ignore the arc minutes* of GHA and ***a* λ.**

Example when GHA is less than ***a* λ** **GHA**= 43° 25.2' ***a* λ**= W 55° 15.1'

360° + 43° = 403° Then....403° – 55° = 348° (LHA)

In Eastern Longitudes *see Bowditch 2019 Vol. 1 Chapter 19 section 1905 p. 313*

LHA**, in **Eastern Longitudes, is determined by adding the entire GHA figure (degrees and minutes) to the whole degree figure of the Assumed longitude (***a* λ**) *plus* the amount of arc minutes required to get to the next degree of the GHA. If the resulting LHA figure is greater than 360° then subtract 360° from the figure to obtain the LHA.

Example- **GHA**= 58° 01.2' ***a* λ**= E 9° 10.1' (ignore the 10.1')

Step 1- *get GHA degree difference;* 59° - 58° 01.2' = 0° 58.8'

Step 2- add *a* λ degrees to *difference* found in step 1; 9° + 0°58.8' = 9° 58.8' *a* λ

Step 3- *get LHA;* 58° 01.2 + 9° 58.8' = 68° (LHA)

Why would you want to determine Hc using a calculator?

It's faster than looking up in Pub. No. 249 and Pub. No. 229, highly accurate and you don't need a lot of printed out pages of Latitudes from Pub. No. 249 and Pub. No. 229. Pub. No. 249 Vol. 2 & 3 don't cover any declination greater than 29 degrees so you'd have to use Pub. No. 229 which is extremely large.

Celestial Navigation

Determine Z

Z = acos[(sin(**Declination**) – sin(**Ap Latitude)** x sin(**Hc**)) ÷ (cos(**Ap Latitude**) x cos(**Hc**))]

As it would be entered into the Casio calculator... Note- Cos^{-1} is the arc-cosine key

Cos^{-1}((Sin(**Declination**) – Sin(**AP Latitude**) x Sin(**Hc**)) ÷ (Cos(**AP Latitude**) x Cos(**Hc**)

If the heavenly body's declination is *Contrary name* to the Ap Latitude enter a negative sign before it.

To obtain Zn see the rules below for Northern and Southern latitudes.

Determine Z independent of Hc

$$Z = \tan^{-1}\left(\frac{\sin \mathrm{LHA}}{(\cos \mathrm{L} \tan \mathrm{d}) - (\sin \mathrm{L} \cos \mathrm{LHA})}\right)$$

"L" is latitude and "*d"* is declination. When the heavenly body's declination is *Contrary name* to your Ap Latitude enter a negative sign before it.

As it would be entered into the Casio calculator... Note- $\tan^{-1}$ is the arc-tangent key

Z = $\tan^{-1}$ ((sin (**LHA**) ÷ (cos(**AP latitude**) x tan(**declination**) – (sin(**AP latitude**) x cos(**LHA**))

The sign convention used in the calculation of this azimuth formula is as follows:
from *Bowditch Chapter 22 CALCULATIONS AND CONVERSIONS, page 331*

1) If latitude and declination are of contrary name, declination is treated as a negative quantity;
2) If the local hour angle is greater than 180°, it is treated as a negative quantity. If the azimuth angle as calculated is negative, add 180° to obtain the desired value.

To obtain Zn apply the following rules

In Northern Latitudes	**In Southern Latitudes**
LHA greater than 180°....Zn=Z	LHA greater than 180°....Zn= 180° – Z
LHA less than 180°.....Zn=360° – Z	LHA less than 180°.....Zn= 180° + Z

Determine Refraction 0.96 ÷ Tan of (Ha)
Gives good results down to about 8° from the horizon but not less.

Refraction (good overall formula from 90° to below 8° from the horizon)

$$R_0 = \cot\left(H_a + \frac{7.31}{H_a + 4.4}\right)$$

As it would be entered into the Casio calculator...

1 ÷ Tan((Ha + (7.31 ÷ (Ha + 4.4))

Both refraction formulas use the standard pressure and temperature of;

1010 mb	10° C
29.83 in	53° F

Determine Dip using feet 0.97 x (Square Root of *He* (Height of Eye) in feet)

Determine Dip using meters 1.76 x (Square Root of *He* (Height of eye) in meters)

Rules to Calculate Latitude using the Sun- *Noon-Sight*

1- Latitude and declination *Same name* but latitude is greater than declination:

Latitude= (90° – Ho) + declination

2- Latitude and declination *Same name* but declination greater than latitude:

Latitude= Declination – (90° – Ho)

3- Latitude and declination *Contrary name*:

Latitude= (90° – Ho) – Declination

To get AP longitude (needed for plotting the LOP)

In Western longitudes

Combine the DR Longitude figure with only the minutes (of arc) of the total GHA figure. The Ap λ figure will be used when plotting the LOP on the UPS.

In Eastern longitudes

In Eastern longitudes the Ap λ is determined as follows;

DR longitude + (0°60' *minus* GHA minutes of arc)

Example- E 075° + (0°60' – 0° 02')= 75° 58' Ap longitude

fair winds...clear skies and following seas
TheNauticalAlmanac.com

Formula Sheet added to NA.odt

Explanation of The Nautical Almanac *Daily Pages*

1	Date and Time based on GMT/UT
2	**Mer. pass**- meridian passage of Aries at the Prime Meridian- Greenwich- 0°. Time figure is GMT/UT.
3	Planet or Moon GHA **v** value and planet or Moon declination **d** value. **v**- "The change in hour angle arising from v of the body at the time of the sight observation is accounted for with the *v correction*." *Source- Bowditch 2017, Chapter 19- Sight Reduction p. 313.* The planet's **v** is positive unless preceeded by a minus sign which is sometimes the case with Venus. The sign of the Moon's **v** is positive. **d**- "The change in declination of the body at the time of the sight observation is accounted for with the *d correction*." *Source- Bowditch 2017, Chapter 19- Sight Reduction p. 313.* The sign of the Moon or planet's **d** correction is determined by the declination trend- positive if successive declination values increase and negative if they decrease. Corrections for both **v** and **d** are found in the Increments and Corrections pages of The Nautical Almanac. To find the correction for either **v** or **d** enter the Increments and Corrections pages for the minutes in time of the observation and find the value in the **v and d corr.** columns Find the **v**, or **d**, value in the left side of one of the three columns. To the right of that value is the **v**, or **d**, correction. Be sure to add or subtract the values depending upon the *sign* of the value as mentioned above.
	Example for v & d correction- June 10, 2020 GMT- 21:19:10 Body- Moon
	GHA= 247° 20.6′ ***v =*** 12.1′ GHA increment 4° 34.4′ ***v-*** correction for 12.1′ + 0° 03.9′ GHA= 251° 58.9′ Dec= S 17° 43.8′ **d**= 8.9′ **d-** correction for 8.9′ – 0° 02.9′ dec= S 17° 40.9′ *declination trend is decreasing so the sign of d correction is negative*
4	**m**- is the *magnitude* or brightness of the planet. A bright planet will have a *minus* sign beside the figure. A fainter planet will have no sign beside its magnitude figure.
5	**Stars**- **SHA**, *Sidereal Hour Angle*, and **Declination**. 59 stars are listed. Typically, only 57 stars are used for navigational purposes in both Northern and Southern Hemispheres. Here you'll also find Polaris and Scheat. In the Northern Hemisphere Polaris is often used for determination of latitude.
6	**Mer. pass**- planet meridian passage time at the Prime Meridian- Greenwich- 0°. Time figure is GMT/UT.
7	**SHA**- planet SHA. Planet SHA is calculated by subtracting Aries GHA from planet GHA. If planet GHA figure is less than Aries GHA, add 360° to planet GHA and then subtract Aries GHA.
8	**Horizontal parallax**- for Venus and Mars. Horizontal parallax is the angle subtended by half the Earth's diameter as viewed from the planet in minutes of arc.
9	**SD**- Semi-diameter of the Sun in minutes of arc. One half of the angular width of the Sun as observed on earth.
10	**d**- the daily average change, per hour, in the Sun's declination in minutes of arc.

11	**SD**- Semi-diameter of the Moon in minutes of arc. Semi-diameter is one half of the angular width of the Moon, as observed on earth.
12	**HP**- the angle between two lines, one from the center of the Moon to the center of the Earth, the other from the center of the Moon to the edge of the Earth. This angle is about 56', but it changes slightly from day to day as the distance to the Moon changes along its elliptical path around the Earth. *Source- starpath.com*
13	**Sun- Eqn. of Time**- Basically the Equation of Time (EoT) is the difference between clock time and time seen on a sundial. This is comparing "clock time", as a mechanical measurement of time, and the sundial being time determined by the position of the Sun at any given moment. The figures listed are for 00^h and 12^h. Using the EoT you can get fairly accurate determination of when Meridian Passage (Local Apparent Noon) occurs at your position. Unshaded EoT values are subtracted from 12:00 to get Meridian Passage. Shaded EoT values are added to 12:00 to get Meridian Passage. An Equation of Time chart (as a curve) is provided in each almanac on TheNauticalAlmanac.com **Example**- Meridian Passage on May 30, 2020 equals 12:00 – EoT of 2 minutes 21 seconds MP= 11:57:39 *Local Apparent Noon* **Example**- Meridian Passage on August 25, 2020 equals 12:00 + EoT of 1 minute 59 seconds MP= 12:01:59 *Local Apparent Noon*
14	**Sun- Mer. Pass** just to the right of the **Eqn. of Time** is the approximate GMT/UT when the Sun crosses The Prime Meridian (at Greenwich) for that specific date.
15	**Moon- Mer. Pass**- is the approximate GMT/UT when the Moon crosses The Prime Meridian (at Greenwich) or the 180° line of longitude. **Upper** means the GMT/UT when the Moon crosses The Prime Meridian (Greenwich). **Lower** means the GMT/UT when the Moon crosses the 180° line of longitude.
16	**Moon- Age**- this is the number of days past a new Moon. Typically, there are 29 days in a lunar month. Moon- %- the amount of the Moon's illumination. 100% would be a full moon. 49% would be about ½ of the Moon is illuminated. A 3 day range percentage is provided but only one graphic for the phase.
17* see notes at bottom	**(morning) Twilight- Naut.**- the approximate GMT/UT when morning Nautical Twilight begins. Nautical twilight is the time when the center of the sun is 12° below the horizon and the horizon is visible enough to be used for marine sextant observations. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(morning) Twilight- Civil-** the approximate GMT/UT of morning civil twilight starts when the geometric center of the sun is 6° below the horizon. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* *see* notes *at bottom*	**Sunrise**- the approximate GMT/UT when the Sun is 0° 50' (semi-diameter plus refraction) below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.

17* see notes at bottom	**Sunset**- the approximate GMT/UT when the Sun is 0° 50' (semi-diameter plus refraction) below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(evening) Twilight- Civil-** the approximate GMT/UT of evening civil twilight that ends when the geometric center of the sun is 6° below the horizon. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(evening) Twilight- Naut.**- the approximate GMT/UT of when evening Nautical Twilight ends. Nautical twilight is the time when the center of the sun is 12° below the horizon and the horizon is no longer visible enough to be used for sextant observations. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.
18* see notes at bottom	**Moonrise**- the approximate GMT/UT when the Moon is about 0° 05' to 0° 10' below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time under the specific day.
18* see notes at bottom	**Moonset**- the approximate GMT/UT when the Moon is about 0° 05' to 0° 10' below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time under the specific day.

* Note-

▭ means the Sun or Moon remains continuously above the horizon on that day.

–:– can also mean twilight lasts all night

▬ means the Sun or Moon remains continuously below the horizon on that day.

–:– means Moon does not rise or set on that day but may have risen or set the previous day or following day.

* **Note**- Time of Sunrise, Sunset, Moonrise, Moonset and twilight is based on GMT/UT of the event at 0° (Greenwich) and can be condsidered as approximate LMT (Local Mean Time) with a tolerance of +/- 30 minutes depending on where you are within a time zone.

Wednesday, February 24, 2021

Explanation_of_The_Nautical_Almanac_Daily_Pages.odt

January 01, 02 ,03 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°32.5	181°58.1	S23°38.5	318°04.0	N18°45.1	131°37.2	S13°36.5	275°29.9	N00°18.5
1	115°35.0	196°57.1	38.4	333°06.8	45.4	146°39.2	36.4	290°32.3	18.5
2	130°37.4	211°56.1	38.3	348°09.6	45.6	161°41.2	36.2	305°34.7	18.5
3	145°39.9	226°55.1	·· 38.2	3°12.4	·· 45.8	176°43.2	·· 36.0	320°37.1	·· 18.5
4	160°42.4	241°54.2	38.1	18°15.2	46.0	191°45.1	35.8	335°39.5	18.5
5	175°44.8	256°53.2	38.0	33°18.1	46.2	206°47.1	35.7	350°41.9	18.5
6	190°47.3	271°52.2	S23°37.9	48°20.9	N18°46.5	221°49.1	S13°35.5	5°44.3	N00°18.5
7	205°49.8	286°51.3	37.8	63°23.7	46.7	236°51.1	35.3	20°46.7	18.5
8	220°52.2	301°50.3	37.7	78°26.5	46.9	251°53.0	35.1	35°49.2	18.5
9	235°54.7	316°49.3	·· 37.6	93°29.4	·· 47.1	266°55.0	·· 35.0	50°51.6	·· 18.4
10	250°57.2	331°48.4	37.5	108°32.2	47.3	281°57.0	34.8	65°54.0	18.4
11	265°59.6	346°47.4	37.4	123°35.0	47.6	296°59.0	34.6	80°56.4	18.4
12	281°02.1	1°46.4	S23°37.3	138°37.9	N18°47.8	312°00.9	S13°34.4	95°58.8	N00°18.4
13	296°04.5	16°45.5	37.2	153°40.7	48.0	327°02.9	34.3	111°01.2	18.4
14	311°07.0	31°44.5	37.1	168°43.5	48.2	342°04.9	34.1	126°03.6	18.4
15	326°09.5	46°43.5	·· 37.0	183°46.4	·· 48.5	357°06.8	·· 33.9	141°06.0	·· 18.4
16	341°11.9	61°42.6	36.9	198°49.2	48.7	12°08.8	33.7	156°08.4	18.4
17	356°14.4	76°41.6	36.8	213°52.0	48.9	27°10.8	33.6	171°10.8	18.4
18	11°16.9	91°40.6	S23°36.7	228°54.9	N18°49.1	42°12.8	S13°33.4	186°13.2	N00°18.3
19	26°19.3	106°39.6	36.5	243°57.7	49.4	57°14.7	33.2	201°15.7	18.3
20	41°21.8	121°38.7	36.4	259°00.6	49.6	72°16.7	33.0	216°18.1	18.3
21	56°24.3	136°37.7	·· 36.3	274°03.4	·· 49.8	87°18.7	·· 32.9	231°20.5	·· 18.3
22	71°26.7	151°36.7	36.2	289°06.3	50.0	102°20.7	32.7	246°22.9	18.3
23	86°29.2	166°35.8	36.1	304°09.1	50.3	117°22.6	32.5	261°25.3	18.3
Mer.pass.:17:14		v-1.0 d0.1		v2.8 d0.2		v2.0 d0.2		v2.4 d-0.0	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	101°31.7	181°34.8	S23°36.0	319°12.0	N18°50.5	132°24.6	S13°32.3	276°27.7	N00°18.3
1	116°34.1	196°33.8	35.8	334°14.8	50.7	147°26.6	32.2	291°30.1	18.3
2	131°36.6	211°32.9	35.7	349°17.7	51.0	162°28.6	32.0	306°32.5	18.3
3	146°39.0	226°31.9	·· 35.6	4°20.5	·· 51.2	177°30.5	·· 31.8	321°34.9	·· 18.3
4	161°41.5	241°30.9	35.5	19°23.4	51.4	192°32.5	31.6	336°37.3	18.2
5	176°44.0	256°30.0	35.3	34°26.2	51.6	207°34.5	31.5	351°39.8	18.2
6	191°46.4	271°29.0	S23°35.2	49°29.1	N18°51.9	222°36.4	S13°31.3	6°42.2	N00°18.2
7	206°48.9	286°28.0	35.1	64°31.9	52.1	237°38.4	31.1	21°44.6	18.2
8	221°51.4	301°27.1	34.9	79°34.8	52.3	252°40.4	30.9	36°47.0	18.2
9	236°53.8	316°26.1	·· 34.8	94°37.7	·· 52.6	267°42.4	·· 30.8	51°49.4	·· 18.2
10	251°56.3	331°25.1	34.7	109°40.5	52.8	282°44.3	30.6	66°51.8	18.2
11	266°58.8	346°24.2	34.5	124°43.4	53.0	297°46.3	30.4	81°54.2	18.2
12	282°01.2	1°23.2	S23°34.4	139°46.3	N18°53.3	312°48.3	S13°30.2	96°56.6	N00°18.2
13	297°03.7	16°22.2	34.3	154°49.1	53.5	327°50.2	30.1	111°59.1	18.2
14	312°06.1	31°21.3	34.1	169°52.0	53.7	342°52.2	29.9	127°01.5	18.2
15	327°08.6	46°20.3	·· 34.0	184°54.9	·· 54.0	357°54.2	·· 29.7	142°03.9	·· 18.1
16	342°11.1	61°19.3	33.8	199°57.7	54.2	12°56.2	29.5	157°06.3	18.1
17	357°13.5	76°18.4	33.7	215°00.6	54.4	27°58.1	29.3	172°08.7	18.1
18	12°16.0	91°17.4	S23°33.6	230°03.5	N18°54.7	43°00.1	S13°29.2	187°11.1	N00°18.1
19	27°18.5	106°16.5	33.4	245°06.4	54.9	58°02.1	29.0	202°13.5	18.1
20	42°20.9	121°15.5	33.3	260°09.3	55.1	73°04.0	28.8	217°16.0	18.1
21	57°23.4	136°14.5	·· 33.1	275°12.1	·· 55.4	88°06.0	·· 28.6	232°18.4	·· 18.1
22	72°25.9	151°13.6	33.0	290°15.0	55.6	103°08.0	28.5	247°20.8	18.1
23	87°28.3	166°12.6	32.8	305°17.9	55.9	118°09.9	28.3	262°23.2	18.1
Mer.pass.:17:11		v-1.0 d0.1		v2.9 d0.2		v2.0 d0.2		v2.4 d-0.0	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	102°30.8	181°11.6	S23°32.7	320°20.8	N18°56.1	133°11.9	S13°28.1	277°25.6	N00°18.1
1	117°33.3	196°10.7	32.5	335°23.7	56.3	148°13.9	27.9	292°28.0	18.1
2	132°35.7	211°09.7	32.4	350°26.6	56.6	163°15.9	27.8	307°30.4	18.1
3	147°38.2	226°08.7	·· 32.2	5°29.4	·· 56.8	178°17.8	·· 27.6	322°32.9	·· 18.0
4	162°40.6	241°07.8	32.0	20°32.3	57.0	193°19.8	27.4	337°35.3	18.0
5	177°43.1	256°06.8	31.9	35°35.2	57.3	208°21.8	27.2	352°37.7	18.0
6	192°45.6	271°05.8	S23°31.7	50°38.1	N18°57.5	223°23.7	S13°27.0	7°40.1	N00°18.0
7	207°48.0	286°04.9	31.6	65°41.0	57.8	238°25.7	26.9	22°42.5	18.0
8	222°50.5	301°03.9	31.4	80°43.9	58.0	253°27.7	26.7	37°44.9	18.0
9	237°53.0	316°03.0	·· 31.2	95°46.8	·· 58.2	268°29.6	·· 26.5	52°47.4	·· 18.0
10	252°55.4	331°02.0	31.1	110°49.7	58.5	283°31.6	26.3	67°49.8	18.0
11	267°57.9	346°01.0	30.9	125°52.6	58.7	298°33.6	26.2	82°52.2	18.0
12	283°00.4	1°00.1	S23°30.7	140°55.5	N18°59.0	313°35.5	S13°26.0	97°54.6	N00°18.0
13	298°02.8	15°59.1	30.6	155°58.4	59.2	328°37.5	25.8	112°57.0	18.0
14	313°05.3	30°58.1	30.4	171°01.3	59.5	343°39.5	25.6	127°59.4	18.0
15	328°07.8	45°57.2	·· 30.2	186°04.2	·· 59.7	358°41.4	·· 25.4	143°01.9	·· 18.0
16	343°10.2	60°56.2	30.1	201°07.1	18°59.9	13°43.4	25.3	158°04.3	17.9
17	358°12.7	75°55.3	29.9	216°10.0	19°00.2	28°45.4	25.1	173°06.7	17.9
18	13°15.1	90°54.3	S23°29.7	231°13.0	N19°00.4	43°47.3	S13°24.9	188°09.1	N00°17.9
19	28°17.6	105°53.3	29.5	246°15.9	00.7	58°49.3	24.7	203°11.5	17.9
20	43°20.1	120°52.4	29.4	261°18.8	00.9	73°51.3	24.6	218°13.9	17.9
21	58°22.5	135°51.4	·· 29.2	276°21.7	·· 01.2	88°53.3	·· 24.4	233°16.4	·· 17.9
22	73°25.0	150°50.4	29.0	291°24.6	01.4	103°55.2	24.2	248°18.8	17.9
23	88°27.5	165°49.5	28.8	306°27.5	01.7	118°57.2	24.0	263°21.2	17.9
Mer.pass.:17:07		v-1.0 d0.2		v2.9 d0.2		v2.0 d0.2		v2.4 d-0.0	

Stars

	SHA	Dec
Alpheratz	357°46.2	29°09.0
Ankaa	353°18.1	-42°15.2
Schedar	349°43.6	56°35.9
Diphda	348°58.3	-17°55.9
Achernar	335°28.3	-57°11.3
Hamal	328°03.5	23°30.8
Polaris	318°47.1	89°18.8
Akamar	315°19.9	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.0
Aldebaran	290°52.0	16°31.9
Rigel	281°14.1	-8°11.4
Capella	280°37.8	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.6	-1°11.7
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.1
Sirius	258°35.5	-16°43.6
Adara	255°14.1	-28°59.2
Procyon	245°01.9	5°12.0
Pollux	243°30.3	28°00.0
Avior	234°18.6	-59°32.4
Suhail	222°54.0	-43°28.3
Miaplacidus	221°39.7	-69°45.4
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.2	61°41.4
Denebola	182°36.0	14°30.8
Gienah	175°54.9	-17°35.9
Acrux	173°12.3	-63°09.1
Gacrux	172°03.9	-57°10.0
Alioth	166°22.8	55°53.9
Spica	158°34.0	-11°12.9
Alcaid	153°00.9	49°15.4
Hadar	148°51.9	-60°25.1
Menkent	148°10.8	-36°25.1
Arcturus	145°58.0	19°07.9
Rigil Kent.	139°55.6	-60°52.4
Zubenelg.	137°08.4	-16°05.0
Kochab	137°20.2	74°06.5
Alphecca	126°13.4	26°40.7
Antares	112°29.7	-26°27.2
Atria	107°34.4	-69°02.6
Sabik	102°15.8	-15°44.3
Shaula	96°25.8	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.2
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.8	-26°17.1
Altair	62°11.1	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.4
Alnair	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.0	15°15.7

Jan 01 Fri	SHA	Mer.pass
Venus	81°25.5	11:53
Mars	217°31.4	02:47
Jupiter	31°04.7	15:12
Saturn	174°57.4	05:37

Jan 02 Sat	SHA	Mer.pass
Venus	80°03.2	11:54
Mars	217°40.3	02:43
Jupiter	30°53.0	15:08
Saturn	174°56.1	05:33

Jan 03 Sun	SHA	Mer.pass
Venus	78°40.8	11:56
Mars	217°50.0	02:38
Jupiter	30°41.1	15:05
Saturn	174°54.8	05:29

Horizontal parallax	
Venus:	0.1
Mars:	0.2

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file date- June 16 2020

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2020 January 01 to Jan. 03

h	Sun		Moon				
Wed	GHA	Dec	GHA	v	Dec	d	HP
0	179° 13.7	S23° 03.5	110° 56.9	15.3′	S09° 58.5	10.7′	54.3′
1	194° 13.4	03.3	125° 31.3	15.4′	09° 47.8	10.7′	54.3′
2	209° 13.1	03.1	140° 05.7	15.4′	09° 37.1	10.7′	54.3′
3	224° 12.8	·· 03.0	154° 40.1	15.5′	09° 26.3	10.8′	54.3′
4	239° 12.5	02.8	169° 14.6	15.5′	09° 15.5	10.8′	54.3′
5	254° 12.2	02.6	183° 49.1	15.5′	09° 04.7	10.8′	54.2′
6	269° 11.9	S23° 02.4	198° 23.6	15.6′	S08° 53.8	10.9′	54.2′
7	284° 11.6	02.2	212° 58.2	15.6′	08° 42.9	10.9′	54.2′
8	299° 11.3	02.0	227° 32.8	15.6′	08° 32.0	10.9′	54.2′
9	314° 11.0	·· 01.8	242° 07.5	15.7′	08° 21.0	11.0′	54.2′
10	329° 10.7	01.6	256° 42.2	15.7′	08° 10.0	11.0′	54.2′
11	344° 10.4	01.4	271° 16.9	15.7′	07° 59.0	11.0′	54.2′
12	359° 10.1	S23° 01.2	285° 51.7	15.8′	S07° 48.0	11.1′	54.2′
13	14° 09.8	01.0	300° 26.4	15.8′	07° 36.9	11.1′	54.2′
14	29° 09.5	00.8	315° 01.2	15.8′	07° 25.8	11.1′	54.2′
15	44° 09.2	·· 00.6	329° 36.1	15.9′	07° 14.7	11.1′	54.2′
16	59° 08.9	00.4	344° 10.9	15.9′	07° 03.5	11.2′	54.2′
17	74° 08.6	00.2	358° 45.8	15.9′	06° 52.3	11.2′	54.2′
18	89° 08.3	S23° 00.0	13° 20.7	15.9′	S06° 41.1	11.2′	54.2′
19	104° 08.0	22° 59.7	27° 55.7	16.0′	06° 29.9	11.2′	54.2′
20	119° 07.7	59.5	42° 30.7	16.0′	06° 18.7	11.3′	54.2′
21	134° 07.5	·· 59.3	57° 05.6	16.0′	06° 07.4	11.3′	54.2′
22	149° 07.2	59.1	71° 40.6	16.0′	05° 56.1	11.3′	54.2′
23	164° 06.9	58.9	86° 15.7	16.0′	05° 44.8	11.3′	54.2′
	SD.=16.3	d=0.2			S.D.=14.8		

Thu	GHA	Dec	GHA	v	Dec	d	HP
0	179° 06.6	S22° 58.7	100° 50.7	16.1′	S05° 33.4	11.3′	54.2′
1	194° 06.3	58.5	115° 25.8	16.1′	05° 22.1	11.4′	54.2′
2	209° 06.0	58.3	130° 00.9	16.1′	05° 10.7	11.4′	54.2′
3	224° 05.7	·· 58.1	144° 36.0	16.1′	04° 59.3	11.4′	54.2′
4	239° 05.4	57.9	159° 11.1	16.1′	04° 47.9	11.4′	54.2′
5	254° 05.1	57.6	173° 46.3	16.1′	04° 36.5	11.4′	54.2′
6	269° 04.8	S22° 57.4	188° 21.4	16.2′	S04° 25.0	11.5′	54.2′
7	284° 04.5	57.2	202° 56.6	16.2′	04° 13.5	11.5′	54.2′
8	299° 04.2	57.0	217° 31.7	16.2′	04° 02.1	11.5′	54.2′
9	314° 03.9	·· 56.8	232° 06.9	16.2′	03° 50.6	11.5′	54.2′
10	329° 03.6	56.6	246° 42.1	16.2′	03° 39.0	11.5′	54.2′
11	344° 03.3	56.3	261° 17.3	16.2′	03° 27.5	11.5′	54.2′
12	359° 03.0	S22° 56.1	275° 52.6	16.2′	S03° 16.0	11.5′	54.2′
13	14° 02.8	55.9	290° 27.8	16.2′	03° 04.4	11.6′	54.2′
14	29° 02.5	55.7	305° 03.0	16.2′	02° 52.8	11.6′	54.2′
15	44° 02.2	·· 55.5	319° 38.3	16.2′	02° 41.3	11.6′	54.2′
16	59° 01.9	55.2	334° 13.5	16.2′	02° 29.7	11.6′	54.2′
17	74° 01.6	55.0	348° 48.8	16.3′	02° 18.1	11.6′	54.2′
18	89° 01.3	S22° 54.8	3° 24.0	16.3′	S02° 06.5	11.6′	54.2′
19	104° 01.0	54.6	17° 59.3	16.3′	01° 54.8	11.6′	54.2′
20	119° 00.7	54.3	32° 34.5	16.3′	01° 43.2	11.6′	54.2′
21	134° 00.4	·· 54.1	47° 09.8	16.3′	01° 31.6	11.6′	54.2′
22	149° 00.1	53.9	61° 45.0	16.3′	01° 19.9	11.7′	54.2′
23	163° 59.8	53.7	76° 20.3	16.3′	01° 08.2	11.7′	54.3′
	SD.=16.3	d=0.2			S.D.=14.8		

Fri	GHA	Dec	GHA	v	Dec	d	HP
0	178° 59.5	S22° 53.4	90° 55.5	16.2′	S00° 56.6	11.7′	54.3′
1	193° 59.3	53.2	105° 30.8	16.2′	00° 44.9	11.7′	54.3′
2	208° 59.0	53.0	120° 06.0	16.2′	00° 33.2	11.7′	54.3′
3	223° 58.7	·· 52.7	134° 41.3	16.2′	00° 21.5	11.7′	54.3′
4	238° 58.4	52.5	149° 16.5	16.2′	S00° 09.9	11.7′	54.3′
5	253° 58.1	52.3	163° 51.7	16.2′	N00° 01.8	11.7′	54.3′
6	268° 57.8	S22° 52.0	178° 26.9	16.2′	N00° 13.5	11.7′	54.3′
7	283° 57.5	51.8	193° 02.1	16.2′	00° 25.2	11.7′	54.3′
8	298° 57.2	51.6	207° 37.3	16.2′	00° 36.9	11.7′	54.3′
9	313° 56.9	·· 51.3	222° 12.5	16.2′	00° 48.6	11.7′	54.3′
10	328° 56.6	51.1	236° 47.7	16.2′	01° 00.3	11.7′	54.3′
11	343° 56.4	50.8	251° 22.8	16.1′	01° 12.0	11.7′	54.4′
12	358° 56.1	S22° 50.6	265° 58.0	16.1′	N01° 23.7	11.7′	54.4′
13	13° 55.8	50.4	280° 33.1	16.1′	01° 35.4	11.7′	54.4′
14	28° 55.5	50.1	295° 08.2	16.1′	01° 47.1	11.7′	54.4′
15	43° 55.2	·· 49.9	309° 43.3	16.1′	01° 58.8	11.7′	54.4′
16	58° 54.9	49.6	324° 18.4	16.1′	02° 10.5	11.7′	54.4′
17	73° 54.6	49.4	338° 53.4	16.0′	02° 22.2	11.7′	54.4′
18	88° 54.3	S22° 49.2	353° 28.4	16.0′	N02° 33.9	11.7′	54.4′
19	103° 54.0	48.9	8° 03.5	16.0′	02° 45.6	11.7′	54.4′
20	118° 53.8	48.7	22° 38.4	16.0′	02° 57.3	11.7′	54.5′
21	133° 53.5	·· 48.4	37° 13.4	16.0′	03° 09.0	11.7′	54.5′
22	148° 53.2	48.2	51° 48.4	15.9′	03° 20.6	11.7′	54.5′
23	163° 52.9	47.9	66° 23.3	15.9′	03° 32.3	11.7′	54.5′
	SD.=16.3	d=0.2			S.D.=14.8		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:23	10:41	▬	▬	13:27	15:45
N 70°	08:05	09:49	▬	▬	14:19	16:03
68°	07:50	09:16	▬	▬	14:52	16:18
66°	07:37	08:53	10:27	13:41	15:15	16:31
64°	07:26	08:34	09:49	14:19	15:34	16:41
62°	07:17	08:18	09:23	14:45	15:49	16:51
60°	07:09	08:05	09:02	15:06	16:02	16:59
N 58°	07:02	07:54	08:45	15:23	16:14	17:06
56°	06:56	07:44	08:31	15:37	16:24	17:12
54°	06:50	07:35	08:19	15:49	16:32	17:18
52°	06:44	07:28	08:08	16:00	16:40	17:24
50°	06:39	07:20	07:58	16:09	16:47	17:29
45°	06:28	07:05	07:38	16:29	17:03	17:40
N 40°	06:18	06:52	07:22	16:46	17:16	17:50
35°	06:08	06:40	07:08	17:00	17:28	17:59
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:11	06:35	17:32	17:56	18:24
N 10°	05:28	05:54	06:17	17:50	18:13	18:40
0°	05:11	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:24	18:43	19:08	19:37
30°	04:02	04:35	05:03	19:05	19:32	20:05
35°	03:44	04:20	04:50	19:17	19:47	20:23
40°	03:21	04:03	04:35	19:32	20:05	20:46
45°	02:52	03:41	04:18	19:50	20:27	21:15
S 50°	02:08	03:12	03:56	20:11	20:55	21:59
52°	01:42	02:57	03:45	20:22	21:10	22:24
54°	01:02	02:40	03:33	20:34	21:27	23:03
56°	▭	02:19	03:20	20:47	21:48	▭
58°	▭	01:51	03:03	21:04	22:15	▭
S 60°	▭	01:08	02:44	21:23	22:58	▭

18

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	12:37	12:18	12:00	21:58	23:43	–:–
N 70°	12:26	12:13	12:02	22:06	23:44	–:–
68°	12:17	12:10	12:03	22:14	23:45	–:–
66°	12:09	12:07	12:04	22:20	23:46	–:–
64°	12:02	12:04	12:05	22:25	23:47	–:–
62°	11:57	12:02	12:06	22:29	23:48	–:–
60°	11:52	12:00	12:07	22:33	23:49	–:–
N 58°	11:48	11:58	12:08	22:36	23:49	–:–
56°	11:44	11:56	12:08	22:39	23:50	–:–
54°	11:40	11:55	12:09	22:42	23:50	–:–
52°	11:37	11:54	12:10	22:44	23:51	–:–
50°	11:34	11:52	12:10	22:46	23:51	–:–
45°	11:28	11:50	12:11	22:51	23:52	–:–
N 40°	11:23	11:48	12:12	22:55	23:52	–:–
35°	11:18	11:46	12:13	22:58	23:53	–:–
30°	11:14	11:44	12:14	23:01	23:54	–:–
20°	11:07	11:41	12:15	23:06	23:54	–:–
N 10°	11:01	11:39	12:16	23:11	23:55	–:–
0°	10:55	11:36	12:17	23:15	23:56	–:–
S 10°	10:49	11:34	12:18	23:19	23:57	–:–
20°	10:43	11:31	12:19	23:24	23:57	–:–
30°	10:36	11:28	12:20	23:29	23:58	–:–
35°	10:32	11:26	12:21	23:31	23:59	–:–
40°	10:27	11:25	12:22	23:35	23:59	–:–
45°	10:21	11:22	12:23	23:38	–:–	00:00
S 50°	10:15	11:20	12:24	23:43	–:–	00:00
52°	10:12	11:18	12:25	23:45	–:–	00:01
54°	10:08	11:17	12:25	23:47	–:–	00:01
56°	10:05	11:15	12:26	23:49	–:–	00:01
58°	10:01	11:14	12:27	23:52	–:–	00:02
S 60°	09:56	11:12	12:28	23:55	–:–	00:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 6-8 34-53%
01	03:05	03:20	12:03	17:05	04:44	
02	03:34	03:48	12:04	17:46	05:26	
03	04:02	04:16	12:04	18:27	06:06	

13 14 15 16

9 10 3 11 3 12

3

Information in the data page footers

Information pertaining to the IERS EOP data has been added to the odd data page footers if using MiKTeX or TeX Live (2020 or later). The International Earth Rotation Service (IERS) provides accurate data (updated weekly) on the Earth Orientation Parameters (EOP).

Earth's speed of rotation is not constant, i.e. the day length fluctuates.[1] This is due to *internal torques* caused by relative movements and mass redistribution of Earth's core, mantle, oceans, atmosphere, and cryosphere. This has an immediate impact on the GHA values of all celestial objects.

The IERS monitors and measures several parameters taking the actual speed of Earth's rotation into account. Their measured data begins on 2nd Januaray 1973. Predictive data begins following the last day of (obtained) data and extends about 360 days into the future. (The IERS results are published with a delay of about 18-hours between the date of publication and the last available date with measured EOP.[2]) These Nautical Almanac daily pages take the (measured or predicted) UT1-UTC values into account providing highly accurate navigational data especially if the predictions are fairly recent.

As long as either measured or predicted data is available the footer will show:
IERS Earth Orientation data as of dd-mmm-yyyy
This indicates that IERS EOP data is in use - older dates are measured; newer dates are predictions.

If the final date of IERS prediction data is on the current data page, the footer shows:
IERS Earth Orientation predictions end dd-mmm-yyyy

Pages with dates beyond the final date of IERS prediction data have the following footer:
No IERS EOP prediction data available
Skyfield then defaults to using the ΔT and leap second files that ship with Skyfield internally.

The footers mentioned are only displayed as long as **'useIERS = True'** is set in *config.py* to enable use of IERS EOP data.

Brief historical overview

The story begins with the XEphem astronomical library, which is declared 'end of life' by its author, Elwood Charles Downey, as no further updates are planned. He generously gave permission for use of XEphem code in Ephem (also known as Pyephem), an astronomical library authored by Brandon Rhodes. Enno Rodegerdts (https://sv-inua.net/) created the original Nautical Almanac 'daily pages' in Pyalmanac using Python 2 and LaTeX. After contacting him I obtained permission for its future enhancement and maintenance. Pyalmanac uses Ephem.

Meanwhile Brandon Rhodes was working on a far more sophisticated astronomical library, Skyfield. This was 'state of the art' and clearly surpassed the 'Jean Meeus'-based Pyephem/Ephem. Skyfield uses NASA's NAIF (Navigation and Ancillary Information Facility) SPICE algorithms. The results agree with those from the HORIZONS System (*operated by NASA JPL (Jet Propulsion Laboratory) SSD (Solar System Dynamics) group, not by NAIF*). This in turn implies that celestial positions calculated by Skyfield agree with those generated by the United States Naval Observatory and their *Astronomical Almanac* to within 0.0005 arcseconds (half a milliarcsecond).

Pyephem was then in 'maintenance mode'. Clearly Pyalmanac needed adaptation to use Skyfield, and thus SFalmanac was born. However its performance was poor regarding the calculation of 'events' such as: sunrise, sunset, moonrise, moonset, civil twilight start/end and nautical twilight start/end. An interim (faster) solution was required.

A hybrid application, originally named Skyalmanac, was developed using Ephem to calculate 'events' and Skyfield for the rest. This was indeed much faster at the cost of poorer 'event time' data. It took a while to find a better solution: multiprocessing, which was built into SFalmanac. This now could compare to the execution times in Pyalmanac but with improved data.

New functionality was added to SFalmanac, e.g. lunar phase as a graphic; Lunar Distance tables and charts. The original Skyalmanac is deprecated and has now been replaced with the latest SFalmanac code, so Skyalmanac and SFalmanac are now identical apart from the name. Since April 2019 http://thenauticalalmanac.com has been publishing Celestial Navigation related material with software provided here.

[1] https://en.wikipedia.org/wiki/Day_length_fluctuations
[2] https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html

January 01, 02, 03 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°39.7	180°36.3	S23°37.3	176°47.0	S23°43.2	347°32.3	N21°58.7	103°16.9	S03°35.8
1	115°42.2	195°35.4	37.2	191°47.3	43.0	2°35.1	58.8	118°19.2	35.7
2	130°44.7	210°34.4	37.1	206°47.7	42.9	17°37.9	58.9	133°21.5	35.7
3	145°47.1	225°33.4	·· 37.0	221°48.1	·· 42.7	32°40.7	·· 58.9	148°23.9	·· 35.6
4	160°49.6	240°32.5	36.8	236°48.5	42.5	47°43.5	59.0	163°26.2	35.5
5	175°52.1	255°31.5	36.7	251°48.9	42.4	62°46.3	59.0	178°28.5	35.5
6	190°54.5	270°30.5	S23°36.6	266°49.2	S23°42.2	77°49.1	N21°59.1	193°30.9	S03°35.4
7	205°57.0	285°29.6	36.4	281°49.6	42.0	92°52.0	59.1	208°33.2	35.3
8	220°59.4	300°28.6	36.3	296°50.0	41.8	107°54.8	59.2	223°35.5	35.3
9	236°01.9	315°27.6	·· 36.2	311°50.4	·· 41.7	122°57.6	·· 59.3	238°37.9	·· 35.2
10	251°04.4	330°26.7	36.0	326°50.8	41.5	138°00.4	59.3	253°40.2	35.1
11	266°06.8	345°25.7	35.9	341°51.1	41.3	153°03.2	59.4	268°42.5	35.1
12	281°09.3	0°24.7	S23°35.7	356°51.5	S23°41.2	168°06.0	N21°59.4	283°44.9	S03°35.0
13	296°11.8	15°23.8	35.6	11°51.9	41.0	183°08.8	59.5	298°47.2	34.9
14	311°14.2	30°22.8	35.5	26°52.3	40.8	198°11.6	59.5	313°49.5	34.9
15	326°16.7	45°21.8	·· 35.3	41°52.7	·· 40.6	213°14.4	·· 59.6	328°51.9	·· 34.8
16	341°19.2	60°20.9	35.2	56°53.0	40.5	228°17.3	59.7	343°54.2	34.7
17	356°21.6	75°19.9	35.0	71°53.4	40.3	243°20.1	59.7	358°56.5	34.7
18	11°24.1	90°18.9	S23°34.9	86°53.8	S23°40.1	258°22.9	N21°59.8	13°58.9	S03°34.6
19	26°26.6	105°18.0	34.7	101°54.2	39.9	273°25.7	59.8	29°01.2	34.5
20	41°29.0	120°17.0	34.6	116°54.6	39.8	288°28.5	59.9	44°03.5	34.5
21	56°31.5	135°16.0	·· 34.4	131°54.9	·· 39.6	303°31.3	21°59.9	59°05.8	·· 34.4
22	71°33.9	150°15.1	34.3	146°55.3	39.4	318°34.1	22°00.0	74°08.2	34.3
23	86°36.4	165°14.1	34.1	161°55.7	39.2	333°37.0	00.1	89°10.5	34.3
Mer.pass. 17:15		ν -1.0′ d 0.1′		m -3.90	ν 0.4′ d 0.2′		m 1.12	ν 2.8′ d 0.1′	m -2.67	ν 2.3′ d 0.1′	m 1.01

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	101°38.9	180°13.2	S23°34.0	176°56.1	S23°39.1	348°39.8	N22°00.1	104°12.8	S03°34.2
1	116°41.3	195°12.2	33.8	191°56.5	38.9	3°42.6	00.2	119°15.2	34.1
2	131°43.8	210°11.2	33.7	206°56.8	38.7	18°45.4	00.2	134°17.5	34.1
3	146°46.3	225°10.3	·· 33.5	221°57.2	·· 38.5	33°48.2	·· 00.3	149°19.8	·· 34.0
4	161°48.7	240°09.3	33.3	236°57.6	38.3	48°51.0	00.3	164°22.2	33.9
5	176°51.2	255°08.3	33.2	251°58.0	38.2	63°53.8	00.4	179°24.5	33.9
6	191°53.7	270°07.4	S23°33.0	266°58.4	S23°38.0	78°56.6	N22°00.5	194°26.8	S03°33.8
7	206°56.1	285°06.4	32.8	281°58.7	37.8	93°59.5	00.5	209°29.1	33.7
8	221°58.6	300°05.4	32.7	296°59.1	37.6	109°02.3	00.6	224°31.5	33.7
9	237°01.1	315°04.5	·· 32.5	311°59.5	·· 37.4	124°05.1	·· 00.6	239°33.8	·· 33.6
10	252°03.5	330°03.5	32.3	326°59.9	37.2	139°07.9	00.7	254°36.1	33.5
11	267°06.0	345°02.5	32.2	342°00.3	37.1	154°10.7	00.7	269°38.5	33.5
12	282°08.4	0°01.6	S23°32.0	357°00.6	S23°36.9	169°13.5	N22°00.8	284°40.8	S03°33.4
13	297°10.9	15°00.6	31.8	12°01.0	36.7	184°16.3	00.9	299°43.1	33.3
14	312°13.4	29°59.7	31.7	27°01.4	36.5	199°19.2	00.9	314°45.4	33.3
15	327°15.8	44°58.7	·· 31.5	42°01.8	·· 36.3	214°22.0	·· 01.0	329°47.8	·· 33.2
16	342°18.3	59°57.7	31.3	57°02.2	36.1	229°24.8	01.0	344°50.1	33.1
17	357°20.8	74°56.8	31.1	72°02.5	36.0	244°27.6	01.1	359°52.4	33.0
18	12°23.2	89°55.8	S23°31.0	87°02.9	S23°35.8	259°30.4	N22°01.1	14°54.8	S03°33.0
19	27°25.7	104°54.8	30.8	102°03.3	35.6	274°33.2	01.2	29°57.1	32.9
20	42°28.2	119°53.9	30.6	117°03.7	35.4	289°36.0	01.3	44°59.4	32.8
21	57°30.6	134°52.9	·· 30.4	132°04.1	·· 35.2	304°38.9	·· 01.3	60°01.7	·· 32.8
22	72°33.1	149°52.0	30.2	147°04.4	35.0	319°41.7	01.4	75°04.1	32.7
23	87°35.6	164°51.0	30.1	162°04.8	34.8	334°44.5	01.4	90°06.4	32.6
Mer.pass. 17:11		ν -1.0′ d 0.2′		m -3.90	ν 0.4′ d 0.2′		m 1.12	ν 2.8′ d 0.1′	m -2.67	ν 2.3′ d 0.1′	m 1.01

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	102°38.0	179°50.0	S23°29.9	177°05.2	S23°34.6	349°47.3	N22°01.5	105°08.7	S03°32.6
1	117°40.5	194°49.1	29.7	192°05.6	34.4	4°50.1	01.5	120°11.0	32.5
2	132°42.9	209°48.1	29.5	207°06.0	34.3	19°52.9	01.6	135°13.4	32.4
3	147°45.4	224°47.2	·· 29.3	222°06.3	·· 34.1	34°55.8	·· 01.7	150°15.7	·· 32.4
4	162°47.9	239°46.2	29.1	237°06.7	33.9	49°58.6	01.7	165°18.0	32.3
5	177°50.3	254°45.2	28.9	252°07.1	33.7	65°01.4	01.8	180°20.3	32.2
6	192°52.8	269°44.3	S23°28.7	267°07.5	S23°33.5	80°04.2	N22°01.8	195°22.7	S03°32.2
7	207°55.3	284°43.3	28.5	282°07.9	33.3	95°07.0	01.9	210°25.0	32.1
8	222°57.7	299°42.4	28.3	297°08.2	33.1	110°09.8	01.9	225°27.3	32.0
9	238°00.2	314°41.4	·· 28.1	312°08.6	·· 32.9	125°12.7	·· 02.0	240°29.6	·· 32.0
10	253°02.7	329°40.4	27.9	327°09.0	32.7	140°15.5	02.1	255°32.0	31.9
11	268°05.1	344°39.5	27.7	342°09.4	32.5	155°18.3	02.1	270°34.3	31.8
12	283°07.6	359°38.5	S23°27.5	357°09.8	S23°32.3	170°21.1	N22°02.2	285°36.6	S03°31.7
13	298°10.1	14°37.6	27.3	12°10.2	32.1	185°23.9	02.2	300°38.9	31.7
14	313°12.5	29°36.6	27.1	27°10.5	31.9	200°26.7	02.3	315°41.3	31.6
15	328°15.0	44°35.6	·· 26.9	42°10.9	·· 31.7	215°29.6	·· 02.3	330°43.6	·· 31.5
16	343°17.4	59°34.7	26.7	57°11.3	31.5	230°32.4	02.4	345°45.9	31.5
17	358°19.9	74°33.7	26.5	72°11.7	31.4	245°35.2	02.5	0°48.2	31.4
18	13°22.4	89°32.8	S23°26.3	87°12.1	S23°31.2	260°38.0	N22°02.5	15°50.6	S03°31.3
19	28°24.8	104°31.8	26.1	102°12.4	31.0	275°40.8	02.6	30°52.9	31.3
20	43°27.3	119°30.9	25.9	117°12.8	30.8	290°43.6	02.6	45°55.2	31.2
21	58°29.8	134°29.9	·· 25.7	132°13.2	·· 30.6	305°46.5	·· 02.7	60°57.5	·· 31.1
22	73°32.2	149°28.9	25.5	147°13.6	30.4	320°49.3	02.7	75°59.9	31.1
23	88°34.7	164°28.0	25.3	162°14.0	30.2	335°52.1	02.8	91°02.2	31.0
Mer.pass. 17:07		ν -1.0′ d 0.2′		m -3.90	ν 0.4′ d 0.2′		m 1.11	ν 2.8′ d 0.1′	m -2.67	ν 2.3′ d 0.1′	m 1.01

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.1	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.4	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°17.9	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.6
Sirius	258°25.2	-16°45.1
Adhara	255°04.8	-29°00.4
Procyon	244°49.6	5°09.5
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.4
Suhail	222°45.3	-43°32.1
Miaplacidus	221°37.3	-69°49.2
Alphard	217°46.7	-8°46.3
Regulus	207°33.4	11°50.3
Dubhe	193°39.7	61°36.3
Denebola	182°24.0	14°25.5
Gienah	175°42.7	-17°41.1
Acrux	172°59.1	-63°14.3
Gacrux	171°50.7	-57°15.3
Alioth	166°12.3	55°48.8
Spica	158°21.5	-11°17.8
Alkaid	152°51.5	49°10.7
Hadar	148°35.1	-60°29.7
Menkent	147°56.8	-36°29.7
Arcturus	145°47.3	19°02.6
Rigil Kent.	139°39.5	-60°56.3
Kochab	137°20.5	74°02.5
Zuben'ubi	136°55.3	-16°09.0
Alphecca	126°03.3	26°37.4
Antares	112°15.2	-26°29.3
Atria	107°09.2	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.1	12°32.4
Eltanin	90°42.3	51°29.0
Kaus Aust.	83°31.8	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.2	15°20.8

Jan 01 Thu	SHA	Mer.pass
Venus	79°56.6	11:58
Mars	76°07.2	12:13
Jupiter	246°52.5	00:50
Saturn	2°37.1	17:04

Jan 02 Fri	SHA	Mer.pass
Venus	78°34.3	12:00
Mars	75°17.2	12:12
Jupiter	247°00.9	00:45
Saturn	2°34.0	17:01

Jan 03 Sat	SHA	Mer.pass
Venus	77°12.0	12:01
Mars	74°27.2	12:11
Jupiter	247°09.3	00:41
Saturn	2°30.7	16:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.0880 sec ΔT = TT-UT1 = +69.0960 sec

2026 January 01 to Jan. 03 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°10.1	S23°01.0	36°44.5	2.4′	N26°24.2	6.7′	60.7′
1	194°09.8	00.8	51°06.0	2.3′	26°30.9	6.5′	60.7′
2	209°09.5	00.6	65°27.3	2.3′	26°37.4	6.3′	60.7′
3	224°09.2	·· 00.4	79°48.6	2.2′	26°43.7	6.1′	60.7′
4	239°08.9	00.2	94°09.7	2.1′	26°49.8	5.9′	60.7′
5	254°08.6	23°00.0	108°30.8	2.0′	26°55.7	5.8′	60.7′
6	269°08.3	S22°59.8	122°51.8	1.9′	N27°01.5	5.5′	60.7′
7	284°08.0	59.6	137°12.7	1.8′	27°07.0	5.3′	60.7′
8	299°07.7	59.4	151°33.5	1.8′	27°12.3	5.1′	60.7′
9	314°07.4	·· 59.2	165°54.3	1.7′	27°17.4	4.9′	60.7′
10	329°07.1	59.0	180°14.9	1.6′	27°22.3	4.7′	60.7′
11	344°06.8	58.8	194°35.6	1.5′	27°27.0	4.4′	60.7′
12	359°06.5	S22°58.6	208°56.1	1.5′	N27°31.4	4.3′	60.7′
13	14°06.2	58.3	223°16.6	1.4′	27°35.7	4.1′	60.8′
14	29°05.9	58.1	237°37.0	1.4′	27°39.8	3.8′	60.8′
15	44°05.6	·· 57.9	251°57.3	1.3′	27°43.6	3.7′	60.8′
16	59°05.4	57.7	266°17.6	1.2′	27°47.3	3.4′	60.8′
17	74°05.1	57.5	280°37.9	1.2′	27°50.7	3.2′	60.8′
18	89°04.8	S22°57.3	294°58.1	1.2′	N27°53.9	3.0′	60.8′
19	104°04.5	57.1	309°18.2	1.1′	27°56.9	2.8′	60.8′
20	119°04.2	56.8	323°38.3	1.1′	27°59.7	2.5′	60.8′
21	134°03.9	·· 56.6	337°58.4	1.0′	28°02.2	2.4′	60.8′
22	149°03.6	56.4	352°18.5	1.0′	28°04.6	2.1′	60.8′
23	164°03.3	56.2	6°38.5	1.0′	28°06.7	1.9′	60.8′
	SD = 16.3′	d = 0.2′	SD = 16.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°03.0	S22°56.0	20°58.4	1.0′	N28°08.6	1.7′	60.8′
1	194°02.7	55.7	35°18.4	0.9′	28°10.3	1.5′	60.8′
2	209°02.4	55.5	49°38.3	0.9′	28°11.8	1.2′	60.8′
3	224°02.2	·· 55.3	63°58.2	0.9′	28°13.0	1.1′	60.8′
4	239°01.9	55.1	78°18.2	0.9′	28°14.1	0.8′	60.8′
5	254°01.6	54.8	92°38.0	0.9′	28°14.9	0.6′	60.8′
6	269°01.3	S22°54.6	106°57.9	0.9′	N28°15.5	0.3′	60.8′
7	284°01.0	54.4	121°17.8	0.9′	28°15.8	0.2′	60.8′
8	299°00.7	54.2	135°37.7	0.9′	28°16.0	0.1′	60.7′
9	314°00.4	·· 53.9	149°57.6	0.9′	28°15.9	0.3′	60.7′
10	329°00.1	53.7	164°17.5	0.9′	28°15.6	0.5′	60.7′
11	343°59.8	53.5	178°37.4	0.9′	28°15.1	0.7′	60.7′
12	358°59.5	S22°53.3	192°57.3	0.9′	N28°14.4	1.0′	60.7′
13	13°59.3	53.0	207°17.3	1.0′	28°13.4	1.1′	60.7′
14	28°59.0	52.8	221°37.3	1.0′	28°12.3	1.4′	60.7′
15	43°58.7	·· 52.6	235°57.3	1.0′	28°10.9	1.6′	60.7′
16	58°58.4	52.3	250°17.3	1.1′	28°09.3	1.9′	60.7′
17	73°58.1	52.1	264°37.4	1.1′	28°07.4	2.0′	60.7′
18	88°57.8	S22°51.9	278°57.5	1.1′	N28°05.4	2.3′	60.7′
19	103°57.5	51.6	293°17.6	1.2′	28°03.1	2.4′	60.7′
20	118°57.2	51.4	307°37.8	1.2′	28°00.7	2.7′	60.6′
21	133°56.9	·· 51.1	321°58.0	1.3′	27°58.0	2.9′	60.6′
22	148°56.7	50.9	336°18.3	1.3′	27°55.1	3.1′	60.6′
23	163°56.4	50.7	350°38.7	1.4′	27°52.0	3.4′	60.6′
	SD = 16.3′	d = 0.2′	SD = 16.6′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°56.1	S22°50.4	4°59.1	1.5′	N27°48.6	3.5′	60.6′
1	193°55.8	50.2	19°19.5	1.5′	27°45.1	3.7′	60.6′
2	208°55.5	49.9	33°40.1	1.6′	27°41.4	4.0′	60.6′
3	223°55.2	·· 49.7	48°00.7	1.7′	27°37.4	4.2′	60.6′
4	238°54.9	49.5	62°21.3	1.7′	27°33.2	4.3′	60.5′
5	253°54.6	49.2	76°42.1	1.8′	27°28.9	4.6′	60.5′
6	268°54.4	S22°49.0	91°02.9	1.9′	N27°24.3	4.8′	60.5′
7	283°54.1	48.7	105°23.8	2.0′	27°19.5	5.0′	60.5′
8	298°53.8	48.5	119°44.8	2.1′	27°14.5	5.2′	60.5′
9	313°53.5	·· 48.2	134°05.9	2.2′	27°09.3	5.3′	60.5′
10	328°53.2	48.0	148°27.0	2.3′	27°04.0	5.6′	60.4′
11	343°52.9	47.7	162°48.3	2.3′	26°58.4	5.8′	60.4′
12	358°52.6	S22°47.5	177°09.6	2.4′	N26°52.6	6.0′	60.4′
13	13°52.4	47.2	191°31.1	2.5′	26°46.6	6.1′	60.4′
14	28°52.1	47.0	205°52.6	2.6′	26°40.5	6.4′	60.4′
15	43°51.8	·· 46.7	220°14.3	2.8′	26°34.1	6.5′	60.3′
16	58°51.5	46.5	234°36.0	2.9′	26°27.6	6.8′	60.3′
17	73°51.2	46.2	248°57.9	3.0′	26°20.8	6.9′	60.3′
18	88°50.9	S22°46.0	263°19.8	3.1′	N26°13.9	7.1′	60.3′
19	103°50.7	45.7	277°41.9	3.2′	26°06.8	7.3′	60.3′
20	118°50.4	45.5	292°04.1	3.3′	25°59.5	7.4′	60.2′
21	133°50.1	·· 45.2	306°26.4	3.4′	25°52.1	7.7′	60.2′
22	148°49.8	45.0	320°48.8	3.5′	25°44.4	7.8′	60.2′
23	163°49.5	44.7	335°11.4	3.7′	25°36.6	8.0′	60.2′
	SD = 16.3′	d = 0.2′	SD = 16.5′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	08:23	10:39	▬	▬	13:29	15:46
N 70°	08:04	09:48	▬	▬	14:21	16:04
68°	07:49	09:16	▬	▬	14:53	16:19
66°	07:37	08:52	10:26	13:42	15:16	16:32
64°	07:26	08:34	09:48	14:20	15:35	16:42
62°	07:17	08:18	09:22	14:46	15:50	16:51
60°	07:09	08:05	09:02	15:07	16:03	16:59
N 58°	07:02	07:54	08:45	15:23	16:14	17:06
56°	06:55	07:44	08:31	15:37	16:24	17:13
54°	06:50	07:35	08:19	15:50	16:33	17:19
52°	06:44	07:27	08:08	16:00	16:41	17:24
50°	06:39	07:20	07:58	16:10	16:48	17:29
45°	06:28	07:05	07:38	16:30	17:04	17:41
N 40°	06:18	06:52	07:22	16:46	17:17	17:51
35°	06:09	06:40	07:08	17:00	17:28	18:00
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:12	06:35	17:33	17:57	18:24
N 10°	05:28	05:55	06:17	17:51	18:14	18:40
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:25	18:43	19:08	19:37
30°	04:03	04:36	05:03	19:05	19:32	20:05
35°	03:44	04:21	04:50	19:17	19:47	20:23
40°	03:22	04:03	04:36	19:32	20:05	20:46
45°	02:52	03:41	04:18	19:50	20:27	21:15
S 50°	02:09	03:12	03:56	20:11	20:55	21:58
52°	01:43	02:58	03:46	20:22	21:10	22:24
54°	01:04	02:41	03:34	20:34	21:27	23:02
56°	////	02:20	03:20	20:47	21:48	////
58°	////	01:52	03:04	21:03	22:15	////
S 60°	////	01:09	02:45	21:23	22:56	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	▭	▭	▭	▭
62°	10:58	▭	13:35	08:53	▭	10:56
60°	11:50	12:40	14:19	08:02	09:32	10:12
N 58°	12:21	13:18	14:48	07:31	08:55	09:43
56°	12:45	13:44	15:10	07:07	08:28	09:20
54°	13:05	14:05	15:28	06:48	08:07	09:02
52°	13:21	14:23	15:44	06:32	07:49	08:46
50°	13:36	14:38	15:57	06:18	07:34	08:32
45°	14:05	15:08	16:25	05:49	07:04	08:04
N 40°	14:27	15:32	16:46	05:27	06:40	07:42
35°	14:46	15:51	17:04	05:09	06:20	07:23
30°	15:03	16:08	17:19	04:53	06:04	07:07
20°	15:30	16:36	17:45	04:26	05:35	06:40
N 10°	15:54	17:01	18:08	04:03	05:11	06:17
0°	16:16	17:23	18:29	03:42	04:48	05:55
S 10°	16:39	17:46	18:49	03:20	04:25	05:33
20°	17:03	18:10	19:12	02:58	04:01	05:09
30°	17:31	18:39	19:37	02:31	03:32	04:41
35°	17:48	18:55	19:52	02:16	03:15	04:25
40°	18:07	19:15	20:10	01:58	02:56	04:06
45°	18:31	19:38	20:31	01:36	02:32	03:43
S 50°	19:01	20:09	20:57	01:08	02:01	03:13
52°	19:16	20:24	21:09	00:55	01:46	02:58
54°	19:34	20:41	21:24	00:40	01:28	02:41
56°	19:55	21:02	21:41	00:22	01:07	02:20
58°	20:23	21:28	22:01	00:00	00:39	01:54
S 60°	21:01	22:05	22:26	·· ··	00:00	01:17

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	**Moon** Age 12-14 91-100%
01	03:20	03:34	12:04	22:32	09:59	
02	03:48	04:02	12:04	23:39	11:06	
03	04:16	04:29	12:04	–:–	12:12	

January 04, 05, 06 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	103°37.2	179°27.0	S23°25.0	177°14.3	S23°30.0	350°54.9	N22°02.9	106°04.5	S03°30.9
1	118°39.6	194°26.1	24.8	192°14.7	29.8	5°57.7	02.9	121°06.8	30.8
2	133°42.1	209°25.1	24.6	207°15.1	29.6	21°00.5	03.0	136°09.2	30.8
3	148°44.6	224°24.2	·· 24.4	222°15.5	·· 29.4	36°03.4	·· 03.0	151°11.5	·· 30.7
4	163°47.0	239°23.2	24.2	237°15.9	29.2	51°06.2	03.1	166°13.8	30.6
5	178°49.5	254°22.3	23.9	252°16.3	29.0	66°09.0	03.1	181°16.1	30.6
6	193°51.9	269°21.3	S23°23.7	267°16.6	S23°28.7	81°11.8	N22°03.2	196°18.4	S03°30.5
7	208°54.4	284°20.3	23.5	282°17.0	28.5	96°14.6	03.3	211°20.8	30.4
8	223°56.9	299°19.4	23.3	297°17.4	28.3	111°17.4	03.3	226°23.1	30.4
9	238°59.3	314°18.4	·· 23.0	312°17.8	·· 28.1	126°20.3	·· 03.4	241°25.4	·· 30.3
10	254°01.8	329°17.5	22.8	327°18.2	27.9	141°23.1	03.4	256°27.7	30.2
11	269°04.3	344°16.5	22.6	342°18.5	27.7	156°25.9	03.5	271°30.1	30.1
12	284°06.7	359°15.6	S23°22.3	357°18.9	S23°27.5	171°28.7	N22°03.5	286°32.4	S03°30.1
13	299°09.2	14°14.6	22.1	12°19.3	27.3	186°31.5	03.6	301°34.7	30.0
14	314°11.7	29°13.7	21.9	27°19.7	27.1	201°34.4	03.6	316°37.0	29.9
15	329°14.1	44°12.7	·· 21.6	42°20.1	·· 26.9	216°37.2	·· 03.7	331°39.3	·· 29.9
16	344°16.6	59°11.8	21.4	57°20.5	26.7	231°40.0	03.8	346°41.7	29.8
17	359°19.1	74°10.8	21.2	72°20.8	26.5	246°42.8	03.8	1°44.0	29.7
18	14°21.5	89°09.8	S23°20.9	87°21.2	S23°26.3	261°45.6	N22°03.9	16°46.3	S03°29.6
19	29°24.0	104°08.9	20.7	102°21.6	26.1	276°48.4	03.9	31°48.6	29.6
20	44°26.4	119°07.9	20.5	117°22.0	25.9	291°51.3	04.0	46°50.9	29.5
21	59°28.9	134°07.0	·· 20.2	132°22.4	·· 25.6	306°54.1	·· 04.0	61°53.3	·· 29.4
22	74°31.4	149°06.0	20.0	147°22.7	25.4	321°56.9	04.1	76°55.6	29.4
23	89°33.8	164°05.1	19.7	162°23.1	25.2	336°59.7	04.2	91°57.9	29.3
Mer.pass. 17:03		ν -1.0′	d 0.2′	m -3.90	ν 0.4′	d 0.2′	m 1.11	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.01

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	104°36.3	179°04.1	S23°19.5	177°23.5	S23°25.0	352°02.5	N22°04.2	107°00.2	S03°29.2
1	119°38.8	194°03.2	19.2	192°23.9	24.8	7°05.4	04.3	122°02.5	29.2
2	134°41.2	209°02.2	19.0	207°24.3	24.6	22°08.2	04.3	137°04.9	29.1
3	149°43.7	224°01.3	·· 18.7	222°24.7	·· 24.4	37°11.0	·· 04.4	152°07.2	·· 29.0
4	164°46.2	239°00.3	18.5	237°25.0	24.2	52°13.8	04.4	167°09.5	28.9
5	179°48.6	253°59.4	18.2	252°25.4	24.0	67°16.6	04.5	182°11.8	28.9
6	194°51.1	268°58.4	S23°18.0	267°25.8	S23°23.7	82°19.5	N22°04.6	197°14.1	S03°28.8
7	209°53.6	283°57.5	17.7	282°26.2	23.5	97°22.3	04.6	212°16.5	28.7
8	224°56.0	298°56.5	17.5	297°26.6	23.3	112°25.1	04.7	227°18.8	28.6
9	239°58.5	313°55.6	·· 17.2	312°26.9	·· 23.1	127°27.9	·· 04.7	242°21.1	·· 28.6
10	255°00.9	328°54.6	17.0	327°27.3	22.9	142°30.7	04.8	257°23.4	28.5
11	270°03.4	343°53.7	16.7	342°27.7	22.7	157°33.6	04.8	272°25.7	28.4
12	285°05.9	358°52.7	S23°16.4	357°28.1	S23°22.4	172°36.4	N22°04.9	287°28.0	S03°28.4
13	300°08.3	13°51.8	16.2	12°28.5	22.2	187°39.2	05.0	302°30.4	28.3
14	315°10.8	28°50.8	15.9	27°28.9	22.0	202°42.0	05.0	317°32.7	28.2
15	330°13.3	43°49.9	·· 15.6	42°29.2	·· 21.8	217°44.8	·· 05.1	332°35.0	·· 28.1
16	345°15.7	58°48.9	15.4	57°29.6	21.6	232°47.7	05.1	347°37.3	28.1
17	0°18.2	73°48.0	15.1	72°30.0	21.4	247°50.5	05.2	2°39.6	28.0
18	15°20.7	88°47.0	S23°14.8	87°30.4	S23°21.1	262°53.3	N22°05.2	17°41.9	S03°27.9
19	30°23.1	103°46.1	14.6	102°30.8	20.9	277°56.1	05.3	32°44.3	27.9
20	45°25.6	118°45.1	14.3	117°31.2	20.7	292°58.9	05.4	47°46.6	27.8
21	60°28.0	133°44.2	·· 14.0	132°31.5	·· 20.5	308°01.8	·· 05.4	62°48.9	·· 27.7
22	75°30.5	148°43.3	13.8	147°31.9	20.3	323°04.6	05.5	77°51.2	27.6
23	90°33.0	163°42.3	13.5	162°32.3	20.0	338°07.4	05.5	92°53.5	27.6
Mer.pass. 16:59		ν -1.0′	d 0.2′	m -3.90	ν 0.4′	d 0.2′	m 1.10	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.01

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	105°35.4	178°41.4	S23°13.2	177°32.7	S23°19.8	353°10.2	N22°05.6	107°55.8	S03°27.5
1	120°37.9	193°40.4	12.9	192°33.1	19.6	8°13.0	05.6	122°58.2	27.4
2	135°40.4	208°39.5	12.7	207°33.5	19.4	23°15.9	05.7	138°00.5	27.4
3	150°42.8	223°38.5	·· 12.4	222°33.8	·· 19.1	38°18.7	·· 05.8	153°02.8	·· 27.3
4	165°45.3	238°37.6	12.1	237°34.2	18.9	53°21.5	05.8	168°05.1	27.2
5	180°47.8	253°36.6	11.8	252°34.6	18.7	68°24.3	05.9	183°07.4	27.1
6	195°50.2	268°35.7	S23°11.5	267°35.0	S23°18.5	83°27.1	N22°05.9	198°09.7	S03°27.1
7	210°52.7	283°34.7	11.2	282°35.4	18.2	98°30.0	06.0	213°12.1	27.0
8	225°55.2	298°33.8	11.0	297°35.8	18.0	113°32.8	06.0	228°14.4	26.9
9	240°57.6	313°32.9	·· 10.7	312°36.1	·· 17.8	128°35.6	·· 06.1	243°16.7	·· 26.8
10	256°00.1	328°31.9	10.4	327°36.5	17.6	143°38.4	06.1	258°19.0	26.8
11	271°02.5	343°31.0	10.1	342°36.9	17.3	158°41.2	06.2	273°21.3	26.7
12	286°05.0	358°30.0	S23°09.8	357°37.3	S23°17.1	173°44.1	N22°06.3	288°23.6	S03°26.6
13	301°07.5	13°29.1	09.5	12°37.7	16.9	188°46.9	06.3	303°25.9	26.5
14	316°09.9	28°28.1	09.2	27°38.1	16.7	203°49.7	06.4	318°28.3	26.5
15	331°12.4	43°27.2	·· 08.9	42°38.4	·· 16.4	218°52.5	·· 06.4	333°30.6	·· 26.4
16	346°14.9	58°26.3	08.6	57°38.8	16.2	233°55.4	06.5	348°32.9	26.3
17	1°17.3	73°25.3	08.3	72°39.2	16.0	248°58.2	06.5	3°35.2	26.3
18	16°19.8	88°24.4	S23°08.0	87°39.6	S23°15.7	264°01.0	N22°06.6	18°37.5	S03°26.2
19	31°22.3	103°23.4	07.7	102°40.0	15.5	279°03.8	06.7	33°39.8	26.1
20	46°24.7	118°22.5	07.4	117°40.4	15.3	294°06.6	06.7	48°42.1	26.0
21	61°27.2	133°21.5	·· 07.1	132°40.7	·· 15.0	309°09.5	·· 06.8	63°44.5	·· 26.0
22	76°29.7	148°20.6	06.8	147°41.1	14.8	324°12.3	06.8	78°46.8	25.9
23	91°32.1	163°19.7	06.5	162°41.5	14.6	339°15.1	06.9	93°49.1	25.8
Mer.pass. 16:55		ν -0.9′	d 0.3′	m -3.90	ν 0.4′	d 0.2′	m 1.10	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.01

Stars

	SHA	**Dec**
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.1	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.4	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°18.8	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.4	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.6
Sirius	258°25.1	-16°45.1
Adhara	255°04.8	-29°00.4
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.4
Suhail	222°45.3	-43°32.1
Miaplacidus	221°37.3	-69°49.2
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°39.7	61°36.3
Denebola	182°24.0	14°25.4
Gienah	175°42.7	-17°41.2
Acrux	172°59.1	-63°14.3
Gacrux	171°50.7	-57°15.3
Alioth	166°12.2	55°48.8
Spica	158°21.5	-11°17.8
Alkaid	152°51.5	49°10.7
Hadar	148°35.0	-60°29.7
Menkent	147°56.8	-36°29.7
Arcturus	145°47.3	19°02.6
Rigil Kent.	139°39.4	-60°56.3
Kochab	137°20.4	74°02.5
Zuben'ubi	136°55.3	-16°09.0
Alphecca	126°03.3	26°37.4
Antares	112°15.1	-26°29.3
Atria	107°09.1	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.1	12°32.4
Eltanin	90°42.3	51°29.0
Kaus Aust.	83°31.8	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.2	15°20.8

Jan 04 Sun	**SHA**	**Mer.pass**
Venus	75°49.9	12:03
Mars	73°37.2	12:11
Jupiter	247°17.7	00:36
Saturn	2°27.3	16:53

Jan 05 Mon	**SHA**	**Mer.pass**
Venus	74°27.8	12:04
Mars	72°47.2	12:10
Jupiter	247°26.2	00:32
Saturn	2°23.9	16:49

Jan 06 Tue	**SHA**	**Mer.pass**
Venus	73°05.9	12:06
Mars	71°57.2	12:10
Jupiter	247°34.8	00:27
Saturn	2°20.4	16:46

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.2	S22°44.4	349°34.0	3.8′	N25°28.6	8.1′	60.2′
1	193°49.0	44.2	3°56.8	3.9′	25°20.5	8.4′	60.1′
2	208°48.7	43.9	18°19.7	4.0′	25°12.1	8.5′	60.1′
3	223°48.4	·· 43.7	32°42.7	4.2′	25°03.6	8.6′	60.1′
4	238°48.1	43.4	47°05.9	4.3′	24°55.0	8.9′	60.1′
5	253°47.8	43.1	61°29.2	4.4′	24°46.1	9.0′	60.0′
6	268°47.5	S22°42.9	75°52.6	4.5′	N24°37.1	9.1′	60.0′
7	283°47.3	42.6	90°16.1	4.7′	24°28.0	9.3′	60.0′
8	298°47.0	42.4	104°39.8	4.8′	24°18.7	9.5′	59.9′
9	313°46.7	·· 42.1	119°03.6	4.9′	24°09.2	9.6′	59.9′
10	328°46.4	41.8	133°27.5	5.1′	23°59.6	9.8′	59.9′
11	343°46.1	41.6	147°51.6	5.2′	23°49.8	9.9′	59.9′
12	358°45.8	S22°41.3	162°15.8	5.3′	N23°39.9	10.1′	59.8′
13	13°45.6	41.0	176°40.2	5.5′	23°29.8	10.2′	59.8′
14	28°45.3	40.7	191°04.6	5.6′	23°19.6	10.3′	59.8′
15	43°45.0	·· 40.5	205°29.2	5.8′	23°09.3	10.5′	59.7′
16	58°44.7	40.2	219°54.0	5.9′	22°58.8	10.6′	59.7′
17	73°44.4	39.9	234°18.9	6.0′	22°48.2	10.8′	59.7′
18	88°44.2	S22°39.7	248°43.9	6.2′	N22°37.4	10.9′	59.7′
19	103°43.9	39.4	263°09.1	6.3′	22°26.5	11.0′	59.6′
20	118°43.6	39.1	277°34.4	6.4′	22°15.5	11.2′	59.6′
21	133°43.3	·· 38.8	291°59.8	6.6′	22°04.3	11.3′	59.6′
22	148°43.0	38.6	306°25.4	6.7′	21°53.0	11.4′	59.5′
23	163°42.8	38.3	320°51.1	6.9′	21°41.6	11.5′	59.5′
	SD = 16.3′	d = 0.3′		SD = 16.4′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°42.5	S22°38.0	335°17.0	7.0′	N21°30.1	11.6′	59.5′
1	193°42.2	37.7	349°43.0	7.1′	21°18.5	11.8′	59.4′
2	208°41.9	37.5	4°09.1	7.3′	21°06.7	11.9′	59.4′
3	223°41.6	·· 37.2	18°35.4	7.4′	20°54.8	12.0′	59.4′
4	238°41.4	36.9	33°01.8	7.6′	20°42.8	12.1′	59.3′
5	253°41.1	36.6	47°28.3	7.7′	20°30.7	12.2′	59.3′
6	268°40.8	S22°36.3	61°55.0	7.8′	N20°18.5	12.3′	59.3′
7	283°40.5	36.1	76°21.9	8.0′	20°06.2	12.4′	59.2′
8	298°40.3	35.8	90°48.8	8.1′	19°53.8	12.6′	59.2′
9	313°40.0	·· 35.5	105°15.9	8.2′	19°41.2	12.6′	59.2′
10	328°39.7	35.2	119°43.2	8.4′	19°28.6	12.7′	59.1′
11	343°39.4	34.9	134°10.5	8.5′	19°15.9	12.8′	59.1′
12	358°39.2	S22°34.6	148°38.0	8.6′	N19°03.1	12.9′	59.1′
13	13°38.9	34.3	163°05.7	8.8′	18°50.2	13.0′	59.0′
14	28°38.6	34.1	177°33.5	8.9′	18°37.2	13.1′	59.0′
15	43°38.3	·· 33.8	192°01.4	9.0′	18°24.1	13.2′	59.0′
16	58°38.0	33.5	206°29.4	9.2′	18°10.9	13.3′	58.9′
17	73°37.8	33.2	220°57.6	9.3′	17°57.6	13.3′	58.9′
18	88°37.5	S22°32.9	235°25.9	9.4′	N17°44.3	13.4′	58.8′
19	103°37.2	32.6	249°54.3	9.6′	17°30.9	13.5′	58.8′
20	118°36.9	32.3	264°22.9	9.7′	17°17.4	13.6′	58.8′
21	133°36.7	·· 32.0	278°51.6	9.8′	17°03.8	13.7′	58.7′
22	148°36.4	31.7	293°20.4	9.9′	16°50.1	13.7′	58.7′
23	163°36.1	31.4	307°49.3	10.1′	16°36.4	13.8′	58.7′
	SD = 16.3′	d = 0.3′		SD = 16.2′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.8	S22°31.1	322°18.4	10.2′	N16°22.6	13.9′	58.6′
1	193°35.6	30.8	336°47.6	10.3′	16°08.7	13.9′	58.6′
2	208°35.3	30.5	351°16.9	10.4′	15°54.8	14.0′	58.6′
3	223°35.0	·· 30.2	5°46.3	10.6′	15°40.8	14.1′	58.5′
4	238°34.7	29.9	20°15.9	10.7′	15°26.7	14.1′	58.5′
5	253°34.5	29.6	34°45.5	10.8′	15°12.6	14.2′	58.4′
6	268°34.2	S22°29.3	49°15.3	10.9′	N14°58.4	14.3′	58.4′
7	283°33.9	29.0	63°45.2	11.0′	14°44.1	14.3′	58.4′
8	298°33.7	28.7	78°15.3	11.1′	14°29.8	14.3′	58.3′
9	313°33.4	·· 28.4	92°45.4	11.3′	14°15.5	14.4′	58.3′
10	328°33.1	28.1	107°15.7	11.4′	14°01.1	14.5′	58.2′
11	343°32.8	27.8	121°46.0	11.5′	13°46.6	14.5′	58.2′
12	358°32.6	S22°27.5	136°16.5	11.6′	N13°32.1	14.6′	58.2′
13	13°32.3	27.2	150°47.1	11.7′	13°17.5	14.6′	58.1′
14	28°32.0	26.9	165°17.8	11.8′	13°02.9	14.6′	58.1′
15	43°31.7	·· 26.6	179°48.6	11.9′	12°48.3	14.7′	58.1′
16	58°31.5	26.3	194°19.5	12.0′	12°33.6	14.7′	58.0′
17	73°31.2	26.0	208°50.5	12.1′	12°18.9	14.8′	58.0′
18	88°30.9	S22°25.7	223°21.6	12.2′	N12°04.1	14.8′	57.9′
19	103°30.7	25.4	237°52.9	12.3′	11°49.3	14.8′	57.9′
20	118°30.4	25.1	252°24.2	12.4′	11°34.5	14.9′	57.9′
21	133°30.1	·· 24.7	266°55.6	12.5′	11°19.6	14.9′	57.8′
22	148°29.9	24.4	281°27.1	12.6′	11°04.7	15.0′	57.8′
23	163°29.6	24.1	295°58.7	12.7′	10°49.7	14.9′	57.7′
	SD = 16.3′	d = 0.3′		SD = 16.0′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:19	10:30	▬	▬	13:42	15:52
N 70°	08:01	09:43	▬	▬	14:29	16:10
68°	07:47	09:12	11:29	12:42	14:59	16:24
66°	07:35	08:49	10:20	13:51	15:22	16:36
64°	07:25	08:31	09:45	14:27	15:40	16:46
62°	07:16	08:16	09:19	14:52	15:55	16:55
60°	07:08	08:04	09:00	15:11	16:07	17:03
N 58°	07:01	07:53	08:43	15:28	16:18	17:10
56°	06:55	07:43	08:30	15:41	16:28	17:16
54°	06:49	07:35	08:18	15:53	16:36	17:22
52°	06:44	07:27	08:07	16:04	16:44	17:27
50°	06:39	07:20	07:58	16:13	16:51	17:32
45°	06:28	07:05	07:38	16:33	17:06	17:43
N 40°	06:18	06:52	07:22	16:49	17:19	17:53
35°	06:09	06:41	07:09	17:02	17:30	18:02
30°	06:01	06:30	06:57	17:14	17:40	18:10
20°	05:45	06:12	06:36	17:35	17:58	18:26
N 10°	05:30	05:56	06:18	17:52	18:15	18:41
0°	05:13	05:39	06:02	18:09	18:31	18:58
S 10°	04:55	05:22	05:45	18:26	18:49	19:16
20°	04:33	05:02	05:27	18:44	19:09	19:37
30°	04:05	04:38	05:05	19:05	19:32	20:05
35°	03:47	04:23	04:53	19:18	19:47	20:23
40°	03:25	04:06	04:38	19:32	20:04	20:45
45°	02:56	03:44	04:21	19:49	20:26	21:14
S 50°	02:14	03:16	04:00	20:11	20:54	21:56
52°	01:49	03:02	03:49	20:21	21:08	22:20
54°	01:13	02:45	03:38	20:32	21:25	22:56
56°	////	02:25	03:24	20:46	21:45	////
58°	////	01:58	03:09	21:01	22:11	////
S 60°	////	01:19	02:50	21:20	22:49	////

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▭	▭	18:27	▭	▭	12:03
N 70°	▭	16:00	18:49	▭	12:42	11:39
68°	▭	16:44	19:06	▭	11:57	11:20
66°	14:23	17:13	19:19	12:20	11:27	11:05
64°	15:18	17:34	19:30	11:24	11:04	10:52
62°	15:50	17:51	19:40	10:51	10:46	10:41
60°	16:14	18:06	19:48	10:26	10:31	10:32
N 58°	16:33	18:18	19:55	10:06	10:18	10:24
56°	16:49	18:28	20:01	09:50	10:06	10:17
54°	17:03	18:37	20:06	09:35	09:56	10:10
52°	17:15	18:45	20:11	09:23	09:47	10:05
50°	17:25	18:53	20:16	09:12	09:39	09:59
45°	17:47	19:08	20:25	08:49	09:22	09:48
N 40°	18:04	19:21	20:33	08:30	09:08	09:38
35°	18:19	19:32	20:40	08:15	08:56	09:30
30°	18:32	19:41	20:46	08:01	08:45	09:23
20°	18:53	19:57	20:56	07:38	08:27	09:10
N 10°	19:12	20:11	21:05	07:17	08:11	08:59
0°	19:29	20:24	21:13	06:58	07:56	08:48
S 10°	19:46	20:37	21:22	06:39	07:41	08:37
20°	20:05	20:51	21:30	06:18	07:24	08:26
30°	20:26	21:06	21:40	05:54	07:05	08:12
35°	20:38	21:15	21:46	05:40	06:54	08:05
40°	20:52	21:26	21:53	05:23	06:41	07:56
45°	21:09	21:38	22:00	05:03	06:26	07:45
S 50°	21:29	21:52	22:09	04:38	06:07	07:33
52°	21:39	21:59	22:13	04:26	05:58	07:27
54°	21:50	22:06	22:18	04:12	05:48	07:20
56°	22:02	22:15	22:23	03:55	05:36	07:13
58°	22:16	22:24	22:28	03:36	05:23	07:04
S 60°	22:33	22:34	22:35	03:11	05:07	06:55

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 15-17 99-91%
04	04:43	04:57	12:05	00:44	13:14	
05	05:10	05:23	12:05	01:43	14:10	
06	05:37	05:50	12:06	02:36	15:01	

January 07, 08, 09 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	106°34.6	178°18.7	S23°06.2	177°41.9	S23°14.3	354°17.9	N22°06.9	108°51.4	S03°25.7
1	121°37.0	193°17.8	05.9	192°42.3	14.1	9°20.7	07.0	123°53.7	25.7
2	136°39.5	208°16.8	05.6	207°42.7	13.9	24°23.6	07.1	138°56.0	25.6
3	151°42.0	223°15.9	·· 05.3	222°43.0	·· 13.6	39°26.4	·· 07.1	153°58.3	·· 25.5
4	166°44.4	238°15.0	05.0	237°43.4	13.4	54°29.2	07.2	169°00.6	25.4
5	181°46.9	253°14.0	04.7	252°43.8	13.2	69°32.0	07.2	184°03.0	25.4
6	196°49.4	268°13.1	S23°04.4	267°44.2	S23°12.9	84°34.9	N22°07.3	199°05.3	S03°25.3
7	211°51.8	283°12.2	04.0	282°44.6	12.7	99°37.7	07.3	214°07.6	25.2
8	226°54.3	298°11.2	03.7	297°45.0	12.5	114°40.5	07.4	229°09.9	25.1
9	241°56.8	313°10.3	·· 03.4	312°45.4	·· 12.2	129°43.3	·· 07.4	244°12.2	·· 25.1
10	256°59.2	328°09.3	03.1	327°45.7	12.0	144°46.1	07.5	259°14.5	25.0
11	272°01.7	343°08.4	02.8	342°46.1	11.7	159°49.0	07.6	274°16.8	24.9
12	287°04.1	358°07.5	S23°02.5	357°46.5	S23°11.5	174°51.8	N22°07.6	289°19.1	S03°24.8
13	302°06.6	13°06.5	02.1	12°46.9	11.3	189°54.6	07.7	304°21.4	24.8
14	317°09.1	28°05.6	01.8	27°47.3	11.0	204°57.4	07.7	319°23.8	24.7
15	332°11.5	43°04.7	·· 01.5	42°47.7	·· 10.8	220°00.3	·· 07.8	334°26.1	·· 24.6
16	347°14.0	58°03.7	01.2	57°48.0	10.5	235°03.1	07.8	349°28.4	24.5
17	2°16.5	73°02.8	00.8	72°48.4	10.3	250°05.9	07.9	4°30.7	24.5
18	17°18.9	88°01.9	S23°00.5	87°48.8	S23°10.1	265°08.7	N22°08.0	19°33.0	S03°24.4
19	32°21.4	103°00.9	23°00.2	102°49.2	09.8	280°11.5	08.0	34°35.3	24.3
20	47°23.9	118°00.0	22°59.8	117°49.6	09.6	295°14.4	08.1	49°37.6	24.2
21	62°26.3	132°59.0	·· 59.5	132°50.0	·· 09.3	310°17.2	·· 08.1	64°39.9	·· 24.2
22	77°28.8	147°58.1	59.2	147°50.4	09.1	325°20.0	08.2	79°42.2	24.1
23	92°31.3	162°57.2	58.8	162°50.7	08.8	340°22.8	08.2	94°44.5	24.0
Mer.pass. 16:51		ν -0.9′	d 0.3′	m -3.90	ν 0.4′	d 0.2′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.01

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	107°33.7	177°56.2	S22°58.5	177°51.1	S23°08.6	355°25.7	N22°08.3	109°46.9	S03°23.9
1	122°36.2	192°55.3	58.2	192°51.5	08.4	10°28.5	08.3	124°49.2	23.9
2	137°38.6	207°54.4	57.8	207°51.9	08.1	25°31.3	08.4	139°51.5	23.8
3	152°41.1	222°53.4	·· 57.5	222°52.3	·· 07.9	40°34.1	·· 08.5	154°53.8	·· 23.7
4	167°43.6	237°52.5	57.2	237°52.7	07.6	55°36.9	08.5	169°56.1	23.6
5	182°46.0	252°51.6	56.8	252°53.1	07.4	70°39.8	08.6	184°58.4	23.6
6	197°48.5	267°50.7	S22°56.5	267°53.4	S23°07.1	85°42.6	N22°08.6	200°00.7	S03°23.5
7	212°51.0	282°49.7	56.1	282°53.8	06.9	100°45.4	08.7	215°03.0	23.4
8	227°53.4	297°48.8	55.8	297°54.2	06.6	115°48.2	08.7	230°05.3	23.3
9	242°55.9	312°47.9	·· 55.4	312°54.6	·· 06.4	130°51.1	·· 08.8	245°07.6	·· 23.3
10	257°58.4	327°46.9	55.1	327°55.0	06.1	145°53.9	08.9	260°09.9	23.2
11	273°00.8	342°46.0	54.7	342°55.4	05.9	160°56.7	08.9	275°12.3	23.1
12	288°03.3	357°45.1	S22°54.4	357°55.8	S23°05.6	175°59.5	N22°09.0	290°14.6	S03°23.0
13	303°05.8	12°44.1	54.0	12°56.1	05.4	191°02.4	09.0	305°16.9	23.0
14	318°08.2	27°43.2	53.7	27°56.5	05.1	206°05.2	09.1	320°19.2	22.9
15	333°10.7	42°42.3	·· 53.3	42°56.9	·· 04.9	221°08.0	·· 09.1	335°21.5	·· 22.8
16	348°13.1	57°41.4	53.0	57°57.3	04.6	236°10.8	09.2	350°23.8	22.7
17	3°15.6	72°40.4	52.6	72°57.7	04.4	251°13.6	09.2	5°26.1	22.7
18	18°18.1	87°39.5	S22°52.3	87°58.1	S23°04.1	266°16.5	N22°09.3	20°28.4	S03°22.6
19	33°20.5	102°38.6	51.9	102°58.5	03.9	281°19.3	09.4	35°30.7	22.5
20	48°23.0	117°37.6	51.5	117°58.8	03.6	296°22.1	09.4	50°33.0	22.4
21	63°25.5	132°36.7	·· 51.2	132°59.2	·· 03.4	311°24.9	·· 09.5	65°35.3	·· 22.4
22	78°27.9	147°35.8	50.8	147°59.6	03.1	326°27.8	09.5	80°37.6	22.3
23	93°30.4	162°34.9	50.5	163°00.0	02.9	341°30.6	09.6	95°39.9	22.2
Mer.pass. 16:47		ν -0.9′	d 0.3′	m -3.90	ν 0.4′	d 0.2′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	108°32.9	177°33.9	S22°50.1	178°00.4	S23°02.6	356°33.4	N22°09.6	110°42.2	S03°22.1
1	123°35.3	192°33.0	49.7	193°00.8	02.4	11°36.2	09.7	125°44.5	22.0
2	138°37.8	207°32.1	49.4	208°01.2	02.1	26°39.1	09.7	140°46.9	22.0
3	153°40.2	222°31.2	·· 49.0	223°01.6	·· 01.8	41°41.9	·· 09.8	155°49.2	·· 21.9
4	168°42.7	237°30.2	48.6	238°01.9	01.6	56°44.7	09.9	170°51.5	21.8
5	183°45.2	252°29.3	48.3	253°02.3	01.3	71°47.5	09.9	185°53.8	21.7
6	198°47.6	267°28.4	S22°47.9	268°02.7	S23°01.1	86°50.3	N22°10.0	200°56.1	S03°21.7
7	213°50.1	282°27.5	47.5	283°03.1	00.8	101°53.2	10.0	215°58.4	21.6
8	228°52.6	297°26.5	47.1	298°03.5	00.6	116°56.0	10.1	231°00.7	21.5
9	243°55.0	312°25.6	·· 46.8	313°03.9	·· 00.3	131°58.8	·· 10.1	246°03.0	·· 21.4
10	258°57.5	327°24.7	46.4	328°04.3	23°00.0	147°01.6	10.2	261°05.3	21.4
11	274°00.0	342°23.8	46.0	343°04.7	22°59.8	162°04.5	10.3	276°07.6	21.3
12	289°02.4	357°22.8	S22°45.6	358°05.0	S22°59.5	177°07.3	N22°10.3	291°09.9	S03°21.2
13	304°04.9	12°21.9	45.2	13°05.4	59.3	192°10.1	10.4	306°12.2	21.1
14	319°07.4	27°21.0	44.9	28°05.8	59.0	207°12.9	10.4	321°14.5	21.0
15	334°09.8	42°20.1	·· 44.5	43°06.2	·· 58.7	222°15.8	·· 10.5	336°16.8	·· 21.0
16	349°12.3	57°19.2	44.1	58°06.6	58.5	237°18.6	10.5	351°19.1	20.9
17	4°14.7	72°18.2	43.7	73°07.0	58.2	252°21.4	10.6	6°21.4	20.8
18	19°17.2	87°17.3	S22°43.3	88°07.4	S22°57.9	267°24.2	N22°10.6	21°23.7	S03°20.7
19	34°19.7	102°16.4	42.9	103°07.8	57.7	282°27.1	10.7	36°26.0	20.7
20	49°22.1	117°15.5	42.6	118°08.1	57.4	297°29.9	10.8	51°28.3	20.6
21	64°24.6	132°14.6	·· 42.2	133°08.5	·· 57.1	312°32.7	·· 10.8	66°30.6	·· 20.5
22	79°27.1	147°13.6	41.8	148°08.9	56.9	327°35.5	10.9	81°32.9	20.4
23	94°29.5	162°12.7	41.4	163°09.3	56.6	342°38.3	10.9	96°35.2	20.3
Mer.pass. 16:43		ν -0.9′	d 0.4′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Stars

	SHA	**Dec**
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.2	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.5	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°20.1	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.4	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.6
Sirius	258°25.1	-16°45.1
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.5
Suhail	222°45.3	-43°32.2
Miaplacidus	221°37.3	-69°49.3
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°39.6	61°36.3
Denebola	182°24.0	14°25.4
Gienah	175°42.7	-17°41.2
Acrux	172°59.1	-63°14.4
Gacrux	171°50.6	-57°15.3
Alioth	166°12.2	55°48.8
Spica	158°21.4	-11°17.8
Alkaid	152°51.4	49°10.7
Hadar	148°35.0	-60°29.7
Menkent	147°56.7	-36°29.7
Arcturus	145°47.3	19°02.6
Rigil Kent.	139°39.4	-60°56.3
Kochab	137°20.4	74°02.5
Zuben'ubi	136°55.2	-16°09.0
Alphecca	126°03.3	26°37.4
Antares	112°15.1	-26°29.3
Atria	107°09.1	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.1	12°32.4
Eltanin	90°42.3	51°29.0
Kaus Aust.	83°31.8	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.2	15°20.8

Jan 07 Wed	**SHA**	**Mer.pass**
Venus	71°44.1	12:08
Mars	71°07.3	12:09
Jupiter	247°43.3	00:23
Saturn	2°16.8	16:42

Jan 08 Thu	**SHA**	**Mer.pass**
Venus	70°22.5	12:09
Mars	70°17.4	12:08
Jupiter	247°51.9	00:18
Saturn	2°13.1	16:38

Jan 09 Fri	**SHA**	**Mer.pass**
Venus	69°01.1	12:10
Mars	69°27.5	12:08
Jupiter	248°00.6	00:14
Saturn	2°09.4	16:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°29.3	S22°23.8	310°30.4	12.8′	N10°34.8	15.0′	57.7′
1	193°29.0	23.5	325°02.2	12.9′	10°19.8	15.1′	57.7′
2	208°28.8	23.2	339°34.1	13.0′	10°04.7	15.0′	57.6′
3	223°28.5	·· 22.9	354°06.1	13.1′	09°49.7	15.1′	57.6′
4	238°28.2	22.5	8°38.2	13.2′	09°34.6	15.1′	57.6′
5	253°28.0	22.2	23°10.4	13.3′	09°19.5	15.1′	57.5′
6	268°27.7	S22°21.9	37°42.6	13.3′	N09°04.4	15.1′	57.5′
7	283°27.4	21.6	52°15.0	13.4′	08°49.3	15.2′	57.4′
8	298°27.2	21.3	66°47.4	13.5′	08°34.1	15.2′	57.4′
9	313°26.9	·· 20.9	81°19.9	13.6′	08°18.9	15.2′	57.4′
10	328°26.6	20.6	95°52.5	13.7′	08°03.7	15.2′	57.3′
11	343°26.4	20.3	110°25.1	13.7′	07°48.5	15.2′	57.3′
12	358°26.1	S22°20.0	124°57.9	13.8′	N07°33.3	15.2′	57.2′
13	13°25.8	19.7	139°30.7	13.9′	07°18.1	15.3′	57.2′
14	28°25.6	19.3	154°03.6	14.0′	07°02.8	15.2′	57.2′
15	43°25.3	·· 19.0	168°36.6	14.0′	06°47.6	15.3′	57.1′
16	58°25.0	18.7	183°09.6	14.1′	06°32.3	15.2′	57.1′
17	73°24.8	18.4	197°42.7	14.2′	06°17.1	15.3′	57.1′
18	88°24.5	S22°18.0	212°15.9	14.3′	N06°01.8	15.3′	57.0′
19	103°24.2	17.7	226°49.2	14.3′	05°46.5	15.3′	57.0′
20	118°24.0	17.4	241°22.5	14.4′	05°31.2	15.3′	56.9′
21	133°23.7	·· 17.0	255°55.9	14.4′	05°15.9	15.2′	56.9′
22	148°23.4	16.7	270°29.3	14.5′	05°00.7	15.3′	56.9′
23	163°23.2	16.4	285°02.8	14.6′	04°45.4	15.3′	56.8′
	SD = 16.3′	d = 0.3′	SD = 15.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°22.9	S22°16.0	299°36.4	14.6′	N04°30.1	15.3′	56.8′
1	193°22.6	15.7	314°10.0	14.7′	04°14.8	15.3′	56.8′
2	208°22.4	15.4	328°43.7	14.7′	03°59.5	15.3′	56.7′
3	223°22.1	·· 15.0	343°17.5	14.8′	03°44.2	15.2′	56.7′
4	238°21.8	14.7	357°51.3	14.9′	03°29.0	15.3′	56.6′
5	253°21.6	14.4	12°25.1	14.9′	03°13.7	15.3′	56.6′
6	268°21.3	S22°14.0	26°59.0	15.0′	N02°58.4	15.2′	56.6′
7	283°21.0	13.7	41°33.0	15.0′	02°43.2	15.3′	56.5′
8	298°20.8	13.4	56°07.0	15.1′	02°27.9	15.2′	56.5′
9	313°20.5	·· 13.0	70°41.1	15.1′	02°12.7	15.2′	56.5′
10	328°20.3	12.7	85°15.2	15.2′	01°57.5	15.2′	56.4′
11	343°20.0	12.3	99°49.3	15.2′	01°42.3	15.2′	56.4′
12	358°19.7	S22°12.0	114°23.5	15.2′	N01°27.1	15.2′	56.4′
13	13°19.5	11.7	128°57.8	15.3′	01°11.9	15.2′	56.3′
14	28°19.2	11.3	143°32.0	15.3′	00°56.7	15.1′	56.3′
15	43°18.9	·· 11.0	158°06.4	15.4′	00°41.6	15.1′	56.3′
16	58°18.7	10.6	172°40.7	15.4′	00°26.5	15.2′	56.2′
17	73°18.4	10.3	187°15.1	15.4′	N00°11.3	15.1′	56.2′
18	88°18.2	S22°09.9	201°49.6	15.5′	S00°03.8	15.0′	56.2′
19	103°17.9	09.6	216°24.0	15.5′	00°18.8	15.1′	56.1′
20	118°17.6	09.2	230°58.6	15.5′	00°33.9	15.0′	56.1′
21	133°17.4	·· 08.9	245°33.1	15.6′	00°48.9	15.1′	56.1′
22	148°17.1	08.5	260°07.7	15.6′	01°04.0	15.0′	56.0′
23	163°16.9	08.2	274°42.3	15.6′	01°19.0	14.9′	56.0′
	SD = 16.3′	d = 0.3′	SD = 15.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°16.6	S22°07.8	289°16.9	15.7′	S01°33.9	15.0′	56.0′
1	193°16.3	07.5	303°51.6	15.7′	01°48.9	14.9′	55.9′
2	208°16.1	07.1	318°26.2	15.7′	02°03.8	14.9′	55.9′
3	223°15.8	·· 06.8	333°00.9	15.7′	02°18.7	14.9′	55.9′
4	238°15.6	06.4	347°35.7	15.8′	02°33.6	14.8′	55.8′
5	253°15.3	06.1	2°10.4	15.8′	02°48.4	14.8′	55.8′
6	268°15.0	S22°05.7	16°45.2	15.8′	S03°03.2	14.8′	55.8′
7	283°14.8	05.4	31°20.0	15.8′	03°18.0	14.8′	55.7′
8	298°14.5	05.0	45°54.8	15.8′	03°32.8	14.7′	55.7′
9	313°14.3	·· 04.6	60°29.6	15.8′	03°47.5	14.7′	55.7′
10	328°14.0	04.3	75°04.5	15.9′	04°02.2	14.6′	55.6′
11	343°13.8	03.9	89°39.3	15.9′	04°16.8	14.7′	55.6′
12	358°13.5	S22°03.6	104°14.2	15.9′	S04°31.5	14.6′	55.6′
13	13°13.2	03.2	118°49.1	15.9′	04°46.1	14.5′	55.6′
14	28°13.0	02.9	133°24.0	15.9′	05°00.6	14.6′	55.5′
15	43°12.7	·· 02.5	147°58.9	15.9′	05°15.2	14.4′	55.5′
16	58°12.5	02.1	162°33.8	15.9′	05°29.6	14.5′	55.5′
17	73°12.2	01.8	177°08.7	15.9′	05°44.1	14.4′	55.4′
18	88°12.0	S22°01.4	191°43.7	15.9′	S05°58.5	14.4′	55.4′
19	103°11.7	01.0	206°18.6	15.9′	06°12.9	14.3′	55.4′
20	118°11.5	00.7	220°53.5	15.9′	06°27.2	14.3′	55.4′
21	133°11.2	22°00.3	235°28.5	15.9′	06°41.5	14.3′	55.3′
22	148°10.9	21°59.9	250°03.4	15.9′	06°55.8	14.2′	55.3′
23	163°10.7	59.6	264°38.4	15.9′	07°10.0	14.2′	55.3′
	SD = 16.3′	d = 0.4′	SD = 15.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:15	10:19	▬	▬	13:55	15:59
N 70°	07:58	09:36	▬	▬	14:38	16:16
68°	07:44	09:07	11:09	13:05	15:06	16:30
66°	07:32	08:46	10:13	14:01	15:28	16:42
64°	07:23	08:28	09:40	14:34	15:45	16:51
62°	07:14	08:14	09:16	14:58	16:00	17:00
60°	07:07	08:02	08:57	15:17	16:12	17:07
N 58°	07:00	07:51	08:41	15:33	16:23	17:14
56°	06:54	07:42	08:28	15:46	16:32	17:20
54°	06:48	07:34	08:16	15:58	16:40	17:26
52°	06:43	07:26	08:06	16:08	16:48	17:31
50°	06:38	07:19	07:57	16:17	16:55	17:35
45°	06:28	07:04	07:38	16:36	17:09	17:46
N 40°	06:18	06:52	07:22	16:52	17:22	17:56
35°	06:09	06:41	07:09	17:05	17:33	18:04
30°	06:01	06:31	06:57	17:17	17:43	18:12
20°	05:46	06:13	06:37	17:37	18:00	18:28
N 10°	05:31	05:57	06:19	17:54	18:17	18:43
0°	05:15	05:41	06:03	18:10	18:33	18:59
S 10°	04:57	05:24	05:46	18:27	18:50	19:17
20°	04:35	05:04	05:28	18:45	19:09	19:38
30°	04:08	04:41	05:08	19:05	19:33	20:05
35°	03:50	04:26	04:55	19:18	19:47	20:23
40°	03:28	04:09	04:41	19:32	20:04	20:44
45°	03:00	03:48	04:24	19:49	20:25	21:13
S 50°	02:19	03:20	04:03	20:09	20:52	21:53
52°	01:56	03:07	03:53	20:19	21:06	22:16
54°	01:23	02:50	03:42	20:31	21:22	22:48
56°	////	02:31	03:29	20:43	21:41	////
58°	////	02:06	03:14	20:59	22:06	////
S 60°	////	01:30	02:56	21:17	22:41	////

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	20:51	22:59	·· ··	11:16	10:41	10:08
N 70°	20:59	22:57	·· ··	11:05	10:39	10:13
68°	21:05	22:55	·· ··	10:56	10:37	10:18
66°	21:10	22:54	·· ··	10:49	10:35	10:22
64°	21:15	22:53	·· ··	10:43	10:34	10:25
62°	21:19	22:52	·· ··	10:37	10:33	10:28
60°	21:22	22:51	·· ··	10:32	10:32	10:31
N 58°	21:25	22:50	·· ··	10:28	10:31	10:33
56°	21:27	22:49	·· ··	10:24	10:30	10:35
54°	21:30	22:49	·· ··	10:21	10:29	10:37
52°	21:32	22:48	·· ··	10:18	10:28	10:39
50°	21:33	22:48	23:59	10:15	10:28	10:40
45°	21:38	22:46	23:53	10:08	10:26	10:43
N 40°	21:41	22:46	23:48	10:03	10:25	10:46
35°	21:44	22:45	23:44	09:59	10:24	10:49
30°	21:46	22:44	23:40	09:55	10:23	10:51
20°	21:51	22:43	23:34	09:47	10:22	10:55
N 10°	21:55	22:42	23:28	09:41	10:20	10:58
0°	21:58	22:41	23:22	09:35	10:19	11:01
S 10°	22:02	22:40	23:17	09:29	10:18	11:04
20°	22:06	22:39	23:12	09:23	10:16	11:07
30°	22:10	22:38	23:05	09:15	10:14	11:11
35°	22:13	22:38	23:02	09:11	10:13	11:13
40°	22:16	22:37	22:58	09:06	10:12	11:16
45°	22:19	22:36	22:53	09:00	10:11	11:19
S 50°	22:23	22:35	22:48	08:53	10:09	11:22
52°	22:25	22:35	22:45	08:50	10:09	11:24
54°	22:27	22:35	22:42	08:47	10:08	11:26
56°	22:29	22:34	22:39	08:43	10:07	11:28
58°	22:31	22:34	22:36	08:38	10:06	11:30
S 60°	22:34	22:33	22:32	08:33	10:05	11:32

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 84-66%
07	06:03	06:16	12:06	03:24	15:47	
08	06:28	06:41	12:07	04:09	16:30	
09	06:54	07:06	12:07	04:51	17:12	



January 10, 11, 12 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	109°32.0	177°11.8	S22°41.0	178°09.7	S22°56.4	357°41.2	N22°11.0	111°37.5	S03°20.3
1	124°34.5	192°10.9	40.6	193°10.1	56.1	12°44.0	11.0	126°39.8	20.2
2	139°36.9	207°10.0	40.2	208°10.5	55.8	27°46.8	11.1	141°42.2	20.1
3	154°39.4	222°09.1	·· 39.8	223°10.9	·· 55.6	42°49.6	·· 11.1	156°44.5	·· 20.0
4	169°41.9	237°08.1	39.4	238°11.2	55.3	57°52.5	11.2	171°46.8	20.0
5	184°44.3	252°07.2	39.0	253°11.6	55.0	72°55.3	11.3	186°49.1	19.9
6	199°46.8	267°06.3	S22°38.6	268°12.0	S22°54.7	87°58.1	N22°11.3	201°51.4	S03°19.8
7	214°49.2	282°05.4	38.2	283°12.4	54.5	103°00.9	11.4	216°53.7	19.7
8	229°51.7	297°04.5	37.8	298°12.8	54.2	118°03.8	11.4	231°56.0	19.6
9	244°54.2	312°03.6	·· 37.4	313°13.2	·· 53.9	133°06.6	·· 11.5	246°58.3	·· 19.6
10	259°56.6	327°02.6	37.0	328°13.6	53.7	148°09.4	11.5	262°00.6	19.5
11	274°59.1	342°01.7	36.6	343°14.0	53.4	163°12.2	11.6	277°02.9	19.4
12	290°01.6	357°00.8	S22°36.2	358°14.4	S22°53.1	178°15.1	N22°11.6	292°05.2	S03°19.3
13	305°04.0	11°59.9	35.8	13°14.7	52.9	193°17.9	11.7	307°07.5	19.2
14	320°06.5	26°59.0	35.3	28°15.1	52.6	208°20.7	11.8	322°09.8	19.2
15	335°09.0	41°58.1	·· 34.9	43°15.5	·· 52.3	223°23.5	·· 11.8	337°12.1	·· 19.1
16	350°11.4	56°57.2	34.5	58°15.9	52.0	238°26.3	11.9	352°14.4	19.0
17	5°13.9	71°56.2	34.1	73°16.3	51.8	253°29.2	11.9	7°16.7	18.9
18	20°16.3	86°55.3	S22°33.7	88°16.7	S22°51.5	268°32.0	N22°12.0	22°19.0	S03°18.9
19	35°18.8	101°54.4	33.3	103°17.1	51.2	283°34.8	12.0	37°21.3	18.8
20	50°21.3	116°53.5	32.9	118°17.5	50.9	298°37.6	12.1	52°23.6	18.7
21	65°23.7	131°52.6	·· 32.4	133°17.9	·· 50.7	313°40.5	·· 12.1	67°25.9	·· 18.6
22	80°26.2	146°51.7	32.0	148°18.3	50.4	328°43.3	12.2	82°28.2	18.5
23	95°28.7	161°50.8	31.6	163°18.6	50.1	343°46.1	12.2	97°30.5	18.5
Mer.pass. 16:39		ν -0.9′	d 0.4′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	110°31.1	176°49.9	S22°31.2	178°19.0	S22°49.8	358°48.9	N22°12.3	112°32.8	S03°18.4
1	125°33.6	191°49.0	30.8	193°19.4	49.6	13°51.8	12.4	127°35.1	18.3
2	140°36.1	206°48.0	30.3	208°19.8	49.3	28°54.6	12.4	142°37.4	18.2
3	155°38.5	221°47.1	·· 29.9	223°20.2	·· 49.0	43°57.4	·· 12.5	157°39.7	·· 18.1
4	170°41.0	236°46.2	29.5	238°20.6	48.7	59°00.2	12.5	172°42.0	18.1
5	185°43.5	251°45.3	29.0	253°21.0	48.4	74°03.1	12.6	187°44.3	18.0
6	200°45.9	266°44.4	S22°28.6	268°21.4	S22°48.2	89°05.9	N22°12.6	202°46.6	S03°17.9
7	215°48.4	281°43.5	28.2	283°21.8	47.9	104°08.7	12.7	217°48.9	17.8
8	230°50.8	296°42.6	27.8	298°22.2	47.6	119°11.5	12.7	232°51.2	17.7
9	245°53.3	311°41.7	·· 27.3	313°22.5	·· 47.3	134°14.4	·· 12.8	247°53.5	·· 17.7
10	260°55.8	326°40.8	26.9	328°22.9	47.0	149°17.2	12.9	262°55.8	17.6
11	275°58.2	341°39.9	26.5	343°23.3	46.8	164°20.0	12.9	277°58.1	17.5
12	291°00.7	356°39.0	S22°26.0	358°23.7	S22°46.5	179°22.8	N22°13.0	293°00.4	S03°17.4
13	306°03.2	11°38.1	25.6	13°24.1	46.2	194°25.6	13.0	308°02.7	17.3
14	321°05.6	26°37.2	25.1	28°24.5	45.9	209°28.5	13.1	323°05.0	17.3
15	336°08.1	41°36.3	·· 24.7	43°24.9	·· 45.6	224°31.3	·· 13.1	338°07.2	·· 17.2
16	351°10.6	56°35.4	24.3	58°25.3	45.3	239°34.1	13.2	353°09.5	17.1
17	6°13.0	71°34.5	23.8	73°25.7	45.1	254°36.9	13.2	8°11.8	17.0
18	21°15.5	86°33.5	S22°23.4	88°26.1	S22°44.8	269°39.8	N22°13.3	23°14.1	S03°16.9
19	36°18.0	101°32.6	22.9	103°26.4	44.5	284°42.6	13.4	38°16.4	16.9
20	51°20.4	116°31.7	22.5	118°26.8	44.2	299°45.4	13.4	53°18.7	16.8
21	66°22.9	131°30.8	·· 22.0	133°27.2	·· 43.9	314°48.2	·· 13.5	68°21.0	·· 16.7
22	81°25.3	146°29.9	21.6	148°27.6	43.6	329°51.1	13.5	83°23.3	16.6
23	96°27.8	161°29.0	21.1	163°28.0	43.3	344°53.9	13.6	98°25.6	16.5
Mer.pass. 16:35		ν -0.9′	d 0.4′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	111°30.3	176°28.1	S22°20.7	178°28.4	S22°43.1	359°56.7	N22°13.6	113°27.9	S03°16.5
1	126°32.7	191°27.2	20.2	193°28.8	42.8	14°59.5	13.7	128°30.2	16.4
2	141°35.2	206°26.3	19.8	208°29.2	42.5	30°02.4	13.7	143°32.5	16.3
3	156°37.7	221°25.4	·· 19.3	223°29.6	·· 42.2	45°05.2	·· 13.8	158°34.8	·· 16.2
4	171°40.1	236°24.5	18.9	238°30.0	41.9	60°08.0	13.8	173°37.1	16.1
5	186°42.6	251°23.6	18.4	253°30.4	41.6	75°10.8	13.9	188°39.4	16.1
6	201°45.1	266°22.7	S22°18.0	268°30.8	S22°41.3	90°13.6	N22°14.0	203°41.7	S03°16.0
7	216°47.5	281°21.8	17.5	283°31.1	41.0	105°16.5	14.0	218°44.0	15.9
8	231°50.0	296°20.9	17.0	298°31.5	40.7	120°19.3	14.1	233°46.3	15.8
9	246°52.4	311°20.0	·· 16.6	313°31.9	·· 40.4	135°22.1	·· 14.1	248°48.6	·· 15.7
10	261°54.9	326°19.1	16.1	328°32.3	40.2	150°24.9	14.2	263°50.9	15.6
11	276°57.4	341°18.2	15.6	343°32.7	39.9	165°27.8	14.2	278°53.2	15.6
12	291°59.8	356°17.3	S22°15.2	358°33.1	S22°39.6	180°30.6	N22°14.3	293°55.5	S03°15.5
13	307°02.3	11°16.5	14.7	13°33.5	39.3	195°33.4	14.3	308°57.8	15.4
14	322°04.8	26°15.6	14.2	28°33.9	39.0	210°36.2	14.4	324°00.1	15.3
15	337°07.2	41°14.7	·· 13.8	43°34.3	·· 38.7	225°39.1	·· 14.4	339°02.3	·· 15.2
16	352°09.7	56°13.8	13.3	58°34.7	38.4	240°41.9	14.5	354°04.6	15.2
17	7°12.2	71°12.9	12.8	73°35.1	38.1	255°44.7	14.6	9°06.9	15.1
18	22°14.6	86°12.0	S22°12.4	88°35.5	S22°37.8	270°47.5	N22°14.6	24°09.2	S03°15.0
19	37°17.1	101°11.1	11.9	103°35.9	37.5	285°50.3	14.7	39°11.5	14.9
20	52°19.6	116°10.2	11.4	118°36.3	37.2	300°53.2	14.7	54°13.8	14.8
21	67°22.0	131°09.3	·· 10.9	133°36.6	·· 36.9	315°56.0	·· 14.8	69°16.1	·· 14.7
22	82°24.5	146°08.4	10.5	148°37.0	36.6	330°58.8	14.8	84°18.4	14.7
23	97°26.9	161°07.5	10.0	163°37.4	36.3	346°01.6	14.9	99°20.7	14.6
Mer.pass. 16:31		ν -0.9′	d 0.5′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.2	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.5	-57°06.5
Hamal	327°50.2	23°35.3
Polaris	313°21.4	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.6
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.5
Suhail	222°45.3	-43°32.2
Miaplacidus	221°37.3	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°39.6	61°36.3
Denebola	182°24.0	14°25.4
Gienah	175°42.6	-17°41.2
Acrux	172°59.0	-63°14.4
Gacrux	171°50.6	-57°15.3
Alioth	166°12.2	55°48.8
Spica	158°21.4	-11°17.9
Alkaid	152°51.4	49°10.7
Hadar	148°35.0	-60°29.7
Menkent	147°56.7	-36°29.8
Arcturus	145°47.2	19°02.6
Rigil Kent.	139°39.4	-60°56.3
Kochab	137°20.3	74°02.5
Zuben'ubi	136°55.2	-16°09.0
Alphecca	126°03.2	26°37.4
Antares	112°15.1	-26°29.3
Atria	107°09.0	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.1	12°32.4
Eltanin	90°42.3	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.2	15°20.8

Jan 10 Sat	SHA	Mer.pass
Venus	67°39.8	12:12
Mars	68°37.7	12:07
Jupiter	248°09.2	00:09
Saturn	2°05.6	16:31

Jan 11 Sun	SHA	Mer.pass
Venus	66°18.7	12:13
Mars	67°47.9	12:06
Jupiter	248°17.8	00:05
Saturn	2°01.6	16:27

Jan 12 Mon	SHA	Mer.pass
Venus	64°57.9	12:15
Mars	66°58.1	12:06
Jupiter	248°26.4	00:00
Saturn	1°57.7	16:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°10.4	S21°59.2	279°13.3	15.9′	S07°24.2	14.1′	55.2′
1	193°10.2	58.8	293°48.2	15.9′	07°38.3	14.1′	55.2′
2	208°09.9	58.5	308°23.2	15.9′	07°52.4	14.1′	55.2′
3	223°09.7	·· 58.1	322°58.1	15.9′	08°06.5	14.0′	55.2′
4	238°09.4	57.7	337°33.0	15.9′	08°20.5	13.9′	55.1′
5	253°09.2	57.3	352°07.9	15.9′	08°34.4	13.9′	55.1′
6	268°08.9	S21°57.0	6°42.8	15.9′	S08°48.3	13.9′	55.1′
7	283°08.7	56.6	21°17.7	15.9′	09°02.2	13.8′	55.1′
8	298°08.4	56.2	35°52.6	15.9′	09°16.0	13.8′	55.0′
9	313°08.2	·· 55.8	50°27.5	15.9′	09°29.8	13.7′	55.0′
10	328°07.9	55.5	65°02.4	15.9′	09°43.5	13.7′	55.0′
11	343°07.7	55.1	79°37.2	15.8′	09°57.2	13.6′	55.0′
12	358°07.4	S21°54.7	94°12.1	15.8′	S10°10.8	13.6′	54.9′
13	13°07.2	54.3	108°46.9	15.8′	10°24.4	13.5′	54.9′
14	28°06.9	54.0	123°21.7	15.8′	10°37.9	13.5′	54.9′
15	43°06.7	·· 53.6	137°56.5	15.8′	10°51.4	13.4′	54.9′
16	58°06.4	53.2	152°31.2	15.7′	11°04.8	13.4′	54.9′
17	73°06.2	52.8	167°06.0	15.7′	11°18.2	13.3′	54.8′
18	88°05.9	S21°52.4	181°40.7	15.7′	S11°31.5	13.3′	54.8′
19	103°05.7	52.1	196°15.4	15.7′	11°44.8	13.2′	54.8′
20	118°05.4	51.7	210°50.1	15.7′	11°58.0	13.1′	54.8′
21	133°05.2	·· 51.3	225°24.8	15.6′	12°11.1	13.1′	54.7′
22	148°04.9	50.9	239°59.4	15.6′	12°24.2	13.1′	54.7′
23	163°04.7	50.5	254°34.0	15.6′	12°37.3	13.0′	54.7′
	SD = 16.3′	d = 0.4′	SD = 15.1′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°04.4	S21°50.1	269°08.6	15.6′	S12°50.3	12.9′	54.7′
1	193°04.2	49.7	283°43.1	15.5′	13°03.2	12.8′	54.7′
2	208°03.9	49.4	298°17.7	15.5′	13°16.0	12.9′	54.6′
3	223°03.7	·· 49.0	312°52.2	15.5′	13°28.9	12.7′	54.6′
4	238°03.4	48.6	327°26.6	15.4′	13°41.6	12.7′	54.6′
5	253°03.2	48.2	342°01.1	15.4′	13°54.3	12.6′	54.6′
6	268°02.9	S21°47.8	356°35.5	15.4′	S14°06.9	12.6′	54.6′
7	283°02.7	47.4	11°09.8	15.3′	14°19.5	12.5′	54.6′
8	298°02.4	47.0	25°44.1	15.3′	14°32.0	12.4′	54.5′
9	313°02.2	·· 46.6	40°18.4	15.3′	14°44.4	12.4′	54.5′
10	328°01.9	46.2	54°52.7	15.2′	14°56.8	12.3′	54.5′
11	343°01.7	45.8	69°26.9	15.2′	15°09.1	12.2′	54.5′
12	358°01.4	S21°45.4	84°01.1	15.1′	S15°21.3	12.2′	54.5′
13	13°01.2	45.0	98°35.2	15.1′	15°33.5	12.1′	54.5′
14	28°01.0	44.6	113°09.3	15.1′	15°45.6	12.0′	54.4′
15	43°00.7	·· 44.2	127°43.4	15.0′	15°57.6	12.0′	54.4′
16	58°00.5	43.8	142°17.4	15.0′	16°09.6	11.9′	54.4′
17	73°00.2	43.4	156°51.4	14.9′	16°21.5	11.8′	54.4′
18	88°00.0	S21°43.0	171°25.3	14.9′	S16°33.3	11.7′	54.4′
19	102°59.7	42.6	185°59.2	14.8′	16°45.0	11.7′	54.4′
20	117°59.5	42.2	200°33.1	14.8′	16°56.7	11.6′	54.4′
21	132°59.3	·· 41.8	215°06.9	14.8′	17°08.3	11.6′	54.3′
22	147°59.0	41.4	229°40.6	14.7′	17°19.9	11.4′	54.3′
23	162°58.8	41.0	244°14.3	14.7′	17°31.3	11.4′	54.3′
	SD = 16.3′	d = 0.4′	SD = 14.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°58.5	S21°40.6	258°48.0	14.6′	S17°42.7	11.4′	54.3′
1	192°58.3	40.2	273°21.6	14.6′	17°54.1	11.2′	54.3′
2	207°58.0	39.8	287°55.2	14.5′	18°05.3	11.2′	54.3′
3	222°57.8	·· 39.4	302°28.7	14.5′	18°16.5	11.1′	54.3′
4	237°57.6	39.0	317°02.1	14.4′	18°27.6	11.0′	54.2′
5	252°57.3	38.6	331°35.5	14.4′	18°38.6	10.9′	54.2′
6	267°57.1	S21°38.2	346°08.9	14.3′	S18°49.5	10.8′	54.2′
7	282°56.8	37.8	0°42.2	14.2′	19°00.3	10.8′	54.2′
8	297°56.6	37.4	15°15.4	14.2′	19°11.1	10.7′	54.2′
9	312°56.4	·· 37.0	29°48.6	14.1′	19°21.8	10.6′	54.2′
10	327°56.1	36.6	44°21.8	14.1′	19°32.4	10.5′	54.2′
11	342°55.9	36.1	58°54.8	14.0′	19°42.9	10.5′	54.2′
12	357°55.6	S21°35.7	73°27.9	14.0′	S19°53.4	10.4′	54.2′
13	12°55.4	35.3	88°00.8	13.9′	20°03.8	10.2′	54.2′
14	27°55.2	34.9	102°33.8	13.9′	20°14.0	10.2′	54.1′
15	42°54.9	·· 34.5	117°06.6	13.8′	20°24.2	10.1′	54.1′
16	57°54.7	34.1	131°39.4	13.7′	20°34.3	10.0′	54.1′
17	72°54.4	33.7	146°12.2	13.7′	20°44.3	10.0′	54.1′
18	87°54.2	S21°33.2	160°44.8	13.6′	S20°54.3	9.8′	54.1′
19	102°54.0	32.8	175°17.5	13.6′	21°04.1	9.8′	54.1′
20	117°53.7	32.4	189°50.0	13.5′	21°13.9	9.6′	54.1′
21	132°53.5	·· 32.0	204°22.5	13.4′	21°23.5	9.6′	54.1′
22	147°53.3	31.6	218°55.0	13.4′	21°33.1	9.5′	54.1′
23	162°53.0	31.1	233°27.3	13.3′	21°42.6	9.4′	54.1′
	SD = 16.3′	d = 0.4′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:09	10:07	▬	▬	14:09	16:07
N 70°	07:53	09:29	▬	▬	14:48	16:23
68°	07:40	09:02	10:53	13:24	15:15	16:36
66°	07:29	08:41	10:05	14:12	15:35	16:47
64°	07:20	08:25	09:34	14:42	15:52	16:57
62°	07:12	08:11	09:11	15:05	16:05	17:05
60°	07:04	07:59	08:53	15:23	16:17	17:12
N 58°	06:58	07:49	08:38	15:38	16:27	17:18
56°	06:52	07:40	08:25	15:51	16:36	17:24
54°	06:47	07:32	08:14	16:02	16:44	17:29
52°	06:42	07:25	08:04	16:12	16:52	17:34
50°	06:37	07:18	07:55	16:21	16:58	17:39
45°	06:27	07:04	07:37	16:40	17:13	17:49
N 40°	06:18	06:51	07:21	16:55	17:25	17:58
35°	06:09	06:41	07:08	17:08	17:35	18:07
30°	06:01	06:31	06:57	17:19	17:45	18:15
20°	05:47	06:14	06:37	17:38	18:02	18:29
N 10°	05:32	05:58	06:20	17:56	18:18	18:44
0°	05:16	05:42	06:04	18:12	18:34	19:00
S 10°	04:58	05:25	05:48	18:28	18:51	19:17
20°	04:37	05:06	05:30	18:45	19:09	19:38
30°	04:11	04:43	05:10	19:05	19:32	20:05
35°	03:53	04:29	04:58	19:17	19:46	20:22
40°	03:32	04:12	04:44	19:31	20:03	20:43
45°	03:05	03:52	04:28	19:47	20:23	21:10
S 50°	02:25	03:25	04:07	20:08	20:50	21:49
52°	02:03	03:12	03:58	20:17	21:03	22:11
54°	01:33	02:56	03:47	20:28	21:19	22:41
56°	00:32	02:37	03:34	20:41	21:37	23:35
58°	////	02:14	03:19	20:55	22:00	////
S 60°	////	01:41	03:02	21:12	22:32	////

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	01:04	03:23	▬	09:32	08:41	▬
N 70°	00:52	02:54	05:33	09:46	09:12	08:03
68°	00:42	02:33	04:40	09:58	09:34	08:57
66°	00:34	02:17	04:08	10:08	09:52	09:30
64°	00:28	02:04	03:45	10:16	10:07	09:55
62°	00:22	01:53	03:26	10:24	10:19	10:14
60°	00:17	01:43	03:11	10:30	10:29	10:30
N 58°	00:13	01:35	02:58	10:35	10:39	10:43
56°	00:09	01:28	02:47	10:40	10:47	10:55
54°	00:05	01:21	02:38	10:45	10:54	11:05
52°	00:02	01:16	02:29	10:49	11:00	11:15
50°	·· ··	01:10	02:22	10:53	11:06	11:23
45°	·· ··	00:59	02:05	11:01	11:19	11:40
N 40°	·· ··	00:50	01:52	11:07	11:30	11:55
35°	·· ··	00:42	01:41	11:13	11:39	12:07
30°	·· ··	00:35	01:31	11:18	11:47	12:18
20°	·· ··	00:24	01:14	11:27	12:01	12:36
N 10°	·· ··	00:13	01:00	11:35	12:13	12:53
0°	·· ··	00:04	00:47	11:42	12:24	13:08
S 10°	23:54	·· ··	00:33	11:50	12:36	13:23
20°	23:44	·· ··	00:19	11:58	12:48	13:39
30°	23:33	·· ··	00:03	12:07	13:02	13:58
35°	23:27	23:53	·· ··	12:12	13:11	14:09
40°	23:19	23:43	·· ··	12:18	13:20	14:22
45°	23:11	23:30	23:54	12:25	13:31	14:37
S 50°	23:00	23:15	23:34	12:34	13:45	14:56
52°	22:56	23:08	23:25	12:38	13:51	15:05
54°	22:51	23:01	23:14	12:42	13:58	15:15
56°	22:45	22:52	23:02	12:47	14:06	15:26
58°	22:38	22:42	22:49	12:52	14:15	15:39
S 60°	22:31	22:31	22:33	12:58	14:25	15:54

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 57-37%
10	07:18	07:30	12:08	05:32	17:53	
11	07:42	07:54	12:08	06:14	18:35	
12	08:06	08:17	12:08	06:57	19:19	

January 13, 14, 15 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	112°29.4	176°06.6	S22°09.5	178°37.8	S22°36.0	1°04.5	N22°14.9	114°23.0	S03°14.5
1	127°31.9	191°05.7	09.0	193°38.2	35.7	16°07.3	15.0	129°25.3	14.4
2	142°34.3	206°04.8	08.5	208°38.6	35.4	31°10.1	15.0	144°27.6	14.3
3	157°36.8	221°03.9	·· 08.1	223°39.0	·· 35.1	46°12.9	·· 15.1	159°29.9	·· 14.3
4	172°39.3	236°03.1	07.6	238°39.4	34.8	61°15.8	15.2	174°32.2	14.2
5	187°41.7	251°02.2	07.1	253°39.8	34.5	76°18.6	15.2	189°34.5	14.1
6	202°44.2	266°01.3	S22°06.6	268°40.2	S22°34.2	91°21.4	N22°15.3	204°36.7	S03°14.0
7	217°46.7	281°00.4	06.1	283°40.6	33.9	106°24.2	15.3	219°39.0	13.9
8	232°49.1	295°59.5	05.6	298°41.0	33.6	121°27.0	15.4	234°41.3	13.8
9	247°51.6	310°58.6	·· 05.1	313°41.4	·· 33.3	136°29.9	·· 15.4	249°43.6	·· 13.8
10	262°54.1	325°57.7	04.7	328°41.8	33.0	151°32.7	15.5	264°45.9	13.7
11	277°56.5	340°56.8	04.2	343°42.2	32.7	166°35.5	15.5	279°48.2	13.6
12	292°59.0	355°55.9	S22°03.7	358°42.6	S22°32.4	181°38.3	N22°15.6	294°50.5	S03°13.5
13	308°01.4	10°55.1	03.2	13°42.9	32.1	196°41.2	15.6	309°52.8	13.4
14	323°03.9	25°54.2	02.7	28°43.3	31.8	211°44.0	15.7	324°55.1	13.3
15	338°06.4	40°53.3	·· 02.2	43°43.7	·· 31.5	226°46.8	·· 15.7	339°57.4	·· 13.3
16	353°08.8	55°52.4	01.7	58°44.1	31.2	241°49.6	15.8	354°59.7	13.2
17	8°11.3	70°51.5	01.2	73°44.5	30.9	256°52.5	15.9	10°02.0	13.1
18	23°13.8	85°50.6	S22°00.7	88°44.9	S22°30.6	271°55.3	N22°15.9	25°04.2	S03°13.0
19	38°16.2	100°49.7	22°00.2	103°45.3	30.3	286°58.1	16.0	40°06.5	12.9
20	53°18.7	115°48.9	21°59.7	118°45.7	30.0	302°00.9	16.0	55°08.8	12.9
21	68°21.2	130°48.0	·· 59.2	133°46.1	·· 29.7	317°03.7	·· 16.1	70°11.1	·· 12.8
22	83°23.6	145°47.1	58.7	148°46.5	29.3	332°06.6	16.1	85°13.4	12.7
23	98°26.1	160°46.2	58.2	163°46.9	29.0	347°09.4	16.2	100°15.7	12.6
Mer.pass. 16:27		ν -0.9′	d 0.5′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	113°28.5	175°45.3	S21°57.7	178°47.3	S22°28.7	2°12.2	N22°16.2	115°18.0	S03°12.5
1	128°31.0	190°44.4	57.2	193°47.7	28.4	17°15.0	16.3	130°20.3	12.4
2	143°33.5	205°43.6	56.6	208°48.1	28.1	32°17.9	16.3	145°22.6	12.4
3	158°35.9	220°42.7	·· 56.1	223°48.5	·· 27.8	47°20.7	·· 16.4	160°24.9	·· 12.3
4	173°38.4	235°41.8	55.6	238°48.9	27.5	62°23.5	16.4	175°27.1	12.2
5	188°40.9	250°40.9	55.1	253°49.3	27.2	77°26.3	16.5	190°29.4	12.1
6	203°43.3	265°40.0	S21°54.6	268°49.7	S22°26.9	92°29.1	N22°16.6	205°31.7	S03°12.0
7	218°45.8	280°39.2	54.1	283°50.1	26.6	107°32.0	16.6	220°34.0	11.9
8	233°48.3	295°38.3	53.6	298°50.5	26.2	122°34.8	16.7	235°36.3	11.9
9	248°50.7	310°37.4	·· 53.0	313°50.9	·· 25.9	137°37.6	·· 16.7	250°38.6	·· 11.8
10	263°53.2	325°36.5	52.5	328°51.3	25.6	152°40.4	16.8	265°40.9	11.7
11	278°55.7	340°35.6	52.0	343°51.6	25.3	167°43.2	16.8	280°43.2	11.6
12	293°58.1	355°34.8	S21°51.5	358°52.0	S22°25.0	182°46.1	N22°16.9	295°45.5	S03°11.5
13	309°00.6	10°33.9	51.0	13°52.4	24.7	197°48.9	16.9	310°47.7	11.4
14	324°03.0	25°33.0	50.4	28°52.8	24.4	212°51.7	17.0	325°50.0	11.3
15	339°05.5	40°32.1	·· 49.9	43°53.2	·· 24.0	227°54.5	·· 17.0	340°52.3	·· 11.3
16	354°08.0	55°31.3	49.4	58°53.6	23.7	242°57.4	17.1	355°54.6	11.2
17	9°10.4	70°30.4	48.9	73°54.0	23.4	258°00.2	17.1	10°56.9	11.1
18	24°12.9	85°29.5	S21°48.3	88°54.4	S22°23.1	273°03.0	N22°17.2	25°59.2	S03°11.0
19	39°15.4	100°28.6	47.8	103°54.8	22.8	288°05.8	17.3	41°01.5	10.9
20	54°17.8	115°27.8	47.3	118°55.2	22.5	303°08.6	17.3	56°03.8	10.8
21	69°20.3	130°26.9	·· 46.8	133°55.6	·· 22.1	318°11.5	·· 17.4	71°06.0	·· 10.8
22	84°22.8	145°26.0	46.2	148°56.0	21.8	333°14.3	17.4	86°08.3	10.7
23	99°25.2	160°25.1	45.7	163°56.4	21.5	348°17.1	17.5	101°10.6	10.6
Mer.pass. 16:23		ν -0.9′	d 0.5′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.68	ν 2.3′	d 0.1′ m 1.02

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	114°27.7	175°24.3	S21°45.2	178°56.8	S22°21.2	3°19.9	N22°17.5	116°12.9	S03°10.5
1	129°30.2	190°23.4	44.6	193°57.2	20.9	18°22.8	17.6	131°15.2	10.4
2	144°32.6	205°22.5	44.1	208°57.6	20.5	33°25.6	17.6	146°17.5	10.3
3	159°35.1	220°21.7	·· 43.5	223°58.0	·· 20.2	48°28.4	·· 17.7	161°19.8	·· 10.3
4	174°37.5	235°20.8	43.0	238°58.4	19.9	63°31.2	17.7	176°22.1	10.2
5	189°40.0	250°19.9	42.5	253°58.8	19.6	78°34.0	17.8	191°24.3	10.1
6	204°42.5	265°19.0	S21°41.9	268°59.2	S22°19.3	93°36.9	N22°17.8	206°26.6	S03°10.0
7	219°44.9	280°18.2	41.4	283°59.6	18.9	108°39.7	17.9	221°28.9	09.9
8	234°47.4	295°17.3	40.8	299°00.0	18.6	123°42.5	17.9	236°31.2	09.8
9	249°49.9	310°16.4	·· 40.3	314°00.4	·· 18.3	138°45.3	·· 18.0	251°33.5	·· 09.7
10	264°52.3	325°15.6	39.7	329°00.8	18.0	153°48.1	18.1	266°35.8	09.7
11	279°54.8	340°14.7	39.2	344°01.2	17.6	168°51.0	18.1	281°38.1	09.6
12	294°57.3	355°13.8	S21°38.6	359°01.6	S22°17.3	183°53.8	N22°18.2	296°40.3	S03°09.5
13	309°59.7	10°13.0	38.1	14°02.0	17.0	198°56.6	18.2	311°42.6	09.4
14	325°02.2	25°12.1	37.5	29°02.4	16.7	213°59.4	18.3	326°44.9	09.3
15	340°04.7	40°11.2	·· 37.0	44°02.8	·· 16.3	229°02.2	·· 18.3	341°47.2	·· 09.2
16	355°07.1	55°10.4	36.4	59°03.2	16.0	244°05.1	18.4	356°49.5	09.1
17	10°09.6	70°09.5	35.9	74°03.6	15.7	259°07.9	18.4	11°51.8	09.1
18	25°12.0	85°08.6	S21°35.3	89°04.0	S22°15.4	274°10.7	N22°18.5	26°54.0	S03°09.0
19	40°14.5	100°07.8	34.8	104°04.4	15.0	289°13.5	18.5	41°56.3	08.9
20	55°17.0	115°06.9	34.2	119°04.8	14.7	304°16.3	18.6	56°58.6	08.8
21	70°19.4	130°06.1	·· 33.7	134°05.2	·· 14.4	319°19.2	·· 18.6	72°00.9	·· 08.7
22	85°21.9	145°05.2	33.1	149°05.6	14.0	334°22.0	18.7	87°03.2	08.6
23	100°24.4	160°04.3	32.5	164°06.0	13.7	349°24.8	18.7	102°05.5	08.5
Mer.pass. 16:19		ν -0.9′	d 0.5′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.02

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.2	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.5	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°22.5	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.6
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.5
Suhail	222°45.3	-43°32.2
Miaplacidus	221°37.2	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.3
Denebola	182°23.9	14°25.4
Gienah	175°42.6	-17°41.2
Acrux	172°59.0	-63°14.4
Gacrux	171°50.6	-57°15.3
Alioth	166°12.1	55°48.8
Spica	158°21.4	-11°17.9
Alkaid	152°51.4	49°10.6
Hadar	148°34.9	-60°29.7
Menkent	147°56.7	-36°29.8
Arcturus	145°47.2	19°02.6
Rigil Kent.	139°39.3	-60°56.3
Kochab	137°20.2	74°02.5
Zuben'ubi	136°55.2	-16°09.0
Alphecca	126°03.2	26°37.4
Antares	112°15.1	-26°29.3
Atria	107°09.0	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°42.3	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°33.1	38°48.3
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.1
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.3	15°20.8

Jan 13 Tue	SHA	Mer.pass
Venus	63°37.2	12:16
Mars	66°08.4	12:05
Jupiter	248°35.1	23:51
Saturn	1°53.6	16:20

Jan 14 Wed	SHA	Mer.pass
Venus	62°16.8	12:18
Mars	65°18.7	12:05
Jupiter	248°43.7	23:47
Saturn	1°49.4	16:16

Jan 15 Thu	SHA	Mer.pass
Venus	60°56.6	12:19
Mars	64°29.1	12:04
Jupiter	248°52.2	23:42
Saturn	1°45.2	16:13

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°52.8	S21°30.7	247°59.7	13.3′	S21°52.0	9.3′	54.1′
1	192°52.5	30.3	262°31.9	13.2′	22°01.3	9.2′	54.1′
2	207°52.3	29.9	277°04.1	13.1′	22°10.5	9.1′	54.1′
3	222°52.1	·· 29.4	291°36.2	13.1′	22°19.6	9.0′	54.1′
4	237°51.8	29.0	306°08.3	13.0′	22°28.6	8.9′	54.1′
5	252°51.6	28.6	320°40.3	12.9′	22°37.5	8.8′	54.1′
6	267°51.4	S21°28.2	335°12.3	12.9′	S22°46.3	8.8′	54.0′
7	282°51.1	27.7	349°44.1	12.8′	22°55.1	8.6′	54.0′
8	297°50.9	27.3	4°16.0	12.8′	23°03.7	8.5′	54.0′
9	312°50.7	·· 26.9	18°47.7	12.7′	23°12.2	8.4′	54.0′
10	327°50.4	26.5	33°19.4	12.6′	23°20.6	8.4′	54.0′
11	342°50.2	26.0	47°51.0	12.6′	23°29.0	8.2′	54.0′
12	357°50.0	S21°25.6	62°22.6	12.5′	S23°37.2	8.1′	54.0′
13	12°49.7	25.2	76°54.1	12.4′	23°45.3	8.0′	54.0′
14	27°49.5	24.7	91°25.5	12.4′	23°53.3	7.9′	54.0′
15	42°49.3	·· 24.3	105°56.9	12.3′	24°01.2	7.8′	54.0′
16	57°49.0	23.9	120°28.2	12.2′	24°09.0	7.7′	54.0′
17	72°48.8	23.4	134°59.4	12.2′	24°16.7	7.6′	54.0′
18	87°48.6	S21°23.0	149°30.6	12.1′	S24°24.3	7.5′	54.0′
19	102°48.3	22.6	164°01.7	12.0′	24°31.8	7.4′	54.0′
20	117°48.1	22.1	178°32.8	12.0′	24°39.2	7.3′	54.0′
21	132°47.9	·· 21.7	193°03.7	11.9′	24°46.5	7.1′	54.0′
22	147°47.7	21.3	207°34.7	11.9′	24°53.6	7.1′	54.0′
23	162°47.4	20.8	222°05.5	11.8′	25°00.7	6.9′	54.0′
	SD = 16.3′	d = 0.4′	SD = 14.7′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°47.2	S21°20.4	236°36.3	11.7′	S25°07.6	6.9′	54.0′
1	192°47.0	19.9	251°07.0	11.7′	25°14.5	6.7′	54.0′
2	207°46.7	19.5	265°37.7	11.6′	25°21.2	6.6′	54.0′
3	222°46.5	·· 19.1	280°08.3	11.5′	25°27.8	6.5′	54.0′
4	237°46.3	18.6	294°38.8	11.5′	25°34.3	6.3′	54.0′
5	252°46.1	18.2	309°09.3	11.4′	25°40.6	6.3′	54.0′
6	267°45.8	S21°17.7	323°39.7	11.4′	S25°46.9	6.1′	54.0′
7	282°45.6	17.3	338°10.1	11.3′	25°53.0	6.1′	54.0′
8	297°45.4	16.8	352°40.4	11.2′	25°59.1	5.9′	54.0′
9	312°45.1	·· 16.4	7°10.6	11.2′	26°05.0	5.8′	54.0′
10	327°44.9	16.0	21°40.8	11.1′	26°10.8	5.6′	54.0′
11	342°44.7	15.5	36°10.9	11.1′	26°16.4	5.6′	54.0′
12	357°44.5	S21°15.1	50°40.9	11.0′	S26°22.0	5.4′	54.0′
13	12°44.2	14.6	65°10.9	10.9′	26°27.4	5.3′	54.1′
14	27°44.0	14.2	79°40.9	10.9′	26°32.7	5.2′	54.1′
15	42°43.8	·· 13.7	94°10.7	10.8′	26°37.9	5.1′	54.1′
16	57°43.6	13.3	108°40.5	10.8′	26°43.0	4.9′	54.1′
17	72°43.3	12.8	123°10.3	10.7′	26°47.9	4.8′	54.1′
18	87°43.1	S21°12.4	137°40.0	10.6′	S26°52.7	4.7′	54.1′
19	102°42.9	11.9	152°09.7	10.6′	26°57.4	4.6′	54.1′
20	117°42.7	11.5	166°39.3	10.5′	27°02.0	4.4′	54.1′
21	132°42.4	·· 11.0	181°08.8	10.5′	27°06.4	4.3′	54.1′
22	147°42.2	10.5	195°38.3	10.4′	27°10.7	4.2′	54.1′
23	162°42.0	10.1	210°07.7	10.4′	27°14.9	4.1′	54.1′
	SD = 16.3′	d = 0.4′	SD = 14.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°41.8	S21°09.6	224°37.1	10.3′	S27°19.0	3.9′	54.1′
1	192°41.5	09.2	239°06.4	10.3′	27°22.9	3.8′	54.1′
2	207°41.3	08.7	253°35.7	10.2′	27°26.7	3.6′	54.1′
3	222°41.1	·· 08.3	268°05.0	10.2′	27°30.3	3.6′	54.1′
4	237°40.9	07.8	282°34.1	10.1′	27°33.9	3.4′	54.1′
5	252°40.7	07.3	297°03.3	10.1′	27°37.3	3.3′	54.1′
6	267°40.4	S21°06.9	311°32.4	10.0′	S27°40.6	3.1′	54.2′
7	282°40.2	06.4	326°01.4	10.0′	27°43.7	3.0′	54.2′
8	297°40.0	06.0	340°30.4	10.0′	27°46.7	2.9′	54.2′
9	312°39.8	·· 05.5	354°59.4	9.9′	27°49.6	2.7′	54.2′
10	327°39.6	05.0	9°28.3	9.9′	27°52.3	2.6′	54.2′
11	342°39.3	04.6	23°57.2	9.8′	27°54.9	2.5′	54.2′
12	357°39.1	S21°04.1	38°26.0	9.8′	S27°57.4	2.3′	54.2′
13	12°38.9	03.6	52°54.8	9.8′	27°59.7	2.2′	54.2′
14	27°38.7	03.2	67°23.6	9.7′	28°01.9	2.1′	54.2′
15	42°38.5	·· 02.7	81°52.3	9.7′	28°04.0	1.9′	54.2′
16	57°38.2	02.2	96°21.0	9.7′	28°05.9	1.8′	54.2′
17	72°38.0	01.8	110°49.6	9.6′	28°07.7	1.6′	54.3′
18	87°37.8	S21°01.3	125°18.2	9.6′	S28°09.3	1.5′	54.3′
19	102°37.6	00.8	139°46.8	9.6′	28°10.8	1.4′	54.3′
20	117°37.4	21°00.4	154°15.4	9.5′	28°12.2	1.2′	54.3′
21	132°37.1	20°59.9	168°43.9	9.5′	28°13.4	1.1′	54.3′
22	147°36.9	59.4	183°12.4	9.5′	28°14.5	1.0′	54.3′
23	162°36.7	59.0	197°40.9	9.4′	28°15.5	0.8′	54.3′
	SD = 16.3′	d = 0.5′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:03	09:55	▬	▬	14:23	16:16
N 70°	07:48	09:21	▬	▬	14:58	16:31
68°	07:36	08:56	10:38	13:41	15:23	16:43
66°	07:25	08:36	09:56	14:23	15:43	16:54
64°	07:16	08:20	09:28	14:51	15:58	17:02
62°	07:09	08:07	09:06	15:12	16:11	17:10
60°	07:02	07:56	08:49	15:29	16:23	17:17
N 58°	06:56	07:46	08:35	15:44	16:32	17:23
56°	06:50	07:38	08:22	15:56	16:41	17:28
54°	06:45	07:30	08:12	16:07	16:49	17:34
52°	06:40	07:23	08:02	16:17	16:56	17:38
50°	06:36	07:16	07:53	16:25	17:02	17:43
45°	06:26	07:02	07:35	16:43	17:16	17:52
N 40°	06:17	06:51	07:20	16:58	17:28	18:01
35°	06:09	06:40	07:08	17:11	17:38	18:09
30°	06:01	06:31	06:57	17:22	17:47	18:17
20°	05:47	06:14	06:38	17:40	18:04	18:31
N 10°	05:33	05:59	06:21	17:57	18:20	18:46
0°	05:17	05:43	06:05	18:13	18:35	19:01
S 10°	05:00	05:27	05:50	18:28	18:51	19:18
20°	04:40	05:08	05:32	18:45	19:10	19:38
30°	04:13	04:46	05:13	19:05	19:32	20:04
35°	03:57	04:32	05:01	19:17	19:46	20:21
40°	03:36	04:16	04:48	19:30	20:02	20:41
45°	03:09	03:56	04:32	19:46	20:22	21:08
S 50°	02:32	03:30	04:12	20:06	20:47	21:45
52°	02:11	03:17	04:02	20:15	21:00	22:06
54°	01:43	03:02	03:52	20:25	21:15	22:33
56°	00:57	02:44	03:40	20:37	21:32	23:15
58°	////	02:22	03:26	20:51	21:54	////
S 60°	////	01:52	03:09	21:08	22:23	////

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	06:27	▬	▬	08:45	▬	▬
64°	05:37	▬	▬	09:36	▬	▬
62°	05:05	06:52	09:01	10:08	10:01	09:37
60°	04:42	06:15	07:42	10:32	10:39	10:56
N 58°	04:24	05:48	07:07	10:51	11:05	11:32
56°	04:08	05:28	06:41	11:07	11:27	11:57
54°	03:55	05:10	06:21	11:21	11:44	12:18
52°	03:43	04:56	06:04	11:33	11:59	12:35
50°	03:33	04:43	05:49	11:44	12:12	12:50
45°	03:12	04:17	05:19	12:06	12:39	13:20
N 40°	02:55	03:57	04:56	12:24	13:00	13:43
35°	02:40	03:39	04:37	12:40	13:18	14:02
30°	02:28	03:25	04:21	12:53	13:33	14:19
20°	02:06	03:00	03:54	13:16	13:59	14:47
N 10°	01:48	02:38	03:30	13:35	14:21	15:11
0°	01:31	02:18	03:08	13:54	14:42	15:33
S 10°	01:14	01:59	02:47	14:12	15:03	15:56
20°	00:56	01:38	02:23	14:32	15:26	16:20
30°	00:36	01:13	01:56	14:55	15:52	16:48
35°	00:24	00:59	01:40	15:09	16:08	17:04
40°	00:10	00:42	01:22	15:25	16:26	17:24
45°	·· ··	00:23	00:59	15:43	16:47	17:47
S 50°	23:58	·· ··	00:31	16:07	17:15	18:17
52°	23:47	·· ··	00:17	16:18	17:29	18:32
54°	23:33	·· ··	00:01	16:31	17:45	18:49
56°	23:18	23:42	·· ··	16:46	18:03	19:10
58°	23:00	23:19	23:55	17:04	18:26	19:37
S 60°	22:37	22:49	23:18	17:26	18:56	20:14

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 29-13%
13	08:29	08:40	12:09	07:42	20:06	
14	08:51	09:02	12:09	08:30	20:55	
15	09:13	09:24	12:09	09:21	21:47	

January 16, 17, 18 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	115°26.8	175°03.5	S21°32.0	179°06.4	S22°13.4	4°27.6	N22°18.8	117°07.8	S03°08.5
1	130°29.3	190°02.6	31.4	194°06.8	13.1	19°30.4	18.8	132°10.0	08.4
2	145°31.8	205°01.7	30.9	209°07.2	12.7	34°33.3	18.9	147°12.3	08.3
3	160°34.2	220°00.9	·· 30.3	224°07.6	·· 12.4	49°36.1	·· 19.0	162°14.6	·· 08.2
4	175°36.7	235°00.0	29.7	239°08.0	12.1	64°38.9	19.0	177°16.9	08.1
5	190°39.2	249°59.2	29.2	254°08.4	11.7	79°41.7	19.1	192°19.2	08.0
6	205°41.6	264°58.3	S21°28.6	269°08.8	S22°11.4	94°44.5	N22°19.1	207°21.5	S03°07.9
7	220°44.1	279°57.4	28.0	284°09.2	11.1	109°47.4	19.2	222°23.7	07.9
8	235°46.5	294°56.6	27.5	299°09.6	10.7	124°50.2	19.2	237°26.0	07.8
9	250°49.0	309°55.7	·· 26.9	314°10.0	·· 10.4	139°53.0	·· 19.3	252°28.3	·· 07.7
10	265°51.5	324°54.9	26.3	329°10.4	10.1	154°55.8	19.3	267°30.6	07.6
11	280°53.9	339°54.0	25.7	344°10.8	09.7	169°58.6	19.4	282°32.9	07.5
12	295°56.4	354°53.2	S21°25.2	359°11.2	S22°09.4	185°01.5	N22°19.4	297°35.1	S03°07.4
13	310°58.9	9°52.3	24.6	14°11.6	09.1	200°04.3	19.5	312°37.4	07.3
14	326°01.3	24°51.5	24.0	29°12.0	08.7	215°07.1	19.5	327°39.7	07.3
15	341°03.8	39°50.6	·· 23.4	44°12.4	·· 08.4	230°09.9	·· 19.6	342°42.0	·· 07.2
16	356°06.3	54°49.7	22.8	59°12.8	08.1	245°12.7	19.6	357°44.3	07.1
17	11°08.7	69°48.9	22.3	74°13.2	07.7	260°15.6	19.7	12°46.6	07.0
18	26°11.2	84°48.0	S21°21.7	89°13.6	S22°07.4	275°18.4	N22°19.7	27°48.8	S03°06.9
19	41°13.7	99°47.2	21.1	104°14.0	07.0	290°21.2	19.8	42°51.1	06.8
20	56°16.1	114°46.3	20.5	119°14.4	06.7	305°24.0	19.8	57°53.4	06.7
21	71°18.6	129°45.5	·· 19.9	134°14.8	·· 06.4	320°26.8	·· 19.9	72°55.7	·· 06.6
22	86°21.0	144°44.6	19.3	149°15.2	06.0	335°29.6	20.0	87°58.0	06.6
23	101°23.5	159°43.8	18.8	164°15.6	05.7	350°32.5	20.0	103°00.2	06.5
Mer.pass. 16:16		ν -0.9′	d 0.6′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.02

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	116°26.0	174°42.9	S21°18.2	179°16.0	S22°05.3	5°35.3	N22°20.1	118°02.5	S03°06.4
1	131°28.4	189°42.1	17.6	194°16.4	05.0	20°38.1	20.1	133°04.8	06.3
2	146°30.9	204°41.2	17.0	209°16.8	04.7	35°40.9	20.2	148°07.1	06.2
3	161°33.4	219°40.4	·· 16.4	224°17.2	·· 04.3	50°43.7	·· 20.2	163°09.4	·· 06.1
4	176°35.8	234°39.5	15.8	239°17.6	04.0	65°46.6	20.3	178°11.6	06.0
5	191°38.3	249°38.7	15.2	254°18.0	03.6	80°49.4	20.3	193°13.9	06.0
6	206°40.8	264°37.8	S21°14.6	269°18.4	S22°03.3	95°52.2	N22°20.4	208°16.2	S03°05.9
7	221°43.2	279°37.0	14.0	284°18.8	02.9	110°55.0	20.4	223°18.5	05.8
8	236°45.7	294°36.1	13.4	299°19.2	02.6	125°57.8	20.5	238°20.8	05.7
9	251°48.1	309°35.3	·· 12.8	314°19.6	·· 02.3	141°00.6	·· 20.5	253°23.0	·· 05.6
10	266°50.6	324°34.4	12.2	329°20.0	01.9	156°03.5	20.6	268°25.3	05.5
11	281°53.1	339°33.6	11.6	344°20.4	01.6	171°06.3	20.6	283°27.6	05.4
12	296°55.5	354°32.7	S21°11.0	359°20.8	S22°01.2	186°09.1	N22°20.7	298°29.9	S03°05.3
13	311°58.0	9°31.9	10.4	14°21.2	00.9	201°11.9	20.7	313°32.2	05.3
14	327°00.5	24°31.1	09.8	29°21.7	00.5	216°14.7	20.8	328°34.4	05.2
15	342°02.9	39°30.2	·· 09.2	44°22.1	22°00.2	231°17.5	·· 20.8	343°36.7	·· 05.1
16	357°05.4	54°29.4	08.6	59°22.5	21°59.8	246°20.4	20.9	358°39.0	05.0
17	12°07.9	69°28.5	08.0	74°22.9	59.5	261°23.2	20.9	13°41.3	04.9
18	27°10.3	84°27.7	S21°07.4	89°23.3	S21°59.1	276°26.0	N22°21.0	28°43.6	S03°04.8
19	42°12.8	99°26.8	06.8	104°23.7	58.8	291°28.8	21.0	43°45.8	04.7
20	57°15.3	114°26.0	06.2	119°24.1	58.4	306°31.6	21.1	58°48.1	04.6
21	72°17.7	129°25.2	·· 05.6	134°24.5	·· 58.1	321°34.5	·· 21.1	73°50.4	·· 04.5
22	87°20.2	144°24.3	05.0	149°24.9	57.7	336°37.3	21.2	88°52.7	04.5
23	102°22.6	159°23.5	04.3	164°25.3	57.4	351°40.1	21.3	103°54.9	04.4
Mer.pass. 16:12		ν -0.9′	d 0.6′	m -3.90	ν 0.4′	d 0.3′	m 1.09	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.03

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	117°25.1	174°22.6	S21°03.7	179°25.7	S21°57.0	6°42.9	N22°21.3	118°57.2	S03°04.3
1	132°27.6	189°21.8	03.1	194°26.1	56.7	21°45.7	21.4	133°59.5	04.2
2	147°30.0	204°21.0	02.5	209°26.5	56.3	36°48.5	21.4	149°01.8	04.1
3	162°32.5	219°20.1	·· 01.9	224°26.9	·· 56.0	51°51.3	·· 21.5	164°04.1	·· 04.0
4	177°35.0	234°19.3	01.3	239°27.3	55.6	66°54.2	21.5	179°06.3	03.9
5	192°37.4	249°18.4	00.6	254°27.7	55.3	81°57.0	21.6	194°08.6	03.8
6	207°39.9	264°17.6	S21°00.0	269°28.1	S21°54.9	96°59.8	N22°21.6	209°10.9	S03°03.8
7	222°42.4	279°16.8	20°59.4	284°28.5	54.6	112°02.6	21.7	224°13.2	03.7
8	237°44.8	294°15.9	58.8	299°28.9	54.2	127°05.4	21.7	239°15.4	03.6
9	252°47.3	309°15.1	·· 58.1	314°29.3	·· 53.9	142°08.2	·· 21.8	254°17.7	·· 03.5
10	267°49.8	324°14.3	57.5	329°29.8	53.5	157°11.1	21.8	269°20.0	03.4
11	282°52.2	339°13.4	56.9	344°30.2	53.2	172°13.9	21.9	284°22.3	03.3
12	297°54.7	354°12.6	S20°56.3	359°30.6	S21°52.8	187°16.7	N22°21.9	299°24.5	S03°03.2
13	312°57.1	9°11.8	55.6	14°31.0	52.4	202°19.5	22.0	314°26.8	03.1
14	327°59.6	24°10.9	55.0	29°31.4	52.1	217°22.3	22.0	329°29.1	03.0
15	343°02.1	39°10.1	·· 54.4	44°31.8	·· 51.7	232°25.1	·· 22.1	344°31.4	·· 03.0
16	358°04.5	54°09.3	53.7	59°32.2	51.4	247°28.0	22.1	359°33.7	02.9
17	13°07.0	69°08.4	53.1	74°32.6	51.0	262°30.8	22.2	14°35.9	02.8
18	28°09.5	84°07.6	S20°52.5	89°33.0	S21°50.7	277°33.6	N22°22.2	29°38.2	S03°02.7
19	43°11.9	99°06.8	51.8	104°33.4	50.3	292°36.4	22.3	44°40.5	02.6
20	58°14.4	114°05.9	51.2	119°33.8	49.9	307°39.2	22.3	59°42.8	02.5
21	73°16.9	129°05.1	·· 50.6	134°34.2	·· 49.6	322°42.0	·· 22.4	74°45.0	·· 02.4
22	88°19.3	144°04.3	49.9	149°34.6	49.2	337°44.8	22.4	89°47.3	02.3
23	103°21.8	159°03.5	49.3	164°35.0	48.9	352°47.7	22.5	104°49.6	02.2
Mer.pass. 16:08		ν -0.8′	d 0.6′	m -3.90	ν 0.4′	d 0.4′	m 1.09	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.03

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.2	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.5	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°23.6	89°22.7
Acamar	315°11.0	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.6
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.7	-59°35.5
Suhail	222°45.3	-43°32.2
Miaplacidus	221°37.2	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.3
Denebola	182°23.9	14°25.4
Gienah	175°42.6	-17°41.2
Acrux	172°58.9	-63°14.4
Gacrux	171°50.5	-57°15.3
Alioth	166°12.1	55°48.7
Spica	158°21.4	-11°17.9
Alkaid	152°51.3	49°10.6
Hadar	148°34.9	-60°29.7
Menkent	147°56.7	-36°29.8
Arcturus	145°47.2	19°02.6
Rigil Kent.	139°39.3	-60°56.3
Kochab	137°20.2	74°02.5
Zuben'ubi	136°55.2	-16°09.0
Alphecca	126°03.2	26°37.4
Antares	112°15.0	-26°29.3
Atria	107°08.9	-69°04.2
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°42.3	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°33.1	38°48.3
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.1
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.3	15°20.8

Jan 16 Fri	SHA	Mer.pass
Venus	59°36.6	12:20
Mars	63°39.5	12:03
Jupiter	249°00.8	23:38
Saturn	1°40.9	16:09

Jan 17 Sat	SHA	Mer.pass
Venus	58°16.9	12:22
Mars	62°50.0	12:03
Jupiter	249°09.3	23:33
Saturn	1°36.6	16:05

Jan 18 Sun	SHA	Mer.pass
Venus	56°57.5	12:23
Mars	62°00.6	12:02
Jupiter	249°17.8	23:29
Saturn	1°32.1	16:02

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°36.5	S20°58.5	212°09.3	9.4′	S28°16.3	0.7′	54.3′
1	192°36.3	58.0	226°37.7	9.4′	28°17.0	0.5′	54.3′
2	207°36.1	57.5	241°06.1	9.4′	28°17.5	0.4′	54.3′
3	222°35.9	·· 57.1	255°34.5	9.4′	28°17.9	0.2′	54.4′
4	237°35.6	56.6	270°02.8	9.3′	28°18.1	0.1′	54.4′
5	252°35.4	56.1	284°31.2	9.3′	28°18.2	0.0′	54.4′
6	267°35.2	S20°55.6	298°59.5	9.3′	S28°18.2	0.2′	54.4′
7	282°35.0	55.2	313°27.8	9.3′	28°18.0	0.3′	54.4′
8	297°34.8	54.7	327°56.1	9.3′	28°17.7	0.4′	54.4′
9	312°34.6	·· 54.2	342°24.3	9.3′	28°17.3	0.7′	54.4′
10	327°34.4	53.7	356°52.6	9.2′	28°16.6	0.7′	54.4′
11	342°34.1	53.2	11°20.8	9.2′	28°15.9	0.9′	54.5′
12	357°33.9	S20°52.8	25°49.1	9.2′	S28°15.0	1.0′	54.5′
13	12°33.7	52.3	40°17.3	9.2′	28°14.0	1.2′	54.5′
14	27°33.5	51.8	54°45.5	9.2′	28°12.8	1.3′	54.5′
15	42°33.3	·· 51.3	69°13.7	9.2′	28°11.5	1.5′	54.5′
16	57°33.1	50.8	83°41.9	9.2′	28°10.0	1.6′	54.5′
17	72°32.9	50.3	98°10.1	9.2′	28°08.4	1.7′	54.5′
18	87°32.7	S20°49.9	112°38.3	9.2′	S28°06.7	1.9′	54.6′
19	102°32.4	49.4	127°06.5	9.2′	28°04.8	2.1′	54.6′
20	117°32.2	48.9	141°34.7	9.2′	28°02.7	2.1′	54.6′
21	132°32.0	·· 48.4	156°02.9	9.2′	28°00.6	2.4′	54.6′
22	147°31.8	47.9	170°31.1	9.2′	27°58.2	2.4′	54.6′
23	162°31.6	47.4	184°59.3	9.2′	27°55.8	2.6′	54.6′
	SD = 16.3′	d = 0.5′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°31.4	S20°46.9	199°27.6	9.2′	S27°53.2	2.8′	54.6′
1	192°31.2	46.4	213°55.8	9.2′	27°50.4	2.9′	54.7′
2	207°31.0	45.9	228°24.0	9.2′	27°47.5	3.0′	54.7′
3	222°30.8	·· 45.5	242°52.3	9.3′	27°44.5	3.2′	54.7′
4	237°30.6	45.0	257°20.5	9.3′	27°41.3	3.3′	54.7′
5	252°30.4	44.5	271°48.8	9.3′	27°38.0	3.5′	54.7′
6	267°30.2	S20°44.0	286°17.1	9.3′	S27°34.5	3.6′	54.7′
7	282°29.9	43.5	300°45.4	9.3′	27°30.9	3.7′	54.7′
8	297°29.7	43.0	315°13.7	9.3′	27°27.2	3.9′	54.8′
9	312°29.5	·· 42.5	329°42.0	9.4′	27°23.3	4.1′	54.8′
10	327°29.3	42.0	344°10.4	9.4′	27°19.2	4.1′	54.8′
11	342°29.1	41.5	358°38.7	9.4′	27°15.1	4.3′	54.8′
12	357°28.9	S20°41.0	13°07.1	9.4′	S27°10.8	4.5′	54.8′
13	12°28.7	40.5	27°35.6	9.4′	27°06.3	4.6′	54.8′
14	27°28.5	40.0	42°04.0	9.5′	27°01.7	4.7′	54.9′
15	42°28.3	·· 39.5	56°32.5	9.5′	26°57.0	4.9′	54.9′
16	57°28.1	39.0	71°01.0	9.5′	26°52.1	5.0′	54.9′
17	72°27.9	38.5	85°29.5	9.5′	26°47.1	5.1′	54.9′
18	87°27.7	S20°38.0	99°58.0	9.6′	S26°42.0	5.3′	54.9′
19	102°27.5	37.5	114°26.6	9.6′	26°36.7	5.4′	54.9′
20	117°27.3	37.0	128°55.2	9.6′	26°31.3	5.6′	55.0′
21	132°27.1	·· 36.5	143°23.9	9.7′	26°25.7	5.7′	55.0′
22	147°26.9	36.0	157°52.5	9.7′	26°20.0	5.8′	55.0′
23	162°26.7	35.5	172°21.2	9.7′	26°14.2	6.0′	55.0′
	SD = 16.3′	d = 0.5′	SD = 14.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°26.5	S20°35.0	186°50.0	9.8′	S26°08.2	6.1′	55.0′
1	192°26.3	34.5	201°18.8	9.8′	26°02.1	6.2′	55.0′
2	207°26.1	34.0	215°47.6	9.9′	25°55.9	6.4′	55.1′
3	222°25.9	·· 33.5	230°16.4	9.9′	25°49.5	6.5′	55.1′
4	237°25.7	32.9	244°45.3	9.9′	25°43.0	6.6′	55.1′
5	252°25.5	32.4	259°14.3	10.0′	25°36.4	6.8′	55.1′
6	267°25.3	S20°31.9	273°43.2	10.0′	S25°29.6	6.9′	55.1′
7	282°25.1	31.4	288°12.2	10.1′	25°22.7	7.0′	55.1′
8	297°24.9	30.9	302°41.3	10.1′	25°15.7	7.2′	55.2′
9	312°24.7	·· 30.4	317°10.4	10.1′	25°08.5	7.3′	55.2′
10	327°24.5	29.9	331°39.5	10.2′	25°01.2	7.4′	55.2′
11	342°24.3	29.4	346°08.7	10.2′	24°53.8	7.6′	55.2′
12	357°24.1	S20°28.9	0°38.0	10.3′	S24°46.2	7.6′	55.2′
13	12°23.9	28.3	15°07.2	10.3′	24°38.6	7.8′	55.3′
14	27°23.7	27.8	29°36.6	10.4′	24°30.8	8.0′	55.3′
15	42°23.5	·· 27.3	44°05.9	10.4′	24°22.8	8.0′	55.3′
16	57°23.3	26.8	58°35.3	10.5′	24°14.8	8.2′	55.3′
17	72°23.1	26.3	73°04.8	10.5′	24°06.6	8.3′	55.3′
18	87°22.9	S20°25.8	87°34.3	10.6′	S23°58.3	8.4′	55.3′
19	102°22.7	25.2	102°03.9	10.6′	23°49.9	8.6′	55.4′
20	117°22.5	24.7	116°33.5	10.7′	23°41.3	8.6′	55.4′
21	132°22.3	·· 24.2	131°03.1	10.7′	23°32.7	8.8′	55.4′
22	147°22.1	23.7	145°32.9	10.8′	23°23.9	8.9′	55.4′
23	162°21.9	23.2	160°02.6	10.8′	23°15.0	9.1′	55.4′
	SD = 16.2′	d = 0.5′	SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:56	09:43	▬	▬	14:38	16:26
N 70°	07:42	09:12	11:41	12:40	15:09	16:39
68°	07:30	08:48	10:23	13:57	15:32	16:51
66°	07:21	08:30	09:47	14:34	15:51	17:00
64°	07:12	08:15	09:21	15:00	16:05	17:09
62°	07:05	08:03	09:01	15:20	16:18	17:16
60°	06:59	07:52	08:44	15:36	16:28	17:22
N 58°	06:53	07:43	08:31	15:50	16:38	17:28
56°	06:48	07:35	08:19	16:02	16:46	17:33
54°	06:43	07:27	08:08	16:12	16:53	17:38
52°	06:38	07:21	07:59	16:21	17:00	17:42
50°	06:34	07:14	07:51	16:30	17:06	17:46
45°	06:25	07:01	07:34	16:47	17:20	17:56
N 40°	06:16	06:50	07:19	17:01	17:31	18:04
35°	06:09	06:40	07:07	17:13	17:41	18:12
30°	06:01	06:31	06:56	17:24	17:50	18:19
20°	05:47	06:14	06:38	17:42	18:06	18:33
N 10°	05:33	05:59	06:22	17:59	18:21	18:47
0°	05:19	05:44	06:06	18:14	18:36	19:01
S 10°	05:02	05:28	05:51	18:29	18:52	19:18
20°	04:42	05:10	05:34	18:45	19:09	19:38
30°	04:16	04:49	05:15	19:05	19:31	20:03
35°	04:00	04:35	05:04	19:16	19:44	20:19
40°	03:40	04:19	04:51	19:29	20:00	20:39
45°	03:14	04:00	04:35	19:44	20:19	21:05
S 50°	02:38	03:35	04:16	20:03	20:44	21:40
52°	02:19	03:23	04:07	20:12	20:56	22:00
54°	01:53	03:08	03:57	20:22	21:10	22:24
56°	01:15	02:51	03:45	20:33	21:27	23:01
58°	////	02:31	03:32	20:47	21:47	////
S 60°	////	02:03	03:16	21:02	22:14	////

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	10:48	▬	▬	13:18
62°	▬	10:12	10:01	▬	12:04	14:04
60°	08:47	09:19	09:31	11:39	12:58	14:34
N 58°	08:08	08:46	09:07	12:19	13:30	14:56
56°	07:41	08:22	08:49	12:46	13:54	15:14
54°	07:19	08:03	08:33	13:07	14:13	15:30
52°	07:01	07:46	08:19	13:25	14:29	15:43
50°	06:46	07:32	08:07	13:40	14:43	15:55
45°	06:16	07:03	07:42	14:11	15:11	16:19
N 40°	05:52	06:41	07:22	14:35	15:34	16:38
35°	05:32	06:22	07:06	14:54	15:52	16:54
30°	05:15	06:06	06:51	15:11	16:08	17:08
20°	04:47	05:38	06:26	15:39	16:34	17:31
N 10°	04:23	05:15	06:05	16:03	16:57	17:51
0°	04:00	04:53	05:45	16:26	17:18	18:10
S 10°	03:38	04:31	05:25	16:48	17:39	18:28
20°	03:13	04:07	05:03	17:12	18:02	18:48
30°	02:45	03:40	04:38	17:40	18:28	19:11
35°	02:29	03:24	04:24	17:57	18:43	19:24
40°	02:09	03:05	04:07	18:16	19:01	19:39
45°	01:46	02:42	03:46	18:39	19:22	19:57
S 50°	01:15	02:12	03:20	19:09	19:49	20:19
52°	01:00	01:58	03:07	19:24	20:02	20:30
54°	00:43	01:41	02:52	19:41	20:17	20:42
56°	00:22	01:20	02:35	20:01	20:35	20:56
58°	·· ··	00:55	02:15	20:27	20:56	21:12
S 60°	·· ··	00:20	01:48	21:02	21:23	21:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 27-0 8-1%
16	09:34	09:44	12:10	10:13	22:39	
17	09:54	10:04	12:10	11:06	23:32	
18	10:14	10:24	12:10	11:57	–:–	

January 19, 20, 21 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	118°24.3	174°02.6	S20°48.6	179°35.4	S21°48.5	7°50.5	N22°22.5	119°51.9	S03°02.2
1	133°26.7	189°01.8	48.0	194°35.9	48.1	22°53.3	22.6	134°54.1	02.1
2	148°29.2	204°01.0	47.4	209°36.3	47.8	37°56.1	22.6	149°56.4	02.0
3	163°31.6	219°00.2	·· 46.7	224°36.7	·· 47.4	52°58.9	·· 22.7	164°58.7	·· 01.9
4	178°34.1	233°59.3	46.1	239°37.1	47.1	68°01.7	22.7	180°00.9	01.8
5	193°36.6	248°58.5	45.4	254°37.5	46.7	83°04.5	22.8	195°03.2	01.7
6	208°39.0	263°57.7	S20°44.8	269°37.9	S21°46.3	98°07.4	N22°22.8	210°05.5	S03°01.6
7	223°41.5	278°56.8	44.1	284°38.3	46.0	113°10.2	22.9	225°07.8	01.5
8	238°44.0	293°56.0	43.5	299°38.7	45.6	128°13.0	22.9	240°10.0	01.4
9	253°46.4	308°55.2	·· 42.8	314°39.1	·· 45.2	143°15.8	·· 23.0	255°12.3	·· 01.3
10	268°48.9	323°54.4	42.2	329°39.5	44.9	158°18.6	23.0	270°14.6	01.3
11	283°51.4	338°53.6	41.5	344°39.9	44.5	173°21.4	23.1	285°16.9	01.2
12	298°53.8	353°52.7	S20°40.9	359°40.3	S21°44.1	188°24.2	N22°23.1	300°19.1	S03°01.1
13	313°56.3	8°51.9	40.2	14°40.8	43.8	203°27.0	23.2	315°21.4	01.0
14	328°58.8	23°51.1	39.6	29°41.2	43.4	218°29.9	23.2	330°23.7	00.9
15	344°01.2	38°50.3	·· 38.9	44°41.6	·· 43.0	233°32.7	·· 23.3	345°26.0	·· 00.8
16	359°03.7	53°49.5	38.3	59°42.0	42.7	248°35.5	23.3	0°28.2	00.7
17	14°06.1	68°48.6	37.6	74°42.4	42.3	263°38.3	23.4	15°30.5	00.6
18	29°08.6	83°47.8	S20°36.9	89°42.8	S21°41.9	278°41.1	N22°23.4	30°32.8	S03°00.5
19	44°11.1	98°47.0	36.3	104°43.2	41.6	293°43.9	23.5	45°35.0	00.4
20	59°13.5	113°46.2	35.6	119°43.6	41.2	308°46.7	23.5	60°37.3	00.4
21	74°16.0	128°45.4	·· 34.9	134°44.0	·· 40.8	323°49.5	·· 23.6	75°39.6	·· 00.3
22	89°18.5	143°44.5	34.3	149°44.4	40.5	338°52.4	23.6	90°41.9	00.2
23	104°20.9	158°43.7	33.6	164°44.9	40.1	353°55.2	23.7	105°44.1	00.1
Mer.pass. 16:04		ν -0.8′	d 0.6′	m -3.90	ν 0.4′	d 0.4′	m 1.09	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.03

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	119°23.4	173°42.9	S20°33.0	179°45.3	S21°39.7	8°58.0	N22°23.8	120°46.4	S03°00.0
1	134°25.9	188°42.1	32.3	194°45.7	39.3	24°00.8	23.8	135°48.7	02°59.9
2	149°28.3	203°41.3	31.6	209°46.1	39.0	39°03.6	23.9	150°51.0	59.8
3	164°30.8	218°40.5	·· 30.9	224°46.5	·· 38.6	54°06.4	·· 23.9	165°53.2	·· 59.7
4	179°33.2	233°39.6	30.3	239°46.9	38.2	69°09.2	24.0	180°55.5	59.6
5	194°35.7	248°38.8	29.6	254°47.3	37.9	84°12.0	24.0	195°57.8	59.5
6	209°38.2	263°38.0	S20°28.9	269°47.7	S21°37.5	99°14.9	N22°24.1	211°00.0	S02°59.4
7	224°40.6	278°37.2	28.3	284°48.1	37.1	114°17.7	24.1	226°02.3	59.4
8	239°43.1	293°36.4	27.6	299°48.6	36.7	129°20.5	24.2	241°04.6	59.3
9	254°45.6	308°35.6	·· 26.9	314°49.0	·· 36.4	144°23.3	·· 24.2	256°06.9	·· 59.2
10	269°48.0	323°34.8	26.2	329°49.4	36.0	159°26.1	24.3	271°09.1	59.1
11	284°50.5	338°34.0	25.6	344°49.8	35.6	174°28.9	24.3	286°11.4	59.0
12	299°53.0	353°33.2	S20°24.9	359°50.2	S21°35.2	189°31.7	N22°24.4	301°13.7	S02°58.9
13	314°55.4	8°32.3	24.2	14°50.6	34.9	204°34.5	24.4	316°15.9	58.8
14	329°57.9	23°31.5	23.5	29°51.0	34.5	219°37.3	24.5	331°18.2	58.7
15	345°00.4	38°30.7	·· 22.8	44°51.4	·· 34.1	234°40.1	·· 24.5	346°20.5	·· 58.6
16	0°02.8	53°29.9	22.2	59°51.8	33.7	249°43.0	24.6	1°22.7	58.5
17	15°05.3	68°29.1	21.5	74°52.3	33.3	264°45.8	24.6	16°25.0	58.4
18	30°07.7	83°28.3	S20°20.8	89°52.7	S21°33.0	279°48.6	N22°24.7	31°27.3	S02°58.4
19	45°10.2	98°27.5	20.1	104°53.1	32.6	294°51.4	24.7	46°29.6	58.3
20	60°12.7	113°26.7	19.4	119°53.5	32.2	309°54.2	24.8	61°31.8	58.2
21	75°15.1	128°25.9	·· 18.7	134°53.9	·· 31.8	324°57.0	·· 24.8	76°34.1	·· 58.1
22	90°17.6	143°25.1	18.0	149°54.3	31.4	339°59.8	24.9	91°36.4	58.0
23	105°20.1	158°24.3	17.3	164°54.7	31.1	355°02.6	24.9	106°38.6	57.9
Mer.pass. 16:00		ν -0.8′	d 0.7′	m -3.90	ν 0.4′	d 0.4′	m 1.09	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.03

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	120°22.5	173°23.5	S20°16.7	179°55.2	S21°30.7	10°05.4	N22°24.9	121°40.9	S02°57.8
1	135°25.0	188°22.7	16.0	194°55.6	30.3	25°08.2	25.0	136°43.2	57.7
2	150°27.5	203°21.9	15.3	209°56.0	29.9	40°11.1	25.0	151°45.4	57.6
3	165°29.9	218°21.1	·· 14.6	224°56.4	·· 29.5	55°13.9	·· 25.1	166°47.7	·· 57.5
4	180°32.4	233°20.3	13.9	239°56.8	29.2	70°16.7	25.1	181°50.0	57.4
5	195°34.9	248°19.5	13.2	254°57.2	28.8	85°19.5	25.2	196°52.2	57.3
6	210°37.3	263°18.7	S20°12.5	269°57.6	S21°28.4	100°22.3	N22°25.2	211°54.5	S02°57.3
7	225°39.8	278°17.9	11.8	284°58.1	28.0	115°25.1	25.3	226°56.8	57.2
8	240°42.2	293°17.1	11.1	299°58.5	27.6	130°27.9	25.3	241°59.0	57.1
9	255°44.7	308°16.3	·· 10.4	314°58.9	·· 27.2	145°30.7	·· 25.4	257°01.3	·· 57.0
10	270°47.2	323°15.5	09.7	329°59.3	26.9	160°33.5	25.4	272°03.6	56.9
11	285°49.6	338°14.7	09.0	344°59.7	26.5	175°36.3	25.5	287°05.8	56.8
12	300°52.1	353°13.9	S20°08.3	0°00.1	S21°26.1	190°39.1	N22°25.5	302°08.1	S02°56.7
13	315°54.6	8°13.1	07.6	15°00.5	25.7	205°41.9	25.6	317°10.4	56.6
14	330°57.0	23°12.3	06.9	30°01.0	25.3	220°44.8	25.6	332°12.7	56.5
15	345°59.5	38°11.5	·· 06.2	45°01.4	·· 24.9	235°47.6	·· 25.7	347°14.9	·· 56.4
16	1°02.0	53°10.7	05.5	60°01.8	24.5	250°50.4	25.7	2°17.2	56.3
17	16°04.4	68°09.9	04.7	75°02.2	24.1	265°53.2	25.8	17°19.5	56.2
18	31°06.9	83°09.1	S20°04.0	90°02.6	S21°23.8	280°56.0	N22°25.8	32°21.7	S02°56.1
19	46°09.3	98°08.3	03.3	105°03.0	23.4	295°58.8	25.9	47°24.0	56.1
20	61°11.8	113°07.5	02.6	120°03.4	23.0	311°01.6	25.9	62°26.3	56.0
21	76°14.3	128°06.7	·· 01.9	135°03.9	·· 22.6	326°04.4	·· 26.0	77°28.5	·· 55.9
22	91°16.7	143°05.9	01.2	150°04.3	22.2	341°07.2	26.0	92°30.8	55.8
23	106°19.2	158°05.1	00.5	165°04.7	21.8	356°10.0	26.1	107°33.1	55.7
Mer.pass. 15:56		ν -0.8′	d 0.7′	m -3.90	ν 0.4′	d 0.4′	m 1.09	ν 2.8′	d 0.0′ m -2.66	ν 2.3′	d 0.1′ m 1.03

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.2	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.6	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°25.0	89°22.8
Acamar	315°11.0	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.7
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.7	-59°35.5
Suhail	222°45.2	-43°32.2
Miaplacidus	221°37.2	-69°49.3
Alphard	217°46.6	-8°46.4
Regulus	207°33.2	11°50.3
Dubhe	193°39.5	61°36.3
Denebola	182°23.9	14°25.4
Gienah	175°42.6	-17°41.2
Acrux	172°58.9	-63°14.4
Gacrux	171°50.5	-57°15.4
Alioth	166°12.0	55°48.7
Spica	158°21.3	-11°17.9
Alkaid	152°51.3	49°10.6
Hadar	148°34.8	-60°29.7
Menkent	147°56.6	-36°29.8
Arcturus	145°47.1	19°02.6
Rigil Kent.	139°39.2	-60°56.4
Kochab	137°20.1	74°02.5
Zuben'ubi	136°55.1	-16°09.0
Alphecca	126°03.2	26°37.4
Antares	112°15.0	-26°29.3
Atria	107°08.9	-69°04.2
Sabik	102°02.0	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°42.3	51°28.9
Kaus Aust.	83°31.7	-34°22.3
Vega	80°33.0	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.2
Peacock	53°05.0	-56°39.1
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.8

Jan 19 Mon	SHA	Mer.pass
Venus	55°38.4	12:25
Mars	61°11.2	12:01
Jupiter	249°26.2	23:24
Saturn	1°27.6	15:58

Jan 20 Tue	SHA	Mer.pass
Venus	54°19.5	12:26
Mars	60°21.9	12:01
Jupiter	249°34.6	23:20
Saturn	1°23.0	15:54

Jan 21 Wed	SHA	Mer.pass
Venus	53°00.9	12:27
Mars	59°32.6	12:00
Jupiter	249°42.9	23:15
Saturn	1°18.4	15:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°21.7	S20°22.6	174°32.4	10.9′	S23°05.9	9.1′	55.5′
1	192°21.5	22.1	189°02.3	10.9′	22°56.8	9.3′	55.5′
2	207°21.3	21.6	203°32.2	11.0′	22°47.5	9.4′	55.5′
3	222°21.1	·· 21.1	218°02.2	11.0′	22°38.1	9.5′	55.5′
4	237°21.0	20.5	232°32.2	11.1′	22°28.6	9.6′	55.5′
5	252°20.8	20.0	247°02.3	11.1′	22°19.0	9.7′	55.6′
6	267°20.6	S20°19.5	261°32.4	11.2′	S22°09.3	9.8′	55.6′
7	282°20.4	19.0	276°02.6	11.2′	21°59.5	10.0′	55.6′
8	297°20.2	18.4	290°32.8	11.3′	21°49.5	10.1′	55.6′
9	312°20.0	·· 17.9	305°03.1	11.3′	21°39.4	10.1′	55.6′
10	327°19.8	17.4	319°33.4	11.4′	21°29.3	10.3′	55.7′
11	342°19.6	16.9	334°03.8	11.4′	21°19.0	10.4′	55.7′
12	357°19.4	S20°16.3	348°34.3	11.5′	S21°08.6	10.5′	55.7′
13	12°19.2	15.8	3°04.8	11.6′	20°58.1	10.6′	55.7′
14	27°19.0	15.3	17°35.3	11.6′	20°47.5	10.7′	55.7′
15	42°18.9	·· 14.7	32°05.9	11.7′	20°36.8	10.8′	55.8′
16	57°18.7	14.2	46°36.6	11.7′	20°26.0	10.9′	55.8′
17	72°18.5	13.7	61°07.3	11.8′	20°15.1	11.1′	55.8′
18	87°18.3	S20°13.1	75°38.1	11.8′	S20°04.0	11.1′	55.8′
19	102°18.1	12.6	90°08.9	11.9′	19°52.9	11.2′	55.8′
20	117°17.9	12.1	104°39.8	11.9′	19°41.7	11.3′	55.9′
21	132°17.7	·· 11.5	119°10.7	12.0′	19°30.4	11.5′	55.9′
22	147°17.5	11.0	133°41.7	12.0′	19°18.9	11.5′	55.9′
23	162°17.4	10.5	148°12.7	12.1′	19°07.4	11.6′	55.9′
	SD = 16.2′	d = 0.5′	SD = 15.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°17.2	S20°09.9	162°43.8	12.1′	S18°55.8	11.7′	55.9′
1	192°17.0	09.4	177°14.9	12.2′	18°44.1	11.8′	55.9′
2	207°16.8	08.8	191°46.1	12.2′	18°32.3	11.9′	56.0′
3	222°16.6	·· 08.3	206°17.4	12.3′	18°20.4	12.0′	56.0′
4	237°16.4	07.8	220°48.6	12.3′	18°08.4	12.1′	56.0′
5	252°16.2	07.2	235°20.0	12.4′	17°56.3	12.2′	56.0′
6	267°16.1	S20°06.7	249°51.4	12.4′	S17°44.1	12.2′	56.0′
7	282°15.9	06.1	264°22.8	12.5′	17°31.9	12.4′	56.1′
8	297°15.7	05.6	278°54.3	12.5′	17°19.5	12.4′	56.1′
9	312°15.5	·· 05.0	293°25.8	12.6′	17°07.1	12.6′	56.1′
10	327°15.3	04.5	307°57.4	12.6′	16°54.5	12.6′	56.1′
11	342°15.1	04.0	322°29.1	12.7′	16°41.9	12.7′	56.1′
12	357°15.0	S20°03.4	337°00.8	12.7′	S16°29.2	12.8′	56.2′
13	12°14.8	02.9	351°32.5	12.8′	16°16.4	12.8′	56.2′
14	27°14.6	02.3	6°04.3	12.8′	16°03.6	13.0′	56.2′
15	42°14.4	·· 01.8	20°36.1	12.9′	15°50.6	13.0′	56.2′
16	57°14.2	01.2	35°08.0	12.9′	15°37.6	13.1′	56.2′
17	72°14.0	00.7	49°39.9	13.0′	15°24.5	13.2′	56.3′
18	87°13.9	S20°00.1	64°11.8	13.0′	S15°11.3	13.3′	56.3′
19	102°13.7	19°59.6	78°43.8	13.0′	14°58.0	13.3′	56.3′
20	117°13.5	59.0	93°15.9	13.1′	14°44.7	13.4′	56.3′
21	132°13.3	·· 58.5	107°48.0	13.1′	14°31.3	13.5′	56.3′
22	147°13.1	57.9	122°20.1	13.2′	14°17.8	13.6′	56.4′
23	162°13.0	57.4	136°52.3	13.2′	14°04.2	13.6′	56.4′
	SD = 16.2′	d = 0.5′	SD = 15.3′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°12.8	S19°56.8	151°24.5	13.3′	S13°50.6	13.7′	56.4′
1	192°12.6	56.3	165°56.7	13.3′	13°36.9	13.8′	56.4′
2	207°12.4	55.7	180°29.0	13.3′	13°23.1	13.8′	56.5′
3	222°12.3	·· 55.1	195°01.4	13.4′	13°09.3	13.9′	56.5′
4	237°12.1	54.6	209°33.7	13.4′	12°55.4	14.0′	56.5′
5	252°11.9	54.0	224°06.1	13.4′	12°41.4	14.1′	56.5′
6	267°11.7	S19°53.5	238°38.6	13.5′	S12°27.3	14.1′	56.5′
7	282°11.5	52.9	253°11.1	13.5′	12°13.2	14.2′	56.6′
8	297°11.4	52.4	267°43.6	13.5′	11°59.0	14.2′	56.6′
9	312°11.2	·· 51.8	282°16.1	13.6′	11°44.8	14.3′	56.6′
10	327°11.0	51.2	296°48.7	13.6′	11°30.5	14.3′	56.6′
11	342°10.8	50.7	311°21.3	13.6′	11°16.2	14.5′	56.6′
12	357°10.7	S19°50.1	325°53.9	13.7′	S11°01.7	14.4′	56.7′
13	12°10.5	49.6	340°26.6	13.7′	10°47.3	14.6′	56.7′
14	27°10.3	49.0	354°59.3	13.7′	10°32.7	14.5′	56.7′
15	42°10.1	·· 48.4	9°32.0	13.8′	10°18.2	14.7′	56.7′
16	57°10.0	47.9	24°04.8	13.8′	10°03.5	14.7′	56.7′
17	72°09.8	47.3	38°37.5	13.8′	09°48.8	14.7′	56.8′
18	87°09.6	S19°46.7	53°10.3	13.8′	S09°34.1	14.8′	56.8′
19	102°09.5	46.2	67°43.2	13.8′	09°19.3	14.9′	56.8′
20	117°09.3	45.6	82°16.0	13.9′	09°04.4	14.9′	56.8′
21	132°09.1	·· 45.0	96°48.9	13.9′	08°49.5	14.9′	56.8′
22	147°08.9	44.5	111°21.8	13.9′	08°34.6	15.0′	56.9′
23	162°08.8	43.9	125°54.7	13.9′	08°19.6	15.0′	56.9′
	SD = 16.2′	d = 0.6′	SD = 15.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:48	09:31	▬	▬	14:52	16:35
N 70°	07:35	09:02	11:05	13:18	15:21	16:48
68°	07:24	08:41	10:10	14:13	15:42	16:59
66°	07:15	08:24	09:37	14:46	15:59	17:07
64°	07:08	08:10	09:13	15:09	16:13	17:15
62°	07:01	07:58	08:55	15:28	16:25	17:22
60°	06:55	07:48	08:39	15:43	16:35	17:28
N 58°	06:50	07:39	08:26	15:56	16:43	17:33
56°	06:45	07:31	08:15	16:08	16:51	17:38
54°	06:40	07:24	08:05	16:18	16:58	17:42
52°	06:36	07:18	07:56	16:26	17:05	17:47
50°	06:32	07:12	07:48	16:34	17:11	17:50
45°	06:23	06:59	07:31	16:51	17:23	17:59
N 40°	06:15	06:48	07:18	17:05	17:34	18:07
35°	06:08	06:39	07:06	17:16	17:44	18:15
30°	06:01	06:30	06:56	17:27	17:52	18:21
20°	05:47	06:14	06:38	17:44	18:08	18:35
N 10°	05:34	06:00	06:22	18:00	18:22	18:48
0°	05:20	05:45	06:07	18:15	18:37	19:02
S 10°	05:04	05:30	05:53	18:29	18:52	19:18
20°	04:44	05:13	05:36	18:45	19:09	19:37
30°	04:19	04:51	05:18	19:04	19:30	20:02
35°	04:04	04:38	05:07	19:15	19:43	20:18
40°	03:44	04:23	04:54	19:27	19:58	20:37
45°	03:20	04:05	04:40	19:42	20:17	21:01
S 50°	02:45	03:41	04:21	20:00	20:40	21:35
52°	02:27	03:29	04:12	20:09	20:52	21:53
54°	02:04	03:15	04:03	20:18	21:05	22:16
56°	01:31	02:59	03:52	20:29	21:21	22:47
58°	////	02:40	03:39	20:42	21:40	23:57
S 60°	////	02:15	03:24	20:56	22:05	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	11:58	10:48	▬	15:36	18:23
N 70°	▬	11:14	10:30	▬	16:18	18:39
68°	11:44	10:44	10:15	14:07	16:46	18:51
66°	10:51	10:22	10:03	14:59	17:07	19:01
64°	10:19	10:04	09:53	15:30	17:24	19:10
62°	09:54	09:49	09:44	15:54	17:38	19:17
60°	09:35	09:36	09:36	16:12	17:49	19:23
N 58°	09:19	09:26	09:30	16:28	17:59	19:29
56°	09:05	09:16	09:24	16:41	18:08	19:34
54°	08:53	09:08	09:18	16:52	18:15	19:38
52°	08:43	09:00	09:14	17:02	18:22	19:42
50°	08:33	08:53	09:09	17:11	18:28	19:46
45°	08:13	08:38	09:00	17:30	18:41	19:53
N 40°	07:57	08:26	08:52	17:45	18:52	19:59
35°	07:43	08:16	08:45	17:57	19:01	20:05
30°	07:31	08:07	08:39	18:09	19:09	20:10
20°	07:10	07:51	08:28	18:27	19:23	20:18
N 10°	06:52	07:37	08:19	18:44	19:35	20:25
0°	06:35	07:24	08:10	18:59	19:46	20:31
S 10°	06:18	07:11	08:01	19:14	19:57	20:38
20°	06:00	06:56	07:52	19:30	20:09	20:45
30°	05:39	06:40	07:41	19:48	20:22	20:53
35°	05:27	06:31	07:34	19:59	20:29	20:57
40°	05:12	06:20	07:27	20:11	20:38	21:02
45°	04:55	06:07	07:19	20:25	20:48	21:08
S 50°	04:34	05:51	07:09	20:42	21:00	21:15
52°	04:24	05:44	07:04	20:50	21:05	21:18
54°	04:13	05:36	06:59	20:59	21:12	21:21
56°	04:00	05:26	06:53	21:09	21:18	21:25
58°	03:44	05:16	06:46	21:20	21:26	21:29
S 60°	03:26	05:04	06:39	21:34	21:34	21:34

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 0-5%
19	10:33	10:42	12:11	12:47	00:23	
20	10:51	11:00	12:11	13:35	01:11	
21	11:09	11:17	12:11	14:21	01:58	

January 22, 23, 24 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	121°21.7	173°04.3	S19°59.8	180°05.1	S21°21.4	11°12.8	N22°26.1	122°35.3	S02°55.6
1	136°24.1	188°03.5	59.0	195°05.5	21.0	26°15.6	26.2	137°37.6	55.5
2	151°26.6	203°02.7	58.3	210°05.9	20.6	41°18.4	26.2	152°39.8	55.4
3	166°29.1	218°02.0	·· 57.6	225°06.4	·· 20.2	56°21.2	·· 26.3	167°42.1	·· 55.3
4	181°31.5	233°01.2	56.9	240°06.8	19.8	71°24.0	26.3	182°44.4	55.2
5	196°34.0	248°00.4	56.2	255°07.2	19.5	86°26.8	26.4	197°46.6	55.1
6	211°36.5	262°59.6	S19°55.4	270°07.6	S21°19.1	101°29.7	N22°26.4	212°48.9	S02°55.0
7	226°38.9	277°58.8	54.7	285°08.0	18.7	116°32.5	26.5	227°51.2	54.9
8	241°41.4	292°58.0	54.0	300°08.5	18.3	131°35.3	26.5	242°53.4	54.8
9	256°43.8	307°57.2	·· 53.3	315°08.9	·· 17.9	146°38.1	·· 26.6	257°55.7	·· 54.8
10	271°46.3	322°56.4	52.5	330°09.3	17.5	161°40.9	26.6	272°58.0	54.7
11	286°48.8	337°55.7	51.8	345°09.7	17.1	176°43.7	26.7	288°00.2	54.6
12	301°51.2	352°54.9	S19°51.1	0°10.1	S21°16.7	191°46.5	N22°26.7	303°02.5	S02°54.5
13	316°53.7	7°54.1	50.4	15°10.5	16.3	206°49.3	26.8	318°04.8	54.4
14	331°56.2	22°53.3	49.6	30°11.0	15.9	221°52.1	26.8	333°07.0	54.3
15	346°58.6	37°52.5	·· 48.9	45°11.4	·· 15.5	236°54.9	·· 26.9	348°09.3	·· 54.2
16	2°01.1	52°51.7	48.2	60°11.8	15.1	251°57.7	26.9	3°11.6	54.1
17	17°03.6	67°51.0	47.4	75°12.2	14.7	267°00.5	27.0	18°13.8	54.0
18	32°06.0	82°50.2	S19°46.7	90°12.6	S21°14.3	282°03.3	N22°27.0	33°16.1	S02°53.9
19	47°08.5	97°49.4	46.0	105°13.1	13.9	297°06.1	27.1	48°18.4	53.8
20	62°11.0	112°48.6	45.2	120°13.5	13.5	312°08.9	27.1	63°20.6	53.7
21	77°13.4	127°47.8	·· 44.5	135°13.9	·· 13.1	327°11.7	·· 27.2	78°22.9	·· 53.6
22	92°15.9	142°47.0	43.8	150°14.3	12.7	342°14.5	27.2	93°25.1	53.5
23	107°18.3	157°46.3	43.0	165°14.7	12.3	357°17.3	27.2	108°27.4	53.4
Mer.pass. 15:52		ν -0.8′ d 0.7′	m -3.90	ν 0.4′ d 0.4′	m 1.10	ν 2.8′ d 0.0′	m -2.66	ν 2.3′ d 0.1′	m 1.03

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	122°20.8	172°45.5	S19°42.3	180°15.1	S21°11.9	12°20.1	N22°27.3	123°29.7	S02°53.4
1	137°23.3	187°44.7	41.5	195°15.6	11.5	27°22.9	27.3	138°31.9	53.3
2	152°25.7	202°43.9	40.8	210°16.0	11.1	42°25.7	27.4	153°34.2	53.2
3	167°28.2	217°43.2	·· 40.1	225°16.4	·· 10.7	57°28.5	·· 27.4	168°36.5	·· 53.1
4	182°30.7	232°42.4	39.3	240°16.8	10.3	72°31.3	27.5	183°38.7	53.0
5	197°33.1	247°41.6	38.6	255°17.3	09.9	87°34.1	27.5	198°41.0	52.9
6	212°35.6	262°40.8	S19°37.8	270°17.7	S21°09.5	102°36.9	N22°27.6	213°43.2	S02°52.8
7	227°38.1	277°40.0	37.1	285°18.1	09.1	117°39.7	27.6	228°45.5	52.7
8	242°40.5	292°39.3	36.3	300°18.5	08.7	132°42.5	27.7	243°47.8	52.6
9	257°43.0	307°38.5	·· 35.6	315°18.9	·· 08.3	147°45.3	·· 27.7	258°50.0	·· 52.5
10	272°45.4	322°37.7	34.8	330°19.4	07.9	162°48.1	27.8	273°52.3	52.4
11	287°47.9	337°37.0	34.1	345°19.8	07.5	177°51.0	27.8	288°54.6	52.3
12	302°50.4	352°36.2	S19°33.3	0°20.2	S21°07.1	192°53.8	N22°27.9	303°56.8	S02°52.2
13	317°52.8	7°35.4	32.6	15°20.6	06.7	207°56.6	27.9	318°59.1	52.1
14	332°55.3	22°34.6	31.8	30°21.0	06.2	222°59.4	28.0	334°01.3	52.0
15	347°57.8	37°33.9	·· 31.1	45°21.5	·· 05.8	238°02.2	·· 28.0	349°03.6	·· 51.9
16	3°00.2	52°33.1	30.3	60°21.9	05.4	253°05.0	28.1	4°05.9	51.8
17	18°02.7	67°32.3	29.5	75°22.3	05.0	268°07.8	28.1	19°08.1	51.7
18	33°05.2	82°31.6	S19°28.8	90°22.7	S21°04.6	283°10.6	N22°28.2	34°10.4	S02°51.7
19	48°07.6	97°30.8	28.0	105°23.2	04.2	298°13.4	28.2	49°12.7	51.6
20	63°10.1	112°30.0	27.3	120°23.6	03.8	313°16.2	28.3	64°14.9	51.5
21	78°12.6	127°29.3	·· 26.5	135°24.0	·· 03.4	328°19.0	·· 28.3	79°17.2	·· 51.4
22	93°15.0	142°28.5	25.8	150°24.4	03.0	343°21.8	28.3	94°19.4	51.3
23	108°17.5	157°27.7	25.0	165°24.8	02.6	358°24.6	28.4	109°21.7	51.2
Mer.pass. 15:48		ν -0.8′ d 0.7′	m -3.90	ν 0.4′ d 0.4′	m 1.10	ν 2.8′ d 0.0′	m -2.66	ν 2.3′ d 0.1′	m 1.03

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	123°19.9	172°27.0	S19°24.2	180°25.3	S21°02.2	13°27.4	N22°28.4	124°24.0	S02°51.1
1	138°22.4	187°26.2	23.5	195°25.7	01.7	28°30.2	28.5	139°26.2	51.0
2	153°24.9	202°25.4	22.7	210°26.1	01.3	43°33.0	28.5	154°28.5	50.9
3	168°27.3	217°24.7	·· 21.9	225°26.5	·· 00.9	58°35.8	·· 28.6	169°30.7	·· 50.8
4	183°29.8	232°23.9	21.2	240°27.0	00.5	73°38.6	28.6	184°33.0	50.7
5	198°32.3	247°23.1	20.4	255°27.4	21°00.1	88°41.4	28.7	199°35.3	50.6
6	213°34.7	262°22.4	S19°19.6	270°27.8	S20°59.7	103°44.1	N22°28.7	214°37.5	S02°50.5
7	228°37.2	277°21.6	18.9	285°28.2	59.3	118°46.9	28.8	229°39.8	50.4
8	243°39.7	292°20.8	18.1	300°28.7	58.9	133°49.7	28.8	244°42.0	50.3
9	258°42.1	307°20.1	·· 17.3	315°29.1	·· 58.4	148°52.5	·· 28.9	259°44.3	·· 50.2
10	273°44.6	322°19.3	16.5	330°29.5	58.0	163°55.3	28.9	274°46.6	50.1
11	288°47.1	337°18.6	15.8	345°29.9	57.6	178°58.1	29.0	289°48.8	50.0
12	303°49.5	352°17.8	S19°15.0	0°30.4	S20°57.2	194°00.9	N22°29.0	304°51.1	S02°49.9
13	318°52.0	7°17.0	14.2	15°30.8	56.8	209°03.7	29.1	319°53.3	49.8
14	333°54.4	22°16.3	13.4	30°31.2	56.4	224°06.5	29.1	334°55.6	49.8
15	348°56.9	37°15.5	·· 12.7	45°31.6	·· 55.9	239°09.3	·· 29.1	349°57.9	·· 49.7
16	3°59.4	52°14.8	11.9	60°32.1	55.5	254°12.1	29.2	5°00.1	49.6
17	19°01.8	67°14.0	11.1	75°32.5	55.1	269°14.9	29.2	20°02.4	49.5
18	34°04.3	82°13.3	S19°10.3	90°32.9	S20°54.7	284°17.7	N22°29.3	35°04.6	S02°49.4
19	49°06.8	97°12.5	09.5	105°33.3	54.3	299°20.5	29.3	50°06.9	49.3
20	64°09.2	112°11.7	08.8	120°33.8	53.9	314°23.3	29.4	65°09.1	49.2
21	79°11.7	127°11.0	·· 08.0	135°34.2	·· 53.4	329°26.1	·· 29.4	80°11.4	·· 49.1
22	94°14.2	142°10.2	07.2	150°34.6	53.0	344°28.9	29.5	95°13.7	49.0
23	109°16.6	157°09.5	06.4	165°35.0	52.6	359°31.7	29.5	110°15.9	48.9
Mer.pass. 15:44		ν -0.8′ d 0.8′	m -3.90	ν 0.4′ d 0.4′	m 1.10	ν 2.8′ d 0.0′	m -2.65	ν 2.3′ d 0.1′	m 1.03

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.2
Ankaa	353°06.5	-42°10.1
Schedar	349°30.3	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.6	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°26.6	89°22.8
Acamar	315°11.0	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.8	7°24.7
Canopus	263°51.5	-52°42.7
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.7	-59°35.6
Suhail	222°45.2	-43°32.3
Miaplacidus	221°37.2	-69°49.4
Alphard	217°46.6	-8°46.4
Regulus	207°33.2	11°50.2
Dubhe	193°39.4	61°36.3
Denebola	182°23.9	14°25.4
Gienah	175°42.5	-17°41.2
Acrux	172°58.8	-63°14.4
Gacrux	171°50.4	-57°15.4
Alioth	166°12.0	55°48.7
Spica	158°21.3	-11°17.9
Alkaid	152°51.3	49°10.6
Hadar	148°34.8	-60°29.7
Menkent	147°56.6	-36°29.8
Arcturus	145°47.1	19°02.6
Rigil Kent.	139°39.2	-60°56.4
Kochab	137°20.0	74°02.5
Zuben'ubi	136°55.1	-16°09.0
Alphecca	126°03.1	26°37.4
Antares	112°15.0	-26°29.3
Atria	107°08.8	-69°04.2
Sabik	102°02.0	-15°45.5
Shaula	96°09.5	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°42.2	51°28.9
Kaus Aust.	83°31.7	-34°22.3
Vega	80°33.0	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.2
Peacock	53°04.9	-56°39.1
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.8

Jan 22 Thu	SHA	Mer.pass
Venus	51°42.7	12:28
Mars	58°43.4	11:59
Jupiter	249°51.1	23:11
Saturn	1°13.6	15:47

Jan 23 Fri	SHA	Mer.pass
Venus	50°24.7	12:30
Mars	57°54.3	11:59
Jupiter	249°59.3	23:06
Saturn	1°08.9	15:44

Jan 24 Sat	SHA	Mer.pass
Venus	49°07.0	12:31
Mars	57°05.3	11:58
Jupiter	250°07.4	23:02
Saturn	1°04.0	15:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°08.6	S19°43.3	140°27.6	13.9′	S08°04.6	15.1′	56.9′
1	192°08.4	42.8	155°00.6	14.0′	07°49.5	15.2′	56.9′
2	207°08.3	42.2	169°33.5	14.0′	07°34.3	15.1′	56.9′
3	222°08.1	·· 41.6	184°06.5	14.0′	07°19.2	15.2′	57.0′
4	237°07.9	41.1	198°39.5	14.0′	07°04.0	15.3′	57.0′
5	252°07.8	40.5	213°12.5	14.0′	06°48.7	15.3′	57.0′
6	267°07.6	S19°39.9	227°45.6	14.0′	S06°33.4	15.3′	57.0′
7	282°07.4	39.3	242°18.6	14.0′	06°18.1	15.4′	57.0′
8	297°07.3	38.8	256°51.6	14.1′	06°02.7	15.4′	57.1′
9	312°07.1	·· 38.2	271°24.7	14.1′	05°47.3	15.4′	57.1′
10	327°06.9	37.6	285°57.8	14.1′	05°31.9	15.5′	57.1′
11	342°06.8	37.0	300°30.8	14.1′	05°16.4	15.5′	57.1′
12	357°06.6	S19°36.5	315°03.9	14.1′	S05°00.9	15.6′	57.1′
13	12°06.4	35.9	329°37.0	14.1′	04°45.3	15.5′	57.2′
14	27°06.3	35.3	344°10.1	14.1′	04°29.8	15.6′	57.2′
15	42°06.1	·· 34.7	358°43.2	14.1′	04°14.2	15.7′	57.2′
16	57°05.9	34.1	13°16.3	14.1′	03°58.5	15.6′	57.2′
17	72°05.8	33.6	27°49.3	14.1′	03°42.9	15.7′	57.2′
18	87°05.6	S19°33.0	42°22.4	14.1′	S03°27.2	15.7′	57.3′
19	102°05.4	32.4	56°55.5	14.1′	03°11.5	15.7′	57.3′
20	117°05.3	31.8	71°28.6	14.1′	02°55.8	15.8′	57.3′
21	132°05.1	·· 31.2	86°01.7	14.1′	02°40.0	15.8′	57.3′
22	147°04.9	30.7	100°34.8	14.1′	02°24.2	15.8′	57.3′
23	162°04.8	30.1	115°07.8	14.1′	02°08.4	15.8′	57.4′
	SD = 16.2′	d = 0.6′	SD = 15.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°04.6	S19°29.5	129°40.9	14.1′	S01°52.6	15.8′	57.4′
1	192°04.5	28.9	144°13.9	14.0′	01°36.8	15.9′	57.4′
2	207°04.3	28.3	158°47.0	14.0′	01°20.9	15.8′	57.4′
3	222°04.1	·· 27.7	173°20.0	14.0′	01°05.1	15.9′	57.4′
4	237°04.0	27.1	187°53.0	14.0′	00°49.2	15.9′	57.5′
5	252°03.8	26.6	202°26.0	14.0′	00°33.3	15.9′	57.5′
6	267°03.6	S19°26.0	216°59.0	14.0′	S00°17.4	15.9′	57.5′
7	282°03.5	25.4	231°32.0	13.9′	S00°01.5	16.0′	57.5′
8	297°03.3	24.8	246°04.9	13.9′	N00°14.5	15.9′	57.5′
9	312°03.2	·· 24.2	260°37.9	13.9′	00°30.4	15.9′	57.6′
10	327°03.0	23.6	275°10.8	13.9′	00°46.3	16.0′	57.6′
11	342°02.9	23.0	289°43.7	13.9′	01°02.3	16.0′	57.6′
12	357°02.7	S19°22.4	304°16.5	13.8′	N01°18.3	15.9′	57.6′
13	12°02.5	21.8	318°49.4	13.8′	01°34.2	16.0′	57.6′
14	27°02.4	21.2	333°22.2	13.8′	01°50.2	15.9′	57.7′
15	42°02.2	·· 20.7	347°55.0	13.8′	02°06.1	16.0′	57.7′
16	57°02.1	20.1	2°27.7	13.7′	02°22.1	16.0′	57.7′
17	72°01.9	19.5	17°00.4	13.7′	02°38.1	16.0′	57.7′
18	87°01.8	S19°18.9	31°33.1	13.7′	N02°54.1	15.9′	57.7′
19	102°01.6	18.3	46°05.8	13.6′	03°10.0	16.0′	57.8′
20	117°01.4	17.7	60°38.4	13.6′	03°26.0	15.9′	57.8′
21	132°01.3	·· 17.1	75°11.0	13.6′	03°41.9	16.0′	57.8′
22	147°01.1	16.5	89°43.6	13.5′	03°57.9	15.9′	57.8′
23	162°01.0	15.9	104°16.1	13.5′	04°13.8	15.9′	57.8′
	SD = 16.2′	d = 0.6′	SD = 15.6′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°00.8	S19°15.3	118°48.6	13.4′	N04°29.7	16.0′	57.9′
1	192°00.7	14.7	133°21.0	13.4′	04°45.7	15.9′	57.9′
2	207°00.5	14.1	147°53.4	13.4′	05°01.6	15.9′	57.9′
3	222°00.4	·· 13.5	162°25.8	13.3′	05°17.5	15.8′	57.9′
4	237°00.2	12.9	176°58.1	13.3′	05°33.3	15.9′	57.9′
5	252°00.1	12.3	191°30.4	13.2′	05°49.2	15.9′	58.0′
6	266°59.9	S19°11.7	206°02.6	13.2′	N06°05.1	15.8′	58.0′
7	281°59.8	11.1	220°34.7	13.1′	06°20.9	15.8′	58.0′
8	296°59.6	10.5	235°06.9	13.1′	06°36.7	15.8′	58.0′
9	311°59.5	·· 09.9	249°38.9	13.0′	06°52.5	15.8′	58.0′
10	326°59.3	09.3	264°10.9	13.0′	07°08.3	15.7′	58.1′
11	341°59.2	08.7	278°42.9	12.9′	07°24.0	15.7′	58.1′
12	356°59.0	S19°08.1	293°14.8	12.8′	N07°39.7	15.7′	58.1′
13	11°58.9	07.4	307°46.7	12.8′	07°55.4	15.7′	58.1′
14	26°58.7	06.8	322°18.4	12.7′	08°11.1	15.6′	58.1′
15	41°58.6	·· 06.2	336°50.2	12.7′	08°26.7	15.6′	58.2′
16	56°58.4	05.6	351°21.8	12.6′	08°42.3	15.6′	58.2′
17	71°58.3	05.0	5°53.5	12.5′	08°57.9	15.6′	58.2′
18	86°58.1	S19°04.4	20°25.0	12.5′	N09°13.5	15.5′	58.2′
19	101°58.0	03.8	34°56.5	12.4′	09°29.0	15.4′	58.2′
20	116°57.8	03.2	49°27.9	12.3′	09°44.4	15.5′	58.3′
21	131°57.7	·· 02.6	63°59.2	12.3′	09°59.9	15.4′	58.3′
22	146°57.5	02.0	78°30.5	12.2′	10°15.3	15.3′	58.3′
23	161°57.4	01.3	93°01.7	12.1′	10°30.6	15.4′	58.3′
	SD = 16.2′	d = 0.6′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:39	09:18	▬	▬	15:07	16:46
N 70°	07:27	08:52	10:41	13:44	15:33	16:57
68°	07:18	08:33	09:56	14:28	15:52	17:07
66°	07:10	08:17	09:27	14:57	16:08	17:15
64°	07:03	08:04	09:05	15:19	16:21	17:22
62°	06:56	07:53	08:48	15:36	16:32	17:28
60°	06:51	07:43	08:33	15:51	16:41	17:34
N 58°	06:46	07:35	08:21	16:03	16:49	17:38
56°	06:41	07:28	08:10	16:14	16:57	17:43
54°	06:37	07:21	08:01	16:23	17:03	17:47
52°	06:33	07:15	07:53	16:32	17:09	17:51
50°	06:30	07:09	07:45	16:39	17:15	17:55
45°	06:21	06:57	07:29	16:55	17:27	18:03
N 40°	06:14	06:47	07:16	17:08	17:37	18:10
35°	06:07	06:37	07:05	17:19	17:47	18:17
30°	06:00	06:29	06:55	17:29	17:55	18:24
20°	05:47	06:14	06:37	17:46	18:10	18:36
N 10°	05:35	06:00	06:22	18:01	18:23	18:49
0°	05:21	05:46	06:08	18:15	18:37	19:03
S 10°	05:05	05:31	05:54	18:30	18:52	19:18
20°	04:47	05:15	05:38	18:45	19:09	19:37
30°	04:23	04:54	05:21	19:03	19:29	20:01
35°	04:07	04:42	05:10	19:13	19:41	20:16
40°	03:49	04:27	04:58	19:25	19:56	20:34
45°	03:25	04:09	04:44	19:39	20:14	20:58
S 50°	02:52	03:46	04:26	19:57	20:36	21:30
52°	02:35	03:35	04:18	20:05	20:47	21:46
54°	02:14	03:22	04:08	20:14	21:00	22:07
56°	01:45	03:07	03:58	20:24	21:15	22:35
58°	00:55	02:49	03:46	20:36	21:33	23:20
S 60°	////	02:26	03:32	20:50	21:55	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	10:07	09:32	08:56	20:40	22:53	·· ··
N 70°	09:59	09:33	09:06	20:44	22:47	·· ··
68°	09:53	09:33	09:13	20:47	22:42	·· ··
66°	09:48	09:34	09:20	20:50	22:38	·· ··
64°	09:43	09:34	09:25	20:52	22:35	·· ··
62°	09:39	09:35	09:30	20:54	22:32	·· ··
60°	09:36	09:35	09:34	20:56	22:29	·· ··
N 58°	09:33	09:35	09:38	20:58	22:27	·· ··
56°	09:30	09:36	09:41	20:59	22:25	23:54
54°	09:27	09:36	09:44	21:00	22:23	23:49
52°	09:25	09:36	09:47	21:01	22:22	23:44
50°	09:23	09:36	09:50	21:02	22:20	23:40
45°	09:19	09:37	09:55	21:05	22:17	23:31
N 40°	09:15	09:37	10:00	21:07	22:14	23:24
35°	09:11	09:37	10:04	21:08	22:12	23:18
30°	09:09	09:38	10:07	21:10	22:10	23:12
20°	09:03	09:38	10:14	21:12	22:07	23:03
N 10°	08:59	09:39	10:19	21:14	22:03	22:55
0°	08:55	09:39	10:25	21:16	22:01	22:47
S 10°	08:50	09:40	10:30	21:18	21:58	22:39
20°	08:46	09:40	10:36	21:20	21:55	22:31
30°	08:41	09:41	10:42	21:22	21:51	22:22
35°	08:38	09:41	10:46	21:23	21:49	22:16
40°	08:34	09:42	10:50	21:25	21:47	22:10
45°	08:30	09:42	10:56	21:26	21:44	22:04
S 50°	08:26	09:43	11:02	21:28	21:41	21:55
52°	08:23	09:43	11:05	21:29	21:40	21:51
54°	08:21	09:44	11:08	21:30	21:38	21:47
56°	08:18	09:44	11:11	21:31	21:36	21:43
58°	08:15	09:44	11:15	21:32	21:35	21:37
S 60°	08:12	09:45	11:19	21:33	21:32	21:32

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 4-6 10-27%
22	11:26	11:34	12:12	15:05	02:43	
23	11:42	11:49	12:12	15:50	03:27	
24	11:57	12:04	12:12	16:36	04:13	

January 25, 26, 27 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	124°19.1	172°08.7	S19°05.6	180°35.5	S20°52.2	14°34.5	N22°29.6	125°18.2	S02°48.8
1	139°21.5	187°08.0	04.8	195°35.9	51.8	29°37.3	29.6	140°20.4	48.7
2	154°24.0	202°07.2	04.0	210°36.3	51.3	44°40.1	29.7	155°22.7	48.6
3	169°26.5	217°06.5	·· 03.2	225°36.7	·· 50.9	59°42.9	·· 29.7	170°25.0	·· 48.5
4	184°28.9	232°05.7	02.5	240°37.2	50.5	74°45.7	29.7	185°27.2	48.4
5	199°31.4	247°05.0	01.7	255°37.6	50.1	89°48.5	29.8	200°29.5	48.3
6	214°33.9	262°04.2	S19°00.9	270°38.0	S20°49.6	104°51.3	N22°29.8	215°31.7	S02°48.2
7	229°36.3	277°03.5	19°00.1	285°38.4	49.2	119°54.1	29.9	230°34.0	48.1
8	244°38.8	292°02.7	18°59.3	300°38.9	48.8	134°56.9	29.9	245°36.2	48.0
9	259°41.3	307°02.0	·· 58.5	315°39.3	·· 48.4	149°59.7	·· 30.0	260°38.5	·· 47.9
10	274°43.7	322°01.2	57.7	330°39.7	47.9	165°02.4	30.0	275°40.8	47.8
11	289°46.2	337°00.5	56.9	345°40.2	47.5	180°05.2	30.1	290°43.0	47.7
12	304°48.7	351°59.7	S18°56.1	0°40.6	S20°47.1	195°08.0	N22°30.1	305°45.3	S02°47.6
13	319°51.1	6°59.0	55.3	15°41.0	46.7	210°10.8	30.2	320°47.5	47.5
14	334°53.6	21°58.2	54.5	30°41.4	46.2	225°13.6	30.2	335°49.8	47.4
15	349°56.0	36°57.5	·· 53.7	45°41.9	·· 45.8	240°16.4	·· 30.3	350°52.0	·· 47.3
16	4°58.5	51°56.7	52.9	60°42.3	45.4	255°19.2	30.3	5°54.3	47.2
17	20°01.0	66°56.0	52.1	75°42.7	45.0	270°22.0	30.3	20°56.5	47.2
18	35°03.4	81°55.3	S18°51.3	90°43.2	S20°44.5	285°24.8	N22°30.4	35°58.8	S02°47.1
19	50°05.9	96°54.5	50.5	105°43.6	44.1	300°27.6	30.4	51°01.1	47.0
20	65°08.4	111°53.8	49.7	120°44.0	43.7	315°30.4	30.5	66°03.3	46.9
21	80°10.8	126°53.0	·· 48.9	135°44.4	·· 43.3	330°33.2	·· 30.5	81°05.6	·· 46.8
22	95°13.3	141°52.3	48.1	150°44.9	42.8	345°36.0	30.6	96°07.8	46.7
23	110°15.8	156°51.5	47.3	165°45.3	42.4	0°38.8	30.6	111°10.1	46.6
Mer.pass. 15:40		ν -0.8′	d 0.8′	m -3.90	ν 0.4′	d 0.4′	m 1.10	ν 2.8′	d 0.0′ m -2.65	ν 2.3′	d 0.1′ m 1.03

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	125°18.2	171°50.8	S18°46.4	180°45.7	S20°42.0	15°41.5	N22°30.7	126°12.3	S02°46.5
1	140°20.7	186°50.1	45.6	195°46.2	41.5	30°44.3	30.7	141°14.6	46.4
2	155°23.1	201°49.3	44.8	210°46.6	41.1	45°47.1	30.8	156°16.8	46.3
3	170°25.6	216°48.6	·· 44.0	225°47.0	·· 40.7	60°49.9	·· 30.8	171°19.1	·· 46.2
4	185°28.1	231°47.9	43.2	240°47.5	40.2	75°52.7	30.8	186°21.4	46.1
5	200°30.5	246°47.1	42.4	255°47.9	39.8	90°55.5	30.9	201°23.6	46.0
6	215°33.0	261°46.4	S18°41.6	270°48.3	S20°39.4	105°58.3	N22°30.9	216°25.9	S02°45.9
7	230°35.5	276°45.6	40.8	285°48.8	38.9	121°01.1	31.0	231°28.1	45.8
8	245°37.9	291°44.9	39.9	300°49.2	38.5	136°03.9	31.0	246°30.4	45.7
9	260°40.4	306°44.2	·· 39.1	315°49.6	·· 38.1	151°06.7	·· 31.1	261°32.6	·· 45.6
10	275°42.9	321°43.4	38.3	330°50.0	37.6	166°09.5	31.1	276°34.9	45.5
11	290°45.3	336°42.7	37.5	345°50.5	37.2	181°12.2	31.2	291°37.1	45.4
12	305°47.8	351°42.0	S18°36.7	0°50.9	S20°36.8	196°15.0	N22°31.2	306°39.4	S02°45.3
13	320°50.3	6°41.2	35.8	15°51.3	36.3	211°17.8	31.3	321°41.6	45.2
14	335°52.7	21°40.5	35.0	30°51.8	35.9	226°20.6	31.3	336°43.9	45.1
15	350°55.2	36°39.8	·· 34.2	45°52.2	·· 35.5	241°23.4	·· 31.3	351°46.2	·· 45.0
16	5°57.6	51°39.0	33.4	60°52.6	35.0	256°26.2	31.4	6°48.4	44.9
17	21°00.1	66°38.3	32.5	75°53.1	34.6	271°29.0	31.4	21°50.7	44.8
18	36°02.6	81°37.6	S18°31.7	90°53.5	S20°34.2	286°31.8	N22°31.5	36°52.9	S02°44.7
19	51°05.0	96°36.8	30.9	105°53.9	33.7	301°34.6	31.5	51°55.2	44.6
20	66°07.5	111°36.1	30.1	120°54.4	33.3	316°37.3	31.6	66°57.4	44.5
21	81°10.0	126°35.4	·· 29.2	135°54.8	·· 32.8	331°40.1	·· 31.6	81°59.7	·· 44.4
22	96°12.4	141°34.7	28.4	150°55.2	32.4	346°42.9	31.7	97°01.9	44.3
23	111°14.9	156°33.9	27.6	165°55.7	32.0	1°45.7	31.7	112°04.2	44.2
Mer.pass. 15:36		ν -0.7′	d 0.8′	m -3.90	ν 0.4′	d 0.4′	m 1.10	ν 2.8′	d 0.0′ m -2.65	ν 2.3′	d 0.1′ m 1.03

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	126°17.4	171°33.2	S18°26.7	180°56.1	S20°31.5	16°48.5	N22°31.8	127°06.4	S02°44.1
1	141°19.8	186°32.5	25.9	195°56.5	31.1	31°51.3	31.8	142°08.7	44.0
2	156°22.3	201°31.8	25.1	210°57.0	30.6	46°54.1	31.8	157°10.9	43.9
3	171°24.8	216°31.0	·· 24.2	225°57.4	·· 30.2	61°56.9	·· 31.9	172°13.2	·· 43.8
4	186°27.2	231°30.3	23.4	240°57.8	29.8	76°59.6	31.9	187°15.4	43.7
5	201°29.7	246°29.6	22.6	255°58.3	29.3	92°02.4	32.0	202°17.7	43.6
6	216°32.1	261°28.9	S18°21.7	270°58.7	S20°28.9	107°05.2	N22°32.0	217°19.9	S02°43.5
7	231°34.6	276°28.1	20.9	285°59.1	28.4	122°08.0	32.1	232°22.2	43.4
8	246°37.1	291°27.4	20.1	300°59.6	28.0	137°10.8	32.1	247°24.4	43.3
9	261°39.5	306°26.7	·· 19.2	316°00.0	·· 27.5	152°13.6	·· 32.2	262°26.7	·· 43.2
10	276°42.0	321°26.0	18.4	331°00.4	27.1	167°16.4	32.2	277°29.0	43.1
11	291°44.5	336°25.2	17.5	346°00.9	26.7	182°19.1	32.2	292°31.2	43.1
12	306°46.9	351°24.5	S18°16.7	1°01.3	S20°26.2	197°21.9	N22°32.3	307°33.5	S02°43.0
13	321°49.4	6°23.8	15.8	16°01.8	25.8	212°24.7	32.3	322°35.7	42.9
14	336°51.9	21°23.1	15.0	31°02.2	25.3	227°27.5	32.4	337°38.0	42.8
15	351°54.3	36°22.4	·· 14.2	46°02.6	·· 24.9	242°30.3	·· 32.4	352°40.2	·· 42.7
16	6°56.8	51°21.7	13.3	61°03.1	24.4	257°33.1	32.5	7°42.5	42.6
17	21°59.3	66°20.9	12.5	76°03.5	24.0	272°35.9	32.5	22°44.7	42.5
18	37°01.7	81°20.2	S18°11.6	91°03.9	S20°23.5	287°38.6	N22°32.5	37°47.0	S02°42.4
19	52°04.2	96°19.5	10.8	106°04.4	23.1	302°41.4	32.6	52°49.2	42.3
20	67°06.6	111°18.8	09.9	121°04.8	22.6	317°44.2	32.6	67°51.5	42.2
21	82°09.1	126°18.1	·· 09.1	136°05.2	·· 22.2	332°47.0	·· 32.7	82°53.7	·· 42.1
22	97°11.6	141°17.4	08.2	151°05.7	21.8	347°49.8	32.7	97°56.0	42.0
23	112°14.0	156°16.6	07.4	166°06.1	21.3	2°52.6	32.8	112°58.2	41.9
Mer.pass. 15:32		ν -0.7′	d 0.8′	m -3.90	ν 0.4′	d 0.4′	m 1.10	ν 2.8′	d 0.0′ m -2.64	ν 2.3′	d 0.1′ m 1.03

Stars

	SHA	**Dec**
Alpheratz	357°34.1	29°14.2
Ankaa	353°06.5	-42°10.1
Schedar	349°30.3	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.6	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°28.0	89°22.8
Acamar	315°11.0	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.2	46°01.6
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.7
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.5
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.7	-59°35.6
Suhail	222°45.2	-43°32.3
Miaplacidus	221°37.2	-69°49.4
Alphard	217°46.6	-8°46.4
Regulus	207°33.2	11°50.2
Dubhe	193°39.4	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.2
Acrux	172°58.8	-63°14.4
Gacrux	171°50.4	-57°15.4
Alioth	166°12.0	55°48.7
Spica	158°21.3	-11°17.9
Alkaid	152°51.2	49°10.6
Hadar	148°34.7	-60°29.7
Menkent	147°56.6	-36°29.8
Arcturus	145°47.1	19°02.6
Rigil Kent.	139°39.1	-60°56.4
Kochab	137°20.0	74°02.5
Zuben'ubi	136°55.1	-16°09.0
Alphecca	126°03.1	26°37.3
Antares	112°15.0	-26°29.3
Atria	107°08.8	-69°04.2
Sabik	102°02.0	-15°45.5
Shaula	96°09.5	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°42.2	51°28.9
Kaus Aust.	83°31.7	-34°22.3
Vega	80°33.0	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.9	-56°39.1
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.8

Jan 25 Sun	**SHA**	**Mer.pass**
Venus	47°49.6	12:32
Mars	56°16.4	11:57
Jupiter	250°15.4	22:57
Saturn	0°59.1	15:36

Jan 26 Mon	**SHA**	**Mer.pass**
Venus	46°32.6	12:33
Mars	55°27.5	11:57
Jupiter	250°23.3	22:53
Saturn	0°54.1	15:33

Jan 27 Tue	**SHA**	**Mer.pass**
Venus	45°15.8	12:34
Mars	54°38.7	11:56
Jupiter	250°31.1	22:49
Saturn	0°49.1	15:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°57.2	S19°00.7	107°32.9	12.1′	N10°46.0	15.2′	58.3′
1	191°57.1	19°00.1	122°03.9	12.0′	11°01.2	15.3′	58.4′
2	206°56.9	18°59.5	136°34.9	11.9′	11°16.5	15.1′	58.4′
3	221°56.8	·· 58.9	151°05.8	11.8′	11°31.6	15.2′	58.4′
4	236°56.7	58.3	165°36.7	11.8′	11°46.8	15.1′	58.4′
5	251°56.5	57.7	180°07.4	11.7′	12°01.9	15.0′	58.4′
6	266°56.4	S18°57.0	194°38.1	11.6′	N12°16.9	15.0′	58.5′
7	281°56.2	56.4	209°08.7	11.5′	12°31.9	14.9′	58.5′
8	296°56.1	55.8	223°39.2	11.4′	12°46.8	14.9′	58.5′
9	311°55.9	·· 55.2	238°09.6	11.4′	13°01.7	14.8′	58.5′
10	326°55.8	54.6	252°40.0	11.3′	13°16.5	14.8′	58.5′
11	341°55.7	53.9	267°10.3	11.2′	13°31.3	14.7′	58.6′
12	356°55.5	S18°53.3	281°40.4	11.1′	N13°46.0	14.6′	58.6′
13	11°55.4	52.7	296°10.5	11.0′	14°00.6	14.6′	58.6′
14	26°55.2	52.1	310°40.5	10.9′	14°15.2	14.5′	58.6′
15	41°55.1	·· 51.5	325°10.4	10.8′	14°29.7	14.5′	58.6′
16	56°55.0	50.8	339°40.3	10.7′	14°44.2	14.4′	58.6′
17	71°54.8	50.2	354°10.0	10.6′	14°58.6	14.3′	58.7′
18	86°54.7	S18°49.6	8°39.6	10.5′	N15°12.9	14.2′	58.7′
19	101°54.5	49.0	23°09.2	10.4′	15°27.1	14.2′	58.7′
20	116°54.4	48.3	37°38.6	10.3′	15°41.3	14.1′	58.7′
21	131°54.3	·· 47.7	52°08.0	10.2′	15°55.4	14.0′	58.7′
22	146°54.1	47.1	66°37.2	10.2′	16°09.4	14.0′	58.8′
23	161°54.0	46.5	81°06.4	10.1′	16°23.4	13.8′	58.8′
	SD = 16.2′	d = 0.6′	SD = 15.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°53.8	S18°45.8	95°35.4	9.9′	N16°37.2	13.8′	58.8′
1	191°53.7	45.2	110°04.4	9.8′	16°51.0	13.7′	58.8′
2	206°53.6	44.6	124°33.2	9.7′	17°04.7	13.6′	58.8′
3	221°53.4	·· 43.9	139°02.0	9.6′	17°18.3	13.6′	58.9′
4	236°53.3	43.3	153°30.6	9.5′	17°31.9	13.4′	58.9′
5	251°53.2	42.7	167°59.1	9.4′	17°45.3	13.4′	58.9′
6	266°53.0	S18°42.0	182°27.6	9.3′	N17°58.7	13.2′	58.9′
7	281°52.9	41.4	196°55.9	9.2′	18°11.9	13.2′	58.9′
8	296°52.8	40.8	211°24.1	9.1′	18°25.1	13.1′	58.9′
9	311°52.6	·· 40.2	225°52.2	9.0′	18°38.2	12.9′	59.0′
10	326°52.5	39.5	240°20.2	8.9′	18°51.1	12.9′	59.0′
11	341°52.4	38.9	254°48.1	8.8′	19°04.0	12.8′	59.0′
12	356°52.2	S18°38.2	269°15.9	8.7′	N19°16.8	12.7′	59.0′
13	11°52.1	37.6	283°43.6	8.6′	19°29.5	12.6′	59.0′
14	26°52.0	37.0	298°11.1	8.4′	19°42.1	12.4′	59.0′
15	41°51.8	·· 36.3	312°38.6	8.3′	19°54.5	12.4′	59.1′
16	56°51.7	35.7	327°05.9	8.2′	20°06.9	12.2′	59.1′
17	71°51.6	35.1	341°33.1	8.1′	20°19.1	12.2′	59.1′
18	86°51.4	S18°34.4	356°00.2	8.0′	N20°31.3	12.0′	59.1′
19	101°51.3	33.8	10°27.2	7.9′	20°43.3	11.9′	59.1′
20	116°51.2	33.1	24°54.1	7.8′	20°55.2	11.8′	59.1′
21	131°51.0	·· 32.5	39°20.9	7.7′	21°07.0	11.7′	59.2′
22	146°50.9	31.9	53°47.5	7.5′	21°18.7	11.6′	59.2′
23	161°50.8	31.2	68°14.0	7.4′	21°30.3	11.4′	59.2′
	SD = 16.2′	d = 0.6′	SD = 16.0′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°50.7	S18°30.6	82°40.5	7.3′	N21°41.7	11.3′	59.2′
1	191°50.5	29.9	97°06.8	7.2′	21°53.0	11.2′	59.2′
2	206°50.4	29.3	111°33.0	7.1′	22°04.2	11.1′	59.2′
3	221°50.3	·· 28.7	125°59.0	7.0′	22°15.3	10.9′	59.3′
4	236°50.2	28.0	140°25.0	6.8′	22°26.2	10.8′	59.3′
5	251°50.0	27.4	154°50.8	6.7′	22°37.0	10.7′	59.3′
6	266°49.9	S18°26.7	169°16.6	6.6′	N22°47.7	10.5′	59.3′
7	281°49.8	26.1	183°42.2	6.5′	22°58.2	10.4′	59.3′
8	296°49.6	25.4	198°07.7	6.4′	23°08.6	10.3′	59.3′
9	311°49.5	·· 24.8	212°33.0	6.3′	23°18.9	10.1′	59.3′
10	326°49.4	24.1	226°58.3	6.2′	23°29.0	10.0′	59.4′
11	341°49.3	23.5	241°23.5	6.0′	23°39.0	9.8′	59.4′
12	356°49.1	S18°22.8	255°48.5	5.9′	N23°48.8	9.7′	59.4′
13	11°49.0	22.2	270°13.4	5.8′	23°58.5	9.5′	59.4′
14	26°48.9	21.5	284°38.2	5.7′	24°08.0	9.4′	59.4′
15	41°48.8	·· 20.9	299°02.9	5.6′	24°17.4	9.2′	59.4′
16	56°48.7	20.2	313°27.5	5.5′	24°26.6	9.1′	59.4′
17	71°48.5	19.6	327°52.0	5.4′	24°35.7	8.9′	59.5′
18	86°48.4	S18°18.9	342°16.3	5.3′	N24°44.6	8.8′	59.5′
19	101°48.3	18.3	356°40.6	5.1′	24°53.4	8.6′	59.5′
20	116°48.2	17.6	11°04.7	5.0′	25°02.0	8.5′	59.5′
21	131°48.0	·· 17.0	25°28.8	4.9′	25°10.5	8.3′	59.5′
22	146°47.9	16.3	39°52.7	4.8′	25°18.8	8.1′	59.5′
23	161°47.8	15.7	54°16.5	4.7′	25°26.9	8.0′	59.5′
	SD = 16.2′	d = 0.6′	SD = 16.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:30	09:05	11:38	12:48	15:21	16:57
N 70°	07:19	08:42	10:20	14:06	15:44	17:07
68°	07:11	08:24	09:43	14:43	16:02	17:15
66°	07:03	08:09	09:17	15:09	16:17	17:23
64°	06:57	07:57	08:57	15:29	16:29	17:29
62°	06:51	07:47	08:41	15:45	16:39	17:35
60°	06:46	07:38	08:27	15:58	16:48	17:40
N 58°	06:42	07:30	08:16	16:10	16:55	17:44
56°	06:38	07:23	08:06	16:20	17:02	17:48
54°	06:34	07:17	07:57	16:29	17:09	17:52
52°	06:30	07:11	07:49	16:37	17:14	17:56
50°	06:27	07:06	07:42	16:44	17:20	17:59
45°	06:19	06:54	07:26	16:59	17:31	18:07
N 40°	06:12	06:45	07:14	17:12	17:41	18:14
35°	06:05	06:36	07:03	17:23	17:49	18:20
30°	05:59	06:28	06:53	17:32	17:57	18:26
20°	05:47	06:14	06:37	17:48	18:11	18:38
N 10°	05:35	06:00	06:23	18:03	18:25	18:50
0°	05:22	05:47	06:09	18:16	18:38	19:03
S 10°	05:07	05:33	05:55	18:30	18:52	19:18
20°	04:49	05:17	05:40	18:44	19:08	19:36
30°	04:26	04:57	05:23	19:01	19:28	19:59
35°	04:11	04:45	05:13	19:11	19:39	20:13
40°	03:53	04:31	05:02	19:23	19:53	20:31
45°	03:30	04:14	04:48	19:36	20:10	20:53
S 50°	03:00	03:52	04:31	19:53	20:32	21:24
52°	02:43	03:41	04:23	20:01	20:42	21:40
54°	02:24	03:29	04:14	20:09	20:55	21:59
56°	01:58	03:15	04:04	20:19	21:08	22:24
58°	01:19	02:58	03:53	20:30	21:25	23:00
S 60°	////	02:37	03:40	20:43	21:46	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	08:10	06:17	▭	01:19	04:58	▭
N 70°	08:32	07:36	▭	00:59	03:41	▭
68°	08:50	08:15	▭	00:44	03:04	▭
66°	09:04	08:42	07:58	00:32	02:38	05:15
64°	09:15	09:03	08:45	00:22	02:18	04:30
62°	09:25	09:21	09:16	00:13	02:02	04:00
60°	09:34	09:35	09:39	00:06	01:48	03:37
N 58°	09:42	09:47	09:58	00:00	01:37	03:19
56°	09:48	09:58	10:13	·· ··	01:27	03:04
54°	09:55	10:08	10:27	·· ··	01:18	02:51
52°	10:00	10:16	10:39	·· ··	01:10	02:40
50°	10:05	10:24	10:50	·· ··	01:04	02:30
45°	10:16	10:40	11:12	·· ··	00:49	02:09
N 40°	10:25	10:54	11:30	·· ··	00:37	01:52
35°	10:33	11:06	11:45	·· ··	00:26	01:38
30°	10:40	11:16	11:58	·· ··	00:17	01:26
20°	10:52	11:34	12:21	·· ··	00:02	01:05
N 10°	11:02	11:49	12:41	23:49	·· ··	00:47
0°	11:12	12:04	13:00	23:36	·· ··	00:30
S 10°	11:22	12:18	13:19	23:24	·· ··	00:13
20°	11:33	12:34	13:39	23:11	23:55	·· ··
30°	11:46	12:53	14:02	22:56	23:35	·· ··
35°	11:53	13:03	14:16	22:47	23:23	·· ··
40°	12:02	13:16	14:32	22:37	23:09	23:49
45°	12:11	13:31	14:52	22:26	22:53	23:29
S 50°	12:23	13:49	15:16	22:12	22:33	23:03
52°	12:29	13:57	15:28	22:05	22:24	22:51
54°	12:35	14:07	15:41	21:58	22:14	22:37
56°	12:42	14:18	15:57	21:51	22:02	22:21
58°	12:50	14:31	16:16	21:42	21:49	22:02
S 60°	12:59	14:45	16:39	21:32	21:33	21:38

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 37-59%
25	12:11	12:18	12:12	17:24	04:59	
26	12:25	12:31	12:13	18:17	05:50	
27	12:37	12:43	12:13	19:14	06:45	

January 28, 29, 30 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	127°16.5	171°15.9	S18°06.5	181°06.6	S20°20.9	17°55.3	N22°32.8	128°00.5	S02°41.8
1	142°19.0	186°15.2	05.7	196°07.0	20.4	32°58.1	32.9	143°02.7	41.7
2	157°21.4	201°14.5	04.8	211°07.4	20.0	48°00.9	32.9	158°05.0	41.6
3	172°23.9	216°13.8	·· 03.9	226°07.9	·· 19.5	63°03.7	·· 32.9	173°07.2	·· 41.5
4	187°26.4	231°13.1	03.1	241°08.3	19.1	78°06.5	33.0	188°09.5	41.4
5	202°28.8	246°12.4	02.2	256°08.7	18.6	93°09.2	33.0	203°11.7	41.3
6	217°31.3	261°11.7	S18°01.4	271°09.2	S20°18.2	108°12.0	N22°33.1	218°14.0	S02°41.2
7	232°33.8	276°10.9	18°00.5	286°09.6	17.7	123°14.8	33.1	233°16.2	41.1
8	247°36.2	291°10.2	17°59.6	301°10.1	17.2	138°17.6	33.2	248°18.5	41.0
9	262°38.7	306°09.5	·· 58.8	316°10.5	·· 16.8	153°20.4	·· 33.2	263°20.7	·· 40.9
10	277°41.1	321°08.8	57.9	331°10.9	16.3	168°23.2	33.2	278°23.0	40.8
11	292°43.6	336°08.1	57.1	346°11.4	15.9	183°25.9	33.3	293°25.2	40.7
12	307°46.1	351°07.4	S17°56.2	1°11.8	S20°15.4	198°28.7	N22°33.3	308°27.5	S02°40.6
13	322°48.5	6°06.7	55.3	16°12.3	15.0	213°31.5	33.4	323°29.7	40.5
14	337°51.0	21°06.0	54.5	31°12.7	14.5	228°34.3	33.4	338°32.0	40.4
15	352°53.5	36°05.3	·· 53.6	46°13.1	·· 14.1	243°37.1	·· 33.5	353°34.2	·· 40.3
16	7°55.9	51°04.6	52.7	61°13.6	13.6	258°39.8	33.5	8°36.5	40.2
17	22°58.4	66°03.9	51.9	76°14.0	13.2	273°42.6	33.6	23°38.7	40.1
18	38°00.9	81°03.2	S17°51.0	91°14.4	S20°12.7	288°45.4	N22°33.6	38°40.9	S02°40.0
19	53°03.3	96°02.5	50.1	106°14.9	12.2	303°48.2	33.6	53°43.2	39.9
20	68°05.8	111°01.8	49.3	121°15.3	11.8	318°51.0	33.7	68°45.4	39.8
21	83°08.2	126°01.1	·· 48.4	136°15.8	·· 11.3	333°53.7	·· 33.7	83°47.7	·· 39.7
22	98°10.7	141°00.4	47.5	151°16.2	10.9	348°56.5	33.8	98°49.9	39.6
23	113°13.2	155°59.7	46.6	166°16.7	10.4	3°59.3	33.8	113°52.2	39.5
Mer.pass. 15:28		ν -0.7′	d 0.9′	m -3.90	ν 0.4′	d 0.4′	m 1.10	ν 2.8′	d 0.0′ m -2.64	ν 2.3′	d 0.1′ m 1.03

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	128°15.6	170°59.0	S17°45.8	181°17.1	S20°10.0	19°02.1	N22°33.9	128°54.4	S02°39.4
1	143°18.1	185°58.3	44.9	196°17.5	09.5	34°04.8	33.9	143°56.7	39.3
2	158°20.6	200°57.6	44.0	211°18.0	09.0	49°07.6	33.9	158°58.9	39.2
3	173°23.0	215°56.9	·· 43.1	226°18.4	·· 08.6	64°10.4	·· 34.0	174°01.2	·· 39.1
4	188°25.5	230°56.2	42.3	241°18.9	08.1	79°13.2	34.0	189°03.4	39.0
5	203°28.0	245°55.5	41.4	256°19.3	07.7	94°16.0	34.1	204°05.7	38.9
6	218°30.4	260°54.8	S17°40.5	271°19.7	S20°07.2	109°18.7	N22°34.1	219°07.9	S02°38.8
7	233°32.9	275°54.1	39.6	286°20.2	06.7	124°21.5	34.2	234°10.2	38.7
8	248°35.4	290°53.4	38.7	301°20.6	06.3	139°24.3	34.2	249°12.4	38.6
9	263°37.8	305°52.7	·· 37.9	316°21.1	·· 05.8	154°27.1	·· 34.2	264°14.7	·· 38.5
10	278°40.3	320°52.0	37.0	331°21.5	05.4	169°29.8	34.3	279°16.9	38.4
11	293°42.7	335°51.3	36.1	346°22.0	04.9	184°32.6	34.3	294°19.2	38.3
12	308°45.2	350°50.6	S17°35.2	1°22.4	S20°04.4	199°35.4	N22°34.4	309°21.4	S02°38.2
13	323°47.7	5°49.9	34.3	16°22.8	04.0	214°38.2	34.4	324°23.6	38.1
14	338°50.1	20°49.2	33.4	31°23.3	03.5	229°40.9	34.5	339°25.9	38.0
15	353°52.6	35°48.5	·· 32.5	46°23.7	·· 03.0	244°43.7	·· 34.5	354°28.1	·· 37.9
16	8°55.1	50°47.8	31.7	61°24.2	02.6	259°46.5	34.5	9°30.4	37.8
17	23°57.5	65°47.1	30.8	76°24.6	02.1	274°49.3	34.6	24°32.6	37.7
18	39°00.0	80°46.4	S17°29.9	91°25.1	S20°01.6	289°52.0	N22°34.6	39°34.9	S02°37.6
19	54°02.5	95°45.8	29.0	106°25.5	01.2	304°54.8	34.7	54°37.1	37.5
20	69°04.9	110°45.1	28.1	121°25.9	00.7	319°57.6	34.7	69°39.4	37.4
21	84°07.4	125°44.4	·· 27.2	136°26.4	20°00.2	335°00.4	·· 34.7	84°41.6	·· 37.3
22	99°09.9	140°43.7	26.3	151°26.8	19°59.8	350°03.1	34.8	99°43.9	37.2
23	114°12.3	155°43.0	25.4	166°27.3	59.3	5°05.9	34.8	114°46.1	37.1
Mer.pass. 15:24		ν -0.7′	d 0.9′	m -3.90	ν 0.4′	d 0.5′	m 1.10	ν 2.8′	d 0.0′ m -2.64	ν 2.2′	d 0.1′ m 1.03

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	129°14.8	170°42.3	S17°24.5	181°27.7	S19°58.8	20°08.7	N22°34.9	129°48.4	S02°37.0
1	144°17.2	185°41.6	23.6	196°28.2	58.4	35°11.5	34.9	144°50.6	36.9
2	159°19.7	200°40.9	22.7	211°28.6	57.9	50°14.2	35.0	159°52.8	36.8
3	174°22.2	215°40.3	·· 21.8	226°29.1	·· 57.4	65°17.0	·· 35.0	174°55.1	·· 36.7
4	189°24.6	230°39.6	20.9	241°29.5	57.0	80°19.8	35.0	189°57.3	36.6
5	204°27.1	245°38.9	20.0	256°29.9	56.5	95°22.6	35.1	204°59.6	36.5
6	219°29.6	260°38.2	S17°19.1	271°30.4	S19°56.0	110°25.3	N22°35.1	220°01.8	S02°36.4
7	234°32.0	275°37.5	18.2	286°30.8	55.6	125°28.1	35.2	235°04.1	36.3
8	249°34.5	290°36.8	17.3	301°31.3	55.1	140°30.9	35.2	250°06.3	36.2
9	264°37.0	305°36.2	·· 16.4	316°31.7	·· 54.6	155°33.6	·· 35.2	265°08.6	·· 36.0
10	279°39.4	320°35.5	15.5	331°32.2	54.2	170°36.4	35.3	280°10.8	35.9
11	294°41.9	335°34.8	14.6	346°32.6	53.7	185°39.2	35.3	295°13.0	35.8
12	309°44.4	350°34.1	S17°13.7	1°33.1	S19°53.2	200°42.0	N22°35.4	310°15.3	S02°35.7
13	324°46.8	5°33.4	12.8	16°33.5	52.7	215°44.7	35.4	325°17.5	35.6
14	339°49.3	20°32.7	11.9	31°34.0	52.3	230°47.5	35.5	340°19.8	35.5
15	354°51.7	35°32.1	·· 11.0	46°34.4	·· 51.8	245°50.3	·· 35.5	355°22.0	·· 35.4
16	9°54.2	50°31.4	10.1	61°34.9	51.3	260°53.0	35.5	10°24.3	35.3
17	24°56.7	65°30.7	09.2	76°35.3	50.8	275°55.8	35.6	25°26.5	35.2
18	39°59.1	80°30.0	S17°08.3	91°35.8	S19°50.4	290°58.6	N22°35.6	40°28.7	S02°35.1
19	55°01.6	95°29.4	07.3	106°36.2	49.9	306°01.3	35.7	55°31.0	35.0
20	70°04.1	110°28.7	06.4	121°36.6	49.4	321°04.1	35.7	70°33.2	34.9
21	85°06.5	125°28.0	·· 05.5	136°37.1	·· 48.9	336°06.9	·· 35.7	85°35.5	·· 34.8
22	100°09.0	140°27.3	04.6	151°37.5	48.5	351°09.7	35.8	100°37.7	34.7
23	115°11.5	155°26.7	03.7	166°38.0	48.0	6°12.4	35.8	115°40.0	34.6
Mer.pass. 15:20		ν -0.7′	d 0.9′	m -3.90	ν 0.4′	d 0.5′	m 1.11	ν 2.8′	d 0.0′ m -2.63	ν 2.2′	d 0.1′ m 1.03

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.2
Ankaa	353°06.5	-42°10.1
Schedar	349°30.3	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.6	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°29.2	89°22.8
Acamar	315°11.0	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.2	46°01.6
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.7
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.7	-59°35.6
Suhail	222°45.2	-43°32.3
Miaplacidus	221°37.2	-69°49.4
Alphard	217°46.6	-8°46.4
Regulus	207°33.2	11°50.2
Dubhe	193°39.4	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.2
Acrux	172°58.8	-63°14.4
Gacrux	171°50.4	-57°15.4
Alioth	166°11.9	55°48.7
Spica	158°21.3	-11°17.9
Alkaid	152°51.2	49°10.6
Hadar	148°34.7	-60°29.7
Menkent	147°56.5	-36°29.8
Arcturus	145°47.1	19°02.6
Rigil Kent.	139°39.1	-60°56.4
Kochab	137°19.9	74°02.5
Zuben'ubi	136°55.1	-16°09.0
Alphecca	126°03.1	26°37.3
Antares	112°14.9	-26°29.4
Atria	107°08.7	-69°04.2
Sabik	102°02.0	-15°45.5
Shaula	96°09.5	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°42.2	51°28.9
Kaus Aust.	83°31.7	-34°22.3
Vega	80°33.0	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.9	-56°39.1
Deneb	49°25.7	45°22.4
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Jan 28 Wed	SHA	Mer.pass
Venus	43°59.4	12:36
Mars	53°50.1	11:55
Jupiter	250°38.8	22:44
Saturn	0°44.0	15:26

Jan 29 Thu	SHA	Mer.pass
Venus	42°43.3	12:37
Mars	53°01.5	11:55
Jupiter	250°46.4	22:40
Saturn	0°38.8	15:22

Jan 30 Fri	SHA	Mer.pass
Venus	41°27.5	12:38
Mars	52°12.9	11:54
Jupiter	250°53.9	22:35
Saturn	0°33.6	15:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.7	S18°15.0	68°40.3	4.6′	N25°34.9	7.8′	59.6′
1	191°47.6	14.4	83°03.9	4.5′	25°42.7	7.6′	59.6′
2	206°47.4	13.7	97°27.4	4.4′	25°50.3	7.4′	59.6′
3	221°47.3	·· 13.0	111°50.8	4.3′	25°57.7	7.3′	59.6′
4	236°47.2	12.4	126°14.1	4.2′	26°05.0	7.1′	59.6′
5	251°47.1	11.7	140°37.4	4.1′	26°12.1	7.0′	59.6′
6	266°47.0	S18°11.1	155°00.5	4.0′	N26°19.1	6.7′	59.6′
7	281°46.9	10.4	169°23.5	3.9′	26°25.8	6.6′	59.6′
8	296°46.7	09.7	183°46.4	3.8′	26°32.4	6.4′	59.6′
9	311°46.6	·· 09.1	198°09.3	3.8′	26°38.8	6.2′	59.7′
10	326°46.5	08.4	212°32.0	3.7′	26°45.0	6.1′	59.7′
11	341°46.4	07.8	226°54.7	3.6′	26°51.1	5.8′	59.7′
12	356°46.3	S18°07.1	241°17.3	3.5′	N26°56.9	5.7′	59.7′
13	11°46.2	06.4	255°39.8	3.4′	27°02.6	5.5′	59.7′
14	26°46.0	05.8	270°02.2	3.3′	27°08.1	5.3′	59.7′
15	41°45.9	·· 05.1	284°24.6	3.3′	27°13.4	5.1′	59.7′
16	56°45.8	04.4	298°46.8	3.2′	27°18.5	4.9′	59.7′
17	71°45.7	03.8	313°09.0	3.1′	27°23.4	4.7′	59.7′
18	86°45.6	S18°03.1	327°31.1	3.0′	N27°28.1	4.6′	59.7′
19	101°45.5	02.4	341°53.2	3.0′	27°32.7	4.3′	59.7′
20	116°45.4	01.8	356°15.2	2.9′	27°37.0	4.1′	59.8′
21	131°45.3	·· 01.1	10°37.1	2.8′	27°41.1	4.0′	59.8′
22	146°45.1	18°00.4	24°58.9	2.8′	27°45.1	3.7′	59.8′
23	161°45.0	17°59.8	39°20.7	2.7′	27°48.8	3.6′	59.8′
	SD = 16.2′	d = 0.7′	SD = 16.2′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°44.9	S17°59.1	53°42.4	2.7′	N27°52.4	3.3′	59.8′
1	191°44.8	58.4	68°04.1	2.6′	27°55.7	3.2′	59.8′
2	206°44.7	57.8	82°25.7	2.6′	27°58.9	2.9′	59.8′
3	221°44.6	·· 57.1	96°47.3	2.5′	28°01.8	2.8′	59.8′
4	236°44.5	56.4	111°08.8	2.5′	28°04.6	2.5′	59.8′
5	251°44.4	55.7	125°30.3	2.4′	28°07.1	2.4′	59.8′
6	266°44.3	S17°55.1	139°51.8	2.4′	N28°09.5	2.1′	59.8′
7	281°44.2	54.4	154°13.2	2.4′	28°11.6	2.0′	59.8′
8	296°44.0	53.7	168°34.5	2.3′	28°13.6	1.7′	59.8′
9	311°43.9	·· 53.1	182°55.9	2.3′	28°15.3	1.5′	59.8′
10	326°43.8	52.4	197°17.2	2.3′	28°16.8	1.4′	59.8′
11	341°43.7	51.7	211°38.4	2.3′	28°18.2	1.1′	59.8′
12	356°43.6	S17°51.0	225°59.7	2.2′	N28°19.3	0.9′	59.8′
13	11°43.5	50.4	240°20.9	2.2′	28°20.2	0.7′	59.8′
14	26°43.4	49.7	254°42.1	2.2′	28°20.9	0.5′	59.8′
15	41°43.3	·· 49.0	269°03.3	2.2′	28°21.4	0.3′	59.8′
16	56°43.2	48.3	283°24.5	2.2′	28°21.7	0.1′	59.8′
17	71°43.1	47.6	297°45.7	2.2′	28°21.8	0.2′	59.8′
18	86°43.0	S17°47.0	312°06.9	2.2′	N28°21.6	0.3′	59.9′
19	101°42.9	46.3	326°28.1	2.2′	28°21.3	0.5′	59.9′
20	116°42.8	45.6	340°49.3	2.2′	28°20.8	0.8′	59.9′
21	131°42.7	·· 44.9	355°10.4	2.2′	28°20.0	0.9′	59.9′
22	146°42.6	44.2	9°31.6	2.2′	28°19.1	1.2′	59.9′
23	161°42.5	43.6	23°52.8	2.2′	28°17.9	1.4′	59.9′
	SD = 16.2′	d = 0.7′	SD = 16.3′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°42.4	S17°42.9	38°14.0	2.2′	N28°16.5	1.6′	59.9′
1	191°42.3	42.2	52°35.3	2.3′	28°14.9	1.7′	59.9′
2	206°42.2	41.5	66°56.5	2.3′	28°13.2	2.0′	59.8′
3	221°42.1	·· 40.8	81°17.8	2.3′	28°11.2	2.2′	59.8′
4	236°42.0	40.1	95°39.1	2.3′	28°09.0	2.4′	59.8′
5	251°41.9	39.5	110°00.4	2.4′	28°06.6	2.6′	59.8′
6	266°41.8	S17°38.8	124°21.8	2.4′	N28°04.0	2.8′	59.8′
7	281°41.7	38.1	138°43.2	2.4′	28°01.2	3.0′	59.8′
8	296°41.6	37.4	153°04.6	2.5′	27°58.2	3.2′	59.8′
9	311°41.5	·· 36.7	167°26.1	2.5′	27°55.0	3.5′	59.8′
10	326°41.4	36.0	181°47.6	2.6′	27°51.5	3.6′	59.8′
11	341°41.3	35.3	196°09.2	2.6′	27°47.9	3.8′	59.8′
12	356°41.2	S17°34.6	210°30.8	2.7′	N27°44.1	4.0′	59.8′
13	11°41.1	34.0	224°52.5	2.7′	27°40.1	4.2′	59.8′
14	26°41.0	33.3	239°14.2	2.8′	27°35.9	4.4′	59.8′
15	41°40.9	·· 32.6	253°36.0	2.8′	27°31.5	4.6′	59.8′
16	56°40.8	31.9	267°57.8	2.9′	27°26.9	4.8′	59.8′
17	71°40.7	31.2	282°19.8	3.0′	27°22.1	5.0′	59.8′
18	86°40.6	S17°30.5	296°41.7	3.0′	N27°17.1	5.2′	59.8′
19	101°40.5	29.8	311°03.8	3.1′	27°11.9	5.4′	59.8′
20	116°40.4	29.1	325°25.9	3.2′	27°06.5	5.6′	59.8′
21	131°40.3	·· 28.4	339°48.1	3.3′	27°00.9	5.8′	59.8′
22	146°40.2	27.7	354°10.3	3.3′	26°55.1	5.9′	59.8′
23	161°40.1	27.0	8°32.7	3.4′	26°49.2	6.2′	59.7′
	SD = 16.2′	d = 0.7′	SD = 16.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:20	08:52	10:55	13:32	15:36	17:08
N 70°	07:11	08:31	10:02	14:25	15:56	17:17
68°	07:03	08:15	09:30	14:57	16:13	17:24
66°	06:57	08:01	09:07	15:20	16:26	17:31
64°	06:51	07:50	08:48	15:39	16:37	17:36
62°	06:46	07:41	08:33	15:54	16:46	17:41
60°	06:41	07:33	08:21	16:06	16:54	17:46
N 58°	06:37	07:25	08:10	16:17	17:02	17:50
56°	06:33	07:19	08:00	16:26	17:08	17:54
54°	06:30	07:13	07:52	16:35	17:14	17:57
52°	06:27	07:07	07:45	16:42	17:19	18:00
50°	06:23	07:03	07:38	16:49	17:24	18:03
45°	06:16	06:52	07:23	17:03	17:35	18:10
N 40°	06:10	06:42	07:11	17:15	17:44	18:17
35°	06:04	06:34	07:01	17:26	17:52	18:23
30°	05:58	06:27	06:52	17:35	18:00	18:28
20°	05:47	06:13	06:36	17:50	18:13	18:40
N 10°	05:35	06:01	06:23	18:04	18:26	18:51
0°	05:23	05:48	06:10	18:17	18:38	19:04
S 10°	05:08	05:34	05:56	18:30	18:52	19:18
20°	04:51	05:19	05:42	18:44	19:07	19:35
30°	04:29	05:00	05:26	19:00	19:26	19:57
35°	04:15	04:48	05:16	19:09	19:37	20:11
40°	03:58	04:35	05:05	19:20	19:50	20:28
45°	03:36	04:19	04:52	19:33	20:07	20:49
S 50°	03:07	03:58	04:36	19:49	20:27	21:18
52°	02:52	03:48	04:29	19:56	20:37	21:32
54°	02:34	03:36	04:21	20:04	20:49	21:50
56°	02:11	03:23	04:11	20:14	21:02	22:12
58°	01:38	03:07	04:00	20:24	21:17	22:43
S 60°	00:22	02:48	03:48	20:36	21:36	00:05

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	▭	▭	▭	▭
62°	09:09	▭	10:32	06:11	▭	09:17
60°	09:49	10:21	11:37	05:31	07:13	08:12
N 58°	10:17	10:58	12:12	05:03	06:36	07:37
56°	10:39	11:25	12:37	04:42	06:09	07:12
54°	10:57	11:46	12:57	04:24	05:48	06:51
52°	11:13	12:03	13:14	04:09	05:31	06:34
50°	11:26	12:18	13:29	03:56	05:16	06:20
45°	11:54	12:49	13:58	03:30	04:45	05:50
N 40°	12:15	13:13	14:21	03:09	04:22	05:26
35°	12:34	13:32	14:40	02:51	04:02	05:07
30°	12:49	13:49	14:56	02:36	03:46	04:51
20°	13:16	14:17	15:24	02:10	03:18	04:22
N 10°	13:39	14:42	15:47	01:49	02:53	03:58
0°	14:01	15:05	16:09	01:28	02:31	03:36
S 10°	14:22	15:28	16:31	01:08	02:08	03:13
20°	14:46	15:52	16:55	00:46	01:44	02:49
30°	15:13	16:21	17:22	00:21	01:16	02:20
35°	15:29	16:38	17:38	00:06	01:00	02:03
40°	15:48	16:58	17:57	·· ··	00:40	01:43
45°	16:11	17:22	18:19	·· ··	00:17	01:19
S 50°	16:40	17:53	18:48	23:47	·· ··	00:48
52°	16:55	18:08	19:02	23:32	·· ··	00:33
54°	17:12	18:26	19:18	23:15	·· ··	00:15
56°	17:32	18:48	19:37	22:55	23:53	·· ··
58°	17:57	19:16	20:01	22:29	23:25	·· ··
S 60°	18:32	19:57	20:32	21:54	22:44	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 70-89%
28	12:49	12:55	12:13	20:16	07:44	
29	13:00	13:06	12:13	21:20	08:48	
30	13:11	13:15	12:13	22:24	09:53	

January 31, 01, 02 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	130°13.9	170°26.0	S17°02.8	181°38.4	S19°47.5	21°15.2	N22°35.9	130°42.2	S02°34.5
1	145°16.4	185°25.3	01.9	196°38.9	47.0	36°18.0	35.9	145°44.4	34.4
2	160°18.9	200°24.6	00.9	211°39.3	46.6	51°20.7	36.0	160°46.7	34.3
3	175°21.3	215°24.0	17°00.0	226°39.8	·· 46.1	66°23.5	·· 36.0	175°48.9	·· 34.2
4	190°23.8	230°23.3	16°59.1	241°40.2	45.6	81°26.3	36.0	190°51.2	34.1
5	205°26.2	245°22.6	58.2	256°40.7	45.1	96°29.0	36.1	205°53.4	34.0
6	220°28.7	260°21.9	S16°57.3	271°41.1	S19°44.6	111°31.8	N22°36.1	220°55.7	S02°33.9
7	235°31.2	275°21.3	56.4	286°41.6	44.2	126°34.6	36.2	235°57.9	33.8
8	250°33.6	290°20.6	55.4	301°42.0	43.7	141°37.3	36.2	251°00.1	33.7
9	265°36.1	305°19.9	·· 54.5	316°42.5	·· 43.2	156°40.1	·· 36.2	266°02.4	·· 33.6
10	280°38.6	320°19.3	53.6	331°42.9	42.7	171°42.9	36.3	281°04.6	33.5
11	295°41.0	335°18.6	52.7	346°43.4	42.2	186°45.6	36.3	296°06.9	33.4
12	310°43.5	350°17.9	S16°51.7	1°43.8	S19°41.8	201°48.4	N22°36.4	311°09.1	S02°33.3
13	325°46.0	5°17.3	50.8	16°44.3	41.3	216°51.2	36.4	326°11.4	33.2
14	340°48.4	20°16.6	49.9	31°44.7	40.8	231°53.9	36.4	341°13.6	33.1
15	355°50.9	35°15.9	·· 49.0	46°45.2	·· 40.3	246°56.7	·· 36.5	356°15.8	·· 33.0
16	10°53.4	50°15.3	48.0	61°45.6	39.8	261°59.5	36.5	11°18.1	32.9
17	25°55.8	65°14.6	47.1	76°46.1	39.4	277°02.2	36.6	26°20.3	32.8
18	40°58.3	80°13.9	S16°46.2	91°46.5	S19°38.9	292°05.0	N22°36.6	41°22.6	S02°32.7
19	56°00.7	95°13.3	45.2	106°47.0	38.4	307°07.7	36.6	56°24.8	32.6
20	71°03.2	110°12.6	44.3	121°47.4	37.9	322°10.5	36.7	71°27.0	32.5
21	86°05.7	125°11.9	·· 43.4	136°47.9	·· 37.4	337°13.3	·· 36.7	86°29.3	·· 32.4
22	101°08.1	140°11.3	42.4	151°48.4	36.9	352°16.0	36.8	101°31.5	32.3
23	116°10.6	155°10.6	41.5	166°48.8	36.4	7°18.8	36.8	116°33.8	32.2
Mer.pass. 15:17		ν -0.7′	d 0.9′	m -3.90	ν 0.4′	d 0.5′	m 1.11	ν 2.8′	d 0.0′ m -2.63	ν 2.2′	d 0.1′ m 1.03

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	131°13.1	170°10.0	S16°40.6	181°49.3	S19°36.0	22°21.6	N22°36.8	131°36.0	S02°32.1
1	146°15.5	185°09.3	39.6	196°49.7	35.5	37°24.3	36.9	146°38.2	32.0
2	161°18.0	200°08.6	38.7	211°50.2	35.0	52°27.1	36.9	161°40.5	31.9
3	176°20.5	215°08.0	·· 37.8	226°50.6	·· 34.5	67°29.9	·· 37.0	176°42.7	·· 31.8
4	191°22.9	230°07.3	36.8	241°51.1	34.0	82°32.6	37.0	191°45.0	31.7
5	206°25.4	245°06.7	35.9	256°51.5	33.5	97°35.4	37.0	206°47.2	31.6
6	221°27.9	260°06.0	S16°34.9	271°52.0	S19°33.0	112°38.1	N22°37.1	221°49.4	S02°31.4
7	236°30.3	275°05.4	34.0	286°52.4	32.6	127°40.9	37.1	236°51.7	31.3
8	251°32.8	290°04.7	33.1	301°52.9	32.1	142°43.7	37.2	251°53.9	31.2
9	266°35.2	305°04.0	·· 32.1	316°53.3	·· 31.6	157°46.4	·· 37.2	266°56.2	·· 31.1
10	281°37.7	320°03.4	31.2	331°53.8	31.1	172°49.2	37.2	281°58.4	31.0
11	296°40.2	335°02.7	30.2	346°54.2	30.6	187°51.9	37.3	297°00.6	30.9
12	311°42.6	350°02.1	S16°29.3	1°54.7	S19°30.1	202°54.7	N22°37.3	312°02.9	S02°30.8
13	326°45.1	5°01.4	28.3	16°55.2	29.6	217°57.5	37.4	327°05.1	30.7
14	341°47.6	20°00.8	27.4	31°55.6	29.1	233°00.2	37.4	342°07.4	30.6
15	356°50.0	35°00.1	·· 26.4	46°56.1	·· 28.6	248°03.0	·· 37.4	357°09.6	·· 30.5
16	11°52.5	49°59.5	25.5	61°56.5	28.1	263°05.7	37.5	12°11.8	30.4
17	26°55.0	64°58.8	24.6	76°57.0	27.7	278°08.5	37.5	27°14.1	30.3
18	41°57.4	79°58.2	S16°23.6	91°57.4	S19°27.2	293°11.3	N22°37.6	42°16.3	S02°30.2
19	56°59.9	94°57.5	22.7	106°57.9	26.7	308°14.0	37.6	57°18.6	30.1
20	72°02.3	109°56.9	21.7	121°58.3	26.2	323°16.8	37.6	72°20.8	30.0
21	87°04.8	124°56.2	·· 20.8	136°58.8	·· 25.7	338°19.5	·· 37.7	87°23.0	·· 29.9
22	102°07.3	139°55.6	19.8	151°59.2	25.2	353°22.3	37.7	102°25.3	29.8
23	117°09.7	154°54.9	18.8	166°59.7	24.7	8°25.0	37.8	117°27.5	29.7
Mer.pass. 15:13		ν -0.7′	d 0.9′	m -3.91	ν 0.5′	d 0.5′	m 1.11	ν 2.8′	d 0.0′ m -2.62	ν 2.2′	d 0.1′ m 1.03

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	132°12.2	169°54.3	S16°17.9	182°00.2	S19°24.2	23°27.8	N22°37.8	132°29.7	S02°29.6
1	147°14.7	184°53.6	16.9	197°00.6	23.7	38°30.6	37.8	147°32.0	29.5
2	162°17.1	199°53.0	16.0	212°01.1	23.2	53°33.3	37.9	162°34.2	29.4
3	177°19.6	214°52.3	·· 15.0	227°01.5	·· 22.7	68°36.1	·· 37.9	177°36.5	·· 29.3
4	192°22.1	229°51.7	14.1	242°02.0	22.2	83°38.8	38.0	192°38.7	29.2
5	207°24.5	244°51.0	13.1	257°02.4	21.7	98°41.6	38.0	207°40.9	29.1
6	222°27.0	259°50.4	S16°12.1	272°02.9	S19°21.2	113°44.3	N22°38.0	222°43.2	S02°29.0
7	237°29.5	274°49.7	11.2	287°03.4	20.7	128°47.1	38.1	237°45.4	28.9
8	252°31.9	289°49.1	10.2	302°03.8	20.2	143°49.9	38.1	252°47.6	28.8
9	267°34.4	304°48.5	·· 09.3	317°04.3	·· 19.7	158°52.6	·· 38.2	267°49.9	·· 28.7
10	282°36.8	319°47.8	08.3	332°04.7	19.2	173°55.4	38.2	282°52.1	28.5
11	297°39.3	334°47.2	07.3	347°05.2	18.7	188°58.1	38.2	297°54.4	28.4
12	312°41.8	349°46.5	S16°06.4	2°05.6	S19°18.2	204°00.9	N22°38.3	312°56.6	S02°28.3
13	327°44.2	4°45.9	05.4	17°06.1	17.7	219°03.6	38.3	327°58.8	28.2
14	342°46.7	19°45.2	04.5	32°06.6	17.2	234°06.4	38.3	343°01.1	28.1
15	357°49.2	34°44.6	·· 03.5	47°07.0	·· 16.7	249°09.1	·· 38.4	358°03.3	·· 28.0
16	12°51.6	49°44.0	02.5	62°07.5	16.2	264°11.9	38.4	13°05.5	27.9
17	27°54.1	64°43.3	01.6	77°07.9	15.7	279°14.6	38.5	28°07.8	27.8
18	42°56.6	79°42.7	S16°00.6	92°08.4	S19°15.2	294°17.4	N22°38.5	43°10.0	S02°27.7
19	57°59.0	94°42.1	15°59.6	107°08.9	14.7	309°20.2	38.5	58°12.3	27.6
20	73°01.5	109°41.4	58.6	122°09.3	14.2	324°22.9	38.6	73°14.5	27.5
21	88°04.0	124°40.8	·· 57.7	137°09.8	·· 13.7	339°25.7	·· 38.6	88°16.7	·· 27.4
22	103°06.4	139°40.1	56.7	152°10.2	13.2	354°28.4	38.7	103°19.0	27.3
23	118°08.9	154°39.5	55.7	167°10.7	12.7	9°31.2	38.7	118°21.2	27.2
Mer.pass. 15:09		ν -0.6′	d 1.0′	m -3.91	ν 0.5′	d 0.5′	m 1.11	ν 2.8′	d 0.0′ m -2.62	ν 2.2′	d 0.1′ m 1.03

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.2
Ankaa	353°06.5	-42°10.1
Schedar	349°30.3	56°41.1
Diphda	348°46.6	-17°50.7
Achernar	335°19.7	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°30.4	89°22.8
Acamar	315°11.0	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.8	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.2	46°01.6
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.7
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.7	-59°35.6
Suhail	222°45.2	-43°32.3
Miaplacidus	221°37.2	-69°49.4
Alphard	217°46.5	-8°46.4
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.4
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.3
Acrux	172°58.7	-63°14.5
Gacrux	171°50.3	-57°15.4
Alioth	166°11.9	55°48.7
Spica	158°21.2	-11°17.9
Alkaid	152°51.2	49°10.6
Hadar	148°34.6	-60°29.7
Menkent	147°56.5	-36°29.8
Arcturus	145°47.0	19°02.5
Rigil Kent.	139°39.0	-60°56.4
Kochab	137°19.9	74°02.5
Zuben'ubi	136°55.0	-16°09.0
Alphecca	126°03.1	26°37.3
Antares	112°14.9	-26°29.4
Atria	107°08.6	-69°04.2
Sabik	102°02.0	-15°45.5
Shaula	96°09.4	-37°07.3
Rasalhague	95°57.9	12°32.3
Eltanin	90°42.2	51°28.8
Kaus Aust.	83°31.6	-34°22.3
Vega	80°33.0	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.9	-56°39.1
Deneb	49°25.7	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Jan 31 Sat	SHA	Mer.pass
Venus	40°12.1	12:39
Mars	51°24.5	11:53
Jupiter	251°01.3	22:31
Saturn	0°28.3	15:15

Feb 01 Sun	SHA	Mer.pass
Venus	38°56.9	12:40
Mars	50°36.2	11:52
Jupiter	251°08.5	22:26
Saturn	0°22.9	15:11

Feb 02 Mon	SHA	Mer.pass
Venus	37°42.1	12:41
Mars	49°48.0	11:52
Jupiter	251°15.6	22:22
Saturn	0°17.5	15:08

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°40.0	S17°26.3	22°55.1	3.5′	N26°43.0	6.3′	59.7′
1	191°39.9	25.6	37°17.6	3.6′	26°36.7	6.5′	59.7′
2	206°39.8	24.9	51°40.2	3.7′	26°30.2	6.7′	59.7′
3	221°39.7	·· 24.3	66°02.9	3.8′	26°23.5	6.9′	59.7′
4	236°39.6	23.6	80°25.6	3.9′	26°16.6	7.0′	59.7′
5	251°39.5	22.9	94°48.5	3.9′	26°09.6	7.2′	59.7′
6	266°39.4	S17°22.2	109°11.4	4.0′	N26°02.4	7.5′	59.7′
7	281°39.4	21.5	123°34.5	4.1′	25°54.9	7.5′	59.7′
8	296°39.3	20.8	137°57.6	4.2′	25°47.4	7.8′	59.7′
9	311°39.2	·· 20.1	152°20.9	4.3′	25°39.6	7.9′	59.6′
10	326°39.1	19.4	166°44.2	4.4′	25°31.7	8.1′	59.6′
11	341°39.0	18.7	181°07.6	4.5′	25°23.6	8.3′	59.6′
12	356°38.9	S17°18.0	195°31.2	4.6′	N25°15.3	8.4′	59.6′
13	11°38.8	17.3	209°54.8	4.8′	25°06.9	8.6′	59.6′
14	26°38.7	16.6	224°18.6	4.9′	24°58.3	8.8′	59.6′
15	41°38.6	·· 15.8	238°42.4	5.0′	24°49.5	8.9′	59.6′
16	56°38.5	15.1	253°06.4	5.1′	24°40.6	9.1′	59.6′
17	71°38.5	14.4	267°30.5	5.2′	24°31.5	9.2′	59.5′
18	86°38.4	S17°13.7	281°54.7	5.3′	N24°22.3	9.4′	59.5′
19	101°38.3	13.0	296°19.0	5.4′	24°12.9	9.6′	59.5′
20	116°38.2	12.3	310°43.4	5.5′	24°03.3	9.7′	59.5′
21	131°38.1	·· 11.6	325°07.9	5.6′	23°53.6	9.8′	59.5′
22	146°38.0	10.9	339°32.6	5.8′	23°43.8	10.0′	59.5′
23	161°37.9	10.2	353°57.3	5.9′	23°33.8	10.2′	59.4′
	SD = 16.2′	d = 0.7′	SD = 16.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.9	S17°09.5	8°22.2	6.0′	N23°23.6	10.3′	59.4′
1	191°37.8	08.8	22°47.2	6.1′	23°13.3	10.4′	59.4′
2	206°37.7	08.1	37°12.3	6.2′	23°02.9	10.5′	59.4′
3	221°37.6	·· 07.4	51°37.5	6.3′	22°52.4	10.8′	59.4′
4	236°37.5	06.7	66°02.9	6.5′	22°41.6	10.8′	59.4′
5	251°37.4	05.9	80°28.3	6.6′	22°30.8	11.0′	59.3′
6	266°37.4	S17°05.2	94°53.9	6.7′	N22°19.8	11.1′	59.3′
7	281°37.3	04.5	109°19.6	6.8′	22°08.7	11.2′	59.3′
8	296°37.2	03.8	123°45.4	6.9′	21°57.5	11.4′	59.3′
9	311°37.1	·· 03.1	138°11.4	7.1′	21°46.1	11.5′	59.3′
10	326°37.0	02.4	152°37.5	7.2′	21°34.6	11.6′	59.2′
11	341°36.9	01.7	167°03.6	7.3′	21°23.0	11.7′	59.2′
12	356°36.9	S17°01.0	181°30.0	7.4′	N21°11.3	11.9′	59.2′
13	11°36.8	17°00.2	195°56.4	7.6′	20°59.4	12.0′	59.2′
14	26°36.7	16°59.5	210°22.9	7.7′	20°47.4	12.1′	59.2′
15	41°36.6	·· 58.8	224°49.6	7.8′	20°35.3	12.2′	59.1′
16	56°36.5	58.1	239°16.4	7.9′	20°23.1	12.3′	59.1′
17	71°36.5	57.4	253°43.3	8.0′	20°10.8	12.4′	59.1′
18	86°36.4	S16°56.7	268°10.4	8.2′	N19°58.4	12.5′	59.1′
19	101°36.3	55.9	282°37.5	8.3′	19°45.9	12.7′	59.0′
20	116°36.2	55.2	297°04.8	8.4′	19°33.2	12.7′	59.0′
21	131°36.1	·· 54.5	311°32.2	8.5′	19°20.5	12.9′	59.0′
22	146°36.1	53.8	325°59.7	8.6′	19°07.6	12.9′	59.0′
23	161°36.0	53.1	340°27.3	8.8′	18°54.7	13.1′	58.9′
	SD = 16.2′	d = 0.7′	SD = 16.2′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.9	S16°52.3	354°55.1	8.9′	N18°41.6	13.1′	58.9′
1	191°35.8	51.6	9°23.0	9.0′	18°28.5	13.2′	58.9′
2	206°35.8	50.9	23°51.0	9.1′	18°15.3	13.3′	58.9′
3	221°35.7	·· 50.2	38°19.1	9.2′	18°02.0	13.5′	58.8′
4	236°35.6	49.5	52°47.3	9.3′	17°48.5	13.4′	58.8′
5	251°35.5	48.7	67°15.6	9.5′	17°35.1	13.6′	58.8′
6	266°35.5	S16°48.0	81°44.1	9.6′	N17°21.5	13.7′	58.8′
7	281°35.4	47.3	96°12.6	9.7′	17°07.8	13.7′	58.7′
8	296°35.3	46.6	110°41.3	9.8′	16°54.1	13.9′	58.7′
9	311°35.2	·· 45.8	125°10.1	9.9′	16°40.2	13.9′	58.7′
10	326°35.2	45.1	139°39.0	10.0′	16°26.3	14.0′	58.7′
11	341°35.1	44.4	154°08.1	10.1′	16°12.3	14.0′	58.6′
12	356°35.0	S16°43.7	168°37.2	10.2′	N15°58.3	14.1′	58.6′
13	11°34.9	42.9	183°06.4	10.4′	15°44.2	14.2′	58.6′
14	26°34.9	42.2	197°35.8	10.5′	15°30.0	14.3′	58.6′
15	41°34.8	·· 41.5	212°05.2	10.6′	15°15.7	14.3′	58.5′
16	56°34.7	40.8	226°34.8	10.7′	15°01.4	14.4′	58.5′
17	71°34.7	40.0	241°04.5	10.8′	14°47.0	14.5′	58.5′
18	86°34.6	S16°39.3	255°34.3	10.9′	N14°32.5	14.5′	58.4′
19	101°34.5	38.6	270°04.1	11.0′	14°18.0	14.6′	58.4′
20	116°34.4	37.8	284°34.1	11.1′	14°03.4	14.6′	58.4′
21	131°34.4	·· 37.1	299°04.2	11.2′	13°48.8	14.7′	58.4′
22	146°34.3	36.4	313°34.4	11.3′	13°34.1	14.8′	58.3′
23	161°34.2	35.6	328°04.7	11.4′	13°19.3	14.8′	58.3′
	SD = 16.2′	d = 0.7′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:09	08:38	10:27	14:01	15:50	17:19
N 70°	07:02	08:20	09:45	14:43	16:09	17:27
68°	06:55	08:05	09:17	15:11	16:23	17:33
66°	06:49	07:53	08:56	15:32	16:35	17:39
64°	06:44	07:43	08:39	15:49	16:45	17:44
62°	06:40	07:34	08:26	16:02	16:54	17:48
60°	06:36	07:27	08:14	16:14	17:01	17:52
N 58°	06:32	07:20	08:04	16:24	17:08	17:56
56°	06:29	07:14	07:55	16:33	17:14	17:59
54°	06:26	07:08	07:47	16:41	17:20	18:02
52°	06:23	07:03	07:40	16:48	17:24	18:05
50°	06:20	06:59	07:34	16:54	17:29	18:08
45°	06:13	06:49	07:20	17:08	17:39	18:14
N 40°	06:08	06:40	07:09	17:19	17:48	18:20
35°	06:02	06:32	06:59	17:29	17:55	18:26
30°	05:57	06:25	06:50	17:37	18:02	18:31
20°	05:46	06:12	06:35	17:52	18:15	18:41
N 10°	05:35	06:00	06:22	18:05	18:27	18:52
0°	05:23	05:48	06:10	18:17	18:39	19:04
S 10°	05:10	05:35	05:58	18:29	18:51	19:17
20°	04:53	05:21	05:44	18:43	19:06	19:34
30°	04:32	05:03	05:29	18:58	19:24	19:55
35°	04:18	04:52	05:19	19:07	19:35	20:08
40°	04:02	04:39	05:09	19:17	19:47	20:24
45°	03:42	04:23	04:57	19:30	20:03	20:44
S 50°	03:14	04:04	04:42	19:44	20:22	21:11
52°	03:00	03:54	04:35	19:51	20:32	21:25
54°	02:43	03:43	04:27	19:59	20:42	21:42
56°	02:22	03:31	04:18	20:08	20:55	22:02
58°	01:55	03:16	04:08	20:18	21:09	22:28
S 60°	01:10	02:58	03:56	20:29	21:26	23:09

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°			15:08			10:54
N 70°			15:45			10:14
68°		13:17	16:10		10:49	09:47
66°		14:08	16:30		09:57	09:26
64°	12:03	14:40	16:45	09:59	09:24	09:09
62°	12:56	15:03	16:58	09:06	09:00	08:55
60°	13:28	15:22	17:09	08:33	08:40	08:43
N 58°	13:51	15:37	17:18	08:09	08:24	08:32
56°	14:10	15:50	17:26	07:49	08:10	08:23
54°	14:26	16:01	17:34	07:33	07:58	08:15
52°	14:40	16:11	17:40	07:19	07:48	08:08
50°	14:52	16:20	17:46	07:06	07:38	08:01
45°	15:17	16:39	17:58	06:40	07:18	07:47
N 40°	15:37	16:54	18:09	06:20	07:02	07:35
35°	15:53	17:07	18:17	06:02	06:48	07:25
30°	16:07	17:18	18:25	05:47	06:36	07:16
20°	16:31	17:37	18:38	05:22	06:15	07:00
N 10°	16:52	17:53	18:50	05:00	05:56	06:47
0°	17:11	18:08	19:00	04:39	05:39	06:34
S 10°	17:30	18:23	19:11	04:18	05:22	06:21
20°	17:51	18:40	19:22	03:56	05:03	06:07
30°	18:14	18:58	19:35	03:30	04:41	05:50
35°	18:28	19:09	19:42	03:14	04:28	05:41
40°	18:44	19:21	19:51	02:56	04:13	05:30
45°	19:03	19:35	20:01	02:34	03:56	05:17
S 50°	19:26	19:53	20:12	02:06	03:34	05:01
52°	19:37	20:01	20:18	01:53	03:23	04:54
54°	19:50	20:10	20:24	01:37	03:11	04:45
56°	20:05	20:20	20:30	01:18	02:57	04:36
58°	20:21	20:32	20:38	00:55	02:41	04:25
S 60°	20:42	20:45	20:46	00:25	02:21	04:13

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 95-100%
31	13:20	13:24	12:13	23:25	10:55	
01	13:29	13:33	12:14	–:–	11:54	
02	13:36	13:40	12:14	00:21	12:47	

February 03, 04, 05 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	133°11.3	169°38.9	S15°54.8	182°11.2	S19°12.2	24°33.9	N22°38.7	133°23.4	S02°27.1
1	148°13.8	184°38.2	53.8	197°11.6	11.7	39°36.7	38.8	148°25.7	27.0
2	163°16.3	199°37.6	52.8	212°12.1	11.2	54°39.4	38.8	163°27.9	26.9
3	178°18.7	214°37.0	·· 51.8	227°12.5	·· 10.7	69°42.2	·· 38.8	178°30.1	·· 26.8
4	193°21.2	229°36.3	50.9	242°13.0	10.2	84°44.9	38.9	193°32.4	26.7
5	208°23.7	244°35.7	49.9	257°13.5	09.7	99°47.7	38.9	208°34.6	26.6
6	223°26.1	259°35.1	S15°48.9	272°13.9	S19°09.2	114°50.4	N22°39.0	223°36.8	S02°26.5
7	238°28.6	274°34.4	47.9	287°14.4	08.7	129°53.2	39.0	238°39.1	26.4
8	253°31.1	289°33.8	47.0	302°14.8	08.2	144°55.9	39.0	253°41.3	26.2
9	268°33.5	304°33.2	·· 46.0	317°15.3	·· 07.7	159°58.7	·· 39.1	268°43.6	·· 26.1
10	283°36.0	319°32.5	45.0	332°15.8	07.2	175°01.4	39.1	283°45.8	26.0
11	298°38.4	334°31.9	44.0	347°16.2	06.7	190°04.2	39.2	298°48.0	25.9
12	313°40.9	349°31.3	S15°43.0	2°16.7	S19°06.2	205°06.9	N22°39.2	313°50.3	S02°25.8
13	328°43.4	4°30.7	42.0	17°17.2	05.7	220°09.7	39.2	328°52.5	25.7
14	343°45.8	19°30.0	41.1	32°17.6	05.1	235°12.4	39.3	343°54.7	25.6
15	358°48.3	34°29.4	·· 40.1	47°18.1	·· 04.6	250°15.2	·· 39.3	358°57.0	·· 25.5
16	13°50.8	49°28.8	39.1	62°18.5	04.1	265°17.9	39.3	13°59.2	25.4
17	28°53.2	64°28.2	38.1	77°19.0	03.6	280°20.7	39.4	29°01.4	25.3
18	43°55.7	79°27.5	S15°37.1	92°19.5	S19°03.1	295°23.4	N22°39.4	44°03.7	S02°25.2
19	58°58.2	94°26.9	36.1	107°19.9	02.6	310°26.2	39.5	59°05.9	25.1
20	74°00.6	109°26.3	35.2	122°20.4	02.1	325°28.9	39.5	74°08.1	25.0
21	89°03.1	124°25.7	·· 34.2	137°20.9	·· 01.6	340°31.7	·· 39.5	89°10.4	·· 24.9
22	104°05.6	139°25.0	33.2	152°21.3	01.1	355°34.4	39.6	104°12.6	24.8
23	119°08.0	154°24.4	32.2	167°21.8	00.6	10°37.1	39.6	119°14.8	24.7
Mer.pass. 15:05		ν -0.6′	d 1.0′	ν 0.5′	d 0.5′	ν 2.8′	d 0.0′	ν 2.2′	d 0.1′
		m -3.91		m 1.11		m -2.61		m 1.03	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	134°10.5	169°23.8	S15°31.2	182°22.3	S19°00.0	25°39.9	N22°39.6	134°17.1	S02°24.6
1	149°12.9	184°23.2	30.2	197°22.7	18°59.5	40°42.6	39.7	149°19.3	24.5
2	164°15.4	199°22.5	29.2	212°23.2	59.0	55°45.4	39.7	164°21.5	24.4
3	179°17.9	214°21.9	·· 28.2	227°23.7	·· 58.5	70°48.1	·· 39.8	179°23.8	·· 24.3
4	194°20.3	229°21.3	27.2	242°24.1	58.0	85°50.9	39.8	194°26.0	24.1
5	209°22.8	244°20.7	26.2	257°24.6	57.5	100°53.6	39.8	209°28.2	24.0
6	224°25.3	259°20.1	S15°25.2	272°25.0	S18°57.0	115°56.4	N22°39.9	224°30.5	S02°23.9
7	239°27.7	274°19.4	24.2	287°25.5	56.4	130°59.1	39.9	239°32.7	23.8
8	254°30.2	289°18.8	23.2	302°26.0	55.9	146°01.8	39.9	254°34.9	23.7
9	269°32.7	304°18.2	·· 22.2	317°26.4	·· 55.4	161°04.6	·· 40.0	269°37.2	·· 23.6
10	284°35.1	319°17.6	21.2	332°26.9	54.9	176°07.3	40.0	284°39.4	23.5
11	299°37.6	334°17.0	20.2	347°27.4	54.4	191°10.1	40.0	299°41.6	23.4
12	314°40.1	349°16.4	S15°19.2	2°27.8	S18°53.9	206°12.8	N22°40.1	314°43.9	S02°23.3
13	329°42.5	4°15.7	18.2	17°28.3	53.4	221°15.6	40.1	329°46.1	23.2
14	344°45.0	19°15.1	17.2	32°28.8	52.8	236°18.3	40.2	344°48.3	23.1
15	359°47.4	34°14.5	·· 16.2	47°29.2	·· 52.3	251°21.1	·· 40.2	359°50.6	·· 23.0
16	14°49.9	49°13.9	15.2	62°29.7	51.8	266°23.8	40.2	14°52.8	22.9
17	29°52.4	64°13.3	14.2	77°30.2	51.3	281°26.5	40.3	29°55.0	22.8
18	44°54.8	79°12.7	S15°13.2	92°30.6	S18°50.8	296°29.3	N22°40.3	44°57.3	S02°22.7
19	59°57.3	94°12.1	12.2	107°31.1	50.2	311°32.0	40.3	59°59.5	22.6
20	74°59.8	109°11.5	11.2	122°31.6	49.7	326°34.8	40.4	75°01.7	22.5
21	90°02.2	124°10.8	·· 10.2	137°32.0	·· 49.2	341°37.5	·· 40.4	90°03.9	·· 22.3
22	105°04.7	139°10.2	09.2	152°32.5	48.7	356°40.2	40.5	105°06.2	22.2
23	120°07.2	154°09.6	08.2	167°33.0	48.2	11°43.0	40.5	120°08.4	22.1
Mer.pass. 15:01		ν -0.6′	d 1.0′	ν 0.5′	d 0.5′	ν 2.7′	d 0.0′	ν 2.2′	d 0.1′
		m -3.91		m 1.11		m -2.61		m 1.03	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	135°09.6	169°09.0	S15°07.2	182°33.4	S18°47.7	26°45.7	N22°40.5	135°10.6	S02°22.0
1	150°12.1	184°08.4	06.2	197°33.9	47.1	41°48.5	40.6	150°12.9	21.9
2	165°14.5	199°07.8	05.2	212°34.4	46.6	56°51.2	40.6	165°15.1	21.8
3	180°17.0	214°07.2	·· 04.2	227°34.9	·· 46.1	71°53.9	·· 40.6	180°17.3	·· 21.7
4	195°19.5	229°06.6	03.2	242°35.3	45.6	86°56.7	40.7	195°19.6	21.6
5	210°21.9	244°06.0	02.1	257°35.8	45.0	101°59.4	40.7	210°21.8	21.5
6	225°24.4	259°05.4	S15°01.1	272°36.3	S18°44.5	117°02.2	N22°40.7	225°24.0	S02°21.4
7	240°26.9	274°04.8	15°00.1	287°36.7	44.0	132°04.9	40.8	240°26.3	21.3
8	255°29.3	289°04.2	14°59.1	302°37.2	43.5	147°07.6	40.8	255°28.5	21.2
9	270°31.8	304°03.5	·· 58.1	317°37.7	·· 43.0	162°10.4	·· 40.8	270°30.7	·· 21.1
10	285°34.3	319°02.9	57.1	332°38.1	42.4	177°13.1	40.9	285°33.0	21.0
11	300°36.7	334°02.3	56.1	347°38.6	41.9	192°15.8	40.9	300°35.2	20.9
12	315°39.2	349°01.7	S14°55.0	2°39.1	S18°41.4	207°18.6	N22°41.0	315°37.4	S02°20.7
13	330°41.7	4°01.1	54.0	17°39.6	40.9	222°21.3	41.0	330°39.6	20.6
14	345°44.1	19°00.5	53.0	32°40.0	40.3	237°24.1	41.0	345°41.9	20.5
15	0°46.6	33°59.9	·· 52.0	47°40.5	·· 39.8	252°26.8	·· 41.1	0°44.1	·· 20.4
16	15°49.0	48°59.3	51.0	62°41.0	39.3	267°29.5	41.1	15°46.3	20.3
17	30°51.5	63°58.7	49.9	77°41.4	38.8	282°32.3	41.1	30°48.6	20.2
18	45°54.0	78°58.1	S14°48.9	92°41.9	S18°38.2	297°35.0	N22°41.2	45°50.8	S02°20.1
19	60°56.4	93°57.5	47.9	107°42.4	37.7	312°37.7	41.2	60°53.0	20.0
20	75°58.9	108°56.9	46.9	122°42.8	37.2	327°40.5	41.2	75°55.3	19.9
21	91°01.4	123°56.3	·· 45.9	137°43.3	·· 36.6	342°43.2	·· 41.3	90°57.5	·· 19.8
22	106°03.8	138°55.7	44.8	152°43.8	36.1	357°45.9	41.3	105°59.7	19.7
23	121°06.3	153°55.1	43.8	167°44.3	35.6	12°48.7	41.3	121°01.9	19.6
Mer.pass. 14:57		ν -0.6′	d 1.0′	ν 0.5′	d 0.5′	ν 2.7′	d 0.0′	ν 2.2′	d 0.1′
		m -3.91		m 1.11		m -2.60		m 1.03	

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.2
Ankaa	353°06.5	-42°10.0
Schedar	349°30.3	56°41.1
Diphda	348°46.6	-17°50.7
Achernar	335°19.7	-57°06.5
Hamal	327°50.2	23°35.2
Polaris	313°32.1	89°22.8
Acamar	315°11.1	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.9	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.3	46°01.6
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.6	-52°42.7
Sirius	258°25.1	-16°45.2
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.7	-59°35.6
Suhail	222°45.2	-43°32.3
Miaplacidus	221°37.2	-69°49.4
Alphard	217°46.5	-8°46.4
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.4
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°58.7	-63°14.5
Gacrux	171°50.3	-57°15.4
Alioth	166°11.9	55°48.7
Spica	158°21.2	-11°17.9
Alkaid	152°51.1	49°10.6
Hadar	148°34.6	-60°29.7
Menkent	147°56.5	-36°29.8
Arcturus	145°47.0	19°02.5
Rigil Kent.	139°39.0	-60°56.4
Kochab	137°19.8	74°02.4
Zuben'ubi	136°55.0	-16°09.1
Alphecca	126°03.0	26°37.3
Antares	112°14.9	-26°29.4
Atria	107°08.6	-69°04.2
Sabik	102°01.9	-15°45.5
Shaula	96°09.4	-37°07.3
Rasalhague	95°57.9	12°32.3
Eltanin	90°42.1	51°28.8
Kaus Aust.	83°31.6	-34°22.3
Vega	80°33.0	38°48.2
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.9	-56°39.1
Deneb	49°25.7	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Feb 03 Tue	SHA	Mer.pass
Venus	36°27.5	12:42
Mars	48°59.8	11:51
Jupiter	251°22.6	22:18
Saturn	0°12.1	15:04

Feb 04 Wed	SHA	Mer.pass
Venus	35°13.3	12:43
Mars	48°11.8	11:50
Jupiter	251°29.4	22:13
Saturn	0°06.6	15:01

Feb 05 Thu	SHA	Mer.pass
Venus	33°59.4	12:44
Mars	47°23.8	11:49
Jupiter	251°36.1	22:09
Saturn	0°01.0	14:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°34.2	S16°34.9	342°35.1	11.5′	N13°04.5	14.8′	58.3′
1	191°34.1	34.2	357°05.6	11.6′	12°49.7	14.9′	58.2′
2	206°34.0	33.4	11°36.1	11.7′	12°34.8	14.9′	58.2′
3	221°34.0	·· 32.7	26°06.8	11.8′	12°19.9	15.0′	58.2′
4	236°33.9	32.0	40°37.6	11.9′	12°04.9	15.1′	58.1′
5	251°33.8	31.2	55°08.5	12.0′	11°49.8	15.0′	58.1′
6	266°33.8	S16°30.5	69°39.4	12.1′	N11°34.8	15.1′	58.1′
7	281°33.7	29.8	84°10.5	12.1′	11°19.7	15.2′	58.1′
8	296°33.6	29.0	98°41.6	12.2′	11°04.5	15.2′	58.0′
9	311°33.6	·· 28.3	113°12.8	12.3′	10°49.3	15.2′	58.0′
10	326°33.5	27.6	127°44.2	12.4′	10°34.1	15.3′	58.0′
11	341°33.4	26.8	142°15.6	12.5′	10°18.8	15.3′	57.9′
12	356°33.4	S16°26.1	156°47.1	12.6′	N10°03.5	15.3′	57.9′
13	11°33.3	25.3	171°18.6	12.7′	09°48.2	15.3′	57.9′
14	26°33.3	24.6	185°50.3	12.7′	09°32.9	15.4′	57.8′
15	41°33.2	·· 23.9	200°22.0	12.8′	09°17.5	15.4′	57.8′
16	56°33.1	23.1	214°53.9	12.9′	09°02.1	15.4′	57.8′
17	71°33.1	22.4	229°25.8	13.0′	08°46.7	15.5′	57.7′
18	86°33.0	S16°21.6	243°57.7	13.1′	N08°31.2	15.5′	57.7′
19	101°32.9	20.9	258°29.8	13.1′	08°15.7	15.4′	57.7′
20	116°32.9	20.1	273°01.9	13.2′	08°00.3	15.6′	57.6′
21	131°32.8	·· 19.4	287°34.1	13.3′	07°44.7	15.5′	57.6′
22	146°32.8	18.7	302°06.4	13.3′	07°29.2	15.5′	57.6′
23	161°32.7	17.9	316°38.7	13.4′	07°13.7	15.6′	57.6′
	SD = 16.2′	d = 0.7′	SD = 15.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°32.6	S16°17.2	331°11.2	13.5′	N06°58.1	15.6′	57.5′
1	191°32.6	16.4	345°43.6	13.6′	06°42.5	15.5′	57.5′
2	206°32.5	15.7	0°16.2	13.6′	06°27.0	15.6′	57.5′
3	221°32.5	·· 14.9	14°48.8	13.7′	06°11.4	15.6′	57.4′
4	236°32.4	14.2	29°21.5	13.8′	05°55.8	15.7′	57.4′
5	251°32.3	13.4	43°54.3	13.8′	05°40.1	15.6′	57.4′
6	266°32.3	S16°12.7	58°27.1	13.9′	N05°24.5	15.6′	57.3′
7	281°32.2	12.0	72°59.9	13.9′	05°08.9	15.6′	57.3′
8	296°32.2	11.2	87°32.9	14.0′	04°53.3	15.7′	57.3′
9	311°32.1	·· 10.5	102°05.9	14.1′	04°37.6	15.6′	57.2′
10	326°32.1	09.7	116°38.9	14.1′	04°22.0	15.6′	57.2′
11	341°32.0	09.0	131°12.0	14.2′	04°06.4	15.6′	57.2′
12	356°31.9	S16°08.2	145°45.2	14.2′	N03°50.8	15.7′	57.1′
13	11°31.9	07.5	160°18.4	14.3′	03°35.1	15.6′	57.1′
14	26°31.8	06.7	174°51.7	14.3′	03°19.5	15.6′	57.1′
15	41°31.8	·· 05.9	189°25.0	14.4′	03°03.9	15.6′	57.0′
16	56°31.7	05.2	203°58.4	14.4′	02°48.3	15.6′	57.0′
17	71°31.7	04.4	218°31.8	14.5′	02°32.7	15.6′	57.0′
18	86°31.6	S16°03.7	233°05.3	14.5′	N02°17.1	15.6′	56.9′
19	101°31.6	02.9	247°38.8	14.6′	02°01.5	15.6′	56.9′
20	116°31.5	02.2	262°12.3	14.6′	01°45.9	15.6′	56.9′
21	131°31.5	·· 01.4	276°45.9	14.6′	01°30.3	15.5′	56.8′
22	146°31.4	16°00.7	291°19.6	14.7′	01°14.8	15.6′	56.8′
23	161°31.4	15°59.9	305°53.3	14.7′	00°59.2	15.5′	56.8′
	SD = 16.2′	d = 0.7′	SD = 15.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°31.3	S15°59.2	320°27.0	14.8′	N00°43.7	15.5′	56.7′
1	191°31.2	58.4	335°00.7	14.8′	00°28.2	15.5′	56.7′
2	206°31.2	57.6	349°34.5	14.8′	N00°12.7	15.5′	56.7′
3	221°31.1	·· 56.9	4°08.4	14.9′	S00°02.8	15.4′	56.6′
4	236°31.1	56.1	18°42.3	14.9′	00°18.2	15.5′	56.6′
5	251°31.0	55.4	33°16.2	14.9′	00°33.7	15.4′	56.6′
6	266°31.0	S15°54.6	47°50.1	15.0′	S00°49.1	15.4′	56.5′
7	281°30.9	53.9	62°24.1	15.0′	01°04.5	15.3′	56.5′
8	296°30.9	53.1	76°58.1	15.0′	01°19.8	15.4′	56.5′
9	311°30.8	·· 52.3	91°32.1	15.1′	01°35.2	15.3′	56.4′
10	326°30.8	51.6	106°06.1	15.1′	01°50.5	15.3′	56.4′
11	341°30.8	50.8	120°40.2	15.1′	02°05.8	15.3′	56.4′
12	356°30.7	S15°50.1	135°14.3	15.1′	S02°21.1	15.2′	56.4′
13	11°30.7	49.3	149°48.5	15.2′	02°36.3	15.2′	56.3′
14	26°30.6	48.5	164°22.6	15.2′	02°51.5	15.2′	56.3′
15	41°30.6	·· 47.8	178°56.8	15.2′	03°06.7	15.2′	56.3′
16	56°30.5	47.0	193°31.0	15.2′	03°21.9	15.1′	56.2′
17	71°30.5	46.2	208°05.2	15.2′	03°37.0	15.1′	56.2′
18	86°30.4	S15°45.5	222°39.4	15.2′	S03°52.1	15.0′	56.2′
19	101°30.4	44.7	237°13.7	15.3′	04°07.1	15.0′	56.1′
20	116°30.3	43.9	251°47.9	15.3′	04°22.1	15.0′	56.1′
21	131°30.3	·· 43.2	266°22.2	15.3′	04°37.1	15.0′	56.1′
22	146°30.2	42.4	280°56.5	15.3′	04°52.1	14.9′	56.0′
23	161°30.2	41.6	295°30.8	15.3′	05°07.0	14.9′	56.0′
	SD = 16.2′	d = 0.8′	SD = 15.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:59	08:25	10:04	14:25	16:04	17:31
N 70°	06:52	08:08	09:29	15:00	16:21	17:37
68°	06:46	07:55	09:04	15:24	16:34	17:43
66°	06:42	07:44	08:46	15:43	16:45	17:47
64°	06:37	07:35	08:30	15:59	16:54	17:52
62°	06:33	07:27	08:17	16:11	17:02	17:55
60°	06:30	07:20	08:07	16:22	17:08	17:59
N 58°	06:27	07:14	07:57	16:31	17:15	18:02
56°	06:24	07:08	07:49	16:39	17:20	18:05
54°	06:21	07:03	07:42	16:47	17:25	18:07
52°	06:19	06:59	07:35	16:53	17:30	18:10
50°	06:16	06:55	07:29	16:59	17:34	18:12
45°	06:10	06:45	07:16	17:12	17:43	18:18
N 40°	06:05	06:37	07:06	17:23	17:51	18:23
35°	06:00	06:30	06:56	17:32	17:58	18:28
30°	05:55	06:24	06:48	17:40	18:05	18:33
20°	05:45	06:12	06:34	17:54	18:16	18:43
N 10°	05:35	06:00	06:22	18:06	18:28	18:53
0°	05:24	05:49	06:10	18:17	18:39	19:04
S 10°	05:11	05:37	05:59	18:29	18:51	19:17
20°	04:55	05:23	05:46	18:42	19:05	19:32
30°	04:35	05:06	05:31	18:56	19:22	19:52
35°	04:22	04:55	05:23	19:05	19:32	20:05
40°	04:07	04:43	05:13	19:14	19:44	20:20
45°	03:47	04:28	05:01	19:26	19:59	20:39
S 50°	03:21	04:09	04:47	19:40	20:17	21:05
52°	03:08	04:01	04:40	19:46	20:26	21:18
54°	02:53	03:50	04:33	19:54	20:36	21:33
56°	02:34	03:39	04:25	20:02	20:47	21:51
58°	02:09	03:25	04:15	20:11	21:01	22:14
S 60°	01:35	03:09	04:05	20:21	21:16	22:47

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	17:56	20:12	22:20	09:47	09:07	08:33
N 70°	18:09	20:14	22:13	09:31	09:01	08:35
68°	18:20	20:16	22:07	09:18	08:57	08:37
66°	18:29	20:18	22:02	09:07	08:52	08:39
64°	18:36	20:19	21:57	08:58	08:49	08:40
62°	18:43	20:20	21:54	08:50	08:46	08:41
60°	18:48	20:21	21:51	08:43	08:43	08:42
N 58°	18:53	20:22	21:48	08:37	08:40	08:43
56°	18:57	20:23	21:45	08:32	08:38	08:44
54°	19:01	20:24	21:43	08:27	08:36	08:44
52°	19:04	20:24	21:41	08:23	08:34	08:45
50°	19:07	20:25	21:39	08:18	08:33	08:45
45°	19:14	20:26	21:35	08:10	08:29	08:47
N 40°	19:20	20:27	21:32	08:02	08:26	08:48
35°	19:24	20:28	21:29	07:56	08:23	08:49
30°	19:29	20:29	21:27	07:50	08:21	08:49
20°	19:36	20:30	21:23	07:40	08:17	08:51
N 10°	19:42	20:31	21:19	07:32	08:13	08:52
0°	19:48	20:33	21:15	07:23	08:10	08:53
S 10°	19:54	20:34	21:12	07:15	08:06	08:54
20°	20:00	20:35	21:08	07:06	08:02	08:56
30°	20:07	20:37	21:04	06:56	07:58	08:57
35°	20:11	20:37	21:02	06:50	07:55	08:58
40°	20:16	20:38	21:00	06:43	07:52	08:59
45°	20:21	20:39	20:57	06:35	07:49	09:00
S 50°	20:28	20:41	20:53	06:25	07:45	09:01
52°	20:30	20:41	20:51	06:21	07:43	09:01
54°	20:34	20:42	20:50	06:16	07:41	09:02
56°	20:37	20:43	20:48	06:10	07:39	09:03
58°	20:41	20:43	20:46	06:04	07:36	09:03
S 60°	20:45	20:44	20:43	05:57	07:33	09:04

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 16-18 99-89%
03	13:43	13:46	12:14	01:12	13:36	
04	13:49	13:52	12:14	01:59	14:21	
05	13:55	13:57	12:14	02:43	15:04	



February 06, 07, 08 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	136°08.8	168°54.5	S14°42.8	182°44.7	S18°35.1	27°51.4	N22°41.4	136°04.2	S02°19.5
1	151°11.2	183°53.9	41.8	197°45.2	34.5	42°54.1	41.4	151°06.4	19.4
2	166°13.7	198°53.3	40.7	212°45.7	34.0	57°56.9	41.5	166°08.6	19.3
3	181°16.1	213°52.7	·· 39.7	227°46.2	·· 33.5	72°59.6	·· 41.5	181°10.9	·· 19.1
4	196°18.6	228°52.1	38.7	242°46.6	32.9	88°02.3	41.5	196°13.1	19.0
5	211°21.1	243°51.6	37.6	257°47.1	32.4	103°05.1	41.6	211°15.3	18.9
6	226°23.5	258°51.0	S14°36.6	272°47.6	S18°31.9	118°07.8	N22°41.6	226°17.5	S02°18.8
7	241°26.0	273°50.4	35.6	287°48.0	31.3	133°10.5	41.6	241°19.8	18.7
8	256°28.5	288°49.8	34.6	302°48.5	30.8	148°13.3	41.7	256°22.0	18.6
9	271°30.9	303°49.2	·· 33.5	317°49.0	·· 30.3	163°16.0	·· 41.7	271°24.2	·· 18.5
10	286°33.4	318°48.6	32.5	332°49.5	29.7	178°18.7	41.7	286°26.5	18.4
11	301°35.9	333°48.0	31.5	347°49.9	29.2	193°21.5	41.8	301°28.7	18.3
12	316°38.3	348°47.4	S14°30.4	2°50.4	S18°28.7	208°24.2	N22°41.8	316°30.9	S02°18.2
13	331°40.8	3°46.8	29.4	17°50.9	28.2	223°26.9	41.8	331°33.1	18.1
14	346°43.3	18°46.2	28.4	32°51.4	27.6	238°29.6	41.9	346°35.4	18.0
15	1°45.7	33°45.6	·· 27.3	47°51.8	·· 27.1	253°32.4	·· 41.9	1°37.6	·· 17.9
16	16°48.2	48°45.0	26.3	62°52.3	26.5	268°35.1	41.9	16°39.8	17.7
17	31°50.6	63°44.5	25.2	77°52.8	26.0	283°37.8	42.0	31°42.1	17.6
18	46°53.1	78°43.9	S14°24.2	92°53.3	S18°25.5	298°40.6	N22°42.0	46°44.3	S02°17.5
19	61°55.6	93°43.3	23.2	107°53.7	24.9	313°43.3	42.0	61°46.5	17.4
20	76°58.0	108°42.7	22.1	122°54.2	24.4	328°46.0	42.1	76°48.7	17.3
21	92°00.5	123°42.1	·· 21.1	137°54.7	·· 23.9	343°48.7	·· 42.1	91°51.0	·· 17.2
22	107°03.0	138°41.5	20.1	152°55.2	23.3	358°51.5	42.2	106°53.2	17.1
23	122°05.4	153°40.9	19.0	167°55.6	22.8	13°54.2	42.2	121°55.4	17.0
Mer.pass. 14:53		ν -0.6′	d 1.0′	m -3.91	ν 0.5′	d 0.5′	m 1.11	ν 2.7′	d 0.0′ m -2.60	ν 2.2′	d 0.1′ m 1.02

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	137°07.9	168°40.4	S14°18.0	182°56.1	S18°22.3	28°56.9	N22°42.2	136°57.6	S02°16.9
1	152°10.4	183°39.8	16.9	197°56.6	21.7	43°59.7	42.3	151°59.9	16.8
2	167°12.8	198°39.2	15.9	212°57.1	21.2	59°02.4	42.3	167°02.1	16.7
3	182°15.3	213°38.6	·· 14.8	227°57.6	·· 20.6	74°05.1	·· 42.3	182°04.3	·· 16.6
4	197°17.8	228°38.0	13.8	242°58.0	20.1	89°07.8	42.4	197°06.6	16.5
5	212°20.2	243°37.4	12.7	257°58.5	19.6	104°10.6	42.4	212°08.8	16.3
6	227°22.7	258°36.9	S14°11.7	272°59.0	S18°19.0	119°13.3	N22°42.4	227°11.0	S02°16.2
7	242°25.1	273°36.3	10.7	287°59.5	18.5	134°16.0	42.5	242°13.2	16.1
8	257°27.6	288°35.7	09.6	302°59.9	18.0	149°18.7	42.5	257°15.5	16.0
9	272°30.1	303°35.1	·· 08.6	318°00.4	·· 17.4	164°21.5	·· 42.5	272°17.7	·· 15.9
10	287°32.5	318°34.5	07.5	333°00.9	16.9	179°24.2	42.6	287°19.9	15.8
11	302°35.0	333°33.9	06.5	348°01.4	16.3	194°26.9	42.6	302°22.1	15.7
12	317°37.5	348°33.4	S14°05.4	3°01.9	S18°15.8	209°29.6	N22°42.6	317°24.4	S02°15.6
13	332°39.9	3°32.8	04.4	18°02.3	15.2	224°32.4	42.7	332°26.6	15.5
14	347°42.4	18°32.2	03.3	33°02.8	14.7	239°35.1	42.7	347°28.8	15.4
15	2°44.9	33°31.6	·· 02.3	48°03.3	·· 14.2	254°37.8	·· 42.7	2°31.0	·· 15.3
16	17°47.3	48°31.1	01.2	63°03.8	13.6	269°40.5	42.8	17°33.3	15.2
17	32°49.8	63°30.5	14°00.2	78°04.2	13.1	284°43.3	42.8	32°35.5	15.0
18	47°52.2	78°29.9	S13°59.1	93°04.7	S18°12.5	299°46.0	N22°42.8	47°37.7	S02°14.9
19	62°54.7	93°29.3	58.0	108°05.2	12.0	314°48.7	42.9	62°39.9	14.8
20	77°57.2	108°28.8	57.0	123°05.7	11.4	329°51.4	42.9	77°42.2	14.7
21	92°59.6	123°28.2	·· 55.9	138°06.2	·· 10.9	344°54.1	·· 42.9	92°44.4	·· 14.6
22	108°02.1	138°27.6	54.9	153°06.6	10.4	359°56.9	43.0	107°46.6	14.5
23	123°04.6	153°27.0	53.8	168°07.1	09.8	14°59.6	43.0	122°48.8	14.4
Mer.pass. 14:49		ν -0.6′	d 1.0′	m -3.91	ν 0.5′	d 0.5′	m 1.12	ν 2.7′	d 0.0′ m -2.59	ν 2.2′	d 0.1′ m 1.02

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	138°07.0	168°26.5	S13°52.8	183°07.6	S18°09.3	30°02.3	N22°43.0	137°51.1	S02°14.3
1	153°09.5	183°25.9	51.7	198°08.1	08.7	45°05.0	43.1	152°53.3	14.2
2	168°12.0	198°25.3	50.6	213°08.6	08.2	60°07.7	43.1	167°55.5	14.1
3	183°14.4	213°24.7	·· 49.6	228°09.0	·· 07.6	75°10.5	·· 43.1	182°57.7	·· 14.0
4	198°16.9	228°24.2	48.5	243°09.5	07.1	90°13.2	43.2	198°00.0	13.9
5	213°19.4	243°23.6	47.5	258°10.0	06.5	105°15.9	43.2	213°02.2	13.7
6	228°21.8	258°23.0	S13°46.4	273°10.5	S18°06.0	120°18.6	N22°43.2	228°04.4	S02°13.6
7	243°24.3	273°22.5	45.3	288°11.0	05.4	135°21.3	43.3	243°06.6	13.5
8	258°26.7	288°21.9	44.3	303°11.5	04.9	150°24.1	43.3	258°08.9	13.4
9	273°29.2	303°21.3	·· 43.2	318°11.9	·· 04.3	165°26.8	·· 43.3	273°11.1	·· 13.3
10	288°31.7	318°20.8	42.2	333°12.4	03.8	180°29.5	43.4	288°13.3	13.2
11	303°34.1	333°20.2	41.1	348°12.9	03.2	195°32.2	43.4	303°15.5	13.1
12	318°36.6	348°19.6	S13°40.0	3°13.4	S18°02.7	210°34.9	N22°43.4	318°17.8	S02°13.0
13	333°39.1	3°19.1	39.0	18°13.9	02.1	225°37.7	43.5	333°20.0	12.9
14	348°41.5	18°18.5	37.9	33°14.3	01.6	240°40.4	43.5	348°22.2	12.8
15	3°44.0	33°17.9	·· 36.8	48°14.8	·· 01.0	255°43.1	·· 43.5	3°24.4	·· 12.7
16	18°46.5	48°17.4	35.8	63°15.3	18°00.5	270°45.8	43.6	18°26.7	12.5
17	33°48.9	63°16.8	34.7	78°15.8	17°59.9	285°48.5	43.6	33°28.9	12.4
18	48°51.4	78°16.2	S13°33.6	93°16.3	S17°59.4	300°51.2	N22°43.6	48°31.1	S02°12.3
19	63°53.9	93°15.7	32.5	108°16.8	58.8	315°53.9	43.7	63°33.3	12.2
20	78°56.3	108°15.1	31.5	123°17.3	58.3	330°56.7	43.7	78°35.6	12.1
21	93°58.8	123°14.5	·· 30.4	138°17.7	·· 57.7	345°59.4	·· 43.7	93°37.8	·· 12.0
22	109°01.2	138°14.0	29.3	153°18.2	57.2	1°02.1	43.8	108°40.0	11.9
23	124°03.7	153°13.4	28.3	168°18.7	56.6	16°04.8	43.8	123°42.2	11.8
Mer.pass. 14:45		ν -0.6′	d 1.1′	m -3.91	ν 0.5′	d 0.5′	m 1.12	ν 2.7′	d 0.0′ m -2.59	ν 2.2′	d 0.1′ m 1.02

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.5	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.7	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°33.7	89°22.8
Acamar	315°11.1	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.9	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.3	46°01.6
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.6	-52°42.7
Sirius	258°25.2	-16°45.2
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.7	-59°35.7
Suhail	222°45.2	-43°32.3
Miaplacidus	221°37.2	-69°49.5
Alphard	217°46.5	-8°46.4
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.4
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°58.7	-63°14.5
Gacrux	171°50.3	-57°15.4
Alioth	166°11.8	55°48.7
Spica	158°21.2	-11°17.9
Alkaid	152°51.1	49°10.6
Hadar	148°34.6	-60°29.7
Menkent	147°56.5	-36°29.8
Arcturus	145°47.0	19°02.5
Rigil Kent.	139°39.0	-60°56.4
Kochab	137°19.7	74°02.4
Zuben'ubi	136°55.0	-16°09.1
Alphecca	126°03.0	26°37.3
Antares	112°14.9	-26°29.4
Atria	107°08.5	-69°04.2
Sabik	102°01.9	-15°45.5
Shaula	96°09.4	-37°07.3
Rasalhague	95°57.9	12°32.3
Eltanin	90°42.1	51°28.8
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.9	38°48.2
Nunki	75°46.9	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.9	-56°39.0
Deneb	49°25.7	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Feb 06 Fri	SHA	Mer.pass
Venus	32°45.8	12:45
Mars	46°36.0	11:49
Jupiter	251°42.6	22:05
Saturn	359°55.4	14:54

Feb 07 Sat	SHA	Mer.pass
Venus	31°32.5	12:46
Mars	45°48.2	11:48
Jupiter	251°49.0	22:00
Saturn	359°49.8	14:50

Feb 08 Sun	SHA	Mer.pass
Venus	30°19.4	12:47
Mars	45°00.6	11:47
Jupiter	251°55.3	21:56
Saturn	359°44.0	14:46

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.2	S15°40.9	310°05.1	15.3′	S05°21.9	14.8′	56.0′
1	191°30.1	40.1	324°39.4	15.3′	05°36.7	14.8′	56.0′
2	206°30.1	39.3	339°13.8	15.3′	05°51.5	14.8′	55.9′
3	221°30.0	·· 38.6	353°48.1	15.3′	06°06.3	14.7′	55.9′
4	236°30.0	37.8	8°22.5	15.4′	06°21.0	14.7′	55.9′
5	251°29.9	37.0	22°56.8	15.4′	06°35.7	14.6′	55.8′
6	266°29.9	S15°36.3	37°31.2	15.4′	S06°50.3	14.6′	55.8′
7	281°29.9	35.5	52°05.5	15.4′	07°04.9	14.5′	55.8′
8	296°29.8	34.7	66°39.9	15.4′	07°19.4	14.5′	55.7′
9	311°29.8	·· 33.9	81°14.3	15.4′	07°33.9	14.5′	55.7′
10	326°29.7	33.2	95°48.6	15.4′	07°48.4	14.4′	55.7′
11	341°29.7	32.4	110°23.0	15.4′	08°02.8	14.3′	55.7′
12	356°29.7	S15°31.6	124°57.3	15.4′	S08°17.1	14.3′	55.6′
13	11°29.6	30.9	139°31.7	15.3′	08°31.4	14.3′	55.6′
14	26°29.6	30.1	154°06.0	15.3′	08°45.7	14.2′	55.6′
15	41°29.6	·· 29.3	168°40.4	15.3′	08°59.9	14.2′	55.6′
16	56°29.5	28.5	183°14.7	15.3′	09°14.1	14.1′	55.5′
17	71°29.5	27.8	197°49.0	15.3′	09°28.2	14.0′	55.5′
18	86°29.4	S15°27.0	212°23.4	15.3′	S09°42.2	14.1′	55.5′
19	101°29.4	26.2	226°57.7	15.3′	09°56.3	13.9′	55.4′
20	116°29.4	25.4	241°32.0	15.3′	10°10.2	13.9′	55.4′
21	131°29.3	·· 24.6	256°06.2	15.3′	10°24.1	13.8′	55.4′
22	146°29.3	23.9	270°40.5	15.3′	10°37.9	13.8′	55.4′
23	161°29.3	23.1	285°14.8	15.2′	10°51.7	13.8′	55.3′
	SD = 16.2′	d = 0.8′	SD = 15.3′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.2	S15°22.3	299°49.0	15.2′	S11°05.5	13.6′	55.3′
1	191°29.2	21.5	314°23.2	15.2′	11°19.1	13.6′	55.3′
2	206°29.2	20.8	328°57.5	15.2′	11°32.7	13.6′	55.3′
3	221°29.1	·· 20.0	343°31.6	15.2′	11°46.3	13.5′	55.2′
4	236°29.1	19.2	358°05.8	15.2′	11°59.8	13.4′	55.2′
5	251°29.0	18.4	12°40.0	15.1′	12°13.2	13.4′	55.2′
6	266°29.0	S15°17.6	27°14.1	15.1′	S12°26.6	13.3′	55.2′
7	281°29.0	16.8	41°48.2	15.1′	12°39.9	13.3′	55.1′
8	296°29.0	16.1	56°22.3	15.1′	12°53.2	13.2′	55.1′
9	311°28.9	·· 15.3	70°56.4	15.0′	13°06.4	13.1′	55.1′
10	326°28.9	14.5	85°30.4	15.0′	13°19.5	13.0′	55.1′
11	341°28.9	13.7	100°04.4	15.0′	13°32.5	13.0′	55.1′
12	356°28.8	S15°12.9	114°38.4	15.0′	S13°45.5	13.0′	55.0′
13	11°28.8	12.1	129°12.4	14.9′	13°58.5	12.8′	55.0′
14	26°28.8	11.4	143°46.3	14.9′	14°11.3	12.8′	55.0′
15	41°28.7	·· 10.6	158°20.2	14.9′	14°24.1	12.7′	55.0′
16	56°28.7	09.8	172°54.1	14.8′	14°36.8	12.7′	54.9′
17	71°28.7	09.0	187°27.9	14.8′	14°49.5	12.6′	54.9′
18	86°28.6	S15°08.2	202°01.7	14.8′	S15°02.1	12.5′	54.9′
19	101°28.6	07.4	216°35.5	14.7′	15°14.6	12.5′	54.9′
20	116°28.6	06.6	231°09.3	14.7′	15°27.1	12.3′	54.9′
21	131°28.6	·· 05.9	245°43.0	14.7′	15°39.4	12.3′	54.8′
22	146°28.5	05.1	260°16.6	14.6′	15°51.7	12.3′	54.8′
23	161°28.5	04.3	274°50.3	14.6′	16°04.0	12.1′	54.8′
	SD = 16.2′	d = 0.8′	SD = 15.1′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.5	S15°03.5	289°23.9	14.6′	S16°16.1	12.1′	54.8′
1	191°28.4	02.7	303°57.5	14.5′	16°28.2	12.0′	54.8′
2	206°28.4	01.9	318°31.0	14.5′	16°40.2	11.9′	54.7′
3	221°28.4	·· 01.1	333°04.5	14.4′	16°52.1	11.9′	54.7′
4	236°28.4	15°00.3	347°37.9	14.4′	17°04.0	11.8′	54.7′
5	251°28.3	14°59.5	2°11.3	14.4′	17°15.8	11.7′	54.7′
6	266°28.3	S14°58.7	16°44.7	14.3′	S17°27.5	11.6′	54.7′
7	281°28.3	58.0	31°18.0	14.3′	17°39.1	11.5′	54.6′
8	296°28.3	57.2	45°51.3	14.2′	17°50.6	11.5′	54.6′
9	311°28.2	·· 56.4	60°24.5	14.2′	18°02.1	11.4′	54.6′
10	326°28.2	55.6	74°57.7	14.1′	18°13.5	11.3′	54.6′
11	341°28.2	54.8	89°30.9	14.1′	18°24.8	11.2′	54.6′
12	356°28.2	S14°54.0	104°04.0	14.1′	S18°36.0	11.1′	54.6′
13	11°28.2	53.2	118°37.0	14.0′	18°47.1	11.1′	54.5′
14	26°28.1	52.4	133°10.1	14.0′	18°58.2	10.9′	54.5′
15	41°28.1	·· 51.6	147°43.0	13.9′	19°09.1	10.9′	54.5′
16	56°28.1	50.8	162°15.9	13.9′	19°20.0	10.8′	54.5′
17	71°28.1	50.0	176°48.8	13.8′	19°30.8	10.7′	54.5′
18	86°28.0	S14°49.2	191°21.6	13.8′	S19°41.5	10.7′	54.5′
19	101°28.0	48.4	205°54.4	13.7′	19°52.2	10.5′	54.5′
20	116°28.0	47.6	220°27.1	13.7′	20°02.7	10.4′	54.4′
21	131°28.0	·· 46.8	234°59.8	13.6′	20°13.1	10.4′	54.4′
22	146°28.0	46.0	249°32.4	13.6′	20°23.5	10.3′	54.4′
23	161°27.9	45.2	264°05.0	13.5′	20°33.8	10.1′	54.4′
	SD = 16.2′	d = 0.8′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:47	08:11	09:43	14:47	16:18	17:43
N 70°	06:42	07:57	09:13	15:16	16:33	17:48
68°	06:37	07:45	08:52	15:38	16:44	17:52
66°	06:33	07:35	08:35	15:55	16:54	17:56
64°	06:30	07:27	08:21	16:08	17:02	18:00
62°	06:27	07:20	08:09	16:20	17:09	18:03
60°	06:24	07:14	07:59	16:30	17:16	18:05
N 58°	06:21	07:08	07:51	16:38	17:21	18:08
56°	06:19	07:03	07:43	16:46	17:26	18:10
54°	06:16	06:58	07:36	16:53	17:31	18:13
52°	06:14	06:54	07:30	16:59	17:35	18:15
50°	06:12	06:50	07:24	17:04	17:39	18:17
45°	06:07	06:42	07:12	17:16	17:47	18:22
N 40°	06:02	06:34	07:02	17:26	17:54	18:27
35°	05:58	06:28	06:54	17:35	18:01	18:31
30°	05:53	06:22	06:46	17:42	18:07	18:35
20°	05:44	06:10	06:33	17:55	18:18	18:44
N 10°	05:35	06:00	06:22	18:07	18:28	18:53
0°	05:24	05:49	06:11	18:18	18:39	19:04
S 10°	05:12	05:38	06:00	18:29	18:50	19:16
20°	04:57	05:24	05:48	18:40	19:03	19:31
30°	04:38	05:08	05:34	18:54	19:19	19:50
35°	04:26	04:58	05:26	19:02	19:29	20:02
40°	04:11	04:47	05:16	19:11	19:40	20:16
45°	03:53	04:33	05:05	19:22	19:54	20:34
S 50°	03:28	04:15	04:52	19:35	20:11	20:58
52°	03:16	04:07	04:46	19:41	20:20	21:10
54°	03:02	03:57	04:39	19:48	20:29	21:24
56°	02:45	03:47	04:31	19:55	20:40	21:41
58°	02:23	03:34	04:23	20:04	20:52	22:02
S 60°	01:54	03:19	04:13	20:13	21:07	22:29

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	·· ··	00:34	03:32	07:59	07:15	05:48
N 70°	·· ··	00:14	02:33	08:09	07:38	06:49
68°	23:58	·· ··	01:59	08:18	07:55	07:25
66°	23:45	·· ··	01:34	08:25	08:10	07:50
64°	23:35	·· ··	01:16	08:31	08:21	08:10
62°	23:26	·· ··	01:00	08:36	08:31	08:26
60°	23:19	·· ··	00:48	08:41	08:40	08:40
N 58°	23:12	·· ··	00:37	08:45	08:48	08:52
56°	23:06	·· ··	00:27	08:49	08:55	09:02
54°	23:01	·· ··	00:19	08:52	09:01	09:11
52°	22:56	·· ··	00:11	08:55	09:06	09:19
50°	22:52	·· ··	00:05	08:58	09:11	09:27
45°	22:43	23:50	·· ··	09:04	09:22	09:42
N 40°	22:36	23:39	·· ··	09:09	09:31	09:55
35°	22:29	23:29	·· ··	09:13	09:39	10:06
30°	22:24	23:20	·· ··	09:17	09:46	10:16
20°	22:14	23:05	23:58	09:24	09:58	10:33
N 10°	22:05	22:52	23:41	09:30	10:08	10:48
0°	21:58	22:40	23:25	09:36	10:18	11:02
S 10°	21:50	22:29	23:09	09:41	10:28	11:15
20°	21:42	22:16	22:53	09:47	10:39	11:30
30°	21:32	22:02	22:33	09:54	10:51	11:48
35°	21:27	21:53	22:22	09:58	10:58	11:58
40°	21:21	21:44	22:10	10:03	11:06	12:09
45°	21:14	21:33	21:55	10:08	11:16	12:23
S 50°	21:06	21:20	21:37	10:14	11:27	12:40
52°	21:02	21:14	21:29	10:17	11:32	12:47
54°	20:58	21:07	21:19	10:21	11:38	12:56
56°	20:53	21:00	21:09	10:24	11:45	13:06
58°	20:48	20:51	20:56	10:28	11:52	13:18
S 60°	20:42	20:42	20:42	10:33	12:01	13:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 82-65%
06	13:59	14:01	12:14	03:26	15:47	
07	14:03	14:05	12:14	04:08	16:29	
08	14:06	14:07	12:14	04:51	17:13	

February 09, 10, 11 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	139°06.2	168°12.9	S13°27.2	183°19.2	S17°56.1	31°07.5	N22°43.8	138°44.4	S02°11.7
1	154°08.6	183°12.3	26.1	198°19.7	55.5	46°10.2	43.9	153°46.7	11.6
2	169°11.1	198°11.7	25.0	213°20.2	55.0	61°12.9	43.9	168°48.9	11.5
3	184°13.6	213°11.2	·· 24.0	228°20.6	·· 54.4	76°15.7	·· 43.9	183°51.1	·· 11.3
4	199°16.0	228°10.6	22.9	243°21.1	53.9	91°18.4	44.0	198°53.3	11.2
5	214°18.5	243°10.1	21.8	258°21.6	53.3	106°21.1	44.0	213°55.6	11.1
6	229°21.0	258°09.5	S13°20.7	273°22.1	S17°52.7	121°23.8	N22°44.0	228°57.8	S02°11.0
7	244°23.4	273°08.9	19.7	288°22.6	52.2	136°26.5	44.0	244°00.0	10.9
8	259°25.9	288°08.4	18.6	303°23.1	51.6	151°29.2	44.1	259°02.2	10.8
9	274°28.3	303°07.8	·· 17.5	318°23.6	·· 51.1	166°31.9	·· 44.1	274°04.4	·· 10.7
10	289°30.8	318°07.3	16.4	333°24.0	50.5	181°34.6	44.1	289°06.7	10.6
11	304°33.3	333°06.7	15.3	348°24.5	50.0	196°37.4	44.2	304°08.9	10.5
12	319°35.7	348°06.2	S13°14.3	3°25.0	S17°49.4	211°40.1	N22°44.2	319°11.1	S02°10.4
13	334°38.2	3°05.6	13.2	18°25.5	48.9	226°42.8	44.2	334°13.3	10.2
14	349°40.7	18°05.1	12.1	33°26.0	48.3	241°45.5	44.3	349°15.6	10.1
15	4°43.1	33°04.5	·· 11.0	48°26.5	·· 47.7	256°48.2	·· 44.3	4°17.8	·· 10.0
16	19°45.6	48°03.9	09.9	63°27.0	47.2	271°50.9	44.3	19°20.0	09.9
17	34°48.1	63°03.4	08.8	78°27.5	46.6	286°53.6	44.4	34°22.2	09.8
18	49°50.5	78°02.8	S13°07.8	93°27.9	S17°46.1	301°56.3	N22°44.4	49°24.4	S02°09.7
19	64°53.0	93°02.3	06.7	108°28.4	45.5	316°59.0	44.4	64°26.7	09.6
20	79°55.5	108°01.7	05.6	123°28.9	44.9	332°01.7	44.5	79°28.9	09.5
21	94°57.9	123°01.2	·· 04.5	138°29.4	·· 44.4	347°04.4	·· 44.5	94°31.1	·· 09.4
22	110°00.4	138°00.6	03.4	153°29.9	43.8	2°07.2	44.5	109°33.3	09.3
23	125°02.8	153°00.1	02.3	168°30.4	43.3	17°09.9	44.6	124°35.6	09.1
Mer.pass. 14:41		ν -0.6′	d 1.1′	m -3.91	ν 0.5′	d 0.6′	m 1.12	ν 2.7′	d 0.0′ m -2.58	ν 2.2′	d 0.1′ m 1.02

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	140°05.3	167°59.5	S13°01.2	183°30.9	S17°42.7	32°12.6	N22°44.6	139°37.8	S02°09.0
1	155°07.8	182°59.0	13°00.1	198°31.4	42.1	47°15.3	44.6	154°40.0	08.9
2	170°10.2	197°58.4	12°59.1	213°31.8	41.6	62°18.0	44.6	169°42.2	08.8
3	185°12.7	212°57.9	·· 58.0	228°32.3	·· 41.0	77°20.7	·· 44.7	184°44.4	·· 08.7
4	200°15.2	227°57.3	56.9	243°32.8	40.4	92°23.4	44.7	199°46.7	08.6
5	215°17.6	242°56.8	55.8	258°33.3	39.9	107°26.1	44.7	214°48.9	08.5
6	230°20.1	257°56.2	S12°54.7	273°33.8	S17°39.3	122°28.8	N22°44.8	229°51.1	S02°08.4
7	245°22.6	272°55.7	53.6	288°34.3	38.8	137°31.5	44.8	244°53.3	08.3
8	260°25.0	287°55.2	52.5	303°34.8	38.2	152°34.2	44.8	259°55.5	08.2
9	275°27.5	302°54.6	·· 51.4	318°35.3	·· 37.6	167°36.9	·· 44.9	274°57.8	·· 08.0
10	290°30.0	317°54.1	50.3	333°35.8	37.1	182°39.6	44.9	290°00.0	07.9
11	305°32.4	332°53.5	49.2	348°36.3	36.5	197°42.3	44.9	305°02.2	07.8
12	320°34.9	347°53.0	S12°48.1	3°36.7	S17°35.9	212°45.0	N22°45.0	320°04.4	S02°07.7
13	335°37.3	2°52.4	47.0	18°37.2	35.4	227°47.7	45.0	335°06.6	07.6
14	350°39.8	17°51.9	45.9	33°37.7	34.8	242°50.4	45.0	350°08.9	07.5
15	5°42.3	32°51.3	·· 44.8	48°38.2	·· 34.2	257°53.1	·· 45.1	5°11.1	·· 07.4
16	20°44.7	47°50.8	43.7	63°38.7	33.7	272°55.8	45.1	20°13.3	07.3
17	35°47.2	62°50.3	42.6	78°39.2	33.1	287°58.5	45.1	35°15.5	07.2
18	50°49.7	77°49.7	S12°41.5	93°39.7	S17°32.5	303°01.2	N22°45.1	50°17.7	S02°07.0
19	65°52.1	92°49.2	40.4	108°40.2	32.0	318°04.0	45.2	65°20.0	06.9
20	80°54.6	107°48.6	39.3	123°40.7	31.4	333°06.7	45.2	80°22.2	06.8
21	95°57.1	122°48.1	·· 38.2	138°41.2	·· 30.8	348°09.4	·· 45.2	95°24.4	·· 06.7
22	110°59.5	137°47.6	37.1	153°41.7	30.3	3°12.1	45.3	110°26.6	06.6
23	126°02.0	152°47.0	36.0	168°42.2	29.7	18°14.8	45.3	125°28.8	06.5
Mer.pass. 14:37		ν -0.5′	d 1.1′	m -3.91	ν 0.5′	d 0.6′	m 1.12	ν 2.7′	d 0.0′ m -2.57	ν 2.2′	d 0.1′ m 1.02

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	141°04.4	167°46.5	S12°34.9	183°42.7	S17°29.1	33°17.5	N22°45.3	140°31.1	S02°06.4
1	156°06.9	182°45.9	33.8	198°43.1	28.6	48°20.2	45.4	155°33.3	06.3
2	171°09.4	197°45.4	32.7	213°43.6	28.0	63°22.9	45.4	170°35.5	06.2
3	186°11.8	212°44.9	·· 31.6	228°44.1	·· 27.4	78°25.6	·· 45.4	185°37.7	·· 06.0
4	201°14.3	227°44.3	30.5	243°44.6	26.8	93°28.3	45.4	200°39.9	05.9
5	216°16.8	242°43.8	29.4	258°45.1	26.3	108°30.9	45.5	215°42.1	05.8
6	231°19.2	257°43.3	S12°28.3	273°45.6	S17°25.7	123°33.6	N22°45.5	230°44.4	S02°05.7
7	246°21.7	272°42.7	27.2	288°46.1	25.1	138°36.3	45.5	245°46.6	05.6
8	261°24.2	287°42.2	26.1	303°46.6	24.6	153°39.0	45.6	260°48.8	05.5
9	276°26.6	302°41.7	·· 25.0	318°47.1	·· 24.0	168°41.7	·· 45.6	275°51.0	·· 05.4
10	291°29.1	317°41.1	23.9	333°47.6	23.4	183°44.4	45.6	290°53.2	05.3
11	306°31.6	332°40.6	22.8	348°48.1	22.8	198°47.1	45.7	305°55.5	05.2
12	321°34.0	347°40.1	S12°21.7	3°48.6	S17°22.3	213°49.8	N22°45.7	320°57.7	S02°05.0
13	336°36.5	2°39.5	20.6	18°49.1	21.7	228°52.5	45.7	335°59.9	04.9
14	351°38.9	17°39.0	19.4	33°49.6	21.1	243°55.2	45.7	351°02.1	04.8
15	6°41.4	32°38.5	·· 18.3	48°50.1	·· 20.5	258°57.9	·· 45.8	6°04.3	·· 04.7
16	21°43.9	47°37.9	17.2	63°50.6	20.0	274°00.6	45.8	21°06.5	04.6
17	36°46.3	62°37.4	16.1	78°51.1	19.4	289°03.3	45.8	36°08.8	04.5
18	51°48.8	77°36.9	S12°15.0	93°51.6	S17°18.8	304°06.0	N22°45.9	51°11.0	S02°04.4
19	66°51.3	92°36.3	13.9	108°52.0	18.2	319°08.7	45.9	66°13.2	04.3
20	81°53.7	107°35.8	12.8	123°52.5	17.7	334°11.4	45.9	81°15.4	04.2
21	96°56.2	122°35.3	·· 11.7	138°53.0	·· 17.1	349°14.1	·· 46.0	96°17.6	·· 04.0
22	111°58.7	137°34.8	10.5	153°53.5	16.5	4°16.8	46.0	111°19.8	03.9
23	127°01.1	152°34.2	09.4	168°54.0	15.9	19°19.5	46.0	126°22.1	03.8
Mer.pass. 14:33		ν -0.5′	d 1.1′	m -3.91	ν 0.5′	d 0.6′	m 1.12	ν 2.7′	d 0.0′ m -2.57	ν 2.2′	d 0.1′ m 1.02

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.5	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.7	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°35.0	89°22.8
Acamar	315°11.1	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.9	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.3	46°01.6
Bellatrix	278°21.7	6°22.3
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.6	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.8	-59°35.7
Suhail	222°45.2	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°46.5	-8°46.4
Regulus	207°33.1	11°50.2
Dubhe	193°39.3	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°58.6	-63°14.5
Gacrux	171°50.3	-57°15.5
Alioth	166°11.8	55°48.7
Spica	158°21.2	-11°18.0
Alkaid	152°51.1	49°10.6
Hadar	148°34.5	-60°29.7
Menkent	147°56.4	-36°29.8
Arcturus	145°47.0	19°02.5
Rigil Kent.	139°38.9	-60°56.4
Kochab	137°19.7	74°02.4
Zuben'ubi	136°55.0	-16°09.1
Alphecca	126°03.0	26°37.3
Antares	112°14.8	-26°29.4
Atria	107°08.5	-69°04.2
Sabik	102°01.9	-15°45.5
Shaula	96°09.4	-37°07.3
Rasalhague	95°57.9	12°32.3
Eltanin	90°42.1	51°28.8
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.9	38°48.2
Nunki	75°46.9	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.9	-56°39.0
Deneb	49°25.6	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.2
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Feb 09 Mon	**SHA**	**Mer.pass**
Venus	29°06.7	12:48
Mars	44°13.0	11:46
Jupiter	252°01.4	21:52
Saturn	359°38.3	14:43

Feb 10 Tue	**SHA**	**Mer.pass**
Venus	27°54.2	12:48
Mars	43°25.6	11:46
Jupiter	252°07.3	21:47
Saturn	359°32.5	14:39

Feb 11 Wed	**SHA**	**Mer.pass**
Venus	26°42.0	12:49
Mars	42°38.2	11:45
Jupiter	252°13.0	21:43
Saturn	359°26.6	14:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.9	S14°44.4	278°37.5	13.5′	S20°43.9	10.1′	54.4′
1	191°27.9	43.6	293°09.9	13.4′	20°54.0	10.0′	54.4′
2	206°27.9	42.8	307°42.4	13.4′	21°04.0	9.9′	54.4′
3	221°27.9	·· 42.0	322°14.7	13.3′	21°13.9	9.8′	54.4′
4	236°27.8	41.2	336°47.0	13.2′	21°23.7	9.7′	54.3′
5	251°27.8	40.4	351°19.3	13.2′	21°33.4	9.6′	54.3′
6	266°27.8	S14°39.6	5°51.5	13.1′	S21°43.0	9.6′	54.3′
7	281°27.8	38.8	20°23.6	13.1′	21°52.6	9.4′	54.3′
8	296°27.8	38.0	34°55.7	13.0′	22°02.0	9.3′	54.3′
9	311°27.8	·· 37.2	49°27.7	13.0′	22°11.3	9.2′	54.3′
10	326°27.7	36.4	63°59.7	12.9′	22°20.5	9.2′	54.3′
11	341°27.7	35.6	78°31.6	12.9′	22°29.7	9.0′	54.3′
12	356°27.7	S14°34.8	93°03.4	12.8′	S22°38.7	8.9′	54.3′
13	11°27.7	34.0	107°35.2	12.7′	22°47.6	8.9′	54.3′
14	26°27.7	33.2	122°07.0	12.7′	22°56.5	8.7′	54.2′
15	41°27.7	·· 32.4	136°38.7	12.6′	23°05.2	8.6′	54.2′
16	56°27.7	31.6	151°10.3	12.6′	23°13.8	8.6′	54.2′
17	71°27.6	30.7	165°41.9	12.5′	23°22.4	8.4′	54.2′
18	86°27.6	S14°29.9	180°13.4	12.5′	S23°30.8	8.3′	54.2′
19	101°27.6	29.1	194°44.9	12.4′	23°39.1	8.2′	54.2′
20	116°27.6	28.3	209°16.3	12.3′	23°47.3	8.1′	54.2′
21	131°27.6	·· 27.5	223°47.6	12.3′	23°55.4	8.0′	54.2′
22	146°27.6	26.7	238°18.9	12.2′	24°03.4	7.9′	54.2′
23	161°27.6	25.9	252°50.1	12.2′	24°11.3	7.8′	54.2′
	SD = 16.2′	d = 0.8′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.6	S14°25.1	267°21.3	12.1′	S24°19.1	7.7′	54.2′
1	191°27.6	24.3	281°52.4	12.1′	24°26.8	7.5′	54.2′
2	206°27.5	23.5	296°23.4	12.0′	24°34.3	7.5′	54.2′
3	221°27.5	·· 22.6	310°54.4	11.9′	24°41.8	7.4′	54.2′
4	236°27.5	21.8	325°25.4	11.9′	24°49.2	7.2′	54.2′
5	251°27.5	21.0	339°56.2	11.8′	24°56.4	7.1′	54.2′
6	266°27.5	S14°20.2	354°27.0	11.8′	S25°03.5	7.0′	54.2′
7	281°27.5	19.4	8°57.8	11.7′	25°10.5	6.9′	54.2′
8	296°27.5	18.6	23°28.5	11.6′	25°17.4	6.8′	54.1′
9	311°27.5	·· 17.8	37°59.2	11.6′	25°24.2	6.7′	54.1′
10	326°27.5	17.0	52°29.7	11.5′	25°30.9	6.5′	54.1′
11	341°27.5	16.1	67°00.3	11.5′	25°37.4	6.5′	54.1′
12	356°27.5	S14°15.3	81°30.7	11.4′	S25°43.9	6.3′	54.1′
13	11°27.4	14.5	96°01.2	11.4′	25°50.2	6.2′	54.1′
14	26°27.4	13.7	110°31.5	11.3′	25°56.4	6.1′	54.1′
15	41°27.4	·· 12.9	125°01.8	11.2′	26°02.5	6.0′	54.1′
16	56°27.4	12.1	139°32.1	11.2′	26°08.5	5.8′	54.1′
17	71°27.4	11.2	154°02.3	11.1′	26°14.3	5.7′	54.1′
18	86°27.4	S14°10.4	168°32.4	11.1′	S26°20.0	5.6′	54.1′
19	101°27.4	09.6	183°02.5	11.0′	26°25.6	5.5′	54.1′
20	116°27.4	08.8	197°32.5	11.0′	26°31.1	5.4′	54.1′
21	131°27.4	·· 08.0	212°02.5	10.9′	26°36.5	5.2′	54.1′
22	146°27.4	07.2	226°32.4	10.9′	26°41.7	5.1′	54.1′
23	161°27.4	06.3	241°02.3	10.8′	26°46.8	5.0′	54.1′
	SD = 16.2′	d = 0.8′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.4	S14°05.5	255°32.1	10.8′	S26°51.8	4.9′	54.1′
1	191°27.4	04.7	270°01.9	10.7′	26°56.7	4.7′	54.1′
2	206°27.4	03.9	284°31.6	10.7′	27°01.4	4.7′	54.1′
3	221°27.4	·· 03.0	299°01.3	10.6′	27°06.1	4.5′	54.2′
4	236°27.4	02.2	313°30.9	10.6′	27°10.6	4.3′	54.2′
5	251°27.4	01.4	328°00.4	10.5′	27°14.9	4.3′	54.2′
6	266°27.4	S14°00.6	342°30.0	10.5′	S27°19.2	4.1′	54.2′
7	281°27.4	13°59.8	356°59.4	10.4′	27°23.3	3.9′	54.2′
8	296°27.4	58.9	11°28.8	10.4′	27°27.2	3.9′	54.2′
9	311°27.4	·· 58.1	25°58.2	10.3′	27°31.1	3.7′	54.2′
10	326°27.4	57.3	40°27.5	10.3′	27°34.8	3.6′	54.2′
11	341°27.4	56.5	54°56.8	10.2′	27°38.4	3.5′	54.2′
12	356°27.4	S13°55.6	69°26.1	10.2′	S27°41.9	3.3′	54.2′
13	11°27.4	54.8	83°55.3	10.2′	27°45.2	3.2′	54.2′
14	26°27.4	54.0	98°24.4	10.1′	27°48.4	3.0′	54.2′
15	41°27.4	·· 53.2	112°53.5	10.1′	27°51.4	3.0′	54.2′
16	56°27.4	52.3	127°22.6	10.0′	27°54.4	2.8′	54.2′
17	71°27.4	51.5	141°51.6	10.0′	27°57.2	2.6′	54.2′
18	86°27.4	S13°50.7	156°20.6	10.0′	S27°59.8	2.6′	54.2′
19	101°27.4	49.9	170°49.6	9.9′	28°02.4	2.4′	54.2′
20	116°27.4	49.0	185°18.5	9.9′	28°04.8	2.2′	54.2′
21	131°27.4	·· 48.2	199°47.4	9.8′	28°07.0	2.1′	54.3′
22	146°27.4	47.4	214°16.2	9.8′	28°09.1	2.0′	54.3′
23	161°27.4	46.5	228°45.0	9.8′	28°11.1	1.9′	54.3′
	SD = 16.2′	d = 0.8′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:35	07:58	09:24	15:06	16:32	17:55
N 70°	06:31	07:45	08:58	15:31	16:45	17:59
68°	06:28	07:35	08:39	15:51	16:55	18:02
66°	06:25	07:26	08:24	16:06	17:04	18:05
64°	06:22	07:19	08:11	16:18	17:11	18:08
62°	06:20	07:12	08:01	16:29	17:17	18:10
60°	06:17	07:07	07:51	16:38	17:23	18:12
N 58°	06:15	07:02	07:44	16:46	17:28	18:14
56°	06:13	06:57	07:36	16:53	17:32	18:16
54°	06:11	06:53	07:30	16:59	17:36	18:18
52°	06:09	06:49	07:25	17:05	17:40	18:20
50°	06:07	06:46	07:19	17:10	17:44	18:22
45°	06:03	06:38	07:08	17:21	17:51	18:26
N 40°	05:59	06:31	06:59	17:30	17:58	18:30
35°	05:55	06:25	06:51	17:38	18:04	18:34
30°	05:51	06:19	06:44	17:45	18:09	18:38
20°	05:43	06:09	06:32	17:57	18:19	18:46
N 10°	05:34	05:59	06:21	18:07	18:29	18:54
0°	05:25	05:49	06:11	18:18	18:39	19:04
S 10°	05:13	05:39	06:00	18:28	18:50	19:15
20°	04:59	05:26	05:49	18:39	19:02	19:29
30°	04:41	05:11	05:36	18:52	19:17	19:47
35°	04:29	05:02	05:29	18:59	19:26	19:58
40°	04:16	04:51	05:20	19:08	19:37	20:12
45°	03:58	04:38	05:10	19:18	19:50	20:29
S 50°	03:35	04:21	04:58	19:30	20:06	20:51
52°	03:24	04:13	04:52	19:35	20:14	21:03
54°	03:11	04:05	04:45	19:42	20:22	21:15
56°	02:55	03:54	04:38	19:49	20:32	21:31
58°	02:36	03:43	04:30	19:56	20:43	21:49
S 60°	02:11	03:29	04:21	20:05	20:57	22:13

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	04:50	▬	▬	06:07	▬	▬
66°	03:40	▬	▬	07:18	▬	▬
64°	03:04	05:15	▬	07:54	07:22	▬
62°	02:39	04:23	06:21	08:21	08:13	07:59
60°	02:19	03:52	05:24	08:41	08:45	08:56
N 58°	02:02	03:29	04:51	08:58	09:09	09:29
56°	01:49	03:10	04:27	09:13	09:28	09:54
54°	01:37	02:54	04:07	09:25	09:45	10:14
52°	01:26	02:40	03:51	09:36	09:59	10:30
50°	01:17	02:29	03:37	09:46	10:11	10:45
45°	00:58	02:04	03:08	10:06	10:36	11:14
N 40°	00:42	01:45	02:46	10:23	10:56	11:36
35°	00:29	01:28	02:27	10:37	11:13	11:55
30°	00:17	01:14	02:11	10:50	11:28	12:12
20°	·· ··	00:51	01:45	11:11	11:53	12:39
N 10°	·· ··	00:30	01:22	11:30	12:14	13:03
0°	·· ··	00:11	01:00	11:47	12:35	13:25
S 10°	23:52	·· ··	00:39	12:04	12:55	13:47
20°	23:32	·· ··	00:16	12:23	13:17	14:11
30°	23:09	23:50	·· ··	12:45	13:42	14:38
35°	22:56	23:35	·· ··	12:57	13:57	14:55
40°	22:40	23:17	·· ··	13:12	14:14	15:14
45°	22:22	22:55	23:37	13:30	14:35	15:37
S 50°	21:59	22:28	23:07	13:52	15:02	16:06
52°	21:48	22:15	22:52	14:02	15:15	16:21
54°	21:36	22:00	22:35	14:14	15:29	16:38
56°	21:21	21:42	22:15	14:28	15:47	16:59
58°	21:05	21:20	21:48	14:44	16:08	17:25
S 60°	20:45	20:53	21:12	15:03	16:35	18:01

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 22-24 55-36%
09	14:08	14:09	12:14	05:36	17:59	
10	14:10	14:10	12:14	06:23	18:47	
11	14:10	14:10	12:14	07:12	19:38	

February 12, 13, 14 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	142°03.6	167°33.7	S12°08.3	183°54.5	S17°15.4	34°22.2	N22°46.0	141°24.3	S02°03.7
1	157°06.1	182°33.2	07.2	198°55.0	14.8	49°24.9	46.1	156°26.5	03.6
2	172°08.5	197°32.7	06.1	213°55.5	14.2	64°27.5	46.1	171°28.7	03.5
3	187°11.0	212°32.1	·· 05.0	228°56.0	·· 13.6	79°30.2	·· 46.1	186°30.9	·· 03.4
4	202°13.4	227°31.6	03.8	243°56.5	13.1	94°32.9	46.2	201°33.2	03.3
5	217°15.9	242°31.1	02.7	258°57.0	12.5	109°35.6	46.2	216°35.4	03.1
6	232°18.4	257°30.6	S12°01.6	273°57.5	S17°11.9	124°38.3	N22°46.2	231°37.6	S02°03.0
7	247°20.8	272°30.0	12°00.5	288°58.0	11.3	139°41.0	46.2	246°39.8	02.9
8	262°23.3	287°29.5	11°59.4	303°58.5	10.7	154°43.7	46.3	261°42.0	02.8
9	277°25.8	302°29.0	·· 58.2	318°59.0	·· 10.2	169°46.4	·· 46.3	276°44.2	·· 02.7
10	292°28.2	317°28.5	57.1	333°59.5	09.6	184°49.1	46.3	291°46.5	02.6
11	307°30.7	332°27.9	56.0	349°00.0	09.0	199°51.8	46.4	306°48.7	02.5
12	322°33.2	347°27.4	S11°54.9	4°00.5	S17°08.4	214°54.5	N22°46.4	321°50.9	S02°02.4
13	337°35.6	2°26.9	53.7	19°01.0	07.8	229°57.1	46.4	336°53.1	02.3
14	352°38.1	17°26.4	52.6	34°01.5	07.3	244°59.8	46.5	351°55.3	02.1
15	7°40.6	32°25.9	·· 51.5	49°02.0	·· 06.7	260°02.5	·· 46.5	6°57.5	·· 02.0
16	22°43.0	47°25.3	50.4	64°02.5	06.1	275°05.2	46.5	21°59.7	01.9
17	37°45.5	62°24.8	49.2	79°03.0	05.5	290°07.9	46.5	37°02.0	01.8
18	52°47.9	77°24.3	S11°48.1	94°03.5	S17°04.9	305°10.6	N22°46.6	52°04.2	S02°01.7
19	67°50.4	92°23.8	47.0	109°04.0	04.3	320°13.3	46.6	67°06.4	01.6
20	82°52.9	107°23.3	45.9	124°04.5	03.8	335°16.0	46.6	82°08.6	01.5
21	97°55.3	122°22.7	·· 44.7	139°05.0	·· 03.2	350°18.6	·· 46.7	97°10.8	·· 01.4
22	112°57.8	137°22.2	43.6	154°05.5	02.6	5°21.3	46.7	112°13.0	01.2
23	128°00.3	152°21.7	42.5	169°06.0	02.0	20°24.0	46.7	127°15.3	01.1
Mer.pass. 14:29		ν -0.5′	d 1.1′	m -3.91	ν 0.5′	d 0.6′	m 1.12	ν 2.7′	d 0.0′ m -2.56	ν 2.2′	d 0.1′ m 1.02

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	143°02.7	167°21.2	S11°41.4	184°06.5	S17°01.4	35°26.7	N22°46.7	142°17.5	S02°01.0
1	158°05.2	182°20.7	40.2	199°07.0	00.8	50°29.4	46.8	157°19.7	00.9
2	173°07.7	197°20.2	39.1	214°07.5	17°00.3	65°32.1	46.8	172°21.9	00.8
3	188°10.1	212°19.6	·· 38.0	229°08.0	16°59.7	80°34.8	·· 46.8	187°24.1	·· 00.7
4	203°12.6	227°19.1	36.8	244°08.5	59.1	95°37.4	46.9	202°26.3	00.6
5	218°15.1	242°18.6	35.7	259°09.0	58.5	110°40.1	46.9	217°28.5	00.5
6	233°17.5	257°18.1	S11°34.6	274°09.5	S16°57.9	125°42.8	N22°46.9	232°30.8	S02°00.3
7	248°20.0	272°17.6	33.4	289°10.0	57.3	140°45.5	46.9	247°33.0	00.2
8	263°22.4	287°17.1	32.3	304°10.5	56.7	155°48.2	47.0	262°35.2	00.1
9	278°24.9	302°16.6	·· 31.2	319°11.0	·· 56.1	170°50.9	·· 47.0	277°37.4	02°00.0
10	293°27.4	317°16.1	30.0	334°11.5	55.6	185°53.5	47.0	292°39.6	01°59.9
11	308°29.8	332°15.5	28.9	349°12.0	55.0	200°56.2	47.0	307°41.8	59.8
12	323°32.3	347°15.0	S11°27.8	4°12.5	S16°54.4	215°58.9	N22°47.1	322°44.0	S01°59.7
13	338°34.8	2°14.5	26.6	19°13.0	53.8	231°01.6	47.1	337°46.3	59.6
14	353°37.2	17°14.0	25.5	34°13.6	53.2	246°04.3	47.1	352°48.5	59.4
15	8°39.7	32°13.5	·· 24.3	49°14.1	·· 52.6	261°06.9	·· 47.2	7°50.7	·· 59.3
16	23°42.2	47°13.0	23.2	64°14.6	52.0	276°09.6	47.2	22°52.9	59.2
17	38°44.6	62°12.5	22.1	79°15.1	51.4	291°12.3	47.2	37°55.1	59.1
18	53°47.1	77°12.0	S11°20.9	94°15.6	S16°50.8	306°15.0	N22°47.2	52°57.3	S01°59.0
19	68°49.5	92°11.5	19.8	109°16.1	50.3	321°17.7	47.3	67°59.5	58.9
20	83°52.0	107°11.0	18.6	124°16.6	49.7	336°20.3	47.3	83°01.8	58.8
21	98°54.5	122°10.5	·· 17.5	139°17.1	·· 49.1	351°23.0	·· 47.3	98°04.0	·· 58.7
22	113°56.9	137°09.9	16.4	154°17.6	48.5	6°25.7	47.4	113°06.2	58.5
23	128°59.4	152°09.4	15.2	169°18.1	47.9	21°28.4	47.4	128°08.4	58.4
Mer.pass. 14:25		ν -0.5′	d 1.1′	m -3.91	ν 0.5′	d 0.6′	m 1.12	ν 2.7′	d 0.0′ m -2.56	ν 2.2′	d 0.1′ m 1.02

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	144°01.9	167°08.9	S11°14.1	184°18.6	S16°47.3	36°31.1	N22°47.4	143°10.6	S01°58.3
1	159°04.3	182°08.4	12.9	199°19.1	46.7	51°33.7	47.4	158°12.8	58.2
2	174°06.8	197°07.9	11.8	214°19.6	46.1	66°36.4	47.5	173°15.0	58.1
3	189°09.3	212°07.4	·· 10.7	229°20.1	·· 45.5	81°39.1	·· 47.5	188°17.3	·· 58.0
4	204°11.7	227°06.9	09.5	244°20.6	44.9	96°41.8	47.5	203°19.5	57.9
5	219°14.2	242°06.4	08.4	259°21.1	44.3	111°44.4	47.5	218°21.7	57.7
6	234°16.7	257°05.9	S11°07.2	274°21.6	S16°43.7	126°47.1	N22°47.6	233°23.9	S01°57.6
7	249°19.1	272°05.4	06.1	289°22.1	43.1	141°49.8	47.6	248°26.1	57.5
8	264°21.6	287°04.9	04.9	304°22.7	42.6	156°52.5	47.6	263°28.3	57.4
9	279°24.0	302°04.4	·· 03.8	319°23.2	·· 42.0	171°55.1	·· 47.7	278°30.5	·· 57.3
10	294°26.5	317°03.9	02.6	334°23.7	41.4	186°57.8	47.7	293°32.7	57.2
11	309°29.0	332°03.4	01.5	349°24.2	40.8	202°00.5	47.7	308°35.0	57.1
12	324°31.4	347°02.9	S11°00.3	4°24.7	S16°40.2	217°03.2	N22°47.7	323°37.2	S01°57.0
13	339°33.9	2°02.4	10°59.2	19°25.2	39.6	232°05.8	47.8	338°39.4	56.8
14	354°36.4	17°01.9	58.0	34°25.7	39.0	247°08.5	47.8	353°41.6	56.7
15	9°38.8	32°01.4	·· 56.9	49°26.2	·· 38.4	262°11.2	·· 47.8	8°43.8	·· 56.6
16	24°41.3	47°00.9	55.7	64°26.7	37.8	277°13.9	47.8	23°46.0	56.5
17	39°43.8	62°00.4	54.6	79°27.2	37.2	292°16.5	47.9	38°48.2	56.4
18	54°46.2	76°59.9	S10°53.4	94°27.7	S16°36.6	307°19.2	N22°47.9	53°50.4	S01°56.3
19	69°48.7	91°59.4	52.3	109°28.2	36.0	322°21.9	47.9	68°52.7	56.2
20	84°51.2	106°58.9	51.1	124°28.7	35.4	337°24.5	47.9	83°54.9	56.0
21	99°53.6	121°58.4	·· 50.0	139°29.3	·· 34.8	352°27.2	·· 48.0	98°57.1	·· 55.9
22	114°56.1	136°57.9	48.8	154°29.8	34.2	7°29.9	48.0	113°59.3	55.8
23	129°58.5	151°57.4	47.7	169°30.3	33.6	22°32.6	48.0	129°01.5	55.7
Mer.pass. 14:22		ν -0.5′	d 1.1′	m -3.91	ν 0.5′	d 0.6′	m 1.12	ν 2.7′	d 0.0′ m -2.55	ν 2.2′	d 0.1′ m 1.02

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.5	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.7	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°36.3	89°22.8
Acamar	315°11.1	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.9	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.3	46°01.6
Bellatrix	278°21.7	6°22.3
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.6	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.8	-59°35.7
Suhail	222°45.2	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°46.5	-8°46.4
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°58.6	-63°14.5
Gacrux	171°50.2	-57°15.5
Alioth	166°11.8	55°48.8
Spica	158°21.2	-11°18.0
Alkaid	152°51.1	49°10.6
Hadar	148°34.5	-60°29.8
Menkent	147°56.4	-36°29.9
Arcturus	145°47.0	19°02.5
Rigil Kent.	139°38.9	-60°56.4
Kochab	137°19.6	74°02.4
Zuben'ubi	136°54.9	-16°09.1
Alphecca	126°03.0	26°37.3
Antares	112°14.8	-26°29.4
Atria	107°08.4	-69°04.2
Sabik	102°01.9	-15°45.5
Shaula	96°09.3	-37°07.3
Rasalhague	95°57.9	12°32.3
Eltanin	90°42.1	51°28.8
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.9	38°48.2
Nunki	75°46.9	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.8	-56°39.0
Deneb	49°25.6	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Feb 12 Thu	SHA	Mer.pass
Venus	25°30.1	12:50
Mars	41°50.9	11:44
Jupiter	252°18.6	21:39
Saturn	359°20.7	14:32

Feb 13 Fri	SHA	Mer.pass
Venus	24°18.5	12:51
Mars	41°03.8	11:43
Jupiter	252°24.0	21:34
Saturn	359°14.7	14:29

Feb 14 Sat	SHA	Mer.pass
Venus	23°07.1	12:52
Mars	40°16.7	11:42
Jupiter	252°29.2	21:30
Saturn	359°08.7	14:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.4	S13°45.7	243°13.8	9.7′	S28°13.0	1.7′	54.3′
1	191°27.4	44.9	257°42.6	9.7′	28°14.7	1.6′	54.3′
2	206°27.4	44.0	272°11.3	9.7′	28°16.3	1.4′	54.3′
3	221°27.4	·· 43.2	286°40.0	9.7′	28°17.7	1.3′	54.3′
4	236°27.4	42.4	301°08.6	9.6′	28°19.0	1.2′	54.3′
5	251°27.4	41.5	315°37.2	9.6′	28°20.2	1.0′	54.3′
6	266°27.4	S13°40.7	330°05.8	9.6′	S28°21.2	0.9′	54.3′
7	281°27.4	39.9	344°34.4	9.5′	28°22.1	0.7′	54.3′
8	296°27.5	39.1	359°03.0	9.5′	28°22.8	0.6′	54.4′
9	311°27.5	·· 38.2	13°31.5	9.5′	28°23.4	0.5′	54.4′
10	326°27.5	37.4	28°00.0	9.5′	28°23.9	0.3′	54.4′
11	341°27.5	36.6	42°28.5	9.5′	28°24.2	0.2′	54.4′
12	356°27.5	S13°35.7	56°56.9	9.4′	S28°24.4	0.0′	54.4′
13	11°27.5	34.9	71°25.4	9.4′	28°24.4	0.1′	54.4′
14	26°27.5	34.0	85°53.8	9.4′	28°24.3	0.2′	54.4′
15	41°27.5	·· 33.2	100°22.2	9.4′	28°24.1	0.4′	54.4′
16	56°27.5	32.4	114°50.6	9.4′	28°23.7	0.5′	54.5′
17	71°27.5	31.5	129°18.9	9.4′	28°23.2	0.7′	54.5′
18	86°27.5	S13°30.7	143°47.3	9.4′	S28°22.5	0.8′	54.5′
19	101°27.6	29.9	158°15.7	9.3′	28°21.7	0.9′	54.5′
20	116°27.6	29.0	172°44.0	9.3′	28°20.8	1.1′	54.5′
21	131°27.6	·· 28.2	187°12.3	9.3′	28°19.7	1.3′	54.5′
22	146°27.6	27.3	201°40.7	9.3′	28°18.4	1.3′	54.5′
23	161°27.6	26.5	216°09.0	9.3′	28°17.1	1.6′	54.6′
	SD = 16.2′	d = 0.8′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°27.6	S13°25.7	230°37.3	9.3′	S28°15.5	1.6′	54.6′
1	191°27.6	24.8	245°05.6	9.3′	28°13.9	1.8′	54.6′
2	206°27.6	24.0	259°33.9	9.3′	28°12.1	2.0′	54.6′
3	221°27.7	·· 23.2	274°02.2	9.3′	28°10.1	2.1′	54.6′
4	236°27.7	22.3	288°30.5	9.3′	28°08.0	2.2′	54.6′
5	251°27.7	21.5	302°58.8	9.3′	28°05.8	2.4′	54.6′
6	266°27.7	S13°20.6	317°27.1	9.3′	S28°03.4	2.5′	54.7′
7	281°27.7	19.8	331°55.4	9.3′	28°00.9	2.6′	54.7′
8	296°27.7	18.9	346°23.7	9.3′	27°58.3	2.9′	54.7′
9	311°27.7	·· 18.1	0°52.0	9.3′	27°55.4	2.9′	54.7′
10	326°27.8	17.3	15°20.3	9.3′	27°52.5	3.1′	54.7′
11	341°27.8	16.4	29°48.6	9.3′	27°49.4	3.2′	54.7′
12	356°27.8	S13°15.6	44°17.0	9.3′	S27°46.2	3.4′	54.8′
13	11°27.8	14.7	58°45.3	9.4′	27°42.8	3.5′	54.8′
14	26°27.8	13.9	73°13.7	9.4′	27°39.3	3.7′	54.8′
15	41°27.8	·· 13.0	87°42.0	9.4′	27°35.6	3.8′	54.8′
16	56°27.9	12.2	102°10.4	9.4′	27°31.8	3.9′	54.8′
17	71°27.9	11.3	116°38.8	9.4′	27°27.9	4.1′	54.9′
18	86°27.9	S13°10.5	131°07.2	9.4′	S27°23.8	4.2′	54.9′
19	101°27.9	09.7	145°35.6	9.4′	27°19.6	4.4′	54.9′
20	116°27.9	08.8	160°04.1	9.5′	27°15.2	4.5′	54.9′
21	131°27.9	·· 08.0	174°32.5	9.5′	27°10.7	4.6′	54.9′
22	146°28.0	07.1	189°01.0	9.5′	27°06.1	4.8′	54.9′
23	161°28.0	06.3	203°29.5	9.5′	27°01.3	4.9′	55.0′
	SD = 16.2′	d = 0.8′	SD = 14.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°28.0	S13°05.4	217°58.0	9.5′	S26°56.4	5.1′	55.0′
1	191°28.0	04.6	232°26.6	9.6′	26°51.3	5.2′	55.0′
2	206°28.0	03.7	246°55.1	9.6′	26°46.1	5.3′	55.0′
3	221°28.1	·· 02.9	261°23.7	9.6′	26°40.8	5.5′	55.0′
4	236°28.1	02.0	275°52.3	9.6′	26°35.3	5.6′	55.1′
5	251°28.1	01.2	290°21.0	9.7′	26°29.7	5.8′	55.1′
6	266°28.1	S13°00.3	304°49.7	9.7′	S26°23.9	5.9′	55.1′
7	281°28.1	12°59.5	319°18.4	9.7′	26°18.0	6.0′	55.1′
8	296°28.2	58.6	333°47.1	9.8′	26°12.0	6.2′	55.1′
9	311°28.2	·· 57.8	348°15.8	9.8′	26°05.8	6.3′	55.2′
10	326°28.2	56.9	2°44.6	9.8′	25°59.5	6.4′	55.2′
11	341°28.2	56.1	17°13.5	9.9′	25°53.1	6.6′	55.2′
12	356°28.3	S12°55.2	31°42.3	9.9′	S25°46.5	6.7′	55.2′
13	11°28.3	54.4	46°11.2	9.9′	25°39.8	6.8′	55.3′
14	26°28.3	53.5	60°40.1	10.0′	25°33.0	7.0′	55.3′
15	41°28.3	·· 52.6	75°09.1	10.0′	25°26.0	7.1′	55.3′
16	56°28.4	51.8	89°38.1	10.0′	25°18.9	7.2′	55.3′
17	71°28.4	50.9	104°07.1	10.1′	25°11.7	7.4′	55.3′
18	86°28.4	S12°50.1	118°36.2	10.1′	S25°04.3	7.5′	55.4′
19	101°28.4	49.2	133°05.3	10.1′	24°56.8	7.6′	55.4′
20	116°28.5	48.4	147°34.4	10.2′	24°49.2	7.8′	55.4′
21	131°28.5	·· 47.5	162°03.6	10.2′	24°41.4	7.9′	55.4′
22	146°28.5	46.7	176°32.8	10.3′	24°33.5	8.0′	55.5′
23	161°28.5	45.8	191°02.1	10.3′	24°25.5	8.1′	55.5′
	SD = 16.2′	d = 0.8′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:23	07:44	09:05	15:25	16:46	18:07
N 70°	06:20	07:33	08:43	15:46	16:57	18:10
68°	06:18	07:24	08:26	16:03	17:06	18:12
66°	06:16	07:16	08:13	16:17	17:13	18:14
64°	06:14	07:10	08:01	16:28	17:20	18:16
62°	06:12	07:04	07:52	16:38	17:25	18:17
60°	06:10	06:59	07:44	16:46	17:30	18:19
N 58°	06:09	06:55	07:36	16:53	17:34	18:21
56°	06:07	06:51	07:30	16:59	17:38	18:22
54°	06:06	06:47	07:24	17:05	17:42	18:24
52°	06:04	06:44	07:19	17:10	17:45	18:25
50°	06:03	06:41	07:14	17:15	17:48	18:26
45°	05:59	06:34	07:04	17:25	17:55	18:30
N 40°	05:56	06:28	06:55	17:33	18:01	18:33
35°	05:52	06:22	06:48	17:41	18:07	18:36
30°	05:49	06:17	06:42	17:47	18:12	18:40
20°	05:42	06:08	06:30	17:58	18:21	18:47
N 10°	05:34	05:59	06:20	18:08	18:30	18:55
0°	05:25	05:49	06:11	18:18	18:39	19:03
S 10°	05:14	05:39	06:01	18:27	18:49	19:14
20°	05:01	05:28	05:51	18:37	19:00	19:27
30°	04:44	05:14	05:39	18:49	19:14	19:44
35°	04:33	05:05	05:32	18:56	19:23	19:55
40°	04:20	04:55	05:24	19:04	19:33	20:07
45°	04:03	04:42	05:14	19:13	19:45	20:24
S 50°	03:42	04:27	05:03	19:24	20:00	20:45
52°	03:32	04:20	04:58	19:30	20:07	20:55
54°	03:19	04:12	04:52	19:35	20:15	21:07
56°	03:05	04:02	04:45	19:42	20:24	21:21
58°	02:48	03:51	04:38	19:49	20:35	21:38
S 60°	02:26	03:39	04:29	19:57	20:47	21:59

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	▬	▬	08:18	▬	▬	11:27
60°	06:40	07:24	07:40	09:27	10:33	12:05
N 58°	06:00	06:47	07:13	10:07	11:09	12:31
56°	05:32	06:21	06:52	10:35	11:35	12:52
54°	05:11	06:00	06:35	10:57	11:56	13:09
52°	04:53	05:43	06:20	11:14	12:13	13:24
50°	04:37	05:28	06:07	11:30	12:28	13:36
45°	04:07	04:58	05:40	12:01	12:57	14:02
N 40°	03:43	04:34	05:19	12:24	13:21	14:23
35°	03:23	04:15	05:01	12:44	13:40	14:40
30°	03:07	03:58	04:46	13:01	13:56	14:55
20°	02:38	03:30	04:20	13:29	14:23	15:20
N 10°	02:14	03:06	03:57	13:54	14:47	15:41
0°	01:51	02:44	03:36	14:17	15:09	16:01
S 10°	01:29	02:21	03:15	14:39	15:31	16:21
20°	01:05	01:57	02:52	15:04	15:54	16:42
30°	00:37	01:29	02:26	15:32	16:22	17:06
35°	00:20	01:12	02:11	15:49	16:38	17:20
40°	00:01	00:53	01:52	16:08	16:56	17:37
45°	·· ··	00:29	01:31	16:32	17:18	17:56
S 50°	23:59	·· ··	01:03	17:02	17:47	18:21
52°	23:44	·· ··	00:49	17:17	18:01	18:32
54°	23:26	·· ··	00:33	17:35	18:17	18:46
56°	23:05	·· ··	00:14	17:56	18:36	19:01
58°	22:38	23:51	·· ··	18:23	18:59	19:19
S 60°	22:00	23:21	·· ··	19:02	19:30	19:41

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 25-27 28-12%
12	14:10	14:10	12:14	08:04	20:30	
13	14:10	14:09	12:14	08:56	21:23	
14	14:08	14:07	12:14	09:49	22:14	

February 15, 16, 17 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	145°01.0	166°56.9	S10°46.5	184°30.8	S16°33.0	37°35.2	N22°48.1	144°03.7	S01°55.6
1	160°03.5	181°56.4	45.4	199°31.3	32.4	52°37.9	48.1	159°05.9	55.5
2	175°05.9	196°55.9	44.2	214°31.8	31.8	67°40.6	48.1	174°08.1	55.4
3	190°08.4	211°55.4	·· 43.0	229°32.3	·· 31.2	82°43.2	·· 48.1	189°10.3	·· 55.3
4	205°10.9	226°54.9	41.9	244°32.8	30.6	97°45.9	48.2	204°12.6	55.1
5	220°13.3	241°54.4	40.7	259°33.3	30.0	112°48.6	48.2	219°14.8	55.0
6	235°15.8	256°54.0	S10°39.6	274°33.9	S16°29.4	127°51.2	N22°48.2	234°17.0	S01°54.9
7	250°18.3	271°53.5	38.4	289°34.4	28.8	142°53.9	48.2	249°19.2	54.8
8	265°20.7	286°53.0	37.3	304°34.9	28.2	157°56.6	48.3	264°21.4	54.7
9	280°23.2	301°52.5	·· 36.1	319°35.4	·· 27.6	172°59.2	·· 48.3	279°23.6	·· 54.6
10	295°25.7	316°52.0	34.9	334°35.9	27.0	188°01.9	48.3	294°25.8	54.5
11	310°28.1	331°51.5	33.8	349°36.4	26.4	203°04.6	48.3	309°28.0	54.3
12	325°30.6	346°51.0	S10°32.6	4°36.9	S16°25.8	218°07.2	N22°48.4	324°30.2	S01°54.2
13	340°33.0	1°50.5	31.5	19°37.4	25.2	233°09.9	48.4	339°32.5	54.1
14	355°35.5	16°50.0	30.3	34°37.9	24.6	248°12.6	48.4	354°34.7	54.0
15	10°38.0	31°49.5	·· 29.1	49°38.5	·· 24.0	263°15.2	·· 48.4	9°36.9	·· 53.9
16	25°40.4	46°49.0	28.0	64°39.0	23.4	278°17.9	48.5	24°39.1	53.8
17	40°42.9	61°48.6	26.8	79°39.5	22.8	293°20.6	48.5	39°41.3	53.7
18	55°45.4	76°48.1	S10°25.6	94°40.0	S16°22.2	308°23.2	N22°48.5	54°43.5	S01°53.5
19	70°47.8	91°47.6	24.5	109°40.5	21.6	323°25.9	48.5	69°45.7	53.4
20	85°50.3	106°47.1	23.3	124°41.0	21.0	338°28.6	48.6	84°47.9	53.3
21	100°52.8	121°46.6	·· 22.2	139°41.5	·· 20.4	353°31.2	·· 48.6	99°50.1	·· 53.2
22	115°55.2	136°46.1	21.0	154°42.1	19.7	8°33.9	48.6	114°52.4	53.1
23	130°57.7	151°45.6	19.8	169°42.6	19.1	23°36.6	48.6	129°54.6	53.0
Mer.pass. 14:18		ν -0.5′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.7′	d 0.0′ m -2.54	ν 2.2′	d 0.1′ m 1.02

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	146°00.1	166°45.2	S10°18.7	184°43.1	S16°18.5	38°39.2	N22°48.7	144°56.8	S01°52.9
1	161°02.6	181°44.7	17.5	199°43.6	17.9	53°41.9	48.7	159°59.0	52.7
2	176°05.1	196°44.2	16.3	214°44.1	17.3	68°44.5	48.7	175°01.2	52.6
3	191°07.5	211°43.7	·· 15.2	229°44.6	·· 16.7	83°47.2	·· 48.7	190°03.4	·· 52.5
4	206°10.0	226°43.2	14.0	244°45.1	16.1	98°49.9	48.8	205°05.6	52.4
5	221°12.5	241°42.7	12.8	259°45.7	15.5	113°52.5	48.8	220°07.8	52.3
6	236°14.9	256°42.2	S10°11.7	274°46.2	S16°14.9	128°55.2	N22°48.8	235°10.0	S01°52.2
7	251°17.4	271°41.8	10.5	289°46.7	14.3	143°57.8	48.8	250°12.2	52.1
8	266°19.9	286°41.3	09.3	304°47.2	13.7	159°00.5	48.9	265°14.4	51.9
9	281°22.3	301°40.8	·· 08.1	319°47.7	·· 13.1	174°03.2	·· 48.9	280°16.7	·· 51.8
10	296°24.8	316°40.3	07.0	334°48.2	12.5	189°05.8	48.9	295°18.9	51.7
11	311°27.3	331°39.8	05.8	349°48.7	11.8	204°08.5	48.9	310°21.1	51.6
12	326°29.7	346°39.4	S10°04.6	4°49.3	S16°11.2	219°11.1	N22°49.0	325°23.3	S01°51.5
13	341°32.2	1°38.9	03.5	19°49.8	10.6	234°13.8	49.0	340°25.5	51.4
14	356°34.6	16°38.4	02.3	34°50.3	10.0	249°16.5	49.0	355°27.7	51.3
15	11°37.1	31°37.9	10°01.1	49°50.8	·· 09.4	264°19.1	·· 49.0	10°29.9	·· 51.1
16	26°39.6	46°37.4	09°59.9	64°51.3	08.8	279°21.8	49.1	25°32.1	51.0
17	41°42.0	61°37.0	58.8	79°51.8	08.2	294°24.4	49.1	40°34.3	50.9
18	56°44.5	76°36.5	S09°57.6	94°52.4	S16°07.6	309°27.1	N22°49.1	55°36.5	S01°50.8
19	71°47.0	91°36.0	56.4	109°52.9	07.0	324°29.7	49.1	70°38.7	50.7
20	86°49.4	106°35.5	55.2	124°53.4	06.3	339°32.4	49.2	85°41.0	50.6
21	101°51.9	121°35.0	·· 54.1	139°53.9	·· 05.7	354°35.1	·· 49.2	100°43.2	·· 50.5
22	116°54.4	136°34.6	52.9	154°54.4	05.1	9°37.7	49.2	115°45.4	50.3
23	131°56.8	151°34.1	51.7	169°55.0	04.5	24°40.4	49.2	130°47.6	50.2
Mer.pass. 14:14		ν -0.5′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.7′	d 0.0′ m -2.54	ν 2.2′	d 0.1′ m 1.01

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	146°59.3	166°33.6	S09°50.5	184°55.5	S16°03.9	39°43.0	N22°49.3	145°49.8	S01°50.1
1	162°01.8	181°33.1	49.4	199°56.0	03.3	54°45.7	49.3	160°52.0	50.0
2	177°04.2	196°32.7	48.2	214°56.5	02.7	69°48.3	49.3	175°54.2	49.9
3	192°06.7	211°32.2	·· 47.0	229°57.0	·· 02.1	84°51.0	·· 49.3	190°56.4	·· 49.8
4	207°09.1	226°31.7	45.8	244°57.5	01.4	99°53.6	49.4	205°58.6	49.6
5	222°11.6	241°31.2	44.6	259°58.1	00.8	114°56.3	49.4	221°00.8	49.5
6	237°14.1	256°30.8	S09°43.5	274°58.6	S16°00.2	129°58.9	N22°49.4	236°03.0	S01°49.4
7	252°16.5	271°30.3	42.3	289°59.1	15°59.6	145°01.6	49.4	251°05.2	49.3
8	267°19.0	286°29.8	41.1	304°59.6	59.0	160°04.2	49.5	266°07.5	49.2
9	282°21.5	301°29.3	·· 39.9	320°00.1	·· 58.4	175°06.9	·· 49.5	281°09.7	·· 49.1
10	297°23.9	316°28.9	38.7	335°00.7	57.7	190°09.5	49.5	296°11.9	49.0
11	312°26.4	331°28.4	37.6	350°01.2	57.1	205°12.2	49.5	311°14.1	48.8
12	327°28.9	346°27.9	S09°36.4	5°01.7	S15°56.5	220°14.8	N22°49.6	326°16.3	S01°48.7
13	342°31.3	1°27.5	35.2	20°02.2	55.9	235°17.5	49.6	341°18.5	48.6
14	357°33.8	16°27.0	34.0	35°02.8	55.3	250°20.1	49.6	356°20.7	48.5
15	12°36.2	31°26.5	·· 32.8	50°03.3	·· 54.7	265°22.8	·· 49.6	11°22.9	·· 48.4
16	27°38.7	46°26.1	31.6	65°03.8	54.0	280°25.4	49.7	26°25.1	48.3
17	42°41.2	61°25.6	30.5	80°04.3	53.4	295°28.1	49.7	41°27.3	48.2
18	57°43.6	76°25.1	S09°29.3	95°04.8	S15°52.8	310°30.7	N22°49.7	56°29.5	S01°48.0
19	72°46.1	91°24.6	28.1	110°05.4	52.2	325°33.4	49.7	71°31.7	47.9
20	87°48.6	106°24.2	26.9	125°05.9	51.6	340°36.0	49.7	86°33.9	47.8
21	102°51.0	121°23.7	·· 25.7	140°06.4	·· 50.9	355°38.7	·· 49.8	101°36.1	·· 47.7
22	117°53.5	136°23.2	24.5	155°06.9	50.3	10°41.3	49.8	116°38.4	47.6
23	132°56.0	151°22.8	23.3	170°07.4	49.7	25°44.0	49.8	131°40.6	47.5
Mer.pass. 14:10		ν -0.5′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.7′	d 0.0′ m -2.53	ν 2.2′	d 0.1′ m 1.01

Stars

	SHA	**Dec**
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.5	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.8	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°37.8	89°22.8
Acamar	315°11.1	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°26.9	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.3	46°01.6
Bellatrix	278°21.7	6°22.3
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.6	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.8	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.8	-59°35.7
Suhail	222°45.2	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°46.5	-8°46.4
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°58.6	-63°14.5
Gacrux	171°50.2	-57°15.5
Alioth	166°11.7	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.0	49°10.6
Hadar	148°34.4	-60°29.8
Menkent	147°56.4	-36°29.9
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.8	-60°56.4
Kochab	137°19.5	74°02.4
Zuben'ubi	136°54.9	-16°09.1
Alphecca	126°02.9	26°37.3
Antares	112°14.8	-26°29.4
Atria	107°08.3	-69°04.2
Sabik	102°01.8	-15°45.5
Shaula	96°09.3	-37°07.3
Rasalhague	95°57.8	12°32.3
Eltanin	90°42.0	51°28.8
Kaus Aust.	83°31.5	-34°22.3
Vega	80°32.9	38°48.2
Nunki	75°46.9	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.8	-56°39.0
Deneb	49°25.6	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Feb 15 Sun	**SHA**	**Mer.pass**
Venus	21°55.9	12:53
Mars	39°29.8	11:42
Jupiter	252°34.2	21:26
Saturn	359°02.7	14:22

Feb 16 Mon	**SHA**	**Mer.pass**
Venus	20°45.0	12:53
Mars	38°42.9	11:41
Jupiter	252°39.1	21:22
Saturn	358°56.6	14:18

Feb 17 Tue	**SHA**	**Mer.pass**
Venus	19°34.3	12:54
Mars	37°56.2	11:40
Jupiter	252°43.7	21:17
Saturn	358°50.5	14:15

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°28.6	S12°44.9	205°31.4	10.3′	S24°17.4	8.3′	55.5′
1	191°28.6	44.1	220°00.8	10.4′	24°09.1	8.4′	55.5′
2	206°28.6	43.2	234°30.2	10.4′	24°00.7	8.5′	55.5′
3	221°28.7	·· 42.4	248°59.6	10.5′	23°52.2	8.7′	55.6′
4	236°28.7	41.5	263°29.1	10.5′	23°43.5	8.8′	55.6′
5	251°28.7	40.7	277°58.6	10.6′	23°34.7	8.9′	55.6′
6	266°28.7	S12°39.8	292°28.1	10.6′	S23°25.8	9.0′	55.6′
7	281°28.8	38.9	306°57.8	10.7′	23°16.8	9.1′	55.7′
8	296°28.8	38.1	321°27.4	10.7′	23°07.7	9.3′	55.7′
9	311°28.8	·· 37.2	335°57.1	10.7′	22°58.4	9.4′	55.7′
10	326°28.9	36.4	350°26.8	10.8′	22°49.0	9.5′	55.7′
11	341°28.9	35.5	4°56.6	10.8′	22°39.5	9.6′	55.8′
12	356°28.9	S12°34.6	19°26.5	10.9′	S22°29.9	9.8′	55.8′
13	11°29.0	33.8	33°56.3	10.9′	22°20.1	9.8′	55.8′
14	26°29.0	32.9	48°26.3	11.0′	22°10.3	10.0′	55.8′
15	41°29.0	·· 32.0	62°56.2	11.0′	22°00.3	10.1′	55.9′
16	56°29.0	31.2	77°26.2	11.1′	21°50.2	10.2′	55.9′
17	71°29.1	30.3	91°56.3	11.1′	21°40.0	10.3′	55.9′
18	86°29.1	S12°29.5	106°26.4	11.2′	S21°29.7	10.5′	55.9′
19	101°29.1	28.6	120°56.6	11.2′	21°19.2	10.5′	56.0′
20	116°29.2	27.7	135°26.8	11.3′	21°08.7	10.7′	56.0′
21	131°29.2	·· 26.9	149°57.0	11.3′	20°58.0	10.8′	56.0′
22	146°29.2	26.0	164°27.3	11.3′	20°47.2	10.8′	56.0′
23	161°29.3	25.1	178°57.7	11.4′	20°36.4	11.0′	56.0′
	SD = 16.2′	d = 0.9′	SD = 15.1′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°29.3	S12°24.3	193°28.1	11.4′	S20°25.4	11.1′	56.1′
1	191°29.4	23.4	207°58.5	11.5′	20°14.3	11.2′	56.1′
2	206°29.4	22.5	222°29.0	11.5′	20°03.1	11.3′	56.1′
3	221°29.4	·· 21.7	236°59.5	11.6′	19°51.8	11.5′	56.1′
4	236°29.5	20.8	251°30.1	11.6′	19°40.3	11.5′	56.2′
5	251°29.5	19.9	266°00.7	11.7′	19°28.8	11.6′	56.2′
6	266°29.5	S12°19.1	280°31.4	11.7′	S19°17.2	11.7′	56.2′
7	281°29.6	18.2	295°02.1	11.8′	19°05.5	11.9′	56.2′
8	296°29.6	17.3	309°32.9	11.8′	18°53.6	11.9′	56.3′
9	311°29.6	·· 16.5	324°03.7	11.9′	18°41.7	12.0′	56.3′
10	326°29.7	15.6	338°34.5	11.9′	18°29.7	12.2′	56.3′
11	341°29.7	14.7	353°05.4	11.9′	18°17.5	12.2′	56.3′
12	356°29.8	S12°13.9	7°36.4	12.0′	S18°05.3	12.3′	56.4′
13	11°29.8	13.0	22°07.4	12.0′	17°53.0	12.4′	56.4′
14	26°29.8	12.1	36°38.4	12.1′	17°40.6	12.5′	56.4′
15	41°29.9	·· 11.2	51°09.5	12.1′	17°28.1	12.6′	56.4′
16	56°29.9	10.4	65°40.6	12.2′	17°15.5	12.7′	56.5′
17	71°30.0	09.5	80°11.8	12.2′	17°02.8	12.8′	56.5′
18	86°30.0	S12°08.6	94°43.0	12.2′	S16°50.0	12.9′	56.5′
19	101°30.0	07.8	109°14.2	12.3′	16°37.1	13.0′	56.5′
20	116°30.1	06.9	123°45.5	12.3′	16°24.1	13.0′	56.6′
21	131°30.1	·· 06.0	138°16.8	12.4′	16°11.1	13.2′	56.6′
22	146°30.2	05.1	152°48.2	12.4′	15°57.9	13.2′	56.6′
23	161°30.2	04.3	167°19.6	12.5′	15°44.7	13.3′	56.6′
	SD = 16.2′	d = 0.9′	SD = 15.3′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°30.2	S12°03.4	181°51.1	12.5′	S15°31.4	13.4′	56.7′
1	191°30.3	02.5	196°22.6	12.5′	15°18.0	13.5′	56.7′
2	206°30.3	01.6	210°54.1	12.6′	15°04.5	13.6′	56.7′
3	221°30.4	12°00.8	225°25.7	12.6′	14°50.9	13.6′	56.7′
4	236°30.4	11°59.9	239°57.3	12.6′	14°37.3	13.8′	56.8′
5	251°30.5	59.0	254°28.9	12.7′	14°23.5	13.8′	56.8′
6	266°30.5	S11°58.1	269°00.6	12.7′	S14°09.7	13.8′	56.8′
7	281°30.5	57.3	283°32.3	12.8′	13°55.9	14.0′	56.8′
8	296°30.6	56.4	298°04.1	12.8′	13°41.9	14.0′	56.9′
9	311°30.6	·· 55.5	312°35.9	12.8′	13°27.9	14.1′	56.9′
10	326°30.7	54.6	327°07.7	12.9′	13°13.8	14.2′	56.9′
11	341°30.7	53.8	341°39.6	12.9′	12°59.6	14.3′	56.9′
12	356°30.8	S11°52.9	356°11.5	12.9′	S12°45.3	14.3′	57.0′
13	11°30.8	52.0	10°43.4	13.0′	12°31.0	14.4′	57.0′
14	26°30.9	51.1	25°15.3	13.0′	12°16.6	14.4′	57.0′
15	41°30.9	·· 50.2	39°47.3	13.0′	12°02.2	14.6′	57.0′
16	56°31.0	49.4	54°19.3	13.0′	11°47.6	14.6′	57.1′
17	71°31.0	48.5	68°51.4	13.1′	11°33.0	14.6′	57.1′
18	86°31.0	S11°47.6	83°23.4	13.1′	S11°18.4	14.7′	57.1′
19	101°31.1	46.7	97°55.5	13.1′	11°03.7	14.8′	57.1′
20	116°31.1	45.8	112°27.6	13.1′	10°48.9	14.9′	57.1′
21	131°31.2	·· 45.0	126°59.8	13.2′	10°34.0	14.9′	57.2′
22	146°31.2	44.1	141°32.0	13.2′	10°19.1	14.9′	57.2′
23	161°31.3	43.2	156°04.1	13.2′	10°04.2	15.1′	57.2′
	SD = 16.2′	d = 0.9′	SD = 15.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:10	07:30	08:48	15:42	17:00	18:20
N 70°	06:09	07:21	08:29	16:01	17:09	18:21
68°	06:08	07:13	08:14	16:16	17:17	18:22
66°	06:07	07:06	08:02	16:28	17:23	18:23
64°	06:05	07:01	07:52	16:38	17:28	18:24
62°	06:04	06:56	07:43	16:46	17:33	18:25
60°	06:03	06:52	07:35	16:54	17:37	18:26
N 58°	06:02	06:48	07:29	17:00	17:41	18:27
56°	06:01	06:44	07:23	17:06	17:45	18:28
54°	06:00	06:41	07:18	17:11	17:48	18:29
52°	05:59	06:38	07:13	17:16	17:51	18:30
50°	05:58	06:36	07:09	17:20	17:53	18:31
45°	05:55	06:29	07:00	17:29	17:59	18:34
N 40°	05:52	06:24	06:52	17:37	18:05	18:36
35°	05:50	06:19	06:45	17:44	18:09	18:39
30°	05:47	06:15	06:39	17:49	18:14	18:42
20°	05:40	06:06	06:29	18:00	18:22	18:48
N 10°	05:33	05:58	06:19	18:09	18:30	18:55
0°	05:25	05:49	06:11	18:17	18:39	19:03
S 10°	05:15	05:40	06:02	18:26	18:48	19:13
20°	05:03	05:29	05:52	18:36	18:58	19:25
30°	04:47	05:16	05:41	18:46	19:11	19:41
35°	04:36	05:08	05:35	18:53	19:19	19:51
40°	04:24	04:59	05:27	19:00	19:29	20:03
45°	04:09	04:47	05:19	19:09	19:40	20:18
S 50°	03:49	04:33	05:08	19:19	19:54	20:38
52°	03:39	04:26	05:03	19:24	20:01	20:47
54°	03:28	04:18	04:58	19:29	20:08	20:58
56°	03:15	04:10	04:52	19:35	20:16	21:11
58°	02:59	04:00	04:45	19:41	20:26	21:26
S 60°	02:39	03:49	04:38	19:49	20:37	21:45

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	09:21	▬	▬	15:38
N 70°	▬	09:57	08:56	▬	13:21	16:01
68°	▬	09:13	08:37	▬	14:03	16:18
66°	09:27	08:44	08:22	12:06	14:31	16:32
64°	08:40	08:21	08:09	12:52	14:53	16:43
62°	08:10	08:03	07:58	13:22	15:10	16:52
60°	07:46	07:48	07:49	13:44	15:24	17:01
N 58°	07:28	07:36	07:41	14:02	15:35	17:08
56°	07:12	07:25	07:33	14:18	15:46	17:14
54°	06:58	07:15	07:27	14:30	15:55	17:19
52°	06:47	07:06	07:21	14:42	16:03	17:24
50°	06:36	06:58	07:16	14:52	16:10	17:29
45°	06:14	06:41	07:04	15:13	16:25	17:39
N 40°	05:56	06:27	06:54	15:30	16:38	17:47
35°	05:41	06:16	06:46	15:44	16:49	17:53
30°	05:28	06:05	06:39	15:56	16:58	17:59
20°	05:05	05:47	06:26	16:17	17:14	18:10
N 10°	04:46	05:32	06:15	16:35	17:27	18:18
0°	04:27	05:17	06:05	16:51	17:40	18:27
S 10°	04:09	05:02	05:54	17:08	17:53	18:35
20°	03:49	04:46	05:43	17:26	18:06	18:44
30°	03:26	04:28	05:30	17:46	18:21	18:53
35°	03:13	04:17	05:22	17:58	18:30	18:59
40°	02:57	04:05	05:14	18:11	18:40	19:05
45°	02:39	03:50	05:03	18:27	18:52	19:13
S 50°	02:15	03:33	04:51	18:46	19:06	19:22
52°	02:04	03:24	04:45	18:55	19:12	19:26
54°	01:51	03:15	04:39	19:05	19:19	19:30
56°	01:36	03:04	04:32	19:17	19:27	19:35
58°	01:19	02:51	04:24	19:30	19:36	19:40
S 60°	00:57	02:37	04:15	19:45	19:46	19:46

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-0 7-0%
15	14:06	14:04	12:14	10:40	23:04	
16	14:03	14:01	12:14	11:29	23:52	
17	13:59	13:57	12:14	12:16	–:–	

February 18, 19, 20 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	147°58.4	166°22.3	S09°22.1	185°08.0	S15°49.1	40°46.6	N22°49.8	146°42.8	S01°47.3
1	163°00.9	181°21.8	21.0	200°08.5	48.5	55°49.3	49.9	161°45.0	47.2
2	178°03.4	196°21.4	19.8	215°09.0	47.8	70°51.9	49.9	176°47.2	47.1
3	193°05.8	211°20.9	·· 18.6	230°09.5	·· 47.2	85°54.6	·· 49.9	191°49.4	·· 47.0
4	208°08.3	226°20.4	17.4	245°10.1	46.6	100°57.2	49.9	206°51.6	46.9
5	223°10.7	241°20.0	16.2	260°10.6	46.0	115°59.9	50.0	221°53.8	46.8
6	238°13.2	256°19.5	S09°15.0	275°11.1	S15°45.4	131°02.5	N22°50.0	236°56.0	S01°46.7
7	253°15.7	271°19.1	13.8	290°11.6	44.7	146°05.1	50.0	251°58.2	46.5
8	268°18.1	286°18.6	12.6	305°12.2	44.1	161°07.8	50.0	267°00.4	46.4
9	283°20.6	301°18.1	·· 11.4	320°12.7	·· 43.5	176°10.4	·· 50.0	282°02.6	·· 46.3
10	298°23.1	316°17.7	10.2	335°13.2	42.9	191°13.1	50.1	297°04.8	46.2
11	313°25.5	331°17.2	09.1	350°13.7	42.2	206°15.7	50.1	312°07.0	46.1
12	328°28.0	346°16.7	S09°07.9	5°14.3	S15°41.6	221°18.4	N22°50.1	327°09.2	S01°46.0
13	343°30.5	1°16.3	06.7	20°14.8	41.0	236°21.0	50.1	342°11.4	45.8
14	358°32.9	16°15.8	05.5	35°15.3	40.4	251°23.6	50.2	357°13.6	45.7
15	13°35.4	31°15.4	·· 04.3	50°15.8	·· 39.8	266°26.3	·· 50.2	12°15.9	·· 45.6
16	28°37.9	46°14.9	03.1	65°16.4	39.1	281°28.9	50.2	27°18.1	45.5
17	43°40.3	61°14.4	01.9	80°16.9	38.5	296°31.6	50.2	42°20.3	45.4
18	58°42.8	76°14.0	S09°00.7	95°17.4	S15°37.9	311°34.2	N22°50.3	57°22.5	S01°45.3
19	73°45.2	91°13.5	08°59.5	110°17.9	37.3	326°36.8	50.3	72°24.7	45.1
20	88°47.7	106°13.1	58.3	125°18.5	36.6	341°39.5	50.3	87°26.9	45.0
21	103°50.2	121°12.6	·· 57.1	140°19.0	·· 36.0	356°42.1	·· 50.3	102°29.1	·· 44.9
22	118°52.6	136°12.1	55.9	155°19.5	35.4	11°44.8	50.3	117°31.3	44.8
23	133°55.1	151°11.7	54.7	170°20.0	34.7	26°47.4	50.4	132°33.5	44.7
Mer.pass. 14:06		ν -0.5′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.6′	d 0.0′ m -2.52	ν 2.2′	d 0.1′ m 1.01

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	148°57.6	166°11.2	S08°53.5	185°20.6	S15°34.1	41°50.0	N22°50.4	147°35.7	S01°44.6
1	164°00.0	181°10.8	52.3	200°21.1	33.5	56°52.7	50.4	162°37.9	44.5
2	179°02.5	196°10.3	51.1	215°21.6	32.9	71°55.3	50.4	177°40.1	44.3
3	194°05.0	211°09.8	·· 49.9	230°22.2	·· 32.2	86°58.0	·· 50.5	192°42.3	·· 44.2
4	209°07.4	226°09.4	48.7	245°22.7	31.6	102°00.6	50.5	207°44.5	44.1
5	224°09.9	241°08.9	47.5	260°23.2	31.0	117°03.2	50.5	222°46.7	44.0
6	239°12.3	256°08.5	S08°46.3	275°23.7	S15°30.4	132°05.9	N22°50.5	237°48.9	S01°43.9
7	254°14.8	271°08.0	45.1	290°24.3	29.7	147°08.5	50.5	252°51.1	43.8
8	269°17.3	286°07.6	43.9	305°24.8	29.1	162°11.1	50.6	267°53.3	43.6
9	284°19.7	301°07.1	·· 42.7	320°25.3	·· 28.5	177°13.8	·· 50.6	282°55.5	·· 43.5
10	299°22.2	316°06.7	41.5	335°25.9	27.8	192°16.4	50.6	297°57.7	43.4
11	314°24.7	331°06.2	40.3	350°26.4	27.2	207°19.0	50.6	313°00.0	43.3
12	329°27.1	346°05.8	S08°39.1	5°26.9	S15°26.6	222°21.7	N22°50.6	328°02.2	S01°43.2
13	344°29.6	1°05.3	37.9	20°27.4	25.9	237°24.3	50.7	343°04.4	43.1
14	359°32.1	16°04.8	36.7	35°28.0	25.3	252°26.9	50.7	358°06.6	42.9
15	14°34.5	31°04.4	·· 35.5	50°28.5	·· 24.7	267°29.6	·· 50.7	13°08.8	·· 42.8
16	29°37.0	46°03.9	34.3	65°29.0	24.0	282°32.2	50.7	28°11.0	42.7
17	44°39.5	61°03.5	33.1	80°29.6	23.4	297°34.8	50.8	43°13.2	42.6
18	59°41.9	76°03.0	S08°31.9	95°30.1	S15°22.8	312°37.5	N22°50.8	58°15.4	S01°42.5
19	74°44.4	91°02.6	30.7	110°30.6	22.2	327°40.1	50.8	73°17.6	42.4
20	89°46.8	106°02.1	29.5	125°31.2	21.5	342°42.7	50.8	88°19.8	42.2
21	104°49.3	121°01.7	·· 28.3	140°31.7	·· 20.9	357°45.4	·· 50.8	103°22.0	·· 42.1
22	119°51.8	136°01.2	27.1	155°32.2	20.3	12°48.0	50.9	118°24.2	42.0
23	134°54.2	151°00.8	25.9	170°32.7	19.6	27°50.6	50.9	133°26.4	41.9
Mer.pass. 14:02		ν -0.5′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.6′	d 0.0′ m -2.51	ν 2.2′	d 0.1′ m 1.01

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	149°56.7	166°00.3	S08°24.6	185°33.3	S15°19.0	42°53.3	N22°50.9	148°28.6	S01°41.8
1	164°59.2	180°59.9	23.4	200°33.8	18.4	57°55.9	50.9	163°30.8	41.7
2	180°01.6	195°59.4	22.2	215°34.3	17.7	72°58.5	50.9	178°33.0	41.5
3	195°04.1	210°59.0	·· 21.0	230°34.9	·· 17.1	88°01.2	·· 51.0	193°35.2	·· 41.4
4	210°06.6	225°58.5	19.8	245°35.4	16.5	103°03.8	51.0	208°37.4	41.3
5	225°09.0	240°58.1	18.6	260°35.9	15.8	118°06.4	51.0	223°39.6	41.2
6	240°11.5	255°57.7	S08°17.4	275°36.5	S15°15.2	133°09.0	N22°51.0	238°41.8	S01°41.1
7	255°13.9	270°57.2	16.2	290°37.0	14.5	148°11.7	51.1	253°44.0	41.0
8	270°16.4	285°56.8	15.0	305°37.5	13.9	163°14.3	51.1	268°46.2	40.8
9	285°18.9	300°56.3	·· 13.8	320°38.1	·· 13.3	178°16.9	·· 51.1	283°48.4	·· 40.7
10	300°21.3	315°55.9	12.6	335°38.6	12.6	193°19.5	51.1	298°50.6	40.6
11	315°23.8	330°55.4	11.3	350°39.1	12.0	208°22.2	51.1	313°52.8	40.5
12	330°26.3	345°55.0	S08°10.1	5°39.7	S15°11.4	223°24.8	N22°51.2	328°55.0	S01°40.4
13	345°28.7	0°54.5	08.9	20°40.2	10.7	238°27.4	51.2	343°57.2	40.3
14	0°31.2	15°54.1	07.7	35°40.7	10.1	253°30.0	51.2	358°59.4	40.1
15	15°33.7	30°53.6	·· 06.5	50°41.3	·· 09.5	268°32.7	·· 51.2	14°01.6	·· 40.0
16	30°36.1	45°53.2	05.3	65°41.8	08.8	283°35.3	51.2	29°03.8	39.9
17	45°38.6	60°52.8	04.1	80°42.3	08.2	298°37.9	51.3	44°06.0	39.8
18	60°41.1	75°52.3	S08°02.9	95°42.9	S15°07.5	313°40.5	N22°51.3	59°08.3	S01°39.7
19	75°43.5	90°51.9	01.6	110°43.4	06.9	328°43.2	51.3	74°10.5	39.6
20	90°46.0	105°51.4	08°00.4	125°43.9	06.3	343°45.8	51.3	89°12.7	39.4
21	105°48.4	120°51.0	07°59.2	140°44.5	·· 05.6	358°48.4	·· 51.3	104°14.9	·· 39.3
22	120°50.9	135°50.5	58.0	155°45.0	05.0	13°51.0	51.4	119°17.1	39.2
23	135°53.4	150°50.1	56.8	170°45.6	04.3	28°53.7	51.4	134°19.3	39.1
Mer.pass. 13:58		ν -0.4′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.6′	d 0.0′ m -2.51	ν 2.2′	d 0.1′ m 1.01

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.5	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.8	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°39.5	89°22.8
Acamar	315°11.1	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°27.0	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.8	-8°10.4
Capella	280°20.3	46°01.6
Bellatrix	278°21.7	6°22.3
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.7	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.9	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.8	27°57.7
Avior	234°13.8	-59°35.7
Suhail	222°45.2	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°58.5	-63°14.6
Gacrux	171°50.2	-57°15.5
Alioth	166°11.7	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.0	49°10.6
Hadar	148°34.4	-60°29.8
Menkent	147°56.3	-36°29.9
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.8	-60°56.4
Kochab	137°19.5	74°02.4
Zuben'ubi	136°54.9	-16°09.1
Alphecca	126°02.9	26°37.3
Antares	112°14.7	-26°29.4
Atria	107°08.3	-69°04.2
Sabik	102°01.8	-15°45.5
Shaula	96°09.3	-37°07.3
Rasalhague	95°57.8	12°32.2
Eltanin	90°42.0	51°28.8
Kaus Aust.	83°31.5	-34°22.3
Vega	80°32.9	38°48.2
Nunki	75°46.9	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.8	-56°39.0
Deneb	49°25.6	45°22.3
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.5
Markab	13°29.3	15°20.7

Feb 18 Wed	SHA	Mer.pass
Venus	18°23.9	12:55
Mars	37°09.5	11:39
Jupiter	252°48.2	21:13
Saturn	358°44.3	14:11

Feb 19 Thu	SHA	Mer.pass
Venus	17°13.7	12:56
Mars	36°23.0	11:38
Jupiter	252°52.5	21:09
Saturn	358°38.1	14:08

Feb 20 Fri	SHA	Mer.pass
Venus	16°03.6	12:56
Mars	35°36.6	11:37
Jupiter	252°56.6	21:05
Saturn	358°31.9	14:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°31.3	S11°42.3	170°36.4	13.2′	S09°49.1	15.0′	57.2′
1	191°31.4	41.4	185°08.6	13.3′	09°34.1	15.2′	57.3′
2	206°31.4	40.6	199°40.9	13.3′	09°18.9	15.2′	57.3′
3	221°31.5	·· 39.7	214°13.1	13.3′	09°03.7	15.2′	57.3′
4	236°31.5	38.8	228°45.4	13.3′	08°48.5	15.3′	57.3′
5	251°31.6	37.9	243°17.8	13.3′	08°33.2	15.3′	57.4′
6	266°31.6	S11°37.0	257°50.1	13.4′	S08°17.9	15.4′	57.4′
7	281°31.7	36.1	272°22.5	13.4′	08°02.5	15.5′	57.4′
8	296°31.7	35.3	286°54.8	13.4′	07°47.0	15.5′	57.4′
9	311°31.8	·· 34.4	301°27.2	13.4′	07°31.5	15.5′	57.4′
10	326°31.8	33.5	315°59.6	13.4′	07°16.0	15.6′	57.5′
11	341°31.9	32.6	330°32.0	13.4′	07°00.4	15.6′	57.5′
12	356°32.0	S11°31.7	345°04.4	13.4′	S06°44.8	15.7′	57.5′
13	11°32.0	30.8	359°36.9	13.4′	06°29.1	15.7′	57.5′
14	26°32.1	29.9	14°09.3	13.4′	06°13.4	15.7′	57.6′
15	41°32.1	·· 29.1	28°41.8	13.5′	05°57.7	15.8′	57.6′
16	56°32.2	28.2	43°14.2	13.5′	05°41.9	15.8′	57.6′
17	71°32.2	27.3	57°46.7	13.5′	05°26.1	15.9′	57.6′
18	86°32.3	S11°26.4	72°19.1	13.5′	S05°10.2	15.8′	57.6′
19	101°32.3	25.5	86°51.6	13.5′	04°54.4	16.0′	57.7′
20	116°32.4	24.6	101°24.1	13.5′	04°38.4	15.9′	57.7′
21	131°32.4	·· 23.7	115°56.6	13.5′	04°22.5	16.0′	57.7′
22	146°32.5	22.8	130°29.1	13.5′	04°06.5	16.0′	57.7′
23	161°32.6	22.0	145°01.5	13.5′	03°50.5	16.1′	57.7′
	SD = 16.2′	d = 0.9′	SD = 15.6′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°32.6	S11°21.1	159°34.0	13.5′	S03°34.4	16.0′	57.8′
1	191°32.7	20.2	174°06.5	13.5′	03°18.4	16.1′	57.8′
2	206°32.7	19.3	188°39.0	13.5′	03°02.3	16.2′	57.8′
3	221°32.8	·· 18.4	203°11.4	13.5′	02°46.1	16.1′	57.8′
4	236°32.8	17.5	217°43.9	13.5′	02°30.0	16.2′	57.8′
5	251°32.9	16.6	232°16.4	13.5′	02°13.8	16.1′	57.9′
6	266°33.0	S11°15.7	246°48.8	13.4′	S01°57.7	16.2′	57.9′
7	281°33.0	14.8	261°21.3	13.4′	01°41.5	16.3′	57.9′
8	296°33.1	13.9	275°53.7	13.4′	01°25.2	16.2′	57.9′
9	311°33.1	·· 13.1	290°26.1	13.4′	01°09.0	16.3′	57.9′
10	326°33.2	12.2	304°58.5	13.4′	00°52.7	16.2′	58.0′
11	341°33.3	11.3	319°30.9	13.4′	00°36.5	16.3′	58.0′
12	356°33.3	S11°10.4	334°03.3	13.4′	S00°20.2	16.3′	58.0′
13	11°33.4	09.5	348°35.7	13.3′	S00°03.9	16.3′	58.0′
14	26°33.4	08.6	3°08.0	13.3′	N00°12.4	16.3′	58.0′
15	41°33.5	·· 07.7	17°40.3	13.3′	00°28.7	16.3′	58.0′
16	56°33.6	06.8	32°12.6	13.3′	00°45.0	16.3′	58.1′
17	71°33.6	05.9	46°44.9	13.3′	01°01.3	16.4′	58.1′
18	86°33.7	S11°05.0	61°17.2	13.2′	N01°17.7	16.3′	58.1′
19	101°33.7	04.1	75°49.4	13.2′	01°34.0	16.3′	58.1′
20	116°33.8	03.2	90°21.7	13.2′	01°50.3	16.4′	58.1′
21	131°33.9	·· 02.3	104°53.9	13.2′	02°06.7	16.3′	58.2′
22	146°33.9	01.4	119°26.0	13.1′	02°23.0	16.3′	58.2′
23	161°34.0	00.5	133°58.2	13.1′	02°39.3	16.3′	58.2′
	SD = 16.2′	d = 0.9′	SD = 15.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°34.1	S10°59.6	148°30.3	13.1′	N02°55.6	16.3′	58.2′
1	191°34.1	58.7	163°02.4	13.1′	03°11.9	16.4′	58.2′
2	206°34.2	57.8	177°34.4	13.0′	03°28.3	16.3′	58.2′
3	221°34.2	·· 56.9	192°06.4	13.0′	03°44.6	16.2′	58.3′
4	236°34.3	56.0	206°38.4	12.9′	04°00.8	16.3′	58.3′
5	251°34.4	55.1	221°10.4	12.9′	04°17.1	16.3′	58.3′
6	266°34.4	S10°54.3	235°42.3	12.9′	N04°33.4	16.3′	58.3′
7	281°34.5	53.4	250°14.2	12.8′	04°49.7	16.2′	58.3′
8	296°34.6	52.5	264°46.0	12.8′	05°05.9	16.2′	58.3′
9	311°34.6	·· 51.6	279°17.8	12.8′	05°22.1	16.2′	58.3′
10	326°34.7	50.7	293°49.6	12.7′	05°38.3	16.2′	58.4′
11	341°34.8	49.8	308°21.3	12.7′	05°54.5	16.2′	58.4′
12	356°34.8	S10°48.9	322°52.9	12.6′	N06°10.7	16.1′	58.4′
13	11°34.9	48.0	337°24.6	12.6′	06°26.8	16.1′	58.4′
14	26°35.0	47.1	351°56.1	12.5′	06°42.9	16.1′	58.4′
15	41°35.0	·· 46.2	6°27.7	12.5′	06°59.0	16.1′	58.4′
16	56°35.1	45.3	20°59.2	12.4′	07°15.1	16.0′	58.5′
17	71°35.2	44.4	35°30.6	12.4′	07°31.1	16.0′	58.5′
18	86°35.2	S10°43.4	50°02.0	12.3′	N07°47.1	16.0′	58.5′
19	101°35.3	42.5	64°33.3	12.3′	08°03.1	16.0′	58.5′
20	116°35.4	41.6	79°04.6	12.2′	08°19.1	15.9′	58.5′
21	131°35.5	·· 40.7	93°35.8	12.2′	08°35.0	15.8′	58.5′
22	146°35.5	39.8	108°07.0	12.1′	08°50.8	15.9′	58.5′
23	161°35.6	38.9	122°38.1	12.1′	09°06.7	15.8′	58.5′
	SD = 16.2′	d = 0.9′	SD = 15.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:57	07:16	08:31	15:58	17:14	18:33
N 70°	05:57	07:08	08:14	16:15	17:21	18:32
68°	05:57	07:02	08:01	16:28	17:27	18:32
66°	05:57	06:56	07:51	16:38	17:33	18:32
64°	05:57	06:52	07:42	16:47	17:37	18:33
62°	05:56	06:48	07:34	16:55	17:41	18:33
60°	05:56	06:44	07:27	17:01	17:45	18:33
N 58°	05:55	06:41	07:21	17:07	17:48	18:34
56°	05:55	06:38	07:16	17:12	17:51	18:34
54°	05:54	06:35	07:11	17:17	17:53	18:35
52°	05:53	06:33	07:07	17:21	17:56	18:35
50°	05:53	06:30	07:03	17:25	17:58	18:36
45°	05:51	06:25	06:55	17:33	18:03	18:38
N 40°	05:49	06:20	06:48	17:40	18:08	18:40
35°	05:46	06:16	06:42	17:46	18:12	18:42
30°	05:44	06:12	06:36	17:52	18:16	18:44
20°	05:39	06:04	06:27	18:01	18:23	18:49
N 10°	05:32	05:57	06:18	18:09	18:31	18:55
0°	05:25	05:49	06:10	18:17	18:38	19:03
S 10°	05:16	05:41	06:02	18:25	18:47	19:12
20°	05:04	05:31	05:54	18:34	18:56	19:23
30°	04:49	05:19	05:43	18:44	19:08	19:38
35°	04:40	05:11	05:38	18:49	19:16	19:47
40°	04:28	05:02	05:31	18:56	19:24	19:58
45°	04:14	04:52	05:23	19:04	19:35	20:12
S 50°	03:55	04:39	05:13	19:13	19:48	20:31
52°	03:46	04:32	05:09	19:17	19:54	20:39
54°	03:36	04:25	05:04	19:22	20:01	20:50
56°	03:24	04:17	04:59	19:27	20:08	21:01
58°	03:10	04:08	04:53	19:33	20:17	21:15
S 60°	02:52	03:58	04:46	19:40	20:28	21:32

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	08:33	07:56	07:20	18:05	20:21	22:44
N 70°	08:22	07:54	07:27	18:13	20:19	22:30
68°	08:13	07:52	07:32	18:19	20:17	22:18
66°	08:05	07:51	07:36	18:24	20:15	22:09
64°	07:59	07:49	07:40	18:29	20:13	22:01
62°	07:53	07:48	07:44	18:32	20:12	21:54
60°	07:48	07:47	07:47	18:36	20:11	21:48
N 58°	07:44	07:47	07:49	18:39	20:10	21:43
56°	07:40	07:46	07:52	18:41	20:09	21:39
54°	07:36	07:45	07:54	18:44	20:08	21:35
52°	07:33	07:44	07:56	18:46	20:07	21:31
50°	07:30	07:44	07:57	18:48	20:07	21:28
45°	07:24	07:43	08:01	18:52	20:05	21:21
N 40°	07:19	07:42	08:05	18:55	20:04	21:15
35°	07:14	07:41	08:07	18:58	20:03	21:10
30°	07:10	07:40	08:10	19:01	20:02	21:05
20°	07:03	07:39	08:14	19:05	20:01	20:57
N 10°	06:57	07:37	08:18	19:09	19:59	20:51
0°	06:51	07:36	08:22	19:12	19:58	20:45
S 10°	06:45	07:35	08:26	19:16	19:57	20:38
20°	06:38	07:34	08:30	19:20	19:55	20:32
30°	06:31	07:33	08:35	19:24	19:54	20:24
35°	06:27	07:32	08:38	19:26	19:53	20:20
40°	06:22	07:31	08:41	19:29	19:52	20:15
45°	06:17	07:30	08:44	19:32	19:50	20:09
S 50°	06:10	07:29	08:49	19:36	19:49	20:03
52°	06:07	07:28	08:51	19:37	19:48	20:00
54°	06:03	07:28	08:53	19:39	19:47	19:56
56°	06:00	07:27	08:56	19:41	19:47	19:53
58°	05:55	07:26	08:58	19:43	19:46	19:48
S 60°	05:51	07:26	09:02	19:46	19:45	19:44

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 0-7%
18	13:55	13:52	12:14	13:02	00:39	
19	13:50	13:47	12:14	13:47	01:24	
20	13:44	13:41	12:14	14:33	02:10	

February 21, 22, 23 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	150°55.8	165°49.7	S07°55.6	185°46.1	S15°03.7	43°56.3	N22°51.4	149°21.5	S01°39.0
1	165°58.3	180°49.2	54.3	200°46.6	03.1	58°58.9	51.4	164°23.7	38.9
2	181°00.8	195°48.8	53.1	215°47.2	02.4	74°01.5	51.4	179°25.9	38.7
3	196°03.2	210°48.3	·· 51.9	230°47.7	·· 01.8	89°04.1	·· 51.5	194°28.1	·· 38.6
4	211°05.7	225°47.9	50.7	245°48.2	01.1	104°06.8	51.5	209°30.3	38.5
5	226°08.2	240°47.5	49.5	260°48.8	15°00.5	119°09.4	51.5	224°32.5	38.4
6	241°10.6	255°47.0	S07°48.3	275°49.3	S14°59.9	134°12.0	N22°51.5	239°34.7	S01°38.3
7	256°13.1	270°46.6	47.0	290°49.8	59.2	149°14.6	51.5	254°36.9	38.2
8	271°15.5	285°46.1	45.8	305°50.4	58.6	164°17.2	51.6	269°39.1	38.0
9	286°18.0	300°45.7	·· 44.6	320°50.9	·· 57.9	179°19.9	·· 51.6	284°41.3	·· 37.9
10	301°20.5	315°45.3	43.4	335°51.5	57.3	194°22.5	51.6	299°43.5	37.8
11	316°22.9	330°44.8	42.2	350°52.0	56.6	209°25.1	51.6	314°45.7	37.7
12	331°25.4	345°44.4	S07°40.9	5°52.5	S14°56.0	224°27.7	N22°51.6	329°47.9	S01°37.6
13	346°27.9	0°44.0	39.7	20°53.1	55.4	239°30.3	51.7	344°50.1	37.5
14	1°30.3	15°43.5	38.5	35°53.6	54.7	254°33.0	51.7	359°52.3	37.3
15	16°32.8	30°43.1	·· 37.3	50°54.1	·· 54.1	269°35.6	·· 51.7	14°54.5	·· 37.2
16	31°35.3	45°42.7	36.1	65°54.7	53.4	284°38.2	51.7	29°56.7	37.1
17	46°37.7	60°42.2	34.8	80°55.2	52.8	299°40.8	51.7	44°58.9	37.0
18	61°40.2	75°41.8	S07°33.6	95°55.8	S14°52.1	314°43.4	N22°51.8	60°01.1	S01°36.9
19	76°42.7	90°41.4	32.4	110°56.3	51.5	329°46.0	51.8	75°03.3	36.7
20	91°45.1	105°40.9	31.2	125°56.8	50.8	344°48.6	51.8	90°05.5	36.6
21	106°47.6	120°40.5	·· 29.9	140°57.4	·· 50.2	359°51.3	·· 51.8	105°07.7	·· 36.5
22	121°50.0	135°40.0	28.7	155°57.9	49.6	14°53.9	51.8	120°09.9	36.4
23	136°52.5	150°39.6	27.5	170°58.5	48.9	29°56.5	51.9	135°12.1	36.3
Mer.pass. 13:54		ν -0.4′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.6′	d 0.0′ m -2.50	ν 2.2′	d 0.1′ m 1.01

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	151°55.0	165°39.2	S07°26.3	185°59.0	S14°48.3	44°59.1	N22°51.9	150°14.3	S01°36.2
1	166°57.4	180°38.7	25.0	200°59.5	47.6	60°01.7	51.9	165°16.5	36.0
2	181°59.9	195°38.3	23.8	216°00.1	47.0	75°04.3	51.9	180°18.7	35.9
3	197°02.4	210°37.9	·· 22.6	231°00.6	·· 46.3	90°06.9	·· 51.9	195°20.9	·· 35.8
4	212°04.8	225°37.5	21.4	246°01.2	45.7	105°09.6	51.9	210°23.1	35.7
5	227°07.3	240°37.0	20.1	261°01.7	45.0	120°12.2	52.0	225°25.3	35.6
6	242°09.8	255°36.6	S07°18.9	276°02.2	S14°44.4	135°14.8	N22°52.0	240°27.5	S01°35.5
7	257°12.2	270°36.2	17.7	291°02.8	43.7	150°17.4	52.0	255°29.7	35.3
8	272°14.7	285°35.7	16.5	306°03.3	43.1	165°20.0	52.0	270°31.9	35.2
9	287°17.2	300°35.3	·· 15.2	321°03.9	·· 42.4	180°22.6	·· 52.0	285°34.1	·· 35.1
10	302°19.6	315°34.9	14.0	336°04.4	41.8	195°25.2	52.1	300°36.3	35.0
11	317°22.1	330°34.4	12.8	351°05.0	41.1	210°27.8	52.1	315°38.5	34.9
12	332°24.5	345°34.0	S07°11.5	6°05.5	S14°40.5	225°30.4	N22°52.1	330°40.7	S01°34.8
13	347°27.0	0°33.6	10.3	21°06.0	39.8	240°33.0	52.1	345°42.9	34.6
14	2°29.5	15°33.2	09.1	36°06.6	39.2	255°35.7	52.1	0°45.1	34.5
15	17°31.9	30°32.7	·· 07.9	51°07.1	·· 38.5	270°38.3	·· 52.2	15°47.3	·· 34.4
16	32°34.4	45°32.3	06.6	66°07.7	37.9	285°40.9	52.2	30°49.5	34.3
17	47°36.9	60°31.9	05.4	81°08.2	37.2	300°43.5	52.2	45°51.7	34.2
18	62°39.3	75°31.4	S07°04.2	96°08.8	S14°36.6	315°46.1	N22°52.2	60°53.9	S01°34.0
19	77°41.8	90°31.0	02.9	111°09.3	35.9	330°48.7	52.2	75°56.1	33.9
20	92°44.3	105°30.6	01.7	126°09.8	35.3	345°51.3	52.2	90°58.3	33.8
21	107°46.7	120°30.2	07°00.5	141°10.4	·· 34.6	0°53.9	·· 52.3	106°00.5	·· 33.7
22	122°49.2	135°29.7	06°59.2	156°10.9	34.0	15°56.5	52.3	121°02.7	33.6
23	137°51.6	150°29.3	58.0	171°11.5	33.3	30°59.1	52.3	136°04.9	33.5
Mer.pass. 13:50		ν -0.4′	d 1.2′	m -3.91	ν 0.5′	d 0.6′	m 1.13	ν 2.6′	d 0.0′ m -2.49	ν 2.2′	d 0.1′ m 1.00

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	152°54.1	165°28.9	S06°56.8	186°12.0	S14°32.7	46°01.7	N22°52.3	151°07.1	S01°33.3
1	167°56.6	180°28.5	55.6	201°12.6	32.0	61°04.3	52.3	166°09.3	33.2
2	182°59.0	195°28.0	54.3	216°13.1	31.4	76°06.9	52.4	181°11.5	33.1
3	198°01.5	210°27.6	·· 53.1	231°13.7	·· 30.7	91°09.5	·· 52.4	196°13.7	·· 33.0
4	213°04.0	225°27.2	51.9	246°14.2	30.1	106°12.1	52.4	211°15.9	32.9
5	228°06.4	240°26.8	50.6	261°14.7	29.4	121°14.7	52.4	226°18.1	32.7
6	243°08.9	255°26.3	S06°49.4	276°15.3	S14°28.8	136°17.3	N22°52.4	241°20.3	S01°32.6
7	258°11.4	270°25.9	48.1	291°15.8	28.1	151°19.9	52.4	256°22.5	32.5
8	273°13.8	285°25.5	46.9	306°16.4	27.4	166°22.5	52.5	271°24.7	32.4
9	288°16.3	300°25.1	·· 45.7	321°16.9	·· 26.8	181°25.1	·· 52.5	286°26.9	·· 32.3
10	303°18.8	315°24.6	44.4	336°17.5	26.1	196°27.8	52.5	301°29.1	32.2
11	318°21.2	330°24.2	43.2	351°18.0	25.5	211°30.4	52.5	316°31.3	32.0
12	333°23.7	345°23.8	S06°42.0	6°18.6	S14°24.8	226°33.0	N22°52.5	331°33.5	S01°31.9
13	348°26.1	0°23.4	40.7	21°19.1	24.2	241°35.6	52.6	346°35.7	31.8
14	3°28.6	15°23.0	39.5	36°19.7	23.5	256°38.2	52.6	1°37.9	31.7
15	18°31.1	30°22.5	·· 38.3	51°20.2	·· 22.9	271°40.8	·· 52.6	16°40.1	·· 31.6
16	33°33.5	45°22.1	37.0	66°20.8	22.2	286°43.4	52.6	31°42.3	31.4
17	48°36.0	60°21.7	35.8	81°21.3	21.5	301°46.0	52.6	46°44.5	31.3
18	63°38.5	75°21.3	S06°34.5	96°21.9	S14°20.9	316°48.5	N22°52.6	61°46.7	S01°31.2
19	78°40.9	90°20.9	33.3	111°22.4	20.2	331°51.1	52.7	76°48.9	31.1
20	93°43.4	105°20.4	32.1	126°23.0	19.6	346°53.7	52.7	91°51.1	31.0
21	108°45.9	120°20.0	·· 30.8	141°23.5	·· 18.9	1°56.3	·· 52.7	106°53.3	·· 30.9
22	123°48.3	135°19.6	29.6	156°24.1	18.3	16°58.9	52.7	121°55.5	30.7
23	138°50.8	150°19.2	28.4	171°24.6	17.6	32°01.5	52.7	136°57.7	30.6
Mer.pass. 13:46		ν -0.4′	d 1.2′	m -3.91	ν 0.5′	d 0.7′	m 1.14	ν 2.6′	d 0.0′ m -2.49	ν 2.2′	d 0.1′ m 1.00

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.8	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°41.0	89°22.8
Acamar	315°11.2	-40°12.2
Menkar	314°05.2	4°11.5
Mirfak	308°27.0	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.4	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.2
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.7	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.9	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.7
Suhail	222°45.2	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.3
Acrux	172°58.5	-63°14.6
Gacrux	171°50.2	-57°15.5
Alioth	166°11.7	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.0	49°10.6
Hadar	148°34.4	-60°29.8
Menkent	147°56.3	-36°29.9
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.8	-60°56.4
Kochab	137°19.4	74°02.5
Zuben'ubi	136°54.9	-16°09.1
Alphecca	126°02.9	26°37.3
Antares	112°14.7	-26°29.4
Atria	107°08.2	-69°04.2
Sabik	102°01.8	-15°45.5
Shaula	96°09.2	-37°07.3
Rasalhague	95°57.8	12°32.2
Eltanin	90°42.0	51°28.8
Kaus Aust.	83°31.5	-34°22.3
Vega	80°32.8	38°48.2
Nunki	75°46.8	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.8	-56°39.0
Deneb	49°25.6	45°22.2
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.7	28°13.4
Markab	13°29.3	15°20.7

Feb 21 Sat	SHA	Mer.pass
Venus	14°53.8	12:57
Mars	34°50.3	11:37
Jupiter	253°00.4	21:01
Saturn	358°25.6	14:01

Feb 22 Sun	SHA	Mer.pass
Venus	13°44.2	12:58
Mars	34°04.0	11:36
Jupiter	253°04.1	20:56
Saturn	358°19.3	13:57

Feb 23 Mon	SHA	Mer.pass
Venus	12°34.8	12:58
Mars	33°17.9	11:35
Jupiter	253°07.6	20:52
Saturn	358°13.0	13:53

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°35.7	S10°38.0	137°09.2	12.0′	N09°22.5	15.7′	58.6′
1	191°35.7	37.1	151°40.1	11.9′	09°38.2	15.7′	58.6′
2	206°35.8	36.2	166°11.1	11.9′	09°53.9	15.7′	58.6′
3	221°35.9	·· 35.3	180°42.0	11.8′	10°09.6	15.6′	58.6′
4	236°36.0	34.4	195°12.8	11.7′	10°25.2	15.6′	58.6′
5	251°36.0	33.5	209°43.5	11.7′	10°40.8	15.5′	58.6′
6	266°36.1	S10°32.6	224°14.2	11.6′	N10°56.3	15.5′	58.6′
7	281°36.2	31.7	238°44.8	11.5′	11°11.8	15.5′	58.7′
8	296°36.2	30.8	253°15.4	11.5′	11°27.3	15.3′	58.7′
9	311°36.3	·· 29.9	267°45.8	11.4′	11°42.6	15.4′	58.7′
10	326°36.4	29.0	282°16.2	11.3′	11°58.0	15.2′	58.7′
11	341°36.5	28.1	296°46.6	11.3′	12°13.2	15.2′	58.7′
12	356°36.5	S10°27.2	311°16.9	11.2′	N12°28.4	15.2′	58.7′
13	11°36.6	26.3	325°47.0	11.1′	12°43.6	15.1′	58.7′
14	26°36.7	25.4	340°17.2	11.0′	12°58.7	15.0′	58.7′
15	41°36.8	·· 24.4	354°47.2	11.0′	13°13.7	15.0′	58.7′
16	56°36.8	23.5	9°17.2	10.9′	13°28.7	14.9′	58.8′
17	71°36.9	22.6	23°47.1	10.8′	13°43.6	14.8′	58.8′
18	86°37.0	S10°21.7	38°16.9	10.7′	N13°58.4	14.8′	58.8′
19	101°37.1	20.8	52°46.6	10.7′	14°13.2	14.7′	58.8′
20	116°37.1	19.9	67°16.3	10.6′	14°27.9	14.6′	58.8′
21	131°37.2	·· 19.0	81°45.9	10.5′	14°42.5	14.5′	58.8′
22	146°37.3	18.1	96°15.3	10.4′	14°57.0	14.5′	58.8′
23	161°37.4	17.2	110°44.8	10.3′	15°11.5	14.4′	58.8′
	SD = 16.2′	d = 0.9′		SD = 16.0′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.4	S10°16.3	125°14.1	10.2′	N15°25.9	14.3′	58.8′
1	191°37.5	15.4	139°43.3	10.2′	15°40.2	14.3′	58.8′
2	206°37.6	14.4	154°12.5	10.1′	15°54.5	14.1′	58.9′
3	221°37.7	·· 13.5	168°41.6	10.0′	16°08.6	14.1′	58.9′
4	236°37.8	12.6	183°10.5	9.9′	16°22.7	14.0′	58.9′
5	251°37.8	11.7	197°39.4	9.8′	16°36.7	13.9′	58.9′
6	266°37.9	S10°10.8	212°08.2	9.7′	N16°50.6	13.8′	58.9′
7	281°38.0	09.9	226°36.9	9.6′	17°04.4	13.7′	58.9′
8	296°38.1	09.0	241°05.6	9.5′	17°18.1	13.6′	58.9′
9	311°38.1	·· 08.1	255°34.1	9.4′	17°31.7	13.6′	58.9′
10	326°38.2	07.2	270°02.5	9.3′	17°45.3	13.4′	58.9′
11	341°38.3	06.2	284°30.9	9.3′	17°58.7	13.3′	58.9′
12	356°38.4	S10°05.3	298°59.1	9.2′	N18°12.0	13.3′	58.9′
13	11°38.5	04.4	313°27.3	9.1′	18°25.3	13.1′	58.9′
14	26°38.6	03.5	327°55.4	9.0′	18°38.4	13.1′	59.0′
15	41°38.6	·· 02.6	342°23.3	8.9′	18°51.5	12.9′	59.0′
16	56°38.7	01.7	356°51.2	8.8′	19°04.4	12.8′	59.0′
17	71°38.8	10°00.8	11°19.0	8.7′	19°17.2	12.8′	59.0′
18	86°38.9	S09°59.8	25°46.7	8.6′	N19°30.0	12.6′	59.0′
19	101°39.0	58.9	40°14.3	8.5′	19°42.6	12.5′	59.0′
20	116°39.0	58.0	54°41.7	8.4′	19°55.1	12.4′	59.0′
21	131°39.1	·· 57.1	69°09.1	8.3′	20°07.5	12.3′	59.0′
22	146°39.2	56.2	83°36.4	8.2′	20°19.8	12.1′	59.0′
23	161°39.3	55.3	98°03.6	8.1′	20°31.9	12.1′	59.0′
	SD = 16.2′	d = 0.9′		SD = 16.0′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°39.4	S09°54.3	112°30.7	8.0′	N20°44.0	11.9′	59.0′
1	191°39.5	53.4	126°57.7	7.9′	20°55.9	11.8′	59.0′
2	206°39.5	52.5	141°24.6	7.8′	21°07.7	11.7′	59.0′
3	221°39.6	·· 51.6	155°51.4	7.7′	21°19.4	11.6′	59.0′
4	236°39.7	50.7	170°18.1	7.6′	21°31.0	11.4′	59.0′
5	251°39.8	49.8	184°44.7	7.5′	21°42.4	11.3′	59.0′
6	266°39.9	S09°48.8	199°11.2	7.4′	N21°53.7	11.2′	59.1′
7	281°40.0	47.9	213°37.6	7.3′	22°04.9	11.1′	59.1′
8	296°40.1	47.0	228°03.9	7.2′	22°16.0	10.9′	59.1′
9	311°40.1	·· 46.1	242°30.1	7.1′	22°26.9	10.8′	59.1′
10	326°40.2	45.2	256°56.2	7.0′	22°37.7	10.6′	59.1′
11	341°40.3	44.2	271°22.2	6.9′	22°48.3	10.5′	59.1′
12	356°40.4	S09°43.3	285°48.1	6.8′	N22°58.8	10.4′	59.1′
13	11°40.5	42.4	300°13.9	6.7′	23°09.2	10.2′	59.1′
14	26°40.6	41.5	314°39.6	6.6′	23°19.4	10.1′	59.1′
15	41°40.7	·· 40.6	329°05.2	6.5′	23°29.5	9.9′	59.1′
16	56°40.8	39.6	343°30.7	6.4′	23°39.4	9.8′	59.1′
17	71°40.8	38.7	357°56.1	6.3′	23°49.2	9.7′	59.1′
18	86°40.9	S09°37.8	12°21.4	6.2′	N23°58.9	9.5′	59.1′
19	101°41.0	36.9	26°46.7	6.1′	24°08.4	9.4′	59.1′
20	116°41.1	36.0	41°11.8	6.0′	24°17.8	9.2′	59.1′
21	131°41.2	·· 35.0	55°36.8	5.9′	24°27.0	9.0′	59.1′
22	146°41.3	34.1	70°01.7	5.8′	24°36.0	8.9′	59.1′
23	161°41.4	33.2	84°26.6	5.7′	24°44.9	8.7′	59.1′
	SD = 16.2′	d = 0.9′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:43	07:02	08:14	16:14	17:27	18:46
N 70°	05:45	06:55	08:00	16:28	17:33	18:44
68°	05:46	06:50	07:49	16:40	17:38	18:43
66°	05:47	06:46	07:39	16:49	17:42	18:42
64°	05:47	06:42	07:31	16:57	17:46	18:41
62°	05:48	06:39	07:25	17:03	17:49	18:41
60°	05:48	06:36	07:19	17:09	17:52	18:40
N 58°	05:48	06:33	07:14	17:14	17:55	18:40
56°	05:48	06:31	07:09	17:19	17:57	18:40
54°	05:48	06:29	07:05	17:23	17:59	18:40
52°	05:47	06:27	07:01	17:27	18:01	18:40
50°	05:47	06:25	06:57	17:30	18:03	18:41
45°	05:46	06:20	06:50	17:38	18:07	18:42
N 40°	05:45	06:16	06:44	17:44	18:11	18:43
35°	05:43	06:13	06:38	17:49	18:15	18:44
30°	05:41	06:09	06:33	17:54	18:18	18:46
20°	05:37	06:03	06:25	18:02	18:25	18:50
N 10°	05:31	05:56	06:17	18:10	18:31	18:56
0°	05:25	05:49	06:10	18:17	18:38	19:02
S 10°	05:16	05:41	06:03	18:24	18:45	19:10
20°	05:06	05:32	05:55	18:32	18:54	19:21
30°	04:52	05:21	05:46	18:41	19:05	19:34
35°	04:43	05:14	05:40	18:46	19:12	19:43
40°	04:32	05:06	05:34	18:52	19:20	19:53
45°	04:19	04:56	05:27	18:59	19:29	20:07
S 50°	04:02	04:44	05:19	19:07	19:41	20:23
52°	03:53	04:38	05:15	19:11	19:47	20:32
54°	03:44	04:32	05:10	19:15	19:53	20:41
56°	03:33	04:25	05:05	19:20	20:00	20:52
58°	03:20	04:17	05:00	19:25	20:08	21:04
S 60°	03:04	04:07	04:54	19:31	20:18	21:20

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	06:38	05:25	▭	·· ··	01:42	▭
N 70°	06:55	06:09	▭	·· ··	01:00	▭
68°	07:09	06:39	05:26	·· ··	00:32	03:37
66°	07:21	07:01	06:28	·· ··	00:11	02:36
64°	07:30	07:19	07:03	23:55	·· ··	02:02
62°	07:39	07:34	07:29	23:41	·· ··	01:37
60°	07:46	07:46	07:49	23:30	·· ··	01:18
N 58°	07:52	07:57	08:06	23:20	·· ··	01:02
56°	07:58	08:07	08:20	23:12	·· ··	00:48
54°	08:03	08:15	08:32	23:04	·· ··	00:37
52°	08:08	08:23	08:43	22:57	·· ··	00:26
50°	08:12	08:30	08:53	22:51	·· ··	00:17
45°	08:21	08:45	09:14	22:38	23:58	·· ··
N 40°	08:29	08:57	09:31	22:27	23:42	·· ··
35°	08:36	09:08	09:45	22:18	23:29	·· ··
30°	08:42	09:17	09:57	22:10	23:18	·· ··
20°	08:52	09:33	10:19	21:56	22:58	·· ··
N 10°	09:01	09:47	10:37	21:45	22:42	23:42
0°	09:10	10:00	10:55	21:33	22:26	23:22
S 10°	09:19	10:14	11:13	21:22	22:10	23:03
20°	09:28	10:28	11:32	21:11	21:54	22:42
30°	09:39	10:45	11:54	20:57	21:35	22:18
35°	09:45	10:55	12:07	20:50	21:24	22:04
40°	09:52	11:06	12:22	20:41	21:11	21:48
45°	10:01	11:20	12:40	20:31	20:56	21:29
S 50°	10:11	11:36	13:03	20:19	20:38	21:05
52°	10:16	11:44	13:14	20:13	20:30	20:54
54°	10:21	11:52	13:26	20:07	20:21	20:41
56°	10:27	12:02	13:41	20:00	20:10	20:26
58°	10:34	12:13	13:57	19:52	19:58	20:08
S 60°	10:41	12:26	14:18	19:43	19:44	19:47

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 14-33%
21	13:37	13:34	12:14	15:22	02:57	
22	13:30	13:26	12:13	16:13	03:47	
23	13:22	13:18	12:13	17:09	04:40	

February 24, 25, 26 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	153°53.3	165°18.8	S06°27.1	186°25.1	S14°16.9	47°04.1	N22°52.7	151°59.8	S01°30.5
1	168°55.7	180°18.3	25.9	201°25.7	16.3	62°06.7	52.8	167°02.0	30.4
2	183°58.2	195°17.9	24.6	216°26.2	15.6	77°09.3	52.8	182°04.2	30.3
3	199°00.6	210°17.5	·· 23.4	231°26.8	·· 15.0	92°11.9	·· 52.8	197°06.4	·· 30.1
4	214°03.1	225°17.1	22.2	246°27.3	14.3	107°14.5	52.8	212°08.6	30.0
5	229°05.6	240°16.7	20.9	261°27.9	13.6	122°17.1	52.8	227°10.8	29.9
6	244°08.0	255°16.3	S06°19.7	276°28.4	S14°13.0	137°19.7	N22°52.8	242°13.0	S01°29.8
7	259°10.5	270°15.8	18.4	291°29.0	12.3	152°22.3	52.9	257°15.2	29.7
8	274°13.0	285°15.4	17.2	306°29.5	11.7	167°24.9	52.9	272°17.4	29.6
9	289°15.4	300°15.0	·· 15.9	321°30.1	·· 11.0	182°27.5	·· 52.9	287°19.6	·· 29.4
10	304°17.9	315°14.6	14.7	336°30.6	10.3	197°30.1	52.9	302°21.8	29.3
11	319°20.4	330°14.2	13.5	351°31.2	09.7	212°32.7	52.9	317°24.0	29.2
12	334°22.8	345°13.8	S06°12.2	6°31.7	S14°09.0	227°35.3	N22°52.9	332°26.2	S01°29.1
13	349°25.3	0°13.4	11.0	21°32.3	08.4	242°37.9	53.0	347°28.4	29.0
14	4°27.8	15°12.9	09.7	36°32.9	07.7	257°40.4	53.0	2°30.6	28.8
15	19°30.2	30°12.5	·· 08.5	51°33.4	·· 07.0	272°43.0	·· 53.0	17°32.8	·· 28.7
16	34°32.7	45°12.1	07.2	66°34.0	06.4	287°45.6	53.0	32°35.0	28.6
17	49°35.1	60°11.7	06.0	81°34.5	05.7	302°48.2	53.0	47°37.2	28.5
18	64°37.6	75°11.3	S06°04.8	96°35.1	S14°05.0	317°50.8	N22°53.0	62°39.4	S01°28.4
19	79°40.1	90°10.9	03.5	111°35.6	04.4	332°53.4	53.1	77°41.6	28.2
20	94°42.5	105°10.5	02.3	126°36.2	03.7	347°56.0	53.1	92°43.8	28.1
21	109°45.0	120°10.0	06°01.0	141°36.7	·· 03.1	2°58.6	·· 53.1	107°46.0	·· 28.0
22	124°47.5	135°09.6	05°59.8	156°37.3	02.4	18°01.2	53.1	122°48.2	27.9
23	139°49.9	150°09.2	58.5	171°37.8	01.7	33°03.8	53.1	137°50.4	27.8
Mer.pass. 13:42		ν -0.4′	d 1.2′	m -3.91	ν 0.5′	d 0.7′	m 1.14	ν 2.6′	d 0.0′ m -2.48	ν 2.2′	d 0.1′ m 1.00

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	154°52.4	165°08.8	S05°57.3	186°38.4	S14°01.1	48°06.3	N22°53.1	152°52.6	S01°27.7
1	169°54.9	180°08.4	56.0	201°38.9	14°00.4	63°08.9	53.2	167°54.8	27.5
2	184°57.3	195°08.0	54.8	216°39.5	13°59.7	78°11.5	53.2	182°57.0	27.4
3	199°59.8	210°07.6	·· 53.5	231°40.0	·· 59.1	93°14.1	·· 53.2	197°59.2	·· 27.3
4	215°02.2	225°07.2	52.3	246°40.6	58.4	108°16.7	53.2	213°01.4	27.2
5	230°04.7	240°06.8	51.0	261°41.1	57.7	123°19.3	53.2	228°03.6	27.1
6	245°07.2	255°06.3	S05°49.8	276°41.7	S13°57.1	138°21.9	N22°53.2	243°05.8	S01°26.9
7	260°09.6	270°05.9	48.5	291°42.3	56.4	153°24.4	53.3	258°08.0	26.8
8	275°12.1	285°05.5	47.3	306°42.8	55.7	168°27.0	53.3	273°10.1	26.7
9	290°14.6	300°05.1	·· 46.0	321°43.4	·· 55.1	183°29.6	·· 53.3	288°12.3	·· 26.6
10	305°17.0	315°04.7	44.8	336°43.9	54.4	198°32.2	53.3	303°14.5	26.5
11	320°19.5	330°04.3	43.5	351°44.5	53.7	213°34.8	53.3	318°16.7	26.3
12	335°22.0	345°03.9	S05°42.3	6°45.0	S13°53.1	228°37.4	N22°53.3	333°18.9	S01°26.2
13	350°24.4	0°03.5	41.0	21°45.6	52.4	243°39.9	53.3	348°21.1	26.1
14	5°26.9	15°03.1	39.8	36°46.1	51.7	258°42.5	53.4	3°23.3	26.0
15	20°29.4	30°02.7	·· 38.5	51°46.7	·· 51.1	273°45.1	·· 53.4	18°25.5	·· 25.9
16	35°31.8	45°02.3	37.3	66°47.3	50.4	288°47.7	53.4	33°27.7	25.7
17	50°34.3	60°01.9	36.0	81°47.8	49.7	303°50.3	53.4	48°29.9	25.6
18	65°36.7	75°01.4	S05°34.8	96°48.4	S13°49.1	318°52.9	N22°53.4	63°32.1	S01°25.5
19	80°39.2	90°01.0	33.5	111°48.9	48.4	333°55.4	53.4	78°34.3	25.4
20	95°41.7	105°00.6	32.3	126°49.5	47.7	348°58.0	53.5	93°36.5	25.3
21	110°44.1	120°00.2	·· 31.0	141°50.0	·· 47.1	4°00.6	·· 53.5	108°38.7	·· 25.2
22	125°46.6	134°59.8	29.8	156°50.6	46.4	19°03.2	53.5	123°40.9	25.0
23	140°49.1	149°59.4	28.5	171°51.1	45.7	34°05.8	53.5	138°43.1	24.9
Mer.pass. 13:38		ν -0.4′	d 1.2′	m -3.91	ν 0.6′	d 0.7′	m 1.14	ν 2.6′	d 0.0′ m -2.47	ν 2.2′	d 0.1′ m 1.00

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	155°51.5	164°59.0	S05°27.3	186°51.7	S13°45.0	49°08.3	N22°53.5	153°45.3	S01°24.8
1	170°54.0	179°58.6	26.0	201°52.3	44.4	64°10.9	53.5	168°47.5	24.7
2	185°56.5	194°58.2	24.8	216°52.8	43.7	79°13.5	53.5	183°49.7	24.6
3	200°58.9	209°57.8	·· 23.5	231°53.4	·· 43.0	94°16.1	·· 53.6	198°51.9	·· 24.4
4	216°01.4	224°57.4	22.3	246°53.9	42.4	109°18.7	53.6	213°54.1	24.3
5	231°03.9	239°57.0	21.0	261°54.5	41.7	124°21.2	53.6	228°56.3	24.2
6	246°06.3	254°56.6	S05°19.8	276°55.1	S13°41.0	139°23.8	N22°53.6	243°58.4	S01°24.1
7	261°08.8	269°56.2	18.5	291°55.6	40.3	154°26.4	53.6	259°00.6	24.0
8	276°11.2	284°55.8	17.3	306°56.2	39.7	169°29.0	53.6	274°02.8	23.8
9	291°13.7	299°55.4	·· 16.0	321°56.7	·· 39.0	184°31.5	·· 53.6	289°05.0	·· 23.7
10	306°16.2	314°55.0	14.7	336°57.3	38.3	199°34.1	53.7	304°07.2	23.6
11	321°18.6	329°54.6	13.5	351°57.8	37.7	214°36.7	53.7	319°09.4	23.5
12	336°21.1	344°54.2	S05°12.2	6°58.4	S13°37.0	229°39.3	N22°53.7	334°11.6	S01°23.4
13	351°23.6	359°53.8	11.0	21°59.0	36.3	244°41.8	53.7	349°13.8	23.2
14	6°26.0	14°53.4	09.7	36°59.5	35.6	259°44.4	53.7	4°16.0	23.1
15	21°28.5	29°53.0	·· 08.5	52°00.1	·· 35.0	274°47.0	·· 53.7	19°18.2	·· 23.0
16	36°31.0	44°52.6	07.2	67°00.6	34.3	289°49.6	53.7	34°20.4	22.9
17	51°33.4	59°52.2	05.9	82°01.2	33.6	304°52.1	53.8	49°22.6	22.8
18	66°35.9	74°51.8	S05°04.7	97°01.8	S13°32.9	319°54.7	N22°53.8	64°24.8	S01°22.6
19	81°38.4	89°51.4	03.4	112°02.3	32.3	334°57.3	53.8	79°27.0	22.5
20	96°40.8	104°51.0	02.2	127°02.9	31.6	349°59.8	53.8	94°29.2	22.4
21	111°43.3	119°50.6	05°00.9	142°03.5	·· 30.9	5°02.4	·· 53.8	109°31.4	·· 22.3
22	126°45.7	134°50.2	04°59.7	157°04.0	30.2	20°05.0	53.8	124°33.6	22.2
23	141°48.2	149°49.8	58.4	172°04.6	29.6	35°07.6	53.8	139°35.8	22.0
Mer.pass. 13:34		ν -0.4′	d 1.3′	m -3.91	ν 0.6′	d 0.7′	m 1.14	ν 2.6′	d 0.0′ m -2.46	ν 2.2′	d 0.1′ m 1.00

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.8	-57°06.5
Hamal	327°50.3	23°35.2
Polaris	313°42.2	89°22.8
Acamar	315°11.2	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.0	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.4	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°50.9	7°24.6
Canopus	263°51.7	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.9	-29°00.6
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.8
Suhail	222°45.2	-43°32.4
Miaplacidus	221°37.2	-69°49.6
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.3
Acrux	172°58.5	-63°14.6
Gacrux	171°50.1	-57°15.5
Alioth	166°11.7	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°50.9	49°10.6
Hadar	148°34.3	-60°29.8
Menkent	147°56.3	-36°29.9
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.7	-60°56.4
Kochab	137°19.4	74°02.5
Zuben'ubi	136°54.8	-16°09.1
Alphecca	126°02.9	26°37.3
Antares	112°14.7	-26°29.4
Atria	107°08.2	-69°04.2
Sabik	102°01.8	-15°45.5
Shaula	96°09.2	-37°07.3
Rasalhague	95°57.8	12°32.2
Eltanin	90°42.0	51°28.8
Kaus Aust.	83°31.5	-34°22.3
Vega	80°32.8	38°48.2
Nunki	75°46.8	-26°15.8
Altair	61°59.3	8°56.1
Peacock	53°04.7	-56°39.0
Deneb	49°25.6	45°22.2
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.3	15°20.7

Feb 24 Tue	SHA	Mer.pass
Venus	11°25.5	12:59
Mars	32°31.9	11:34
Jupiter	253°10.9	20:48
Saturn	358°06.6	13:50

Feb 25 Wed	SHA	Mer.pass
Venus	10°16.4	13:00
Mars	31°46.0	11:33
Jupiter	253°13.9	20:44
Saturn	358°00.2	13:46

Feb 26 Thu	SHA	Mer.pass
Venus	9°07.5	13:00
Mars	31°00.2	11:32
Jupiter	253°16.8	20:40
Saturn	357°53.7	13:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°41.5	S09°32.3	98°51.3	5.7′	N24°53.6	8.6′	59.1′
1	191°41.6	31.4	113°16.0	5.6′	25°02.2	8.4′	59.1′
2	206°41.7	30.4	127°40.6	5.5′	25°10.6	8.3′	59.1′
3	221°41.7	·· 29.5	142°05.0	5.4′	25°18.9	8.1′	59.1′
4	236°41.8	28.6	156°29.4	5.3′	25°27.0	7.9′	59.1′
5	251°41.9	27.7	170°53.7	5.2′	25°34.9	7.8′	59.1′
6	266°42.0	S09°26.7	185°18.0	5.1′	N25°42.7	7.6′	59.1′
7	281°42.1	25.8	199°42.1	5.0′	25°50.3	7.5′	59.1′
8	296°42.2	24.9	214°06.1	5.0′	25°57.8	7.2′	59.1′
9	311°42.3	·· 24.0	228°30.1	4.9′	26°05.0	7.1′	59.1′
10	326°42.4	23.0	242°54.0	4.8′	26°12.1	7.0′	59.1′
11	341°42.5	22.1	257°17.8	4.7′	26°19.1	6.7′	59.2′
12	356°42.6	S09°21.2	271°41.5	4.6′	N26°25.8	6.6′	59.2′
13	11°42.7	20.3	286°05.2	4.6′	26°32.4	6.4′	59.2′
14	26°42.8	19.3	300°28.7	4.5′	26°38.8	6.2′	59.2′
15	41°42.9	·· 18.4	314°52.2	4.4′	26°45.0	6.1′	59.2′
16	56°43.0	17.5	329°15.7	4.4′	26°51.1	5.8′	59.2′
17	71°43.0	16.6	343°39.0	4.3′	26°56.9	5.7′	59.2′
18	86°43.1	S09°15.6	358°02.3	4.2′	N27°02.6	5.5′	59.2′
19	101°43.2	14.7	12°25.5	4.2′	27°08.1	5.4′	59.2′
20	116°43.3	13.8	26°48.7	4.1′	27°13.5	5.1′	59.2′
21	131°43.4	·· 12.8	41°11.8	4.0′	27°18.6	5.0′	59.2′
22	146°43.5	11.9	55°34.8	4.0′	27°23.6	4.8′	59.2′
23	161°43.6	11.0	69°57.8	3.9′	27°28.4	4.6′	59.2′
	SD = 16.2′	d = 0.9′	SD = 16.1′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°43.7	S09°10.1	84°20.7	3.9′	N27°33.0	4.4′	59.2′
1	191°43.8	09.1	98°43.6	3.8′	27°37.4	4.2′	59.2′
2	206°43.9	08.2	113°06.4	3.8′	27°41.6	4.0′	59.2′
3	221°44.0	·· 07.3	127°29.2	3.7′	27°45.6	3.8′	59.2′
4	236°44.1	06.3	141°51.9	3.7′	27°49.4	3.7′	59.2′
5	251°44.2	05.4	156°14.6	3.6′	27°53.1	3.5′	59.2′
6	266°44.3	S09°04.5	170°37.2	3.6′	N27°56.6	3.2′	59.2′
7	281°44.4	03.6	184°59.8	3.5′	27°59.8	3.1′	59.2′
8	296°44.5	02.6	199°22.3	3.5′	28°02.9	2.9′	59.2′
9	311°44.6	·· 01.7	213°44.8	3.5′	28°05.8	2.7′	59.2′
10	326°44.7	09°00.8	228°07.3	3.4′	28°08.5	2.5′	59.2′
11	341°44.8	08°59.8	242°29.8	3.4′	28°11.0	2.3′	59.2′
12	356°44.9	S08°58.9	256°52.2	3.4′	N28°13.3	2.1′	59.2′
13	11°45.0	58.0	271°14.6	3.4′	28°15.4	1.9′	59.1′
14	26°45.1	57.0	285°36.9	3.3′	28°17.3	1.7′	59.1′
15	41°45.2	·· 56.1	299°59.3	3.3′	28°19.0	1.5′	59.1′
16	56°45.3	55.2	314°21.6	3.3′	28°20.5	1.4′	59.1′
17	71°45.4	54.2	328°43.9	3.3′	28°21.9	1.1′	59.1′
18	86°45.5	S08°53.3	343°06.2	3.3′	N28°23.0	0.9′	59.1′
19	101°45.6	52.4	357°28.5	3.3′	28°23.9	0.8′	59.1′
20	116°45.7	51.4	11°50.8	3.3′	28°24.7	0.5′	59.1′
21	131°45.8	·· 50.5	26°13.0	3.3′	28°25.2	0.3′	59.1′
22	146°45.9	49.6	40°35.3	3.3′	28°25.5	0.2′	59.1′
23	161°46.0	48.6	54°57.6	3.3′	28°25.7	0.1′	59.1′
	SD = 16.2′	d = 0.9′	SD = 16.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°46.1	S08°47.7	69°19.8	3.3′	N28°25.6	0.2′	59.1′
1	191°46.2	46.8	83°42.1	3.3′	28°25.4	0.5′	59.1′
2	206°46.3	45.8	98°04.4	3.3′	28°24.9	0.6′	59.1′
3	221°46.4	·· 44.9	112°26.7	3.3′	28°24.3	0.8′	59.1′
4	236°46.5	44.0	126°49.0	3.3′	28°23.5	1.1′	59.1′
5	251°46.6	43.0	141°11.3	3.3′	28°22.4	1.2′	59.1′
6	266°46.7	S08°42.1	155°33.6	3.4′	N28°21.2	1.4′	59.1′
7	281°46.8	41.2	169°56.0	3.4′	28°19.8	1.6′	59.1′
8	296°46.9	40.2	184°18.3	3.4′	28°18.2	1.8′	59.1′
9	311°47.1	·· 39.3	198°40.7	3.4′	28°16.4	2.1′	59.1′
10	326°47.2	38.4	213°03.2	3.5′	28°14.3	2.2′	59.1′
11	341°47.3	37.4	227°25.6	3.5′	28°12.1	2.4′	59.1′
12	356°47.4	S08°36.5	241°48.1	3.5′	N28°09.7	2.5′	59.1′
13	11°47.5	35.6	256°10.7	3.6′	28°07.2	2.8′	59.1′
14	26°47.6	34.6	270°33.2	3.6′	28°04.4	3.0′	59.1′
15	41°47.7	·· 33.7	284°55.8	3.7′	28°01.4	3.2′	59.1′
16	56°47.8	32.7	299°18.5	3.7′	27°58.2	3.3′	59.0′
17	71°47.9	31.8	313°41.2	3.7′	27°54.9	3.6′	59.0′
18	86°48.0	S08°30.9	328°03.9	3.8′	N27°51.3	3.7′	59.0′
19	101°48.1	29.9	342°26.7	3.8′	27°47.6	3.9′	59.0′
20	116°48.2	29.0	356°49.6	3.9′	27°43.7	4.1′	59.0′
21	131°48.3	·· 28.1	11°12.5	4.0′	27°39.6	4.3′	59.0′
22	146°48.4	27.1	25°35.4	4.0′	27°35.3	4.5′	59.0′
23	161°48.6	26.2	39°58.4	4.1′	27°30.8	4.7′	59.0′
	SD = 16.1′	d = 0.9′	SD = 16.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:29	06:47	07:58	16:30	17:41	18:59
N 70°	05:32	06:43	07:46	16:42	17:45	18:56
68°	05:35	06:39	07:36	16:51	17:49	18:53
66°	05:37	06:36	07:28	16:59	17:52	18:51
64°	05:38	06:33	07:21	17:06	17:55	18:50
62°	05:39	06:30	07:15	17:12	17:57	18:48
60°	05:40	06:28	07:10	17:17	17:59	18:48
N 58°	05:41	06:26	07:06	17:21	18:01	18:47
56°	05:41	06:24	07:02	17:25	18:03	18:46
54°	05:41	06:22	06:58	17:29	18:05	18:46
52°	05:41	06:20	06:55	17:32	18:06	18:46
50°	05:42	06:19	06:52	17:35	18:08	18:45
45°	05:41	06:15	06:45	17:42	18:11	18:45
N 40°	05:41	06:12	06:39	17:47	18:15	18:46
35°	05:40	06:09	06:35	17:52	18:17	18:47
30°	05:38	06:06	06:30	17:56	18:20	18:48
20°	05:35	06:01	06:23	18:03	18:26	18:51
N 10°	05:30	05:55	06:16	18:10	18:31	18:56
0°	05:24	05:49	06:10	18:16	18:37	19:02
S 10°	05:17	05:42	06:03	18:23	18:44	19:09
20°	05:07	05:34	05:56	18:30	18:52	19:18
30°	04:55	05:24	05:48	18:38	19:02	19:31
35°	04:46	05:17	05:43	18:42	19:08	19:39
40°	04:36	05:10	05:38	18:48	19:15	19:49
45°	04:24	05:01	05:31	18:54	19:24	20:01
S 50°	04:08	04:50	05:24	19:01	19:35	20:16
52°	04:00	04:45	05:20	19:05	19:40	20:24
54°	03:52	04:39	05:16	19:08	19:46	20:33
56°	03:41	04:32	05:12	19:13	19:52	20:42
58°	03:30	04:25	05:07	19:17	20:00	20:54
S 60°	03:16	04:16	05:02	19:23	20:08	21:08

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	06:22	▭	▭	04:43	▭	▭
62°	07:22	07:06	▭	03:44	06:08	▭
60°	07:56	08:17	09:15	03:10	04:57	06:11
N 58°	08:21	08:52	09:53	02:46	04:22	05:33
56°	08:41	09:18	10:20	02:26	03:56	05:06
54°	08:58	09:39	10:41	02:10	03:36	04:45
52°	09:12	09:56	10:58	01:56	03:19	04:27
50°	09:25	10:11	11:13	01:43	03:04	04:12
45°	09:51	10:41	11:44	01:18	02:35	03:42
N 40°	10:12	11:04	12:07	00:58	02:12	03:18
35°	10:30	11:24	12:27	00:42	01:53	02:58
30°	10:45	11:40	12:44	00:27	01:36	02:41
20°	11:10	12:09	13:12	00:03	01:09	02:13
N 10°	11:33	12:33	13:36	·· ··	00:45	01:48
0°	11:54	12:56	13:58	·· ··	00:23	01:26
S 10°	12:15	13:18	14:21	·· ··	00:01	01:03
20°	12:37	13:43	14:45	23:37	·· ··	00:38
30°	13:04	14:11	15:13	23:10	·· ··	00:09
35°	13:19	14:28	15:30	22:54	23:52	·· ··
40°	13:38	14:48	15:49	22:35	23:32	·· ··
45°	14:00	15:12	16:13	22:12	23:08	·· ··
S 50°	14:28	15:43	16:43	21:43	22:37	23:48
52°	14:42	15:59	16:57	21:29	22:22	23:33
54°	14:58	16:17	17:15	21:13	22:03	23:16
56°	15:17	16:39	17:35	20:53	21:41	22:56
58°	15:40	17:07	18:01	20:29	21:13	22:30
S 60°	16:12	17:48	18:37	19:58	20:32	21:55

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 44-67%
24	13:14	13:10	12:13	18:08	05:38	
25	13:05	13:00	12:13	19:11	06:39	
26	12:56	12:51	12:13	20:13	07:42	

February 27, 28, 01 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	156°50.7	164°49.4	S04°57.1	187°05.1	S13°28.9	50°10.1	N22°53.9	154°37.9	S01°21.9
1	171°53.1	179°49.0	55.9	202°05.7	28.2	65°12.7	53.9	169°40.1	21.8
2	186°55.6	194°48.6	54.6	217°06.3	27.5	80°15.3	53.9	184°42.3	21.7
3	201°58.1	209°48.2	·· 53.4	232°06.8	·· 26.9	95°17.8	·· 53.9	199°44.5	·· 21.6
4	217°00.5	224°47.8	52.1	247°07.4	26.2	110°20.4	53.9	214°46.7	21.4
5	232°03.0	239°47.4	50.9	262°07.9	25.5	125°23.0	53.9	229°48.9	21.3
6	247°05.5	254°47.0	S04°49.6	277°08.5	S13°24.8	140°25.5	N22°53.9	244°51.1	S01°21.2
7	262°07.9	269°46.6	48.3	292°09.1	24.2	155°28.1	54.0	259°53.3	21.1
8	277°10.4	284°46.2	47.1	307°09.6	23.5	170°30.7	54.0	274°55.5	21.0
9	292°12.9	299°45.8	·· 45.8	322°10.2	·· 22.8	185°33.3	·· 54.0	289°57.7	·· 20.8
10	307°15.3	314°45.4	44.5	337°10.8	22.1	200°35.8	54.0	304°59.9	20.7
11	322°17.8	329°45.0	43.3	352°11.3	21.4	215°38.4	54.0	320°02.1	20.6
12	337°20.2	344°44.6	S04°42.0	7°11.9	S13°20.8	230°41.0	N22°54.0	335°04.3	S01°20.5
13	352°22.7	359°44.2	40.8	22°12.5	20.1	245°43.5	54.0	350°06.5	20.4
14	7°25.2	14°43.8	39.5	37°13.0	19.4	260°46.1	54.1	5°08.7	20.2
15	22°27.6	29°43.4	·· 38.2	52°13.6	·· 18.7	275°48.6	·· 54.1	20°10.9	·· 20.1
16	37°30.1	44°43.0	37.0	67°14.1	18.1	290°51.2	54.1	35°13.0	20.0
17	52°32.6	59°42.6	35.7	82°14.7	17.4	305°53.8	54.1	50°15.2	19.9
18	67°35.0	74°42.2	S04°34.5	97°15.3	S13°16.7	320°56.3	N22°54.1	65°17.4	S01°19.8
19	82°37.5	89°41.8	33.2	112°15.8	16.0	335°58.9	54.1	80°19.6	19.6
20	97°40.0	104°41.4	31.9	127°16.4	15.3	351°01.5	54.1	95°21.8	19.5
21	112°42.4	119°41.0	·· 30.7	142°17.0	·· 14.7	6°04.0	·· 54.2	110°24.0	·· 19.4
22	127°44.9	134°40.6	29.4	157°17.5	14.0	21°06.6	54.2	125°26.2	19.3
23	142°47.4	149°40.2	28.1	172°18.1	13.3	36°09.2	54.2	140°28.4	19.2
Mer.pass. 13:30		ν -0.4′ d 1.3′		ν 0.6′ d 0.7′		ν 2.6′ d 0.0′		ν 2.2′ d 0.1′	
m -3.91		m 1.14		m -2.46		m 0.99			

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	157°49.8	164°39.8	S04°26.9	187°18.7	S13°12.6	51°11.7	N22°54.2	155°30.6	S01°19.0
1	172°52.3	179°39.5	25.6	202°19.2	11.9	66°14.3	54.2	170°32.8	18.9
2	187°54.7	194°39.1	24.4	217°19.8	11.2	81°16.8	54.2	185°35.0	18.8
3	202°57.2	209°38.7	·· 23.1	232°20.4	·· 10.6	96°19.4	·· 54.2	200°37.2	·· 18.7
4	217°59.7	224°38.3	21.8	247°20.9	09.9	111°22.0	54.2	215°39.4	18.6
5	233°02.1	239°37.9	20.6	262°21.5	09.2	126°24.5	54.3	230°41.6	18.4
6	248°04.6	254°37.5	S04°19.3	277°22.1	S13°08.5	141°27.1	N22°54.3	245°43.7	S01°18.3
7	263°07.1	269°37.1	18.0	292°22.6	07.8	156°29.6	54.3	260°45.9	18.2
8	278°09.5	284°36.7	16.8	307°23.2	07.2	171°32.2	54.3	275°48.1	18.1
9	293°12.0	299°36.3	·· 15.5	322°23.8	·· 06.5	186°34.8	·· 54.3	290°50.3	·· 18.0
10	308°14.5	314°35.9	14.2	337°24.3	05.8	201°37.3	54.3	305°52.5	17.8
11	323°16.9	329°35.5	13.0	352°24.9	05.1	216°39.9	54.3	320°54.7	17.7
12	338°19.4	344°35.1	S04°11.7	7°25.5	S13°04.4	231°42.4	N22°54.3	335°56.9	S01°17.6
13	353°21.8	359°34.7	10.4	22°26.0	03.7	246°45.0	54.4	350°59.1	17.5
14	8°24.3	14°34.4	09.2	37°26.6	03.1	261°47.5	54.4	6°01.3	17.4
15	23°26.8	29°34.0	·· 07.9	52°27.2	·· 02.4	276°50.1	·· 54.4	21°03.5	·· 17.2
16	38°29.2	44°33.6	06.6	67°27.7	01.7	291°52.7	54.4	36°05.7	17.1
17	53°31.7	59°33.2	05.4	82°28.3	01.0	306°55.2	54.4	51°07.9	17.0
18	68°34.2	74°32.8	S04°04.1	97°28.9	S13°00.3	321°57.8	N22°54.4	66°10.1	S01°16.9
19	83°36.6	89°32.4	02.8	112°29.5	12°59.6	337°00.3	54.4	81°12.2	16.8
20	98°39.1	104°32.0	01.6	127°30.0	58.9	352°02.9	54.4	96°14.4	16.6
21	113°41.6	119°31.6	04°00.3	142°30.6	·· 58.3	7°05.4	·· 54.5	111°16.6	·· 16.5
22	128°44.0	134°31.2	03°59.0	157°31.2	57.6	22°08.0	54.5	126°18.8	16.4
23	143°46.5	149°30.9	57.8	172°31.7	56.9	37°10.5	54.5	141°21.0	16.3
Mer.pass. 13:26		ν -0.4′ d 1.3′		ν 0.6′ d 0.7′		ν 2.6′ d 0.0′		ν 2.2′ d 0.1′	
m -3.91		m 1.14		m -2.45		m 0.99			

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	158°49.0	164°30.5	S03°56.5	187°32.3	S12°56.2	52°13.1	N22°54.5	156°23.2	S01°16.2
1	173°51.4	179°30.1	55.2	202°32.9	55.5	67°15.6	54.5	171°25.4	16.0
2	188°53.9	194°29.7	54.0	217°33.4	54.8	82°18.2	54.5	186°27.6	15.9
3	203°56.3	209°29.3	·· 52.7	232°34.0	·· 54.1	97°20.8	·· 54.5	201°29.8	·· 15.8
4	218°58.8	224°28.9	51.4	247°34.6	53.4	112°23.3	54.5	216°32.0	15.7
5	234°01.3	239°28.5	50.1	262°35.2	52.8	127°25.9	54.6	231°34.2	15.6
6	249°03.7	254°28.1	S03°48.9	277°35.7	S12°52.1	142°28.4	N22°54.6	246°36.4	S01°15.4
7	264°06.2	269°27.7	47.6	292°36.3	51.4	157°31.0	54.6	261°38.5	15.3
8	279°08.7	284°27.4	46.3	307°36.9	50.7	172°33.5	54.6	276°40.7	15.2
9	294°11.1	299°27.0	·· 45.1	322°37.4	·· 50.0	187°36.1	·· 54.6	291°42.9	·· 15.1
10	309°13.6	314°26.6	43.8	337°38.0	49.3	202°38.6	54.6	306°45.1	15.0
11	324°16.1	329°26.2	42.5	352°38.6	48.6	217°41.2	54.6	321°47.3	14.8
12	339°18.5	344°25.8	S03°41.3	7°39.2	S12°47.9	232°43.7	N22°54.6	336°49.5	S01°14.7
13	354°21.0	359°25.4	40.0	22°39.7	47.3	247°46.3	54.6	351°51.7	14.6
14	9°23.5	14°25.0	38.7	37°40.3	46.6	262°48.8	54.7	6°53.9	14.5
15	24°25.9	29°24.7	·· 37.4	52°40.9	·· 45.9	277°51.3	·· 54.7	21°56.1	·· 14.4
16	39°28.4	44°24.3	36.2	67°41.4	45.2	292°53.9	54.7	36°58.3	14.2
17	54°30.8	59°23.9	34.9	82°42.0	44.5	307°56.4	54.7	52°00.5	14.1
18	69°33.3	74°23.5	S03°33.6	97°42.6	S12°43.8	322°59.0	N22°54.7	67°02.6	S01°14.0
19	84°35.8	89°23.1	32.4	112°43.2	43.1	338°01.5	54.7	82°04.8	13.9
20	99°38.2	104°22.7	31.1	127°43.7	42.4	353°04.1	54.7	97°07.0	13.8
21	114°40.7	119°22.3	·· 29.8	142°44.3	·· 41.7	8°06.6	·· 54.7	112°09.2	·· 13.6
22	129°43.2	134°22.0	28.5	157°44.9	41.0	23°09.2	54.8	127°11.4	13.5
23	144°45.6	149°21.6	27.3	172°45.5	40.4	38°11.7	54.8	142°13.6	13.4
Mer.pass. 13:23		ν -0.4′ d 1.3′		ν 0.6′ d 0.7′		ν 2.6′ d 0.0′		ν 2.2′ d 0.1′	
m -3.91		m 1.14		m -2.44		m 0.99			

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°10.0
Schedar	349°30.4	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.8	-57°06.4
Hamal	327°50.3	23°35.2
Polaris	313°43.4	89°22.8
Acamar	315°11.2	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.0	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.4	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°50.9	7°24.6
Canopus	263°51.7	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.9	-29°00.7
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.7
Avior	234°13.8	-59°35.8
Suhail	222°45.2	-43°32.5
Miaplacidus	221°37.3	-69°49.6
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.4
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.6
Gacrux	171°50.1	-57°15.6
Alioth	166°11.6	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°50.9	49°10.6
Hadar	148°34.3	-60°29.8
Menkent	147°56.3	-36°29.9
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.7	-60°56.5
Kochab	137°19.3	74°02.5
Zuben'ubi	136°54.8	-16°09.1
Alphecca	126°02.8	26°37.3
Antares	112°14.7	-26°29.4
Atria	107°08.1	-69°04.2
Sabik	102°01.7	-15°45.5
Shaula	96°09.2	-37°07.3
Rasalhague	95°57.7	12°32.2
Eltanin	90°41.9	51°28.7
Kaus Aust.	83°31.4	-34°22.3
Vega	80°32.8	38°48.2
Nunki	75°46.8	-26°15.8
Altair	61°59.3	8°56.1
Peacock	53°04.7	-56°39.0
Deneb	49°25.6	45°22.2
Enif	33°38.2	9°59.6
Al Na'ir	27°32.2	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.3	15°20.7

Feb 27 Fri	SHA	Mer.pass
Venus	7°58.7	13:01
Mars	30°14.5	11:31
Jupiter	253°19.5	20:36
Saturn	357°47.3	13:39

Feb 28 Sat	SHA	Mer.pass
Venus	6°50.0	13:02
Mars	29°28.9	11:30
Jupiter	253°21.9	20:32
Saturn	357°40.8	13:36

Mar 01 Sun	SHA	Mer.pass
Venus	5°41.5	13:02
Mars	28°43.3	11:29
Jupiter	253°24.1	20:28
Saturn	357°34.2	13:32

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°48.7	S08°25.2	54°21.5	4.1′	N27°26.1	4.8′	59.0′
1	191°48.8	24.3	68°44.7	4.2′	27°21.3	5.0′	59.0′
2	206°48.9	23.4	83°07.9	4.3′	27°16.3	5.2′	59.0′
3	221°49.0	·· 22.4	97°31.1	4.3′	27°11.1	5.4′	59.0′
4	236°49.1	21.5	111°54.5	4.4′	27°05.7	5.6′	59.0′
5	251°49.2	20.5	126°17.9	4.5′	27°00.1	5.8′	59.0′
6	266°49.3	S08°19.6	140°41.4	4.6′	N26°54.3	5.9′	58.9′
7	281°49.4	18.7	155°05.0	4.6′	26°48.4	6.1′	58.9′
8	296°49.5	17.7	169°28.6	4.7′	26°42.3	6.3′	58.9′
9	311°49.6	·· 16.8	183°52.3	4.8′	26°36.0	6.4′	58.9′
10	326°49.8	15.8	198°16.1	4.9′	26°29.6	6.6′	58.9′
11	341°49.9	14.9	212°40.0	5.0′	26°23.0	6.8′	58.9′
12	356°50.0	S08°14.0	227°04.0	5.0′	N26°16.2	7.0′	58.9′
13	11°50.1	13.0	241°28.0	5.1′	26°09.2	7.1′	58.9′
14	26°50.2	12.1	255°52.1	5.2′	26°02.1	7.3′	58.9′
15	41°50.3	·· 11.1	270°16.4	5.3′	25°54.8	7.5′	58.9′
16	56°50.4	10.2	284°40.7	5.4′	25°47.3	7.6′	58.9′
17	71°50.5	09.2	299°05.1	5.5′	25°39.7	7.8′	58.8′
18	86°50.7	S08°08.3	313°29.6	5.6′	N25°31.9	7.9′	58.8′
19	101°50.8	07.4	327°54.2	5.7′	25°24.0	8.1′	58.8′
20	116°50.9	06.4	342°18.8	5.8′	25°15.9	8.3′	58.8′
21	131°51.0	·· 05.5	356°43.6	5.9′	25°07.6	8.4′	58.8′
22	146°51.1	04.5	11°08.5	6.0′	24°59.2	8.6′	58.8′
23	161°51.2	03.6	25°33.5	6.1′	24°50.6	8.7′	58.8′
	SD = 16.1′	d = 0.9′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°51.3	S08°02.6	39°58.5	6.2′	N24°41.9	8.9′	58.8′
1	191°51.5	01.7	54°23.7	6.3′	24°33.0	9.0′	58.8′
2	206°51.6	08°00.8	68°49.0	6.4′	24°24.0	9.2′	58.8′
3	221°51.7	07°59.8	83°14.4	6.5′	24°14.8	9.3′	58.7′
4	236°51.8	58.9	97°39.8	6.6′	24°05.5	9.4′	58.7′
5	251°51.9	57.9	112°05.4	6.7′	23°56.1	9.7′	58.7′
6	266°52.0	S07°57.0	126°31.1	6.8′	N23°46.4	9.7′	58.7′
7	281°52.2	56.0	140°56.9	6.9′	23°36.7	9.9′	58.7′
8	296°52.3	55.1	155°22.7	7.0′	23°26.8	10.0′	58.7′
9	311°52.4	·· 54.1	169°48.7	7.1′	23°16.8	10.2′	58.7′
10	326°52.5	53.2	184°14.8	7.2′	23°06.6	10.3′	58.7′
11	341°52.6	52.2	198°41.0	7.3′	22°56.3	10.4′	58.6′
12	356°52.7	S07°51.3	213°07.3	7.4′	N22°45.9	10.6′	58.6′
13	11°52.9	50.4	227°33.8	7.5′	22°35.3	10.7′	58.6′
14	26°53.0	49.4	242°00.3	7.6′	22°24.6	10.8′	58.6′
15	41°53.1	·· 48.5	256°26.9	7.7′	22°13.8	10.9′	58.6′
16	56°53.2	47.5	270°53.6	7.8′	22°02.9	11.1′	58.6′
17	71°53.3	46.6	285°20.5	7.9′	21°51.8	11.2′	58.6′
18	86°53.4	S07°45.6	299°47.4	8.1′	N21°40.6	11.3′	58.5′
19	101°53.6	44.7	314°14.5	8.2′	21°29.3	11.5′	58.5′
20	116°53.7	43.7	328°41.7	8.3′	21°17.8	11.5′	58.5′
21	131°53.8	·· 42.8	343°08.9	8.4′	21°06.3	11.7′	58.5′
22	146°53.9	41.8	357°36.3	8.5′	20°54.6	11.7′	58.5′
23	161°54.0	40.9	12°03.8	8.6′	20°42.9	11.9′	58.5′
	SD = 16.1′	d = 0.9′	SD = 16.0′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°54.2	S07°39.9	26°31.4	8.7′	N20°31.0	12.0′	58.5′
1	191°54.3	39.0	40°59.1	8.8′	20°19.0	12.1′	58.4′
2	206°54.4	38.0	55°26.9	8.9′	20°06.9	12.3′	58.4′
3	221°54.5	·· 37.1	69°54.8	9.0′	19°54.6	12.3′	58.4′
4	236°54.6	36.1	84°22.8	9.1′	19°42.3	12.4′	58.4′
5	251°54.8	35.2	98°51.0	9.2′	19°29.9	12.5′	58.4′
6	266°54.9	S07°34.2	113°19.2	9.3′	N19°17.4	12.7′	58.4′
7	281°55.0	33.3	127°47.5	9.4′	19°04.7	12.7′	58.3′
8	296°55.1	32.3	142°16.0	9.5′	18°52.0	12.8′	58.3′
9	311°55.3	·· 31.4	156°44.5	9.6′	18°39.2	12.9′	58.3′
10	326°55.4	30.4	171°13.1	9.7′	18°26.3	13.0′	58.3′
11	341°55.5	29.5	185°41.9	9.9′	18°13.3	13.1′	58.3′
12	356°55.6	S07°28.5	200°10.7	10.0′	N18°00.2	13.2′	58.3′
13	11°55.7	27.6	214°39.7	10.1′	17°47.0	13.3′	58.2′
14	26°55.9	26.6	229°08.8	10.2′	17°33.7	13.3′	58.2′
15	41°56.0	·· 25.7	243°37.9	10.3′	17°20.4	13.5′	58.2′
16	56°56.1	24.7	258°07.2	10.4′	17°06.9	13.5′	58.2′
17	71°56.2	23.8	272°36.5	10.5′	16°53.4	13.6′	58.2′
18	86°56.4	S07°22.8	287°06.0	10.6′	N16°39.8	13.7′	58.1′
19	101°56.5	21.9	301°35.5	10.6′	16°26.1	13.8′	58.1′
20	116°56.6	20.9	316°05.2	10.7′	16°12.3	13.8′	58.1′
21	131°56.7	·· 20.0	330°34.9	10.8′	15°58.5	13.9′	58.1′
22	146°56.9	19.0	345°04.7	10.9′	15°44.6	14.0′	58.1′
23	161°57.0	18.1	359°34.7	11.0′	15°30.6	14.0′	58.0′
	SD = 16.1′	d = 0.9′	SD = 15.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:15	06:33	07:42	16:45	17:54	19:13
N 70°	05:19	06:30	07:32	16:55	17:57	19:08
68°	05:23	06:27	07:24	17:03	18:00	19:04
66°	05:26	06:25	07:17	17:10	18:02	19:01
64°	05:28	06:23	07:11	17:15	18:04	18:59
62°	05:30	06:21	07:06	17:20	18:05	18:56
60°	05:32	06:20	07:02	17:25	18:07	18:55
N 58°	05:33	06:18	06:58	17:28	18:08	18:53
56°	05:34	06:17	06:54	17:32	18:09	18:52
54°	05:35	06:15	06:51	17:35	18:11	18:52
52°	05:35	06:14	06:48	17:38	18:12	18:51
50°	05:36	06:13	06:46	17:40	18:13	18:50
45°	05:36	06:10	06:40	17:46	18:15	18:49
N 40°	05:36	06:08	06:35	17:51	18:18	18:49
35°	05:36	06:05	06:31	17:55	18:20	18:49
30°	05:35	06:03	06:27	17:58	18:22	18:50
20°	05:33	05:58	06:21	18:05	18:27	18:52
N 10°	05:29	05:54	06:15	18:10	18:31	18:56
0°	05:24	05:48	06:09	18:16	18:37	19:01
S 10°	05:18	05:42	06:03	18:21	18:43	19:07
20°	05:09	05:35	05:57	18:27	18:50	19:16
30°	04:57	05:26	05:50	18:34	18:59	19:27
35°	04:50	05:20	05:46	18:38	19:04	19:35
40°	04:40	05:13	05:41	18:43	19:11	19:44
45°	04:29	05:05	05:36	18:49	19:19	19:55
S 50°	04:14	04:55	05:29	18:55	19:29	20:09
52°	04:07	04:50	05:26	18:58	19:33	20:16
54°	03:59	04:45	05:22	19:01	19:38	20:24
56°	03:50	04:39	05:19	19:05	19:44	20:33
58°	03:39	04:32	05:14	19:09	19:51	20:44
S 60°	03:26	04:25	05:10	19:14	19:58	20:56

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°						
N 70°			12:34			09:01
68°			13:15			08:18
66°		11:03	13:43		08:37	07:49
64°		11:52	14:04		07:47	07:27
62°	10:14	12:23	14:20	07:23	07:15	07:09
60°	10:55	12:46	14:34	06:41	06:51	06:55
N 58°	11:23	13:05	14:46	06:13	06:32	06:42
56°	11:44	13:20	14:56	05:50	06:16	06:31
54°	12:02	13:33	15:05	05:32	06:02	06:21
52°	12:17	13:45	15:13	05:17	05:50	06:12
50°	12:31	13:55	15:20	05:03	05:39	06:04
45°	12:57	14:16	15:35	04:35	05:16	05:48
N 40°	13:19	14:34	15:48	04:14	04:58	05:34
35°	13:36	14:48	15:58	03:55	04:43	05:22
30°	13:51	15:00	16:08	03:40	04:29	05:11
20°	14:17	15:22	16:23	03:13	04:06	04:53
N 10°	14:39	15:40	16:37	02:50	03:46	04:38
0°	15:00	15:57	16:50	02:28	03:27	04:23
S 10°	15:20	16:14	17:03	02:06	03:09	04:08
20°	15:42	16:32	17:16	01:43	02:48	03:52
30°	16:07	16:53	17:31	01:15	02:24	03:33
35°	16:22	17:05	17:40	00:59	02:10	03:22
40°	16:39	17:19	17:50	00:40	01:54	03:09
45°	17:00	17:35	18:02	00:17	01:34	02:54
S 50°	17:25	17:55	18:16	·· ··	01:10	02:36
52°	17:38	18:04	18:23	·· ··	00:58	02:27
54°	17:52	18:15	18:30	·· ··	00:44	02:17
56°	18:08	18:27	18:38	·· ··	00:28	02:06
58°	18:28	18:41	18:47	·· ··	00:09	01:53
S 60°	18:52	18:57	18:58	23:46	·· ··	01:38

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 10-12 77-93%
27	12:45	12:40	12:13	21:14	08:44	
28	12:35	12:29	12:12	22:10	09:42	
01	12:23	12:18	12:12	23:02	10:36	

March 02, 03, 04 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	159°48.1	164°21.2	S03°26.0	187°46.0	S12°39.7	53°14.3	N22°54.8	157°15.8	S01°13.3
1	174°50.6	179°20.8	24.7	202°46.6	39.0	68°16.8	54.8	172°18.0	13.2
2	189°53.0	194°20.4	23.5	217°47.2	38.3	83°19.3	54.8	187°20.2	13.0
3	204°55.5	209°20.0	·· 22.2	232°47.8	·· 37.6	98°21.9	·· 54.8	202°22.4	·· 12.9
4	219°57.9	224°19.7	20.9	247°48.3	36.9	113°24.4	54.8	217°24.6	12.8
5	235°00.4	239°19.3	19.6	262°48.9	36.2	128°27.0	54.8	232°26.7	12.7
6	250°02.9	254°18.9	S03°18.4	277°49.5	S12°35.5	143°29.5	N22°54.8	247°28.9	S01°12.5
7	265°05.3	269°18.5	17.1	292°50.1	34.8	158°32.1	54.8	262°31.1	12.4
8	280°07.8	284°18.1	15.8	307°50.6	34.1	173°34.6	54.9	277°33.3	12.3
9	295°10.3	299°17.7	·· 14.5	322°51.2	·· 33.4	188°37.1	·· 54.9	292°35.5	·· 12.2
10	310°12.7	314°17.4	13.3	337°51.8	32.7	203°39.7	54.9	307°37.7	12.1
11	325°15.2	329°17.0	12.0	352°52.4	32.0	218°42.2	54.9	322°39.9	11.9
12	340°17.7	344°16.6	S03°10.7	7°52.9	S12°31.3	233°44.8	N22°54.9	337°42.1	S01°11.8
13	355°20.1	359°16.2	09.4	22°53.5	30.6	248°47.3	54.9	352°44.3	11.7
14	10°22.6	14°15.8	08.2	37°54.1	30.0	263°49.8	54.9	7°46.5	11.6
15	25°25.1	29°15.5	·· 06.9	52°54.7	·· 29.3	278°52.4	·· 54.9	22°48.6	·· 11.5
16	40°27.5	44°15.1	05.6	67°55.2	28.6	293°54.9	54.9	37°50.8	11.3
17	55°30.0	59°14.7	04.3	82°55.8	27.9	308°57.5	55.0	52°53.0	11.2
18	70°32.4	74°14.3	S03°03.1	97°56.4	S12°27.2	324°00.0	N22°55.0	67°55.2	S01°11.1
19	85°34.9	89°13.9	01.8	112°57.0	26.5	339°02.5	55.0	82°57.4	11.0
20	100°37.4	104°13.5	03°00.5	127°57.5	25.8	354°05.1	55.0	97°59.6	10.9
21	115°39.8	119°13.2	02°59.2	142°58.1	·· 25.1	9°07.6	·· 55.0	113°01.8	·· 10.7
22	130°42.3	134°12.8	58.0	157°58.7	24.4	24°10.1	55.0	128°04.0	10.6
23	145°44.8	149°12.4	56.7	172°59.3	23.7	39°12.7	55.0	143°06.2	10.5
Mer.pass. 13:19		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.14	ν 2.5′	d 0.0′ m -2.43	ν 2.2′	d 0.1′ m 0.99

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	160°47.2	164°12.0	S02°55.4	187°59.9	S12°23.0	54°15.2	N22°55.0	158°08.4	S01°10.4
1	175°49.7	179°11.6	54.1	203°00.4	22.3	69°17.8	55.0	173°10.5	10.3
2	190°52.2	194°11.3	52.9	218°01.0	21.6	84°20.3	55.0	188°12.7	10.1
3	205°54.6	209°10.9	·· 51.6	233°01.6	·· 20.9	99°22.8	·· 55.1	203°14.9	·· 10.0
4	220°57.1	224°10.5	50.3	248°02.2	20.2	114°25.4	55.1	218°17.1	09.9
5	235°59.6	239°10.1	49.0	263°02.7	19.5	129°27.9	55.1	233°19.3	09.8
6	251°02.0	254°09.7	S02°47.8	278°03.3	S12°18.8	144°30.4	N22°55.1	248°21.5	S01°09.6
7	266°04.5	269°09.4	46.5	293°03.9	18.1	159°33.0	55.1	263°23.7	09.5
8	281°06.9	284°09.0	45.2	308°04.5	17.4	174°35.5	55.1	278°25.9	09.4
9	296°09.4	299°08.6	·· 43.9	323°05.1	·· 16.7	189°38.0	·· 55.1	293°28.1	·· 09.3
10	311°11.9	314°08.2	42.6	338°05.6	16.0	204°40.6	55.1	308°30.2	09.2
11	326°14.3	329°07.9	41.4	353°06.2	15.3	219°43.1	55.1	323°32.4	09.0
12	341°16.8	344°07.5	S02°40.1	8°06.8	S12°14.6	234°45.6	N22°55.1	338°34.6	S01°08.9
13	356°19.3	359°07.1	38.8	23°07.4	13.9	249°48.1	55.2	353°36.8	08.8
14	11°21.7	14°06.7	37.5	38°08.0	13.2	264°50.7	55.2	8°39.0	08.7
15	26°24.2	29°06.3	·· 36.3	53°08.5	·· 12.5	279°53.2	·· 55.2	23°41.2	·· 08.6
16	41°26.7	44°06.0	35.0	68°09.1	11.8	294°55.7	55.2	38°43.4	08.4
17	56°29.1	59°05.6	33.7	83°09.7	11.1	309°58.3	55.2	53°45.6	08.3
18	71°31.6	74°05.2	S02°32.4	98°10.3	S12°10.4	325°00.8	N22°55.2	68°47.8	S01°08.2
19	86°34.0	89°04.8	31.1	113°10.9	09.7	340°03.3	55.2	83°49.9	08.1
20	101°36.5	104°04.5	29.9	128°11.5	09.0	355°05.9	55.2	98°52.1	08.0
21	116°39.0	119°04.1	·· 28.6	143°12.0	·· 08.3	10°08.4	·· 55.2	113°54.3	·· 07.8
22	131°41.4	134°03.7	27.3	158°12.6	07.6	25°10.9	55.2	128°56.5	07.7
23	146°43.9	149°03.3	26.0	173°13.2	06.9	40°13.4	55.3	143°58.7	07.6
Mer.pass. 13:15		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.14	ν 2.5′	d 0.0′ m -2.43	ν 2.2′	d 0.1′ m 0.99

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	161°46.4	164°03.0	S02°24.7	188°13.8	S12°06.2	55°16.0	N22°55.3	159°00.9	S01°07.5
1	176°48.8	179°02.6	23.5	203°14.4	05.5	70°18.5	55.3	174°03.1	07.3
2	191°51.3	194°02.2	22.2	218°14.9	04.8	85°21.0	55.3	189°05.3	07.2
3	206°53.8	209°01.8	·· 20.9	233°15.5	·· 04.1	100°23.5	·· 55.3	204°07.5	·· 07.1
4	221°56.2	224°01.5	19.6	248°16.1	03.4	115°26.1	55.3	219°09.6	07.0
5	236°58.7	239°01.1	18.3	263°16.7	02.7	130°28.6	55.3	234°11.8	06.9
6	252°01.2	254°00.7	S02°17.1	278°17.3	S12°02.0	145°31.1	N22°55.3	249°14.0	S01°06.7
7	267°03.6	269°00.3	15.8	293°17.9	01.3	160°33.6	55.3	264°16.2	06.6
8	282°06.1	283°59.9	14.5	308°18.4	12°00.6	175°36.2	55.3	279°18.4	06.5
9	297°08.5	298°59.6	·· 13.2	323°19.0	11°59.9	190°38.7	·· 55.3	294°20.6	·· 06.4
10	312°11.0	313°59.2	11.9	338°19.6	59.2	205°41.2	55.3	309°22.8	06.3
11	327°13.5	328°58.8	10.7	353°20.2	58.5	220°43.7	55.4	324°25.0	06.1
12	342°15.9	343°58.5	S02°09.4	8°20.8	S11°57.8	235°46.3	N22°55.4	339°27.2	S01°06.0
13	357°18.4	358°58.1	08.1	23°21.4	57.1	250°48.8	55.4	354°29.3	05.9
14	12°20.9	13°57.7	06.8	38°21.9	56.4	265°51.3	55.4	9°31.5	05.8
15	27°23.3	28°57.3	·· 05.5	53°22.5	·· 55.7	280°53.8	·· 55.4	24°33.7	·· 05.6
16	42°25.8	43°57.0	04.3	68°23.1	55.0	295°56.3	55.4	39°35.9	05.5
17	57°28.3	58°56.6	03.0	83°23.7	54.3	310°58.9	55.4	54°38.1	05.4
18	72°30.7	73°56.2	S02°01.7	98°24.3	S11°53.6	326°01.4	N22°55.4	69°40.3	S01°05.3
19	87°33.2	88°55.8	02°00.4	113°24.9	52.8	341°03.9	55.4	84°42.5	05.2
20	102°35.6	103°55.5	01°59.1	128°25.5	52.1	356°06.4	55.4	99°44.7	05.0
21	117°38.1	118°55.1	·· 57.9	143°26.0	·· 51.4	11°08.9	·· 55.4	114°46.8	·· 04.9
22	132°40.6	133°54.7	56.6	158°26.6	50.7	26°11.5	55.5	129°49.0	04.8
23	147°43.0	148°54.3	55.3	173°27.2	50.0	41°14.0	55.5	144°51.2	04.7
Mer.pass. 13:11		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.42	ν 2.2′	d 0.1′ m 0.98

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°10.0
Schedar	349°30.5	56°41.0
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.4
Hamal	327°50.3	23°35.2
Polaris	313°44.9	89°22.8
Acamar	315°11.2	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.0	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.4	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°50.9	7°24.6
Canopus	263°51.7	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.9	-29°00.7
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°13.9	-59°35.8
Suhail	222°45.2	-43°32.5
Miaplacidus	221°37.3	-69°49.6
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.6
Gacrux	171°50.1	-57°15.6
Alioth	166°11.6	55°48.8
Spica	158°21.0	-11°18.0
Alkaid	152°50.9	49°10.6
Hadar	148°34.3	-60°29.8
Menkent	147°56.2	-36°29.9
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.6	-60°56.5
Kochab	137°19.2	74°02.5
Zuben'ubi	136°54.8	-16°09.1
Alphecca	126°02.8	26°37.3
Antares	112°14.6	-26°29.4
Atria	107°08.0	-69°04.2
Sabik	102°01.7	-15°45.5
Shaula	96°09.1	-37°07.3
Rasalhague	95°57.7	12°32.2
Eltanin	90°41.9	51°28.7
Kaus Aust.	83°31.4	-34°22.3
Vega	80°32.8	38°48.1
Nunki	75°46.8	-26°15.8
Altair	61°59.3	8°56.1
Peacock	53°04.7	-56°38.9
Deneb	49°25.6	45°22.2
Enif	33°38.2	9°59.6
Al Na'ir	27°32.1	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.3	15°20.7

Mar 02 Mon	SHA	Mer.pass
Venus	4°33.1	13:03
Mars	27°57.9	11:28
Jupiter	253°26.2	20:24
Saturn	357°27.7	13:29

Mar 03 Tue	SHA	Mer.pass
Venus	3°24.8	13:04
Mars	27°12.6	11:28
Jupiter	253°28.0	20:20
Saturn	357°21.1	13:25

Mar 04 Wed	SHA	Mer.pass
Venus	2°16.6	13:04
Mars	26°27.4	11:27
Jupiter	253°29.6	20:16
Saturn	357°14.5	13:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	176°57.1	S07°17.1	14°04.7	11.1′	N15°16.6	14.2′	58.0′
1	191°57.2	16.2	28°34.8	11.2′	15°02.4	14.2′	58.0′
2	206°57.4	15.2	43°05.0	11.3′	14°48.2	14.2′	58.0′
3	221°57.5	·· 14.2	57°35.4	11.4′	14°34.0	14.3′	58.0′
4	236°57.6	13.3	72°05.7	11.5′	14°19.7	14.4′	57.9′
5	251°57.7	12.3	86°36.2	11.6′	14°05.3	14.4′	57.9′
6	266°57.9	S07°11.4	101°06.8	11.7′	N13°50.9	14.5′	57.9′
7	281°58.0	10.4	115°37.5	11.7′	13°36.4	14.6′	57.9′
8	296°58.1	09.5	130°08.2	11.8′	13°21.8	14.6′	57.9′
9	311°58.2	·· 08.5	144°39.0	11.9′	13°07.2	14.7′	57.8′
10	326°58.4	07.6	159°10.0	12.0′	12°52.5	14.7′	57.8′
11	341°58.5	06.6	173°41.0	12.1′	12°37.8	14.8′	57.8′
12	356°58.6	S07°05.7	188°12.0	12.2′	N12°23.0	14.8′	57.8′
13	11°58.8	04.7	202°43.2	12.2′	12°08.2	14.8′	57.8′
14	26°58.9	03.7	217°14.5	12.3′	11°53.4	14.9′	57.7′
15	41°59.0	·· 02.8	231°45.8	12.4′	11°38.5	15.0′	57.7′
16	56°59.1	01.8	246°17.2	12.5′	11°23.5	15.0′	57.7′
17	71°59.3	07°00.9	260°48.7	12.6′	11°08.5	15.0′	57.7′
18	86°59.4	S06°59.9	275°20.2	12.6′	N10°53.5	15.1′	57.6′
19	101°59.5	59.0	289°51.9	12.7′	10°38.4	15.1′	57.6′
20	116°59.7	58.0	304°23.6	12.8′	10°23.3	15.2′	57.6′
21	131°59.8	·· 57.1	318°55.3	12.9′	10°08.1	15.2′	57.6′
22	146°59.9	56.1	333°27.2	12.9′	09°52.9	15.2′	57.6′
23	162°00.1	55.1	347°59.1	13.0′	09°37.7	15.3′	57.5′
	SD = 16.1′	d = 1.0′	SD = 15.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°00.2	S06°54.2	2°31.1	13.1′	N09°22.4	15.3′	57.5′
1	192°00.3	53.2	17°03.2	13.1′	09°07.1	15.3′	57.5′
2	207°00.4	52.3	31°35.3	13.2′	08°51.8	15.3′	57.5′
3	222°00.6	·· 51.3	46°07.5	13.3′	08°36.5	15.4′	57.4′
4	237°00.7	50.4	60°39.7	13.3′	08°21.1	15.4′	57.4′
5	252°00.8	49.4	75°12.1	13.4′	08°05.7	15.4′	57.4′
6	267°01.0	S06°48.4	89°44.5	13.4′	N07°50.3	15.5′	57.4′
7	282°01.1	47.5	104°16.9	13.5′	07°34.8	15.5′	57.3′
8	297°01.2	46.5	118°49.4	13.6′	07°19.3	15.4′	57.3′
9	312°01.4	·· 45.6	133°22.0	13.6′	07°03.9	15.6′	57.3′
10	327°01.5	44.6	147°54.6	13.7′	06°48.3	15.5′	57.3′
11	342°01.6	43.6	162°27.3	13.7′	06°32.8	15.5′	57.3′
12	357°01.8	S06°42.7	177°00.0	13.8′	N06°17.3	15.6′	57.2′
13	12°01.9	41.7	191°32.8	13.8′	06°01.7	15.5′	57.2′
14	27°02.0	40.8	206°05.7	13.9′	05°46.2	15.6′	57.2′
15	42°02.2	·· 39.8	220°38.6	14.0′	05°30.6	15.6′	57.2′
16	57°02.3	38.8	235°11.5	14.0′	05°15.0	15.6′	57.1′
17	72°02.4	37.9	249°44.5	14.1′	04°59.4	15.6′	57.1′
18	87°02.6	S06°36.9	264°17.6	14.1′	N04°43.8	15.6′	57.1′
19	102°02.7	36.0	278°50.7	14.1′	04°28.2	15.7′	57.1′
20	117°02.8	35.0	293°23.8	14.2′	04°12.5	15.6′	57.0′
21	132°03.0	·· 34.0	307°57.0	14.2′	03°56.9	15.6′	57.0′
22	147°03.1	33.1	322°30.3	14.3′	03°41.3	15.7′	57.0′
23	162°03.2	32.1	337°03.5	14.3′	03°25.6	15.6′	57.0′
	SD = 16.1′	d = 1.0′	SD = 15.7′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°03.4	S06°31.2	351°36.9	14.4′	N03°10.0	15.6′	56.9′
1	192°03.5	30.2	6°10.2	14.4′	02°54.4	15.6′	56.9′
2	207°03.6	29.2	20°43.6	14.4′	02°38.8	15.7′	56.9′
3	222°03.8	·· 28.3	35°17.1	14.5′	02°23.1	15.6′	56.9′
4	237°03.9	27.3	49°50.6	14.5′	02°07.5	15.6′	56.8′
5	252°04.1	26.4	64°24.1	14.6′	01°51.9	15.6′	56.8′
6	267°04.2	S06°25.4	78°57.6	14.6′	N01°36.3	15.6′	56.8′
7	282°04.3	24.4	93°31.2	14.6′	01°20.7	15.6′	56.8′
8	297°04.5	23.5	108°04.8	14.7′	01°05.1	15.6′	56.7′
9	312°04.6	·· 22.5	122°38.5	14.7′	00°49.5	15.6′	56.7′
10	327°04.7	21.5	137°12.2	14.7′	00°33.9	15.5′	56.7′
11	342°04.9	20.6	151°45.9	14.7′	00°18.4	15.6′	56.7′
12	357°05.0	S06°19.6	166°19.6	14.8′	N00°02.8	15.5′	56.6′
13	12°05.2	18.7	180°53.4	14.8′	S00°12.7	15.5′	56.6′
14	27°05.3	17.7	195°27.2	14.8′	00°28.2	15.5′	56.6′
15	42°05.4	·· 16.7	210°01.0	14.8′	00°43.7	15.5′	56.5′
16	57°05.6	15.8	224°34.8	14.9′	00°59.2	15.5′	56.5′
17	72°05.7	14.8	239°08.7	14.9′	01°14.7	15.4′	56.5′
18	87°05.8	S06°13.8	253°42.6	14.9′	S01°30.1	15.4′	56.5′
19	102°06.0	12.9	268°16.5	14.9′	01°45.5	15.4′	56.4′
20	117°06.1	11.9	282°50.4	14.9′	02°00.9	15.4′	56.4′
21	132°06.3	·· 10.9	297°24.4	15.0′	02°16.3	15.4′	56.4′
22	147°06.4	10.0	311°58.3	15.0′	02°31.7	15.3′	56.4′
23	162°06.5	09.0	326°32.3	15.0′	02°47.0	15.3′	56.3′
	SD = 16.1′	d = 1.0′	SD = 15.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:00	06:18	07:26	16:59	18:08	19:27
N 70°	05:06	06:17	07:18	17:08	18:09	19:20
68°	05:11	06:15	07:11	17:14	18:10	19:15
66°	05:15	06:14	07:05	17:20	18:11	19:11
64°	05:18	06:13	07:01	17:25	18:12	19:07
62°	05:21	06:12	06:56	17:29	18:13	19:05
60°	05:23	06:11	06:53	17:32	18:14	19:02
N 58°	05:25	06:10	06:49	17:35	18:15	19:00
56°	05:26	06:09	06:47	17:38	18:16	18:59
54°	05:28	06:09	06:44	17:41	18:16	18:57
52°	05:29	06:08	06:42	17:43	18:17	18:56
50°	05:30	06:07	06:39	17:45	18:18	18:55
45°	05:31	06:05	06:35	17:50	18:19	18:53
N 40°	05:32	06:03	06:31	17:54	18:21	18:52
35°	05:32	06:02	06:27	17:57	18:23	18:52
30°	05:32	06:00	06:24	18:00	18:24	18:52
20°	05:31	05:56	06:18	18:06	18:28	18:53
N 10°	05:28	05:52	06:13	18:11	18:32	18:56
0°	05:24	05:48	06:09	18:15	18:36	19:00
S 10°	05:18	05:43	06:04	18:20	18:41	19:06
20°	05:10	05:36	05:58	18:25	18:47	19:13
30°	05:00	05:28	05:52	18:31	18:55	19:24
35°	04:53	05:23	05:49	18:35	19:00	19:30
40°	04:44	05:17	05:45	18:39	19:06	19:39
45°	04:34	05:10	05:40	18:43	19:13	19:49
S 50°	04:20	05:01	05:34	18:49	19:22	20:02
52°	04:14	04:56	05:31	18:51	19:26	20:09
54°	04:06	04:52	05:28	18:54	19:31	20:16
56°	03:58	04:46	05:25	18:57	19:36	20:24
58°	03:48	04:40	05:21	19:01	19:42	20:33
S 60°	03:37	04:33	05:17	19:05	19:49	20:44

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	14:58	17:22	19:33	08:24	07:37	07:01
N 70°	15:19	17:29	19:30	08:00	07:26	06:59
68°	15:35	17:35	19:28	07:42	07:18	06:58
66°	15:48	17:40	19:26	07:27	07:11	06:57
64°	15:58	17:44	19:24	07:15	07:05	06:56
62°	16:08	17:47	19:23	07:04	07:00	06:55
60°	16:15	17:50	19:21	06:55	06:55	06:54
N 58°	16:22	17:53	19:20	06:47	06:51	06:54
56°	16:28	17:55	19:19	06:40	06:47	06:53
54°	16:33	17:57	19:18	06:34	06:44	06:52
52°	16:38	17:59	19:18	06:28	06:41	06:52
50°	16:42	18:01	19:17	06:23	06:38	06:52
45°	16:52	18:05	19:15	06:12	06:32	06:50
N 40°	16:59	18:08	19:14	06:03	06:27	06:50
35°	17:06	18:11	19:13	05:54	06:23	06:49
30°	17:12	18:13	19:12	05:47	06:19	06:48
20°	17:22	18:17	19:10	05:35	06:12	06:47
N 10°	17:30	18:21	19:09	05:24	06:06	06:46
0°	17:39	18:24	19:08	05:13	06:01	06:45
S 10°	17:47	18:27	19:06	05:03	05:55	06:44
20°	17:55	18:31	19:05	04:52	05:49	06:43
30°	18:05	18:35	19:03	04:39	05:41	06:42
35°	18:10	18:37	19:03	04:31	05:37	06:41
40°	18:17	18:40	19:02	04:22	05:33	06:40
45°	18:24	18:43	19:01	04:12	05:27	06:39
S 50°	18:33	18:47	18:59	04:00	05:20	06:38
52°	18:37	18:48	18:59	03:54	05:17	06:37
54°	18:41	18:50	18:58	03:48	05:14	06:36
56°	18:46	18:52	18:57	03:40	05:10	06:36
58°	18:52	18:54	18:57	03:32	05:06	06:35
S 60°	18:58	18:57	18:56	03:23	05:01	06:34

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 13-15 97-100%
02	12:12	12:05	12:12	23:50	11:26	
03	11:59	11:53	12:12	–:–	12:12	
04	11:46	11:40	12:12	00:35	12:56	

March 05, 06, 07 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162°45.5	163°54.0	S01°54.0	188°27.8	S11°49.3	56°16.5	N22°55.5	159°53.4	S01°04.6
1	177°48.0	178°53.6	52.7	203°28.4	48.6	71°19.0	55.5	174°55.6	04.4
2	192°50.4	193°53.2	51.4	218°29.0	47.9	86°21.5	55.5	189°57.8	04.3
3	207°52.9	208°52.8	·· 50.2	233°29.6	·· 47.2	101°24.1	·· 55.5	205°00.0	·· 04.2
4	222°55.4	223°52.5	48.9	248°30.1	46.5	116°26.6	55.5	220°02.2	04.1
5	237°57.8	238°52.1	47.6	263°30.7	45.8	131°29.1	55.5	235°04.3	03.9
6	253°00.3	253°51.7	S01°46.3	278°31.3	S11°45.1	146°31.6	N22°55.5	250°06.5	S01°03.8
7	268°02.8	268°51.4	45.0	293°31.9	44.4	161°34.1	55.5	265°08.7	03.7
8	283°05.2	283°51.0	43.8	308°32.5	43.7	176°36.6	55.5	280°10.9	03.6
9	298°07.7	298°50.6	·· 42.5	323°33.1	·· 43.0	191°39.1	·· 55.5	295°13.1	·· 03.5
10	313°10.1	313°50.2	41.2	338°33.7	42.2	206°41.7	55.5	310°15.3	03.3
11	328°12.6	328°49.9	39.9	353°34.2	41.5	221°44.2	55.6	325°17.5	03.2
12	343°15.1	343°49.5	S01°38.6	8°34.8	S11°40.8	236°46.7	N22°55.6	340°19.7	S01°03.1
13	358°17.5	358°49.1	37.3	23°35.4	40.1	251°49.2	55.6	355°21.8	03.0
14	13°20.0	13°48.8	36.1	38°36.0	39.4	266°51.7	55.6	10°24.0	02.9
15	28°22.5	28°48.4	·· 34.8	53°36.6	·· 38.7	281°54.2	·· 55.6	25°26.2	·· 02.7
16	43°24.9	43°48.0	33.5	68°37.2	38.0	296°56.7	55.6	40°28.4	02.6
17	58°27.4	58°47.6	32.2	83°37.8	37.3	311°59.3	55.6	55°30.6	02.5
18	73°29.9	73°47.3	S01°30.9	98°38.4	S11°36.6	327°01.8	N22°55.6	70°32.8	S01°02.4
19	88°32.3	88°46.9	29.6	113°39.0	35.9	342°04.3	55.6	85°35.0	02.2
20	103°34.8	103°46.5	28.4	128°39.5	35.1	357°06.8	55.6	100°37.1	02.1
21	118°37.2	118°46.2	·· 27.1	143°40.1	·· 34.4	12°09.3	·· 55.6	115°39.3	·· 02.0
22	133°39.7	133°45.8	25.8	158°40.7	33.7	27°11.8	55.6	130°41.5	01.9
23	148°42.2	148°45.4	24.5	173°41.3	33.0	42°14.3	55.6	145°43.7	01.8
Mer.pass. 13:07		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.41	ν 2.2′	d 0.1′ m 0.98

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	163°44.6	163°45.1	S01°23.2	188°41.9	S11°32.3	57°16.8	N22°55.7	160°45.9	S01°01.6
1	178°47.1	178°44.7	21.9	203°42.5	31.6	72°19.3	55.7	175°48.1	01.5
2	193°49.6	193°44.3	20.6	218°43.1	30.9	87°21.8	55.7	190°50.3	01.4
3	208°52.0	208°43.9	·· 19.4	233°43.7	·· 30.2	102°24.4	·· 55.7	205°52.5	·· 01.3
4	223°54.5	223°43.6	18.1	248°44.3	29.5	117°26.9	55.7	220°54.6	01.1
5	238°57.0	238°43.2	16.8	263°44.9	28.7	132°29.4	55.7	235°56.8	01.0
6	253°59.4	253°42.8	S01°15.5	278°45.4	S11°28.0	147°31.9	N22°55.7	250°59.0	S01°00.9
7	269°01.9	268°42.5	14.2	293°46.0	27.3	162°34.4	55.7	266°01.2	00.8
8	284°04.4	283°42.1	12.9	308°46.6	26.6	177°36.9	55.7	281°03.4	00.7
9	299°06.8	298°41.7	·· 11.7	323°47.2	·· 25.9	192°39.4	·· 55.7	296°05.6	·· 00.5
10	314°09.3	313°41.4	10.4	338°47.8	25.2	207°41.9	55.7	311°07.8	00.4
11	329°11.7	328°41.0	09.1	353°48.4	24.5	222°44.4	55.7	326°09.9	00.3
12	344°14.2	343°40.6	S01°07.8	8°49.0	S11°23.8	237°46.9	N22°55.7	341°12.1	S01°00.2
13	359°16.7	358°40.2	06.5	23°49.6	23.0	252°49.4	55.7	356°14.3	01°00.1
14	14°19.1	13°39.9	05.2	38°50.2	22.3	267°51.9	55.7	11°16.5	00°59.9
15	29°21.6	28°39.5	·· 03.9	53°50.8	·· 21.6	282°54.4	·· 55.8	26°18.7	·· 59.8
16	44°24.1	43°39.1	02.7	68°51.4	20.9	297°56.9	55.8	41°20.9	59.7
17	59°26.5	58°38.8	01.4	83°52.0	20.2	312°59.4	55.8	56°23.1	59.6
18	74°29.0	73°38.4	S01°00.1	98°52.5	S11°19.5	328°01.9	N22°55.8	71°25.3	S00°59.4
19	89°31.5	88°38.0	00°58.8	113°53.1	18.8	343°04.4	55.8	86°27.4	59.3
20	104°33.9	103°37.7	57.5	128°53.7	18.0	358°06.9	55.8	101°29.6	59.2
21	119°36.4	118°37.3	·· 56.2	143°54.3	·· 17.3	13°09.4	·· 55.8	116°31.8	·· 59.1
22	134°38.8	133°36.9	54.9	158°54.9	16.6	28°11.9	55.8	131°34.0	59.0
23	149°41.3	148°36.6	53.7	173°55.5	15.9	43°14.4	55.8	146°36.2	58.8
Mer.pass. 13:03		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.40	ν 2.2′	d 0.1′ m 0.98

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	164°43.8	163°36.2	S00°52.4	188°56.1	S11°15.2	58°16.9	N22°55.8	161°38.4	S00°58.7
1	179°46.2	178°35.8	51.1	203°56.7	14.5	73°19.4	55.8	176°40.6	58.6
2	194°48.7	193°35.5	49.8	218°57.3	13.8	88°21.9	55.8	191°42.7	58.5
3	209°51.2	208°35.1	·· 48.5	233°57.9	·· 13.0	103°24.4	·· 55.8	206°44.9	·· 58.3
4	224°53.6	223°34.7	47.2	248°58.5	12.3	118°26.9	55.8	221°47.1	58.2
5	239°56.1	238°34.4	45.9	263°59.1	11.6	133°29.4	55.8	236°49.3	58.1
6	254°58.6	253°34.0	S00°44.7	278°59.7	S11°10.9	148°31.9	N22°55.9	251°51.5	S00°58.0
7	270°01.0	268°33.6	43.4	294°00.3	10.2	163°34.4	55.9	266°53.7	57.9
8	285°03.5	283°33.3	42.1	309°00.9	09.5	178°36.9	55.9	281°55.9	57.7
9	300°06.0	298°32.9	·· 40.8	324°01.5	·· 08.7	193°39.4	·· 55.9	296°58.0	·· 57.6
10	315°08.4	313°32.5	39.5	339°02.0	08.0	208°41.9	55.9	312°00.2	57.5
11	330°10.9	328°32.2	38.2	354°02.6	07.3	223°44.4	55.9	327°02.4	57.4
12	345°13.3	343°31.8	S00°36.9	9°03.2	S11°06.6	238°46.9	N22°55.9	342°04.6	S00°57.2
13	0°15.8	358°31.4	35.7	24°03.8	05.9	253°49.4	55.9	357°06.8	57.1
14	15°18.3	13°31.1	34.4	39°04.4	05.1	268°51.9	55.9	12°09.0	57.0
15	30°20.7	28°30.7	·· 33.1	54°05.0	·· 04.4	283°54.4	·· 55.9	27°11.1	·· 56.9
16	45°23.2	43°30.3	31.8	69°05.6	03.7	298°56.9	55.9	42°13.3	56.8
17	60°25.7	58°30.0	30.5	84°06.2	03.0	313°59.4	55.9	57°15.5	56.6
18	75°28.1	73°29.6	S00°29.2	99°06.8	S11°02.3	329°01.9	N22°55.9	72°17.7	S00°56.5
19	90°30.6	88°29.2	27.9	114°07.4	01.6	344°04.4	55.9	87°19.9	56.4
20	105°33.1	103°28.9	26.6	129°08.0	00.8	359°06.9	55.9	102°22.1	56.3
21	120°35.5	118°28.5	·· 25.4	144°08.6	11°00.1	14°09.4	·· 55.9	117°24.3	·· 56.1
22	135°38.0	133°28.1	24.1	159°09.2	10°59.4	29°11.9	55.9	132°26.4	56.0
23	150°40.5	148°27.8	22.8	174°09.8	58.7	44°14.4	55.9	147°28.6	55.9
Mer.pass. 12:59		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.39	ν 2.2′	d 0.1′ m 0.98

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°10.0
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.4
Hamal	327°50.3	23°35.2
Polaris	313°46.3	89°22.8
Acamar	315°11.2	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.1	49°57.4
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.4	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.8	-52°42.8
Sirius	258°25.2	-16°45.3
Adhara	255°04.9	-29°00.7
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°13.9	-59°35.8
Suhail	222°45.2	-43°32.5
Miaplacidus	221°37.3	-69°49.6
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.6
Gacrux	171°50.1	-57°15.6
Alioth	166°11.6	55°48.8
Spica	158°21.0	-11°18.0
Alkaid	152°50.9	49°10.6
Hadar	148°34.2	-60°29.8
Menkent	147°56.2	-36°29.9
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.6	-60°56.5
Kochab	137°19.2	74°02.5
Zuben'ubi	136°54.8	-16°09.1
Alphecca	126°02.8	26°37.3
Antares	112°14.6	-26°29.4
Atria	107°08.0	-69°04.2
Sabik	102°01.7	-15°45.5
Shaula	96°09.1	-37°07.3
Rasalhague	95°57.7	12°32.2
Eltanin	90°41.9	51°28.7
Kaus Aust.	83°31.4	-34°22.3
Vega	80°32.7	38°48.1
Nunki	75°46.7	-26°15.8
Altair	61°59.2	8°56.1
Peacock	53°04.7	-56°38.9
Deneb	49°25.5	45°22.2
Enif	33°38.2	9°59.6
Al Na'ir	27°32.1	-46°50.1
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.3	15°20.7

Mar 05 Thu	SHA	Mer.pass
Venus	1°08.5	13:05
Mars	25°42.3	11:26
Jupiter	253°31.0	20:12
Saturn	357°07.9	13:18

Mar 06 Fri	SHA	Mer.pass
Venus	0°00.4	13:05
Mars	24°57.3	11:25
Jupiter	253°32.2	20:08
Saturn	357°01.3	13:15

Mar 07 Sat	SHA	Mer.pass
Venus	358°52.4	13:06
Mars	24°12.3	11:24
Jupiter	253°33.2	20:04
Saturn	356°54.6	13:12

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°06.7	S06°08.1	341°06.3	15.0′	S03°02.3	15.3′	56.3′
1	192°06.8	07.1	355°40.3	15.0′	03°17.6	15.2′	56.3′
2	207°07.0	06.1	10°14.3	15.0′	03°32.8	15.3′	56.3′
3	222°07.1	·· 05.2	24°48.3	15.0′	03°48.1	15.1′	56.2′
4	237°07.2	04.2	39°22.4	15.1′	04°03.2	15.2′	56.2′
5	252°07.4	03.2	53°56.4	15.1′	04°18.4	15.1′	56.2′
6	267°07.5	S06°02.3	68°30.5	15.1′	S04°33.5	15.1′	56.2′
7	282°07.7	01.3	83°04.6	15.1′	04°48.6	15.1′	56.1′
8	297°07.8	06°00.3	97°38.6	15.1′	05°03.7	15.0′	56.1′
9	312°08.0	05°59.4	112°12.7	15.1′	05°18.7	15.0′	56.1′
10	327°08.1	58.4	126°46.8	15.1′	05°33.7	14.9′	56.1′
11	342°08.2	57.4	141°20.9	15.1′	05°48.6	14.9′	56.0′
12	357°08.4	S05°56.5	155°55.0	15.1′	S06°03.5	14.9′	56.0′
13	12°08.5	55.5	170°29.1	15.1′	06°18.4	14.8′	56.0′
14	27°08.7	54.5	185°03.2	15.1′	06°33.2	14.8′	56.0′
15	42°08.8	·· 53.6	199°37.2	15.1′	06°48.0	14.8′	55.9′
16	57°08.9	52.6	214°11.3	15.1′	07°02.8	14.7′	55.9′
17	72°09.1	51.6	228°45.4	15.1′	07°17.5	14.6′	55.9′
18	87°09.2	S05°50.7	243°19.5	15.1′	S07°32.1	14.6′	55.9′
19	102°09.4	49.7	257°53.6	15.1′	07°46.7	14.6′	55.8′
20	117°09.5	48.7	272°27.7	15.1′	08°01.3	14.5′	55.8′
21	132°09.7	·· 47.8	287°01.7	15.1′	08°15.8	14.5′	55.8′
22	147°09.8	46.8	301°35.8	15.0′	08°30.3	14.4′	55.8′
23	162°10.0	45.8	316°09.8	15.0′	08°44.7	14.4′	55.7′
	SD = 16.1′	d = 1.0′	SD = 15.4′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°10.1	S05°44.9	330°43.9	15.0′	S08°59.1	14.4′	55.7′
1	192°10.2	43.9	345°17.9	15.0′	09°13.5	14.2′	55.7′
2	207°10.4	42.9	359°51.9	15.0′	09°27.7	14.3′	55.7′
3	222°10.5	·· 41.9	14°25.9	15.0′	09°42.0	14.1′	55.6′
4	237°10.7	41.0	28°59.9	15.0′	09°56.1	14.2′	55.6′
5	252°10.8	40.0	43°33.9	15.0′	10°10.3	14.0′	55.6′
6	267°11.0	S05°39.0	58°07.8	14.9′	S10°24.3	14.0′	55.6′
7	282°11.1	38.1	72°41.8	14.9′	10°38.3	14.0′	55.5′
8	297°11.3	37.1	87°15.7	14.9′	10°52.3	13.9′	55.5′
9	312°11.4	·· 36.1	101°49.6	14.9′	11°06.2	13.8′	55.5′
10	327°11.5	35.2	116°23.5	14.9′	11°20.0	13.8′	55.5′
11	342°11.7	34.2	130°57.4	14.9′	11°33.8	13.7′	55.5′
12	357°11.8	S05°33.2	145°31.3	14.8′	S11°47.5	13.7′	55.4′
13	12°12.0	32.3	160°05.1	14.8′	12°01.2	13.6′	55.4′
14	27°12.1	31.3	174°38.9	14.8′	12°14.8	13.6′	55.4′
15	42°12.3	·· 30.3	189°12.7	14.8′	12°28.4	13.4′	55.4′
16	57°12.4	29.3	203°46.4	14.7′	12°41.8	13.4′	55.3′
17	72°12.6	28.4	218°20.2	14.7′	12°55.2	13.4′	55.3′
18	87°12.7	S05°27.4	232°53.9	14.7′	S13°08.6	13.3′	55.3′
19	102°12.9	26.4	247°27.6	14.7′	13°21.9	13.2′	55.3′
20	117°13.0	25.5	262°01.2	14.6′	13°35.1	13.1′	55.2′
21	132°13.2	·· 24.5	276°34.9	14.6′	13°48.2	13.1′	55.2′
22	147°13.3	23.5	291°08.5	14.6′	14°01.3	13.0′	55.2′
23	162°13.5	22.5	305°42.0	14.5′	14°14.3	13.0′	55.2′
	SD = 16.1′	d = 1.0′	SD = 15.2′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°13.6	S05°21.6	320°15.6	14.5′	S14°27.3	12.9′	55.2′
1	192°13.8	20.6	334°49.1	14.5′	14°40.2	12.8′	55.1′
2	207°13.9	19.6	349°22.6	14.4′	14°53.0	12.7′	55.1′
3	222°14.1	·· 18.7	3°56.0	14.4′	15°05.7	12.7′	55.1′
4	237°14.2	17.7	18°29.4	14.4′	15°18.4	12.6′	55.1′
5	252°14.4	16.7	33°02.8	14.3′	15°31.0	12.5′	55.1′
6	267°14.5	S05°15.7	47°36.1	14.3′	S15°43.5	12.4′	55.0′
7	282°14.7	14.8	62°09.4	14.3′	15°55.9	12.4′	55.0′
8	297°14.8	13.8	76°42.7	14.2′	16°08.3	12.3′	55.0′
9	312°15.0	·· 12.8	91°15.9	14.2′	16°20.6	12.2′	55.0′
10	327°15.1	11.9	105°49.1	14.2′	16°32.8	12.1′	55.0′
11	342°15.3	10.9	120°22.3	14.1′	16°44.9	12.1′	54.9′
12	357°15.4	S05°09.9	134°55.4	14.1′	S16°57.0	11.9′	54.9′
13	12°15.6	08.9	149°28.5	14.0′	17°08.9	11.9′	54.9′
14	27°15.7	08.0	164°01.5	14.0′	17°20.8	11.8′	54.9′
15	42°15.9	·· 07.0	178°34.5	14.0′	17°32.6	11.8′	54.9′
16	57°16.0	06.0	193°07.5	13.9′	17°44.4	11.6′	54.8′
17	72°16.2	05.0	207°40.4	13.9′	17°56.0	11.6′	54.8′
18	87°16.3	S05°04.1	222°13.3	13.8′	S18°07.6	11.5′	54.8′
19	102°16.5	03.1	236°46.1	13.8′	18°19.1	11.4′	54.8′
20	117°16.6	02.1	251°18.9	13.7′	18°30.5	11.3′	54.8′
21	132°16.8	·· 01.1	265°51.6	13.7′	18°41.8	11.2′	54.8′
22	147°16.9	05°00.2	280°24.3	13.7′	18°53.0	11.1′	54.7′
23	162°17.1	04°59.2	294°57.0	13.6′	19°04.1	11.1′	54.7′
	SD = 16.1′	d = 1.0′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:44	06:03	07:11	17:14	18:22	19:41
N 70°	04:52	06:03	07:04	17:20	18:21	19:33
68°	04:59	06:03	06:59	17:25	18:21	19:26
66°	05:04	06:03	06:54	17:30	18:21	19:21
64°	05:08	06:03	06:50	17:34	18:21	19:16
62°	05:11	06:03	06:47	17:37	18:21	19:13
60°	05:14	06:02	06:44	17:40	18:21	19:10
N 58°	05:17	06:02	06:41	17:42	18:22	19:07
56°	05:19	06:02	06:39	17:45	18:22	19:05
54°	05:21	06:02	06:37	17:47	18:22	19:03
52°	05:22	06:01	06:35	17:49	18:22	19:01
50°	05:24	06:01	06:33	17:50	18:23	19:00
45°	05:26	06:00	06:29	17:54	18:23	18:57
N 40°	05:28	05:59	06:26	17:57	18:24	18:56
35°	05:28	05:58	06:23	18:00	18:25	18:55
30°	05:29	05:57	06:20	18:02	18:26	18:54
20°	05:28	05:54	06:16	18:07	18:29	18:54
N 10°	05:26	05:51	06:12	18:11	18:32	18:56
0°	05:23	05:47	06:08	18:14	18:35	18:59
S 10°	05:18	05:43	06:04	18:18	18:39	19:04
20°	05:11	05:37	05:59	18:23	18:45	19:11
30°	05:02	05:30	05:54	18:28	18:52	19:20
35°	04:56	05:26	05:51	18:31	18:56	19:26
40°	04:48	05:20	05:48	18:34	19:01	19:34
45°	04:38	05:14	05:44	18:38	19:08	19:43
S 50°	04:26	05:06	05:39	18:42	19:15	19:55
52°	04:20	05:02	05:37	18:45	19:19	20:01
54°	04:13	04:58	05:34	18:47	19:23	20:07
56°	04:06	04:53	05:31	18:50	19:28	20:15
58°	03:57	04:48	05:28	18:53	19:33	20:23
S 60°	03:47	04:41	05:25	18:56	19:39	20:33

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	21:43	·· ··	00:13	06:27	05:48	04:51
N 70°	21:30	23:39	·· ··	06:33	06:05	05:26
68°	21:19	23:15	·· ··	06:39	06:18	05:52
66°	21:10	22:57	·· ··	06:43	06:29	06:11
64°	21:02	22:43	·· ··	06:47	06:38	06:27
62°	20:56	22:30	·· ··	06:50	06:46	06:41
60°	20:51	22:20	23:51	06:53	06:52	06:52
N 58°	20:46	22:11	23:38	06:56	06:58	07:02
56°	20:41	22:03	23:26	06:58	07:04	07:10
54°	20:38	21:56	23:15	07:00	07:09	07:18
52°	20:34	21:50	23:06	07:02	07:13	07:25
50°	20:31	21:45	22:58	07:04	07:17	07:31
45°	20:24	21:33	22:41	07:08	07:26	07:45
N 40°	20:19	21:23	22:27	07:11	07:33	07:56
35°	20:14	21:14	22:15	07:14	07:39	08:06
30°	20:10	21:07	22:05	07:16	07:45	08:15
20°	20:02	20:54	21:47	07:21	07:54	08:29
N 10°	19:56	20:44	21:32	07:24	08:03	08:42
0°	19:50	20:33	21:17	07:28	08:11	08:54
S 10°	19:45	20:23	21:03	07:32	08:19	09:07
20°	19:38	20:12	20:48	07:35	08:27	09:20
30°	19:31	20:00	20:31	07:40	08:37	09:35
35°	19:27	19:53	20:21	07:42	08:43	09:44
40°	19:23	19:45	20:10	07:45	08:50	09:54
45°	19:18	19:36	19:57	07:49	08:57	10:05
S 50°	19:12	19:25	19:41	07:53	09:06	10:20
52°	19:09	19:20	19:34	07:54	09:11	10:27
54°	19:06	19:15	19:25	07:56	09:15	10:34
56°	19:02	19:09	19:16	07:59	09:21	10:43
58°	18:59	19:02	19:06	08:01	09:27	10:52
S 60°	18:55	18:54	18:54	08:04	09:33	11:03

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 16-18 97-87%
05	11:33	11:26	12:11	01:18	13:39	
06	11:20	11:13	12:11	02:01	14:22	
07	11:06	10:58	12:11	02:44	15:06	

March 08, 09, 10 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	165°42.9	163°27.4	S00°21.5	189°10.4	S10°58.0	59°16.8	N22°56.0	162°30.8	S00°55.8
1	180°45.4	178°27.0	20.2	204°11.0	57.2	74°19.3	56.0	177°33.0	55.7
2	195°47.8	193°26.7	18.9	219°11.6	56.5	89°21.8	56.0	192°35.2	55.5
3	210°50.3	208°26.3	·· 17.6	234°12.2	·· 55.8	104°24.3	·· 56.0	207°37.4	·· 55.4
4	225°52.8	223°25.9	16.4	249°12.8	55.1	119°26.8	56.0	222°39.6	55.3
5	240°55.2	238°25.6	15.1	264°13.4	54.4	134°29.3	56.0	237°41.7	55.2
6	255°57.7	253°25.2	S00°13.8	279°14.0	S10°53.6	149°31.8	N22°56.0	252°43.9	S00°55.0
7	271°00.2	268°24.8	12.5	294°14.6	52.9	164°34.3	56.0	267°46.1	54.9
8	286°02.6	283°24.5	11.2	309°15.2	52.2	179°36.8	56.0	282°48.3	54.8
9	301°05.1	298°24.1	·· 09.9	324°15.8	·· 51.5	194°39.3	·· 56.0	297°50.5	·· 54.7
10	316°07.6	313°23.7	08.6	339°16.4	50.7	209°41.7	56.0	312°52.7	54.6
11	331°10.0	328°23.4	07.3	354°17.0	50.0	224°44.2	56.0	327°54.8	54.4
12	346°12.5	343°23.0	S00°06.1	9°17.6	S10°49.3	239°46.7	N22°56.0	342°57.0	S00°54.3
13	1°14.9	358°22.6	04.8	24°18.2	48.6	254°49.2	56.0	357°59.2	54.2
14	16°17.4	13°22.3	03.5	39°18.8	47.9	269°51.7	56.0	13°01.4	54.1
15	31°19.9	28°21.9	·· 02.2	54°19.4	·· 47.1	284°54.2	·· 56.0	28°03.6	·· 53.9
16	46°22.3	43°21.5	S00°00.9	69°20.0	46.4	299°56.7	56.0	43°05.8	53.8
17	61°24.8	58°21.2	N00°00.4	84°20.6	45.7	314°59.1	56.0	58°08.0	53.7
18	76°27.3	73°20.8	N00°01.7	99°21.2	S10°45.0	330°01.6	N22°56.0	73°10.1	S00°53.6
19	91°29.7	88°20.4	03.0	114°21.8	44.2	345°04.1	56.0	88°12.3	53.5
20	106°32.2	103°20.1	04.2	129°22.4	43.5	0°06.6	56.0	103°14.5	53.3
21	121°34.7	118°19.7	·· 05.5	144°23.0	·· 42.8	15°09.1	·· 56.1	118°16.7	·· 53.2
22	136°37.1	133°19.4	06.8	159°23.6	42.1	30°11.6	56.1	133°18.9	53.1
23	151°39.6	148°19.0	08.1	174°24.2	41.3	45°14.1	56.1	148°21.1	53.0
Mer.pass. 12:55		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.39	ν 2.2′	d 0.1′ m 0.97

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	166°42.1	163°18.6	N00°09.4	189°24.8	S10°40.6	60°16.5	N22°56.1	163°23.2	S00°52.8
1	181°44.5	178°18.3	10.7	204°25.4	39.9	75°19.0	56.1	178°25.4	52.7
2	196°47.0	193°17.9	12.0	219°26.0	39.2	90°21.5	56.1	193°27.6	52.6
3	211°49.4	208°17.5	·· 13.3	234°26.6	·· 38.4	105°24.0	·· 56.1	208°29.8	·· 52.5
4	226°51.9	223°17.2	14.5	249°27.2	37.7	120°26.5	56.1	223°32.0	52.4
5	241°54.4	238°16.8	15.8	264°27.8	37.0	135°28.9	56.1	238°34.2	52.2
6	256°56.8	253°16.4	N00°17.1	279°28.4	S10°36.3	150°31.4	N22°56.1	253°36.3	S00°52.1
7	271°59.3	268°16.1	18.4	294°29.0	35.5	165°33.9	56.1	268°38.5	52.0
8	287°01.8	283°15.7	19.7	309°29.6	34.8	180°36.4	56.1	283°40.7	51.9
9	302°04.2	298°15.3	·· 21.0	324°30.2	·· 34.1	195°38.9	·· 56.1	298°42.9	·· 51.7
10	317°06.7	313°15.0	22.3	339°30.8	33.4	210°41.3	56.1	313°45.1	51.6
11	332°09.2	328°14.6	23.6	354°31.4	32.6	225°43.8	56.1	328°47.3	51.5
12	347°11.6	343°14.3	N00°24.9	9°32.0	S10°31.9	240°46.3	N22°56.1	343°49.5	S00°51.4
13	2°14.1	358°13.9	26.1	24°32.6	31.2	255°48.8	56.1	358°51.6	51.3
14	17°16.6	13°13.5	27.4	39°33.2	30.5	270°51.3	56.1	13°53.8	51.1
15	32°19.0	28°13.2	·· 28.7	54°33.8	·· 29.7	285°53.7	·· 56.1	28°56.0	·· 51.0
16	47°21.5	43°12.8	30.0	69°34.4	29.0	300°56.2	56.1	43°58.2	50.9
17	62°23.9	58°12.4	31.3	84°35.0	28.3	315°58.7	56.1	59°00.4	50.8
18	77°26.4	73°12.1	N00°32.6	99°35.6	S10°27.6	331°01.2	N22°56.1	74°02.6	S00°50.6
19	92°28.9	88°11.7	33.9	114°36.2	26.8	346°03.6	56.1	89°04.7	50.5
20	107°31.3	103°11.3	35.2	129°36.8	26.1	1°06.1	56.1	104°06.9	50.4
21	122°33.8	118°11.0	·· 36.4	144°37.4	·· 25.4	16°08.6	·· 56.1	119°09.1	·· 50.3
22	137°36.3	133°10.6	37.7	159°38.0	24.6	31°11.1	56.2	134°11.3	50.1
23	152°38.7	148°10.3	39.0	174°38.6	23.9	46°13.5	56.2	149°13.5	50.0
Mer.pass. 12:51		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.38	ν 2.2′	d 0.1′ m 0.97

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	167°41.2	163°09.9	N00°40.3	189°39.2	S10°23.2	61°16.0	N22°56.2	164°15.7	S00°49.9
1	182°43.7	178°09.5	41.6	204°39.8	22.5	76°18.5	56.2	179°17.8	49.8
2	197°46.1	193°09.2	42.9	219°40.4	21.7	91°21.0	56.2	194°20.0	49.7
3	212°48.6	208°08.8	·· 44.2	234°41.0	·· 21.0	106°23.4	·· 56.2	209°22.2	·· 49.5
4	227°51.0	223°08.4	45.5	249°41.7	20.3	121°25.9	56.2	224°24.4	49.4
5	242°53.5	238°08.1	46.7	264°42.3	19.5	136°28.4	56.2	239°26.6	49.3
6	257°56.0	253°07.7	N00°48.0	279°42.9	S10°18.8	151°30.9	N22°56.2	254°28.8	S00°49.2
7	272°58.4	268°07.3	49.3	294°43.5	18.1	166°33.3	56.2	269°30.9	49.0
8	288°00.9	283°07.0	50.6	309°44.1	17.4	181°35.8	56.2	284°33.1	48.9
9	303°03.4	298°06.6	·· 51.9	324°44.7	·· 16.6	196°38.3	·· 56.2	299°35.3	·· 48.8
10	318°05.8	313°06.3	53.2	339°45.3	15.9	211°40.7	56.2	314°37.5	48.7
11	333°08.3	328°05.9	54.5	354°45.9	15.2	226°43.2	56.2	329°39.7	48.6
12	348°10.8	343°05.5	N00°55.8	9°46.5	S10°14.4	241°45.7	N22°56.2	344°41.9	S00°48.4
13	3°13.2	358°05.2	57.0	24°47.1	13.7	256°48.1	56.2	359°44.0	48.3
14	18°15.7	13°04.8	58.3	39°47.7	13.0	271°50.6	56.2	14°46.2	48.2
15	33°18.2	28°04.4	00°59.6	54°48.3	·· 12.2	286°53.1	·· 56.2	29°48.4	·· 48.1
16	48°20.6	43°04.1	01°00.9	69°48.9	11.5	301°55.6	56.2	44°50.6	47.9
17	63°23.1	58°03.7	02.2	84°49.5	10.8	316°58.0	56.2	59°52.8	47.8
18	78°25.5	73°03.3	N01°03.5	99°50.1	S10°10.1	332°00.5	N22°56.2	74°55.0	S00°47.7
19	93°28.0	88°03.0	04.8	114°50.7	09.3	347°03.0	56.2	89°57.1	47.6
20	108°30.5	103°02.6	06.1	129°51.3	08.6	2°05.4	56.2	104°59.3	47.4
21	123°32.9	118°02.3	·· 07.3	144°52.0	·· 07.9	17°07.9	·· 56.2	120°01.5	·· 47.3
22	138°35.4	133°01.9	08.6	159°52.6	07.1	32°10.4	56.2	135°03.7	47.2
23	153°37.9	148°01.5	09.9	174°53.2	06.4	47°12.8	56.2	150°05.9	47.1
Mer.pass. 12:47		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.15	ν 2.5′	d 0.0′ m -2.37	ν 2.2′	d 0.1′ m 0.97

Stars

	SHA	**Dec**
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.4
Hamal	327°50.3	23°35.2
Polaris	313°47.5	89°22.7
Acamar	315°11.2	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.1	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.4	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.8	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°04.9	-29°00.7
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°13.9	-59°35.8
Suhail	222°45.2	-43°32.5
Miaplacidus	221°37.3	-69°49.6
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.7
Gacrux	171°50.1	-57°15.6
Alioth	166°11.6	55°48.8
Spica	158°21.0	-11°18.0
Alkaid	152°50.9	49°10.6
Hadar	148°34.2	-60°29.9
Menkent	147°56.2	-36°29.9
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.6	-60°56.5
Kochab	137°19.1	74°02.5
Zuben'ubi	136°54.8	-16°09.1
Alphecca	126°02.8	26°37.3
Antares	112°14.6	-26°29.4
Atria	107°07.9	-69°04.2
Sabik	102°01.7	-15°45.5
Shaula	96°09.1	-37°07.3
Rasalhague	95°57.7	12°32.2
Eltanin	90°41.8	51°28.7
Kaus Aust.	83°31.4	-34°22.3
Vega	80°32.7	38°48.1
Nunki	75°46.7	-26°15.8
Altair	61°59.2	8°56.1
Peacock	53°04.6	-56°38.9
Deneb	49°25.5	45°22.2
Enif	33°38.1	9°59.6
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.3	15°20.7

Mar 08 Sun	**SHA**	**Mer.pass**
Venus	357°44.5	13:06
Mars	23°27.5	11:23
Jupiter	253°33.9	20:00
Saturn	356°47.9	13:08

Mar 09 Mon	**SHA**	**Mer.pass**
Venus	356°36.6	13:07
Mars	22°42.7	11:22
Jupiter	253°34.5	19:56
Saturn	356°41.2	13:05

Mar 10 Tue	**SHA**	**Mer.pass**
Venus	355°28.7	13:08
Mars	21°58.0	11:21
Jupiter	253°34.8	19:52
Saturn	356°34.5	13:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°17.2	S04°58.2	309°29.6	13.6′	S19°15.2	10.9′	54.7′
1	192°17.4	57.3	324°02.2	13.5′	19°26.1	10.9′	54.7′
2	207°17.5	56.3	338°34.7	13.5′	19°37.0	10.8′	54.7′
3	222°17.7	·· 55.3	353°07.2	13.4′	19°47.8	10.7′	54.7′
4	237°17.8	54.3	7°39.6	13.4′	19°58.5	10.6′	54.6′
5	252°18.0	53.4	22°12.0	13.3′	20°09.1	10.5′	54.6′
6	267°18.1	S04°52.4	36°44.3	13.3′	S20°19.6	10.4′	54.6′
7	282°18.3	51.4	51°16.6	13.2′	20°30.0	10.3′	54.6′
8	297°18.4	50.4	65°48.8	13.2′	20°40.3	10.3′	54.6′
9	312°18.6	·· 49.5	80°21.0	13.1′	20°50.6	10.1′	54.6′
10	327°18.8	48.5	94°53.1	13.1′	21°00.7	10.0′	54.5′
11	342°18.9	47.5	109°25.2	13.0′	21°10.7	10.0′	54.5′
12	357°19.1	S04°46.5	123°57.2	13.0′	S21°20.7	9.8′	54.5′
13	12°19.2	45.5	138°29.2	12.9′	21°30.5	9.8′	54.5′
14	27°19.4	44.6	153°01.1	12.9′	21°40.3	9.6′	54.5′
15	42°19.5	·· 43.6	167°33.0	12.8′	21°49.9	9.5′	54.5′
16	57°19.7	42.6	182°04.8	12.8′	21°59.4	9.5′	54.5′
17	72°19.8	41.6	196°36.6	12.7′	22°08.9	9.3′	54.5′
18	87°20.0	S04°40.7	211°08.3	12.7′	S22°18.2	9.3′	54.4′
19	102°20.1	39.7	225°40.0	12.6′	22°27.5	9.1′	54.4′
20	117°20.3	38.7	240°11.6	12.6′	22°36.6	9.0′	54.4′
21	132°20.5	·· 37.7	254°43.2	12.5′	22°45.6	9.0′	54.4′
22	147°20.6	36.8	269°14.7	12.5′	22°54.6	8.8′	54.4′
23	162°20.8	35.8	283°46.1	12.4′	23°03.4	8.7′	54.4′
	SD = 16.1′	d = 1.0′	SD = 14.9′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°20.9	S04°34.8	298°17.5	12.4′	S23°12.1	8.6′	54.4′
1	192°21.1	33.8	312°48.9	12.3′	23°20.7	8.6′	54.4′
2	207°21.2	32.9	327°20.2	12.3′	23°29.3	8.4′	54.3′
3	222°21.4	·· 31.9	341°51.5	12.2′	23°37.7	8.3′	54.3′
4	237°21.6	30.9	356°22.7	12.1′	23°46.0	8.1′	54.3′
5	252°21.7	29.9	10°53.8	12.1′	23°54.1	8.1′	54.3′
6	267°21.9	S04°28.9	25°24.9	12.0′	S24°02.2	8.0′	54.3′
7	282°22.0	28.0	39°55.9	12.0′	24°10.2	7.8′	54.3′
8	297°22.2	27.0	54°26.9	11.9′	24°18.0	7.8′	54.3′
9	312°22.3	·· 26.0	68°57.9	11.9′	24°25.8	7.6′	54.3′
10	327°22.5	25.0	83°28.7	11.8′	24°33.4	7.5′	54.3′
11	342°22.7	24.1	97°59.6	11.8′	24°40.9	7.4′	54.3′
12	357°22.8	S04°23.1	112°30.4	11.7′	S24°48.3	7.3′	54.3′
13	12°23.0	22.1	127°01.1	11.7′	24°55.6	7.2′	54.3′
14	27°23.1	21.1	141°31.8	11.6′	25°02.8	7.1′	54.2′
15	42°23.3	·· 20.1	156°02.4	11.6′	25°09.9	6.9′	54.2′
16	57°23.4	19.2	170°33.0	11.5′	25°16.8	6.9′	54.2′
17	72°23.6	18.2	185°03.5	11.5′	25°23.7	6.7′	54.2′
18	87°23.8	S04°17.2	199°33.9	11.4′	S25°30.4	6.6′	54.2′
19	102°23.9	16.2	214°04.4	11.4′	25°37.0	6.5′	54.2′
20	117°24.1	15.2	228°34.7	11.3′	25°43.5	6.3′	54.2′
21	132°24.2	·· 14.3	243°05.1	11.3′	25°49.8	6.3′	54.2′
22	147°24.4	13.3	257°35.3	11.2′	25°56.1	6.1′	54.2′
23	162°24.6	12.3	272°05.5	11.2′	26°02.2	6.0′	54.2′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°24.7	S04°11.3	286°35.7	11.1′	S26°08.2	5.8′	54.2′
1	192°24.9	10.3	301°05.8	11.1′	26°14.0	5.8′	54.2′
2	207°25.0	09.4	315°35.9	11.0′	26°19.8	5.6′	54.2′
3	222°25.2	·· 08.4	330°05.9	11.0′	26°25.4	5.5′	54.2′
4	237°25.4	07.4	344°35.9	10.9′	26°30.9	5.4′	54.2′
5	252°25.5	06.4	359°05.9	10.9′	26°36.3	5.3′	54.2′
6	267°25.7	S04°05.4	13°35.8	10.8′	S26°41.6	5.1′	54.2′
7	282°25.8	04.5	28°05.6	10.8′	26°46.7	5.0′	54.2′
8	297°26.0	03.5	42°35.4	10.8′	26°51.7	4.9′	54.2′
9	312°26.2	·· 02.5	57°05.1	10.7′	26°56.6	4.8′	54.2′
10	327°26.3	01.5	71°34.9	10.7′	27°01.4	4.6′	54.2′
11	342°26.5	04°00.5	86°04.5	10.6′	27°06.0	4.5′	54.2′
12	357°26.6	S03°59.6	100°34.1	10.6′	S27°10.5	4.4′	54.2′
13	12°26.8	58.6	115°03.7	10.5′	27°14.9	4.3′	54.2′
14	27°27.0	57.6	129°33.3	10.5′	27°19.2	4.1′	54.2′
15	42°27.1	·· 56.6	144°02.8	10.5′	27°23.3	4.0′	54.2′
16	57°27.3	55.6	158°32.2	10.4′	27°27.3	3.8′	54.2′
17	72°27.5	54.7	173°01.7	10.4′	27°31.1	3.8′	54.2′
18	87°27.6	S03°53.7	187°31.0	10.3′	S27°34.9	3.6′	54.2′
19	102°27.8	52.7	202°00.4	10.3′	27°38.5	3.4′	54.2′
20	117°27.9	51.7	216°29.7	10.3′	27°41.9	3.4′	54.2′
21	132°28.1	·· 50.7	230°59.0	10.2′	27°45.3	3.2′	54.2′
22	147°28.3	49.8	245°28.2	10.2′	27°48.5	3.1′	54.2′
23	162°28.4	48.8	259°57.4	10.2′	27°51.6	2.9′	54.2′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:28	05:48	06:55	17:28	18:35	19:56
N 70°	04:38	05:50	06:50	17:33	18:34	19:46
68°	04:46	05:51	06:46	17:37	18:32	19:38
66°	04:52	05:52	06:43	17:40	18:31	19:31
64°	04:57	05:53	06:40	17:43	18:30	19:26
62°	05:02	05:53	06:37	17:45	18:29	19:21
60°	05:05	05:54	06:35	17:47	18:29	19:17
N 58°	05:08	05:54	06:33	17:49	18:28	19:14
56°	05:11	05:54	06:31	17:51	18:28	19:11
54°	05:13	05:54	06:30	17:52	18:28	19:09
52°	05:15	05:55	06:28	17:54	18:27	19:07
50°	05:17	05:55	06:27	17:55	18:27	19:05
45°	05:21	05:55	06:24	17:58	18:27	19:01
N 40°	05:23	05:54	06:21	18:00	18:27	18:59
35°	05:25	05:54	06:19	18:02	18:28	18:57
30°	05:25	05:53	06:17	18:04	18:28	18:56
20°	05:26	05:52	06:14	18:08	18:30	18:55
N 10°	05:25	05:49	06:10	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:14	18:34	18:59
S 10°	05:18	05:43	06:04	18:17	18:38	19:02
20°	05:13	05:38	06:00	18:20	18:42	19:08
30°	05:04	05:32	05:56	18:24	18:48	19:16
35°	04:58	05:28	05:54	18:27	18:52	19:22
40°	04:51	05:24	05:51	18:29	18:56	19:29
45°	04:43	05:18	05:48	18:32	19:02	19:37
S 50°	04:32	05:11	05:44	18:36	19:09	19:48
52°	04:26	05:08	05:42	18:38	19:12	19:53
54°	04:20	05:04	05:40	18:40	19:16	19:59
56°	04:13	05:00	05:38	18:42	19:20	20:06
58°	04:05	04:55	05:35	18:44	19:24	20:14
S 60°	03:56	04:50	05:33	18:47	19:30	20:23

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	03:04	▬	▬	03:34	▬	▬
68°	01:33	▬	▬	05:07	▬	▬
66°	00:55	03:44	▬	05:46	04:34	▬
64°	00:28	02:27	▬	06:14	05:52	▬
62°	00:08	01:51	03:42	06:35	06:29	06:19
60°	·· ··	01:25	02:59	06:52	06:55	07:02
N 58°	·· ··	01:05	02:30	07:07	07:16	07:31
56°	·· ··	00:48	02:08	07:20	07:33	07:54
54°	·· ··	00:34	01:50	07:31	07:47	08:12
52°	·· ··	00:22	01:34	07:40	08:00	08:28
50°	·· ··	00:11	01:21	07:49	08:11	08:41
45°	23:48	·· ··	00:54	08:08	08:35	09:09
N 40°	23:30	·· ··	00:33	08:23	08:54	09:31
35°	23:15	·· ··	00:15	08:36	09:10	09:49
30°	23:02	·· ··	00:00	08:47	09:23	10:05
20°	22:40	23:34	·· ··	09:06	09:47	10:31
N 10°	22:21	23:12	·· ··	09:23	10:07	10:54
0°	22:04	22:52	23:42	09:39	10:27	11:16
S 10°	21:46	22:31	23:20	09:55	10:46	11:37
20°	21:27	22:10	22:56	10:13	11:06	12:00
30°	21:06	21:44	22:29	10:32	11:30	12:27
35°	20:53	21:30	22:12	10:44	11:44	12:43
40°	20:39	21:13	21:53	10:58	12:01	13:02
45°	20:22	20:52	21:31	11:13	12:20	13:24
S 50°	20:01	20:27	21:02	11:33	12:45	13:53
52°	19:51	20:14	20:47	11:43	12:57	14:07
54°	19:40	20:00	20:31	11:53	13:11	14:23
56°	19:27	19:44	20:11	12:05	13:27	14:43
58°	19:13	19:25	19:47	12:19	13:46	15:07
S 60°	18:56	19:01	19:14	12:36	14:09	15:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 19-21 80-63%
08	10:51	10:44	12:11	03:28	15:51	
09	10:36	10:29	12:10	04:15	16:39	
10	10:21	10:13	12:10	05:04	17:29	

March 11, 12, 13 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	168°40.3	163°01.2	N01°11.2	189°53.8	S10°05.7	62°15.3	N22°56.2	165°08.0	S00°47.0
1	183°42.8	178°00.8	12.5	204°54.4	04.9	77°17.8	56.2	180°10.2	46.8
2	198°45.3	193°00.4	13.8	219°55.0	04.2	92°20.2	56.2	195°12.4	46.7
3	213°47.7	208°00.1	·· 15.1	234°55.6	·· 03.5	107°22.7	·· 56.2	210°14.6	·· 46.6
4	228°50.2	222°59.7	16.4	249°56.2	02.7	122°25.1	56.2	225°16.8	46.5
5	243°52.7	237°59.4	17.6	264°56.8	02.0	137°27.6	56.2	240°19.0	46.3
6	258°55.1	252°59.0	N01°18.9	279°57.4	S10°01.3	152°30.1	N22°56.2	255°21.1	S00°46.2
7	273°57.6	267°58.6	20.2	294°58.0	10°00.5	167°32.5	56.2	270°23.3	46.1
8	289°00.0	282°58.3	21.5	309°58.6	09°59.8	182°35.0	56.2	285°25.5	46.0
9	304°02.5	297°57.9	·· 22.8	324°59.3	·· 59.1	197°37.5	·· 56.2	300°27.7	·· 45.9
10	319°05.0	312°57.5	24.1	339°59.9	58.3	212°39.9	56.2	315°29.9	45.7
11	334°07.4	327°57.2	25.4	355°00.5	57.6	227°42.4	56.3	330°32.1	45.6
12	349°09.9	342°56.8	N01°26.7	10°01.1	S09°56.9	242°44.8	N22°56.3	345°34.2	S00°45.5
13	4°12.4	357°56.4	27.9	25°01.7	56.1	257°47.3	56.3	0°36.4	45.4
14	19°14.8	12°56.1	29.2	40°02.3	55.4	272°49.8	56.3	15°38.6	45.2
15	34°17.3	27°55.7	·· 30.5	55°02.9	·· 54.7	287°52.2	·· 56.3	30°40.8	·· 45.1
16	49°19.8	42°55.4	31.8	70°03.5	53.9	302°54.7	56.3	45°43.0	45.0
17	64°22.2	57°55.0	33.1	85°04.1	53.2	317°57.1	56.3	60°45.2	44.9
18	79°24.7	72°54.6	N01°34.4	100°04.7	S09°52.5	332°59.6	N22°56.3	75°47.3	S00°44.7
19	94°27.2	87°54.3	35.7	115°05.4	51.7	348°02.1	56.3	90°49.5	44.6
20	109°29.6	102°53.9	37.0	130°06.0	51.0	3°04.5	56.3	105°51.7	44.5
21	124°32.1	117°53.5	·· 38.2	145°06.6	·· 50.2	18°07.0	·· 56.3	120°53.9	·· 44.4
22	139°34.5	132°53.2	39.5	160°07.2	49.5	33°09.4	56.3	135°56.1	44.3
23	154°37.0	147°52.8	40.8	175°07.8	48.8	48°11.9	56.3	150°58.2	44.1
Mer.pass. 12:43		ν -0.4′	d 1.3′	ν 0.6′	d 0.7′	ν 2.5′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.15		m -2.36		m 0.96	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	169°39.5	162°52.5	N01°42.1	190°08.4	S09°48.0	63°14.3	N22°56.3	166°00.4	S00°44.0
1	184°41.9	177°52.1	43.4	205°09.0	47.3	78°16.8	56.3	181°02.6	43.9
2	199°44.4	192°51.7	44.7	220°09.6	46.6	93°19.3	56.3	196°04.8	43.8
3	214°46.9	207°51.4	·· 46.0	235°10.2	·· 45.8	108°21.7	·· 56.3	211°07.0	·· 43.6
4	229°49.3	222°51.0	47.2	250°10.9	45.1	123°24.2	56.3	226°09.2	43.5
5	244°51.8	237°50.6	48.5	265°11.5	44.4	138°26.6	56.3	241°11.3	43.4
6	259°54.3	252°50.3	N01°49.8	280°12.1	S09°43.6	153°29.1	N22°56.3	256°13.5	S00°43.3
7	274°56.7	267°49.9	51.1	295°12.7	42.9	168°31.5	56.3	271°15.7	43.1
8	289°59.2	282°49.5	52.4	310°13.3	42.1	183°34.0	56.3	286°17.9	43.0
9	305°01.6	297°49.2	·· 53.7	325°13.9	·· 41.4	198°36.4	·· 56.3	301°20.1	·· 42.9
10	320°04.1	312°48.8	55.0	340°14.5	40.7	213°38.9	56.3	316°22.2	42.8
11	335°06.6	327°48.5	56.2	355°15.1	39.9	228°41.3	56.3	331°24.4	42.7
12	350°09.0	342°48.1	N01°57.5	10°15.8	S09°39.2	243°43.8	N22°56.3	346°26.6	S00°42.5
13	5°11.5	357°47.7	01°58.8	25°16.4	38.5	258°46.2	56.3	1°28.8	42.4
14	20°14.0	12°47.4	02°00.1	40°17.0	37.7	273°48.7	56.3	16°31.0	42.3
15	35°16.4	27°47.0	·· 01.4	55°17.6	·· 37.0	288°51.2	·· 56.3	31°33.2	·· 42.2
16	50°18.9	42°46.6	02.7	70°18.2	36.2	303°53.6	56.3	46°35.3	42.0
17	65°21.4	57°46.3	04.0	85°18.8	35.5	318°56.1	56.3	61°37.5	41.9
18	80°23.8	72°45.9	N02°05.2	100°19.4	S09°34.8	333°58.5	N22°56.3	76°39.7	S00°41.8
19	95°26.3	87°45.6	06.5	115°20.1	34.0	349°01.0	56.3	91°41.9	41.7
20	110°28.8	102°45.2	07.8	130°20.7	33.3	4°03.4	56.3	106°44.1	41.5
21	125°31.2	117°44.8	·· 09.1	145°21.3	·· 32.5	19°05.8	·· 56.3	121°46.2	·· 41.4
22	140°33.7	132°44.5	10.4	160°21.9	31.8	34°08.3	56.3	136°48.4	41.3
23	155°36.1	147°44.1	11.7	175°22.5	31.1	49°10.7	56.3	151°50.6	41.2
Mer.pass. 12:39		ν -0.4′	d 1.3′	ν 0.6′	d 0.7′	ν 2.5′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.16		m -2.36		m 0.96	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	170°38.6	162°43.7	N02°13.0	190°23.1	S09°30.3	64°13.2	N22°56.3	166°52.8	S00°41.1
1	185°41.1	177°43.4	14.2	205°23.7	29.6	79°15.6	56.3	181°55.0	40.9
2	200°43.5	192°43.0	15.5	220°24.4	28.8	94°18.1	56.3	196°57.1	40.8
3	215°46.0	207°42.6	·· 16.8	235°25.0	·· 28.1	109°20.5	·· 56.3	211°59.3	·· 40.7
4	230°48.5	222°42.3	18.1	250°25.6	27.4	124°23.0	56.3	227°01.5	40.6
5	245°50.9	237°41.9	19.4	265°26.2	26.6	139°25.4	56.3	242°03.7	40.4
6	260°53.4	252°41.6	N02°20.7	280°26.8	S09°25.9	154°27.9	N22°56.3	257°05.9	S00°40.3
7	275°55.9	267°41.2	22.0	295°27.4	25.1	169°30.3	56.3	272°08.1	40.2
8	290°58.3	282°40.8	23.2	310°28.1	24.4	184°32.8	56.3	287°10.2	40.1
9	306°00.8	297°40.5	·· 24.5	325°28.7	·· 23.7	199°35.2	·· 56.3	302°12.4	·· 39.9
10	321°03.3	312°40.1	25.8	340°29.3	22.9	214°37.7	56.3	317°14.6	39.8
11	336°05.7	327°39.7	27.1	355°29.9	22.2	229°40.1	56.3	332°16.8	39.7
12	351°08.2	342°39.4	N02°28.4	10°30.5	S09°21.4	244°42.5	N22°56.3	347°19.0	S00°39.6
13	6°10.6	357°39.0	29.7	25°31.1	20.7	259°45.0	56.3	2°21.1	39.5
14	21°13.1	12°38.6	30.9	40°31.7	20.0	274°47.4	56.3	17°23.3	39.3
15	36°15.6	27°38.3	·· 32.2	55°32.4	·· 19.2	289°49.9	·· 56.3	32°25.5	·· 39.2
16	51°18.0	42°37.9	33.5	70°33.0	18.5	304°52.3	56.3	47°27.7	39.1
17	66°20.5	57°37.5	34.8	85°33.6	17.7	319°54.7	56.3	62°29.9	39.0
18	81°23.0	72°37.2	N02°36.1	100°34.2	S09°17.0	334°57.2	N22°56.3	77°32.0	S00°38.8
19	96°25.4	87°36.8	37.4	115°34.8	16.2	349°59.6	56.3	92°34.2	38.7
20	111°27.9	102°36.5	38.7	130°35.5	15.5	5°02.1	56.3	107°36.4	38.6
21	126°30.4	117°36.1	·· 39.9	145°36.1	·· 14.8	20°04.5	·· 56.3	122°38.6	·· 38.5
22	141°32.8	132°35.7	41.2	160°36.7	14.0	35°07.0	56.3	137°40.8	38.3
23	156°35.3	147°35.4	42.5	175°37.3	13.3	50°09.4	56.3	152°43.0	38.2
Mer.pass. 12:35		ν -0.4′	d 1.3′	ν 0.6′	d 0.7′	ν 2.4′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.16		m -2.35		m 0.96	

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.4
Hamal	327°50.4	23°35.2
Polaris	313°48.6	89°22.7
Acamar	315°11.3	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.1	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.5	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.8	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°13.9	-59°35.8
Suhail	222°45.2	-43°32.5
Miaplacidus	221°37.3	-69°49.7
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.7
Gacrux	171°50.0	-57°15.6
Alioth	166°11.6	55°48.8
Spica	158°21.0	-11°18.0
Alkaid	152°50.8	49°10.7
Hadar	148°34.2	-60°29.9
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.5	-60°56.5
Kochab	137°19.1	74°02.5
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.3
Antares	112°14.6	-26°29.4
Atria	107°07.9	-69°04.2
Sabik	102°01.6	-15°45.5
Shaula	96°09.1	-37°07.3
Rasalhague	95°57.7	12°32.2
Eltanin	90°41.8	51°28.7
Kaus Aust.	83°31.3	-34°22.3
Vega	80°32.7	38°48.1
Nunki	75°46.7	-26°15.8
Altair	61°59.2	8°56.1
Peacock	53°04.6	-56°38.9
Deneb	49°25.5	45°22.2
Enif	33°38.1	9°59.6
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.3	15°20.7

Mar 11 Wed	SHA	Mer.pass
Venus	354°20.8	13:08
Mars	21°13.4	11:20
Jupiter	253°35.0	19:48
Saturn	356°27.7	12:58

Mar 12 Thu	SHA	Mer.pass
Venus	353°13.0	13:09
Mars	20°28.9	11:19
Jupiter	253°34.9	19:44
Saturn	356°21.0	12:54

Mar 13 Fri	SHA	Mer.pass
Venus	352°05.1	13:09
Mars	19°44.5	11:18
Jupiter	253°34.6	19:40
Saturn	356°14.2	12:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°28.6	S03°47.8	274°26.6	10.1′	S27°54.5	2.8′	54.2′
1	192°28.8	46.8	288°55.7	10.1′	27°57.3	2.7′	54.2′
2	207°28.9	45.8	303°24.8	10.1′	28°00.0	2.5′	54.2′
3	222°29.1	·· 44.8	317°53.9	10.0′	28°02.5	2.4′	54.2′
4	237°29.2	43.9	332°22.9	10.0′	28°04.9	2.3′	54.2′
5	252°29.4	42.9	346°51.9	10.0′	28°07.2	2.1′	54.2′
6	267°29.6	S03°41.9	1°20.9	10.0′	S28°09.3	2.0′	54.2′
7	282°29.7	40.9	15°49.9	9.9′	28°11.3	1.9′	54.2′
8	297°29.9	39.9	30°18.8	9.9′	28°13.2	1.7′	54.2′
9	312°30.1	·· 39.0	44°47.7	9.9′	28°14.9	1.6′	54.2′
10	327°30.2	38.0	59°16.6	9.9′	28°16.5	1.5′	54.2′
11	342°30.4	37.0	73°45.4	9.8′	28°18.0	1.3′	54.2′
12	357°30.6	S03°36.0	88°14.3	9.8′	S28°19.3	1.2′	54.2′
13	12°30.7	35.0	102°43.1	9.8′	28°20.5	1.0′	54.2′
14	27°30.9	34.0	117°11.9	9.8′	28°21.5	0.9′	54.3′
15	42°31.0	·· 33.1	131°40.6	9.8′	28°22.4	0.8′	54.3′
16	57°31.2	32.1	146°09.4	9.7′	28°23.2	0.6′	54.3′
17	72°31.4	31.1	160°38.1	9.7′	28°23.8	0.5′	54.3′
18	87°31.5	S03°30.1	175°06.9	9.7′	S28°24.3	0.4′	54.3′
19	102°31.7	29.1	189°35.6	9.7′	28°24.7	0.2′	54.3′
20	117°31.9	28.1	204°04.2	9.7′	28°24.9	0.1′	54.3′
21	132°32.0	·· 27.2	218°32.9	9.7′	28°25.0	0.1′	54.3′
22	147°32.2	26.2	233°01.6	9.7′	28°24.9	0.2′	54.3′
23	162°32.4	25.2	247°30.2	9.6′	28°24.7	0.3′	54.3′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°32.5	S03°24.2	261°58.9	9.6′	S28°24.4	0.5′	54.3′
1	192°32.7	23.2	276°27.5	9.6′	28°23.9	0.6′	54.4′
2	207°32.9	22.2	290°56.1	9.6′	28°23.3	0.8′	54.4′
3	222°33.0	·· 21.3	305°24.7	9.6′	28°22.5	0.9′	54.4′
4	237°33.2	20.3	319°53.3	9.6′	28°21.6	1.0′	54.4′
5	252°33.4	19.3	334°22.0	9.6′	28°20.6	1.2′	54.4′
6	267°33.5	S03°18.3	348°50.6	9.6′	S28°19.4	1.3′	54.4′
7	282°33.7	17.3	3°19.1	9.6′	28°18.1	1.5′	54.4′
8	297°33.9	16.3	17°47.7	9.6′	28°16.6	1.6′	54.4′
9	312°34.0	·· 15.4	32°16.3	9.6′	28°15.0	1.7′	54.4′
10	327°34.2	14.4	46°44.9	9.6′	28°13.3	1.9′	54.5′
11	342°34.4	13.4	61°13.5	9.6′	28°11.4	2.0′	54.5′
12	357°34.5	S03°12.4	75°42.1	9.6′	S28°09.4	2.2′	54.5′
13	12°34.7	11.4	90°10.7	9.6′	28°07.2	2.3′	54.5′
14	27°34.9	10.4	104°39.3	9.6′	28°04.9	2.4′	54.5′
15	42°35.0	·· 09.5	119°08.0	9.6′	28°02.5	2.6′	54.5′
16	57°35.2	08.5	133°36.6	9.6′	27°59.9	2.7′	54.5′
17	72°35.4	07.5	148°05.2	9.6′	27°57.2	2.9′	54.6′
18	87°35.5	S03°06.5	162°33.8	9.6′	S27°54.3	3.0′	54.6′
19	102°35.7	05.5	177°02.5	9.7′	27°51.3	3.1′	54.6′
20	117°35.9	04.5	191°31.1	9.7′	27°48.2	3.3′	54.6′
21	132°36.0	·· 03.5	205°59.8	9.7′	27°44.9	3.4′	54.6′
22	147°36.2	02.6	220°28.5	9.7′	27°41.5	3.6′	54.6′
23	162°36.4	01.6	234°57.2	9.7′	27°37.9	3.7′	54.7′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°36.6	S03°00.6	249°25.9	9.7′	S27°34.2	3.8′	54.7′
1	192°36.7	02°59.6	263°54.6	9.7′	27°30.4	4.0′	54.7′
2	207°36.9	58.6	278°23.3	9.8′	27°26.4	4.1′	54.7′
3	222°37.1	·· 57.6	292°52.1	9.8′	27°22.3	4.2′	54.7′
4	237°37.2	56.6	307°20.9	9.8′	27°18.1	4.4′	54.7′
5	252°37.4	55.7	321°49.7	9.8′	27°13.7	4.5′	54.8′
6	267°37.6	S02°54.7	336°18.5	9.8′	S27°09.2	4.7′	54.8′
7	282°37.7	53.7	350°47.3	9.9′	27°04.5	4.8′	54.8′
8	297°37.9	52.7	5°16.2	9.9′	26°59.7	4.9′	54.8′
9	312°38.1	·· 51.7	19°45.0	9.9′	26°54.8	5.1′	54.8′
10	327°38.2	50.7	34°13.9	9.9′	26°49.7	5.2′	54.9′
11	342°38.4	49.7	48°42.9	10.0′	26°44.5	5.3′	54.9′
12	357°38.6	S02°48.8	63°11.8	10.0′	S26°39.2	5.5′	54.9′
13	12°38.8	47.8	77°40.8	10.0′	26°33.7	5.6′	54.9′
14	27°38.9	46.8	92°09.8	10.0′	26°28.1	5.7′	54.9′
15	42°39.1	·· 45.8	106°38.8	10.1′	26°22.4	5.9′	55.0′
16	57°39.3	44.8	121°07.9	10.1′	26°16.5	6.0′	55.0′
17	72°39.4	43.8	135°37.0	10.1′	26°10.5	6.2′	55.0′
18	87°39.6	S02°42.8	150°06.1	10.1′	S26°04.3	6.2′	55.0′
19	102°39.8	41.9	164°35.2	10.2′	25°58.1	6.4′	55.1′
20	117°39.9	40.9	179°04.4	10.2′	25°51.7	6.6′	55.1′
21	132°40.1	·· 39.9	193°33.6	10.2′	25°45.1	6.7′	55.1′
22	147°40.3	38.9	208°02.9	10.3′	25°38.4	6.8′	55.1′
23	162°40.5	37.9	222°32.1	10.3′	25°31.6	6.9′	55.1′
	SD = 16.1′	d = 1.0′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:11	05:33	06:40	17:42	18:49	20:12
N 70°	04:23	05:36	06:36	17:45	18:46	19:59
68°	04:32	05:38	06:34	17:48	18:43	19:50
66°	04:40	05:40	06:31	17:50	18:41	19:42
64°	04:46	05:42	06:29	17:52	18:39	19:35
62°	04:52	05:44	06:28	17:53	18:37	19:30
60°	04:56	05:45	06:26	17:55	18:36	19:25
N 58°	05:00	05:46	06:25	17:56	18:35	19:21
56°	05:03	05:46	06:23	17:57	18:34	19:18
54°	05:06	05:47	06:22	17:58	18:33	19:15
52°	05:09	05:48	06:21	17:59	18:33	19:12
50°	05:11	05:48	06:20	18:00	18:32	19:10
45°	05:15	05:49	06:18	18:02	18:31	19:05
N 40°	05:18	05:50	06:17	18:04	18:31	19:02
35°	05:20	05:50	06:15	18:05	18:30	19:00
30°	05:22	05:50	06:14	18:06	18:30	18:58
20°	05:24	05:49	06:11	18:09	18:31	18:56
N 10°	05:23	05:48	06:09	18:11	18:32	18:56
0°	05:22	05:46	06:06	18:13	18:34	18:58
S 10°	05:19	05:43	06:04	18:15	18:36	19:01
20°	05:14	05:39	06:01	18:18	18:40	19:05
30°	05:06	05:34	05:58	18:21	18:45	19:13
35°	05:01	05:31	05:56	18:22	18:48	19:18
40°	04:55	05:27	05:54	18:24	18:52	19:24
45°	04:47	05:22	05:52	18:27	18:56	19:31
S 50°	04:37	05:16	05:49	18:30	19:02	19:41
52°	04:32	05:13	05:47	18:31	19:05	19:46
54°	04:27	05:10	05:46	18:32	19:08	19:51
56°	04:21	05:06	05:44	18:34	19:12	19:57
58°	04:13	05:02	05:42	18:36	19:16	20:04
S 60°	04:05	04:58	05:40	18:38	19:20	20:12

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°						
N 70°						
68°						
66°						
64°						
62°			06:37			08:46
60°	04:24	05:22	05:47	07:22	08:12	09:35
N 58°	03:46	04:42	05:16	08:01	08:52	10:06
56°	03:19	04:15	04:53	08:27	09:19	10:29
54°	02:58	03:53	04:33	08:49	09:41	10:48
52°	02:40	03:35	04:17	09:06	09:58	11:04
50°	02:25	03:20	04:03	09:21	10:14	11:17
45°	01:55	02:49	03:35	09:52	10:44	11:45
N 40°	01:32	02:26	03:13	10:15	11:08	12:07
35°	01:13	02:06	02:54	10:35	11:27	12:25
30°	00:56	01:49	02:38	10:52	11:44	12:41
20°	00:28	01:21	02:11	11:20	12:12	13:07
N 10°	00:04	00:56	01:47	11:44	12:36	13:30
0°	·· ··	00:34	01:26	12:07	12:59	13:51
S 10°	·· ··	00:11	01:04	12:29	13:21	14:11
20°	23:47	·· ··	00:40	12:54	13:45	14:34
30°	23:18	·· ··	00:13	13:22	14:13	14:59
35°	23:02	23:57	·· ··	13:39	14:30	15:15
40°	22:42	23:38	·· ··	13:58	14:49	15:32
45°	22:18	23:15	·· ··	14:22	15:12	15:53
S 50°	21:48	22:46	23:55	14:52	15:41	16:19
52°	21:33	22:32	23:42	15:08	15:56	16:32
54°	21:15	22:15	23:28	15:25	16:13	16:47
56°	20:53	21:55	23:11	15:47	16:33	17:04
58°	20:26	21:30	22:51	16:14	16:59	17:24
S 60°	19:47	20:55	22:26	16:53	17:33	17:50

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 22-24 54-35%
11	10:06	09:58	12:10	05:54	18:20	
12	09:50	09:42	12:10	06:46	19:12	
13	09:34	09:26	12:09	07:38	20:04	

March 14, 15, 16 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	171°37.8	162°35.0	N02°43.8	190°37.9	S09°12.5	65°11.8	N22°56.3	167°45.1	S00°38.1
1	186°40.2	177°34.6	45.1	205°38.5	11.8	80°14.3	56.3	182°47.3	38.0
2	201°42.7	192°34.3	46.4	220°39.2	11.0	95°16.7	56.3	197°49.5	37.9
3	216°45.1	207°33.9	·· 47.6	235°39.8	·· 10.3	110°19.1	·· 56.3	212°51.7	·· 37.7
4	231°47.6	222°33.5	48.9	250°40.4	09.6	125°21.6	56.3	227°53.9	37.6
5	246°50.1	237°33.2	50.2	265°41.0	08.8	140°24.0	56.3	242°56.0	37.5
6	261°52.5	252°32.8	N02°51.5	280°41.6	S09°08.1	155°26.5	N22°56.3	257°58.2	S00°37.4
7	276°55.0	267°32.4	52.8	295°42.3	07.3	170°28.9	56.3	273°00.4	37.2
8	291°57.5	282°32.1	54.1	310°42.9	06.6	185°31.3	56.3	288°02.6	37.1
9	306°59.9	297°31.7	·· 55.3	325°43.5	·· 05.8	200°33.8	·· 56.3	303°04.8	·· 37.0
10	322°02.4	312°31.4	56.6	340°44.1	05.1	215°36.2	56.3	318°06.9	36.9
11	337°04.9	327°31.0	57.9	355°44.7	04.3	230°38.6	56.3	333°09.1	36.7
12	352°07.3	342°30.6	N02°59.2	10°45.4	S09°03.6	245°41.1	N22°56.3	348°11.3	S00°36.6
13	7°09.8	357°30.3	03°00.5	25°46.0	02.9	260°43.5	56.3	3°13.5	36.5
14	22°12.2	12°29.9	01.7	40°46.6	02.1	275°45.9	56.3	18°15.7	36.4
15	37°14.7	27°29.5	·· 03.0	55°47.2	·· 01.4	290°48.4	·· 56.3	33°17.8	·· 36.3
16	52°17.2	42°29.2	04.3	70°47.8	09°00.6	305°50.8	56.3	48°20.0	36.1
17	67°19.6	57°28.8	05.6	85°48.5	08°59.9	320°53.2	56.3	63°22.2	36.0
18	82°22.1	72°28.4	N03°06.9	100°49.1	S08°59.1	335°55.7	N22°56.3	78°24.4	S00°35.9
19	97°24.6	87°28.1	08.2	115°49.7	58.4	350°58.1	56.3	93°26.6	35.8
20	112°27.0	102°27.7	09.4	130°50.3	57.6	6°00.5	56.3	108°28.7	35.6
21	127°29.5	117°27.3	·· 10.7	145°50.9	·· 56.9	21°03.0	·· 56.3	123°30.9	·· 35.5
22	142°32.0	132°27.0	12.0	160°51.6	56.1	36°05.4	56.3	138°33.1	35.4
23	157°34.4	147°26.6	13.3	175°52.2	55.4	51°07.8	56.3	153°35.3	35.3
Mer.pass. 12:31		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.16	ν 2.4′	d 0.0′ m -2.34	ν 2.2′	d 0.1′ m 0.95

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	172°36.9	162°26.2	N03°14.6	190°52.8	S08°54.6	66°10.3	N22°56.3	168°37.5	S00°35.1
1	187°39.4	177°25.9	15.8	205°53.4	53.9	81°12.7	56.3	183°39.6	35.0
2	202°41.8	192°25.5	17.1	220°54.0	53.2	96°15.1	56.3	198°41.8	34.9
3	217°44.3	207°25.1	·· 18.4	235°54.7	·· 52.4	111°17.5	·· 56.3	213°44.0	·· 34.8
4	232°46.7	222°24.8	19.7	250°55.3	51.7	126°20.0	56.3	228°46.2	34.7
5	247°49.2	237°24.4	21.0	265°55.9	50.9	141°22.4	56.3	243°48.4	34.5
6	262°51.7	252°24.0	N03°22.2	280°56.5	S08°50.2	156°24.8	N22°56.3	258°50.5	S00°34.4
7	277°54.1	267°23.7	23.5	295°57.2	49.4	171°27.3	56.3	273°52.7	34.3
8	292°56.6	282°23.3	24.8	310°57.8	48.7	186°29.7	56.3	288°54.9	34.2
9	307°59.1	297°22.9	·· 26.1	325°58.4	·· 47.9	201°32.1	·· 56.3	303°57.1	·· 34.0
10	323°01.5	312°22.6	27.4	340°59.0	47.2	216°34.5	56.3	318°59.3	33.9
11	338°04.0	327°22.2	28.6	355°59.6	46.4	231°37.0	56.3	334°01.4	33.8
12	353°06.5	342°21.8	N03°29.9	11°00.3	S08°45.7	246°39.4	N22°56.3	349°03.6	S00°33.7
13	8°08.9	357°21.5	31.2	26°00.9	44.9	261°41.8	56.3	4°05.8	33.5
14	23°11.4	12°21.1	32.5	41°01.5	44.2	276°44.2	56.3	19°08.0	33.4
15	38°13.9	27°20.7	·· 33.8	56°02.1	·· 43.4	291°46.7	·· 56.3	34°10.2	·· 33.3
16	53°16.3	42°20.4	35.0	71°02.8	42.7	306°49.1	56.3	49°12.3	33.2
17	68°18.8	57°20.0	36.3	86°03.4	41.9	321°51.5	56.3	64°14.5	33.1
18	83°21.2	72°19.6	N03°37.6	101°04.0	S08°41.2	336°53.9	N22°56.2	79°16.7	S00°32.9
19	98°23.7	87°19.3	38.9	116°04.6	40.4	351°56.4	56.2	94°18.9	32.8
20	113°26.2	102°18.9	40.2	131°05.3	39.7	6°58.8	56.2	109°21.1	32.7
21	128°28.6	117°18.5	·· 41.4	146°05.9	·· 38.9	22°01.2	·· 56.2	124°23.2	·· 32.6
22	143°31.1	132°18.2	42.7	161°06.5	38.2	37°03.6	56.2	139°25.4	32.4
23	158°33.6	147°17.8	44.0	176°07.1	37.4	52°06.1	56.2	154°27.6	32.3
Mer.pass. 12:27		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.7′	m 1.16	ν 2.4′	d 0.0′ m -2.33	ν 2.2′	d 0.1′ m 0.95

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	173°36.0	162°17.4	N03°45.3	191°07.8	S08°36.7	67°08.5	N22°56.2	169°29.8	S00°32.2
1	188°38.5	177°17.1	46.5	206°08.4	35.9	82°10.9	56.2	184°32.0	32.1
2	203°41.0	192°16.7	47.8	221°09.0	35.2	97°13.3	56.2	199°34.1	31.9
3	218°43.4	207°16.3	·· 49.1	236°09.6	·· 34.4	112°15.7	·· 56.2	214°36.3	·· 31.8
4	233°45.9	222°16.0	50.4	251°10.3	33.7	127°18.2	56.2	229°38.5	31.7
5	248°48.3	237°15.6	51.7	266°10.9	32.9	142°20.6	56.2	244°40.7	31.6
6	263°50.8	252°15.2	N03°52.9	281°11.5	S08°32.2	157°23.0	N22°56.2	259°42.9	S00°31.4
7	278°53.3	267°14.9	54.2	296°12.1	31.4	172°25.4	56.2	274°45.0	31.3
8	293°55.7	282°14.5	55.5	311°12.8	30.7	187°27.8	56.2	289°47.2	31.2
9	308°58.2	297°14.1	·· 56.8	326°13.4	·· 29.9	202°30.3	·· 56.2	304°49.4	·· 31.1
10	324°00.7	312°13.8	58.0	341°14.0	29.2	217°32.7	56.2	319°51.6	31.0
11	339°03.1	327°13.4	03°59.3	356°14.6	28.4	232°35.1	56.2	334°53.8	30.8
12	354°05.6	342°13.0	N04°00.6	11°15.3	S08°27.7	247°37.5	N22°56.2	349°55.9	S00°30.7
13	9°08.1	357°12.7	01.9	26°15.9	26.9	262°39.9	56.2	4°58.1	30.6
14	24°10.5	12°12.3	03.1	41°16.5	26.2	277°42.3	56.2	20°00.3	30.5
15	39°13.0	27°11.9	·· 04.4	56°17.1	·· 25.4	292°44.8	·· 56.2	35°02.5	·· 30.3
16	54°15.5	42°11.6	05.7	71°17.8	24.7	307°47.2	56.2	50°04.7	30.2
17	69°17.9	57°11.2	07.0	86°18.4	23.9	322°49.6	56.2	65°06.8	30.1
18	84°20.4	72°10.8	N04°08.2	101°19.0	S08°23.2	337°52.0	N22°56.2	80°09.0	S00°30.0
19	99°22.8	87°10.5	09.5	116°19.6	22.4	352°54.4	56.2	95°11.2	29.8
20	114°25.3	102°10.1	10.8	131°20.3	21.7	7°56.8	56.2	110°13.4	29.7
21	129°27.8	117°09.7	·· 12.1	146°20.9	·· 20.9	22°59.2	·· 56.2	125°15.6	·· 29.6
22	144°30.2	132°09.3	13.3	161°21.5	20.2	38°01.7	56.2	140°17.7	29.5
23	159°32.7	147°09.0	14.6	176°22.2	19.4	53°04.1	56.2	155°19.9	29.4
Mer.pass. 12:24		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.8′	m 1.16	ν 2.4′	d 0.0′ m -2.32	ν 2.2′	d 0.1′ m 0.95

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.1
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.4
Hamal	327°50.4	23°35.2
Polaris	313°49.7	89°22.7
Acamar	315°11.3	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.1	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°02.9	-8°10.4
Capella	280°20.5	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.8	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.6	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°13.9	-59°35.8
Suhail	222°45.3	-43°32.5
Miaplacidus	221°37.4	-69°49.7
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.7
Gacrux	171°50.0	-57°15.6
Alioth	166°11.6	55°48.8
Spica	158°21.0	-11°18.0
Alkaid	152°50.8	49°10.7
Hadar	148°34.1	-60°29.9
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.5	-60°56.5
Kochab	137°19.0	74°02.5
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.7	26°37.3
Antares	112°14.5	-26°29.4
Atria	107°07.8	-69°04.2
Sabik	102°01.6	-15°45.5
Shaula	96°09.0	-37°07.3
Rasalhague	95°57.6	12°32.2
Eltanin	90°41.8	51°28.7
Kaus Aust.	83°31.3	-34°22.3
Vega	80°32.7	38°48.1
Nunki	75°46.7	-26°15.8
Altair	61°59.2	8°56.1
Peacock	53°04.6	-56°38.9
Deneb	49°25.5	45°22.2
Enif	33°38.1	9°59.6
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Mar 14 Sat	SHA	Mer.pass
Venus	350°57.2	13:10
Mars	19°00.2	11:17
Jupiter	253°34.1	19:36
Saturn	356°07.4	12:47

Mar 15 Sun	SHA	Mer.pass
Venus	349°49.4	13:11
Mars	18°15.9	11:16
Jupiter	253°33.4	19:32
Saturn	356°00.6	12:44

Mar 16 Mon	SHA	Mer.pass
Venus	348°41.4	13:11
Mars	17°31.7	11:15
Jupiter	253°32.4	19:28
Saturn	355°53.8	12:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°40.6	S02°36.9	237°01.4	10.3′	S25°24.7	7.1′	55.2′
1	192°40.8	35.9	251°30.8	10.4′	25°17.6	7.2′	55.2′
2	207°41.0	35.0	266°00.1	10.4′	25°10.4	7.3′	55.2′
3	222°41.1	·· 34.0	280°29.5	10.4′	25°03.1	7.4′	55.2′
4	237°41.3	33.0	294°59.0	10.5′	24°55.7	7.6′	55.3′
5	252°41.5	32.0	309°28.5	10.5′	24°48.1	7.7′	55.3′
6	267°41.7	S02°31.0	323°58.0	10.5′	S24°40.4	7.9′	55.3′
7	282°41.8	30.0	338°27.5	10.6′	24°32.5	7.9′	55.3′
8	297°42.0	29.0	352°57.1	10.6′	24°24.6	8.1′	55.4′
9	312°42.2	·· 28.1	7°26.7	10.7′	24°16.5	8.2′	55.4′
10	327°42.4	27.1	21°56.4	10.7′	24°08.3	8.4′	55.4′
11	342°42.5	26.1	36°26.1	10.7′	23°59.9	8.4′	55.4′
12	357°42.7	S02°25.1	50°55.8	10.8′	S23°51.5	8.6′	55.5′
13	12°42.9	24.1	65°25.6	10.8′	23°42.9	8.7′	55.5′
14	27°43.0	23.1	79°55.4	10.9′	23°34.2	8.9′	55.5′
15	42°43.2	·· 22.1	94°25.3	10.9′	23°25.3	8.9′	55.5′
16	57°43.4	21.1	108°55.2	10.9′	23°16.4	9.1′	55.6′
17	72°43.6	20.2	123°25.1	11.0′	23°07.3	9.2′	55.6′
18	87°43.7	S02°19.2	137°55.1	11.0′	S22°58.1	9.3′	55.6′
19	102°43.9	18.2	152°25.1	11.1′	22°48.8	9.4′	55.6′
20	117°44.1	17.2	166°55.1	11.1′	22°39.4	9.6′	55.7′
21	132°44.3	·· 16.2	181°25.2	11.1′	22°29.8	9.7′	55.7′
22	147°44.4	15.2	195°55.4	11.2′	22°20.1	9.7′	55.7′
23	162°44.6	14.2	210°25.5	11.2′	22°10.4	9.9′	55.8′
	SD = 16.1′	d = 1.0′	SD = 15.0′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°44.8	S02°13.2	224°55.7	11.3′	S22°00.5	10.1′	55.8′
1	192°45.0	12.3	239°26.0	11.3′	21°50.4	10.1′	55.8′
2	207°45.1	11.3	253°56.3	11.3′	21°40.3	10.3′	55.8′
3	222°45.3	·· 10.3	268°26.6	11.4′	21°30.0	10.3′	55.9′
4	237°45.5	09.3	282°57.0	11.4′	21°19.7	10.5′	55.9′
5	252°45.6	08.3	297°27.4	11.5′	21°09.2	10.6′	55.9′
6	267°45.8	S02°07.3	311°57.9	11.5′	S20°58.6	10.7′	56.0′
7	282°46.0	06.3	326°28.4	11.5′	20°47.9	10.8′	56.0′
8	297°46.2	05.3	340°58.9	11.6′	20°37.1	10.9′	56.0′
9	312°46.3	·· 04.4	355°29.5	11.6′	20°26.2	11.0′	56.0′
10	327°46.5	03.4	10°00.1	11.7′	20°15.2	11.2′	56.1′
11	342°46.7	02.4	24°30.7	11.7′	20°04.0	11.2′	56.1′
12	357°46.9	S02°01.4	39°01.4	11.7′	S19°52.8	11.4′	56.1′
13	12°47.0	02°00.4	53°32.2	11.8′	19°41.4	11.4′	56.2′
14	27°47.2	01°59.4	68°02.9	11.8′	19°30.0	11.6′	56.2′
15	42°47.4	·· 58.4	82°33.7	11.8′	19°18.4	11.7′	56.2′
16	57°47.6	57.4	97°04.6	11.9′	19°06.7	11.7′	56.3′
17	72°47.7	56.4	111°35.5	11.9′	18°55.0	11.9′	56.3′
18	87°47.9	S01°55.5	126°06.4	12.0′	S18°43.1	12.0′	56.3′
19	102°48.1	54.5	140°37.4	12.0′	18°31.1	12.1′	56.3′
20	117°48.3	53.5	155°08.4	12.0′	18°19.0	12.1′	56.4′
21	132°48.5	·· 52.5	169°39.4	12.1′	18°06.9	12.3′	56.4′
22	147°48.6	51.5	184°10.5	12.1′	17°54.6	12.4′	56.4′
23	162°48.8	50.5	198°41.6	12.1′	17°42.2	12.5′	56.5′
	SD = 16.1′	d = 1.0′	SD = 15.2′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	177°49.0	S01°49.5	213°12.7	12.2′	S17°29.7	12.5′	56.5′
1	192°49.2	48.5	227°43.9	12.2′	17°17.2	12.7′	56.5′
2	207°49.3	47.6	242°15.1	12.2′	17°04.5	12.7′	56.6′
3	222°49.5	·· 46.6	256°46.3	12.3′	16°51.8	12.9′	56.6′
4	237°49.7	45.6	271°17.6	12.3′	16°38.9	12.9′	56.6′
5	252°49.9	44.6	285°48.9	12.3′	16°26.0	13.1′	56.7′
6	267°50.0	S01°43.6	300°20.3	12.4′	S16°12.9	13.1′	56.7′
7	282°50.2	42.6	314°51.7	12.4′	15°59.8	13.2′	56.7′
8	297°50.4	41.6	329°23.1	12.4′	15°46.6	13.3′	56.7′
9	312°50.6	·· 40.6	343°54.5	12.5′	15°33.3	13.4′	56.8′
10	327°50.7	39.6	358°26.0	12.5′	15°19.9	13.5′	56.8′
11	342°50.9	38.7	12°57.5	12.5′	15°06.4	13.5′	56.8′
12	357°51.1	S01°37.7	27°29.0	12.6′	S14°52.9	13.7′	56.9′
13	12°51.3	36.7	42°00.6	12.6′	14°39.2	13.7′	56.9′
14	27°51.5	35.7	56°32.2	12.6′	14°25.5	13.8′	56.9′
15	42°51.6	·· 34.7	71°03.8	12.6′	14°11.7	13.9′	57.0′
16	57°51.8	33.7	85°35.4	12.7′	13°57.8	14.0′	57.0′
17	72°52.0	32.7	100°07.1	12.7′	13°43.8	14.1′	57.0′
18	87°52.2	S01°31.7	114°38.8	12.7′	S13°29.7	14.1′	57.1′
19	102°52.3	30.7	129°10.5	12.7′	13°15.6	14.2′	57.1′
20	117°52.5	29.8	143°42.2	12.8′	13°01.4	14.3′	57.1′
21	132°52.7	·· 28.8	158°14.0	12.8′	12°47.1	14.4′	57.2′
22	147°52.9	27.8	172°45.8	12.8′	12°32.7	14.4′	57.2′
23	162°53.1	26.8	187°17.6	12.8′	12°18.3	14.5′	57.2′
	SD = 16.1′	d = 1.0′	SD = 15.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:54	05:17	06:24	17:56	19:03	20:28
N 70°	04:08	05:22	06:22	17:57	18:58	20:13
68°	04:19	05:26	06:21	17:59	18:54	20:02
66°	04:28	05:29	06:20	18:00	18:51	19:52
64°	04:35	05:32	06:19	18:01	18:48	19:45
62°	04:41	05:34	06:18	18:01	18:46	19:38
60°	04:47	05:36	06:17	18:02	18:44	19:33
N 58°	04:51	05:37	06:16	18:03	18:42	19:28
56°	04:55	05:39	06:16	18:03	18:40	19:24
54°	04:59	05:40	06:15	18:04	18:39	19:21
52°	05:02	05:41	06:14	18:04	18:38	19:17
50°	05:04	05:42	06:14	18:05	18:37	19:15
45°	05:09	05:44	06:13	18:06	18:35	19:09
N 40°	05:13	05:45	06:12	18:07	18:34	19:05
35°	05:16	05:46	06:11	18:07	18:33	19:02
30°	05:18	05:46	06:10	18:08	18:32	19:00
20°	05:21	05:47	06:08	18:10	18:32	18:57
N 10°	05:22	05:46	06:07	18:11	18:32	18:56
0°	05:21	05:45	06:06	18:12	18:33	18:57
S 10°	05:19	05:43	06:04	18:14	18:35	18:59
20°	05:15	05:40	06:02	18:15	18:37	19:03
30°	05:08	05:36	06:00	18:17	18:41	19:09
35°	05:04	05:34	05:59	18:18	18:44	19:13
40°	04:58	05:30	05:57	18:20	18:47	19:18
45°	04:52	05:26	05:56	18:21	18:51	19:25
S 50°	04:43	05:21	05:54	18:23	18:55	19:34
52°	04:38	05:19	05:53	18:24	18:58	19:38
54°	04:33	05:16	05:52	18:25	19:01	19:43
56°	04:28	05:13	05:50	18:26	19:03	19:48
58°	04:21	05:09	05:49	18:27	19:07	19:55
S 60°	04:14	05:05	05:48	18:29	19:11	20:02

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▬	▬	08:07	▬	▬	12:32
N 70°	▬	▬	07:30	▬	▬	13:07
68°	▬	07:54	07:03	▬	11:00	13:32
66°	▬	07:10	06:43	▬	11:43	13:50
64°	07:07	06:41	06:26	10:03	12:12	14:06
62°	06:25	06:18	06:12	10:44	12:33	14:18
60°	05:56	06:00	06:01	11:12	12:51	14:29
N 58°	05:34	05:45	05:51	11:33	13:05	14:38
56°	05:16	05:31	05:42	11:51	13:18	14:46
54°	05:01	05:20	05:34	12:06	13:28	14:53
52°	04:48	05:10	05:27	12:18	13:38	14:59
50°	04:36	05:01	05:20	12:30	13:46	15:05
45°	04:12	04:42	05:06	12:53	14:04	15:17
N 40°	03:52	04:26	04:55	13:12	14:19	15:27
35°	03:36	04:13	04:45	13:27	14:31	15:36
30°	03:22	04:01	04:36	13:41	14:42	15:43
20°	02:58	03:41	04:21	14:03	15:00	15:56
N 10°	02:37	03:23	04:08	14:23	15:16	16:07
0°	02:17	03:07	03:55	14:41	15:30	16:18
S 10°	01:57	02:50	03:43	14:59	15:45	16:28
20°	01:36	02:33	03:29	15:19	16:00	16:39
30°	01:12	02:12	03:14	15:41	16:18	16:51
35°	00:57	02:00	03:05	15:54	16:28	16:58
40°	00:40	01:46	02:54	16:08	16:39	17:06
45°	00:20	01:30	02:42	16:26	16:53	17:16
S 50°	·· ··	01:09	02:27	16:48	17:09	17:27
52°	·· ··	01:00	02:20	16:58	17:17	17:32
54°	·· ··	00:49	02:13	17:09	17:26	17:37
56°	·· ··	00:36	02:04	17:23	17:35	17:44
58°	·· ··	00:22	01:54	17:38	17:46	17:51
S 60°	·· ··	00:04	01:42	17:56	17:58	17:59

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 25-27 26-11%
14	09:17	09:09	12:09	08:29	20:54	
15	09:01	08:53	12:09	09:19	21:43	
16	08:44	08:36	12:09	10:06	22:30	

March 17, 18, 19 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	174°35.2	162°08.6	N04°15.9	191°22.8	S08°18.7	68°06.5	N22°56.2	170°22.1	S00°29.2
1	189°37.6	177°08.2	17.2	206°23.4	17.9	83°08.9	56.2	185°24.3	29.1
2	204°40.1	192°07.9	18.4	221°24.0	17.1	98°11.3	56.2	200°26.5	29.0
3	219°42.6	207°07.5	·· 19.7	236°24.7	·· 16.4	113°13.7	·· 56.2	215°28.6	·· 28.9
4	234°45.0	222°07.1	21.0	251°25.3	15.6	128°16.1	56.2	230°30.8	28.7
5	249°47.5	237°06.8	22.3	266°25.9	14.9	143°18.5	56.2	245°33.0	28.6
6	264°50.0	252°06.4	N04°23.5	281°26.6	S08°14.1	158°20.9	N22°56.1	260°35.2	S00°28.5
7	279°52.4	267°06.0	24.8	296°27.2	13.4	173°23.4	56.1	275°37.3	28.4
8	294°54.9	282°05.6	26.1	311°27.8	12.6	188°25.8	56.1	290°39.5	28.2
9	309°57.3	297°05.3	·· 27.4	326°28.4	·· 11.9	203°28.2	·· 56.1	305°41.7	·· 28.1
10	324°59.8	312°04.9	28.6	341°29.1	11.1	218°30.6	56.1	320°43.9	28.0
11	340°02.3	327°04.5	29.9	356°29.7	10.4	233°33.0	56.1	335°46.1	27.9
12	355°04.7	342°04.2	N04°31.2	11°30.3	S08°09.6	248°35.4	N22°56.1	350°48.2	S00°27.7
13	10°07.2	357°03.8	32.5	26°31.0	08.9	263°37.8	56.1	5°50.4	27.6
14	25°09.7	12°03.4	33.7	41°31.6	08.1	278°40.2	56.1	20°52.6	27.5
15	40°12.1	27°03.0	·· 35.0	56°32.2	·· 07.3	293°42.6	·· 56.1	35°54.8	·· 27.4
16	55°14.6	42°02.7	36.3	71°32.9	06.6	308°45.0	56.1	50°57.0	27.3
17	70°17.1	57°02.3	37.5	86°33.5	05.8	323°47.4	56.1	65°59.1	27.1
18	85°19.5	72°01.9	N04°38.8	101°34.1	S08°05.1	338°49.8	N22°56.1	81°01.3	S00°27.0
19	100°22.0	87°01.6	40.1	116°34.7	04.3	353°52.3	56.1	96°03.5	26.9
20	115°24.4	102°01.2	41.4	131°35.4	03.6	8°54.7	56.1	111°05.7	26.8
21	130°26.9	117°00.8	·· 42.6	146°36.0	·· 02.8	23°57.1	·· 56.1	126°07.9	·· 26.6
22	145°29.4	132°00.4	43.9	161°36.6	02.1	38°59.5	56.1	141°10.0	26.5
23	160°31.8	147°00.1	45.2	176°37.3	01.3	54°01.9	56.1	156°12.2	26.4
Mer.pass. 12:20		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.8′	m 1.16	ν 2.4′	d 0.0′ m -2.32	ν 2.2′	d 0.1′ m 0.94

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	175°34.3	161°59.7	N04°46.4	191°37.9	S08°00.5	69°04.3	N22°56.1	171°14.4	S00°26.3
1	190°36.8	176°59.3	47.7	206°38.5	07°59.8	84°06.7	56.1	186°16.6	26.1
2	205°39.2	191°59.0	49.0	221°39.2	59.0	99°09.1	56.1	201°18.8	26.0
3	220°41.7	206°58.6	·· 50.3	236°39.8	·· 58.3	114°11.5	·· 56.1	216°20.9	·· 25.9
4	235°44.2	221°58.2	51.5	251°40.4	57.5	129°13.9	56.1	231°23.1	25.8
5	250°46.6	236°57.8	52.8	266°41.1	56.8	144°16.3	56.1	246°25.3	25.7
6	265°49.1	251°57.5	N04°54.1	281°41.7	S07°56.0	159°18.7	N22°56.1	261°27.5	S00°25.5
7	280°51.6	266°57.1	55.3	296°42.3	55.2	174°21.1	56.1	276°29.6	25.4
8	295°54.0	281°56.7	56.6	311°42.9	54.5	189°23.5	56.0	291°31.8	25.3
9	310°56.5	296°56.4	·· 57.9	326°43.6	·· 53.7	204°25.9	·· 56.0	306°34.0	·· 25.2
10	325°58.9	311°56.0	04°59.1	341°44.2	53.0	219°28.3	56.0	321°36.2	25.0
11	341°01.4	326°55.6	05°00.4	356°44.8	52.2	234°30.7	56.0	336°38.4	24.9
12	356°03.9	341°55.2	N05°01.7	11°45.5	S07°51.5	249°33.1	N22°56.0	351°40.5	S00°24.8
13	11°06.3	356°54.9	02.9	26°46.1	50.7	264°35.5	56.0	6°42.7	24.7
14	26°08.8	11°54.5	04.2	41°46.7	49.9	279°37.9	56.0	21°44.9	24.5
15	41°11.3	26°54.1	·· 05.5	56°47.4	·· 49.2	294°40.3	·· 56.0	36°47.1	·· 24.4
16	56°13.7	41°53.7	06.7	71°48.0	48.4	309°42.7	56.0	51°49.3	24.3
17	71°16.2	56°53.4	08.0	86°48.6	47.7	324°45.1	56.0	66°51.4	24.2
18	86°18.7	71°53.0	N05°09.3	101°49.3	S07°46.9	339°47.5	N22°56.0	81°53.6	S00°24.1
19	101°21.1	86°52.6	10.5	116°49.9	46.2	354°49.9	56.0	96°55.8	23.9
20	116°23.6	101°52.2	11.8	131°50.5	45.4	9°52.3	56.0	111°58.0	23.8
21	131°26.0	116°51.9	·· 13.1	146°51.2	·· 44.6	24°54.7	·· 56.0	127°00.1	·· 23.7
22	146°28.5	131°51.5	14.3	161°51.8	43.9	39°57.1	56.0	142°02.3	23.6
23	161°31.0	146°51.1	15.6	176°52.4	43.1	54°59.5	56.0	157°04.5	23.4
Mer.pass. 12:16		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.8′	m 1.16	ν 2.4′	d 0.0′ m -2.31	ν 2.2′	d 0.1′ m 0.94

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°33.4	161°50.7	N05°16.9	191°53.1	S07°42.4	70°01.9	N22°56.0	172°06.7	S00°23.3
1	191°35.9	176°50.4	18.1	206°53.7	41.6	85°04.3	56.0	187°08.9	23.2
2	206°38.4	191°50.0	19.4	221°54.3	40.8	100°06.7	56.0	202°11.0	23.1
3	221°40.8	206°49.6	·· 20.7	236°55.0	·· 40.1	115°09.1	·· 56.0	217°13.2	·· 22.9
4	236°43.3	221°49.2	21.9	251°55.6	39.3	130°11.4	55.9	232°15.4	22.8
5	251°45.8	236°48.9	23.2	266°56.2	38.6	145°13.8	55.9	247°17.6	22.7
6	266°48.2	251°48.5	N05°24.5	281°56.9	S07°37.8	160°16.2	N22°55.9	262°19.8	S00°22.6
7	281°50.7	266°48.1	25.7	296°57.5	37.1	175°18.6	55.9	277°21.9	22.4
8	296°53.2	281°47.7	27.0	311°58.2	36.3	190°21.0	55.9	292°24.1	22.3
9	311°55.6	296°47.4	·· 28.3	326°58.8	·· 35.5	205°23.4	·· 55.9	307°26.3	·· 22.2
10	326°58.1	311°47.0	29.5	341°59.4	34.8	220°25.8	55.9	322°28.5	22.1
11	342°00.5	326°46.6	30.8	357°00.1	34.0	235°28.2	55.9	337°30.6	22.0
12	357°03.0	341°46.2	N05°32.1	12°00.7	S07°33.3	250°30.6	N22°55.9	352°32.8	S00°21.8
13	12°05.5	356°45.9	33.3	27°01.3	32.5	265°33.0	55.9	7°35.0	21.7
14	27°07.9	11°45.5	34.6	42°02.0	31.7	280°35.4	55.9	22°37.2	21.6
15	42°10.4	26°45.1	·· 35.9	57°02.6	·· 31.0	295°37.8	·· 55.9	37°39.4	·· 21.5
16	57°12.9	41°44.7	37.1	72°03.2	30.2	310°40.1	55.9	52°41.5	21.3
17	72°15.3	56°44.3	38.4	87°03.9	29.5	325°42.5	55.9	67°43.7	21.2
18	87°17.8	71°44.0	N05°39.6	102°04.5	S07°28.7	340°44.9	N22°55.9	82°45.9	S00°21.1
19	102°20.3	86°43.6	40.9	117°05.1	27.9	355°47.3	55.9	97°48.1	21.0
20	117°22.7	101°43.2	42.2	132°05.8	27.2	10°49.7	55.9	112°50.2	20.8
21	132°25.2	116°42.8	·· 43.4	147°06.4	·· 26.4	25°52.1	·· 55.9	127°52.4	·· 20.7
22	147°27.6	131°42.5	44.7	162°07.1	25.6	40°54.5	55.8	142°54.6	20.6
23	162°30.1	146°42.1	45.9	177°07.7	24.9	55°56.9	55.8	157°56.8	20.5
Mer.pass. 12:12		ν -0.4′	d 1.3′	m -3.92	ν 0.6′	d 0.8′	m 1.17	ν 2.4′	d 0.0′ m -2.30	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.4
Hamal	327°50.4	23°35.2
Polaris	313°51.1	89°22.7
Acamar	315°11.3	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.1	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.5	46°01.6
Bellatrix	278°21.8	6°22.3
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.9	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°14.0	-59°35.8
Suhail	222°45.3	-43°32.5
Miaplacidus	221°37.4	-69°49.7
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.4	-63°14.7
Gacrux	171°50.0	-57°15.7
Alioth	166°11.5	55°48.8
Spica	158°21.0	-11°18.0
Alkaid	152°50.8	49°10.7
Hadar	148°34.1	-60°29.9
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.5	-60°56.5
Kochab	137°19.0	74°02.5
Zuben'ubi	136°54.7	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.5	-26°29.4
Atria	107°07.8	-69°04.2
Sabik	102°01.6	-15°45.5
Shaula	96°09.0	-37°07.3
Rasalhague	95°57.6	12°32.2
Eltanin	90°41.7	51°28.7
Kaus Aust.	83°31.3	-34°22.3
Vega	80°32.6	38°48.1
Nunki	75°46.6	-26°15.8
Altair	61°59.2	8°56.1
Peacock	53°04.5	-56°38.9
Deneb	49°25.5	45°22.2
Enif	33°38.1	9°59.6
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.8	-29°29.1
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Mar 17 Tue	SHA	Mer.pass
Venus	347°33.4	13:12
Mars	16°47.6	11:14
Jupiter	253°31.3	19:24
Saturn	355°46.9	12:37

Mar 18 Wed	SHA	Mer.pass
Venus	346°25.4	13:12
Mars	16°03.6	11:13
Jupiter	253°30.0	19:21
Saturn	355°40.1	12:33

Mar 19 Thu	SHA	Mer.pass
Venus	345°17.3	13:13
Mars	15°19.6	11:12
Jupiter	253°28.4	19:17
Saturn	355°33.2	12:30

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°53.2	S01°25.8	201°49.4	12.8′	S12°03.8	14.6′	57.2′
1	192°53.4	24.8	216°21.3	12.9′	11°49.2	14.7′	57.3′
2	207°53.6	23.8	230°53.1	12.9′	11°34.5	14.7′	57.3′
3	222°53.8	·· 22.8	245°25.0	12.9′	11°19.8	14.8′	57.3′
4	237°53.9	21.8	259°56.9	12.9′	11°05.0	14.9′	57.4′
5	252°54.1	20.9	274°28.8	12.9′	10°50.1	14.9′	57.4′
6	267°54.3	S01°19.9	289°00.8	12.9′	S10°35.2	15.0′	57.4′
7	282°54.5	18.9	303°32.7	13.0′	10°20.2	15.1′	57.5′
8	297°54.7	17.9	318°04.7	13.0′	10°05.1	15.1′	57.5′
9	312°54.8	·· 16.9	332°36.6	13.0′	09°50.0	15.2′	57.5′
10	327°55.0	15.9	347°08.6	13.0′	09°34.8	15.2′	57.6′
11	342°55.2	14.9	1°40.6	13.0′	09°19.6	15.3′	57.6′
12	357°55.4	S01°13.9	16°12.6	13.0′	S09°04.3	15.4′	57.6′
13	12°55.6	12.9	30°44.7	13.0′	08°48.9	15.4′	57.6′
14	27°55.7	12.0	45°16.7	13.0′	08°33.5	15.5′	57.7′
15	42°55.9	·· 11.0	59°48.7	13.0′	08°18.0	15.6′	57.7′
16	57°56.1	10.0	74°20.8	13.0′	08°02.4	15.6′	57.7′
17	72°56.3	09.0	88°52.8	13.1′	07°46.8	15.6′	57.8′
18	87°56.4	S01°08.0	103°24.9	13.1′	S07°31.2	15.7′	57.8′
19	102°56.6	07.0	117°56.9	13.1′	07°15.5	15.8′	57.8′
20	117°56.8	06.0	132°29.0	13.1′	06°59.7	15.8′	57.9′
21	132°57.0	·· 05.0	147°01.0	13.1′	06°43.9	15.8′	57.9′
22	147°57.2	04.0	161°33.1	13.1′	06°28.1	15.9′	57.9′
23	162°57.3	03.1	176°05.2	13.1′	06°12.2	15.9′	57.9′
	SD = 16.1′	d = 1.0′		SD = 15.6′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°57.5	S01°02.1	190°37.2	13.1′	S05°56.3	16.0′	58.0′
1	192°57.7	01.1	205°09.3	13.1′	05°40.3	16.0′	58.0′
2	207°57.9	01°00.1	219°41.3	13.0′	05°24.3	16.1′	58.0′
3	222°58.1	00°59.1	234°13.4	13.0′	05°08.2	16.1′	58.1′
4	237°58.2	58.1	248°45.4	13.0′	04°52.1	16.2′	58.1′
5	252°58.4	57.1	263°17.5	13.0′	04°35.9	16.2′	58.1′
6	267°58.6	S00°56.1	277°49.5	13.0′	S04°19.7	16.2′	58.1′
7	282°58.8	55.1	292°21.5	13.0′	04°03.5	16.2′	58.2′
8	297°59.0	54.2	306°53.5	13.0′	03°47.3	16.3′	58.2′
9	312°59.2	·· 53.2	321°25.5	13.0′	03°31.0	16.3′	58.2′
10	327°59.3	52.2	335°57.5	13.0′	03°14.7	16.4′	58.3′
11	342°59.5	51.2	350°29.5	13.0′	02°58.3	16.4′	58.3′
12	357°59.7	S00°50.2	5°01.4	12.9′	S02°41.9	16.4′	58.3′
13	12°59.9	49.2	19°33.4	12.9′	02°25.5	16.4′	58.3′
14	28°00.1	48.2	34°05.3	12.9′	02°09.1	16.5′	58.4′
15	43°00.2	·· 47.2	48°37.2	12.9′	01°52.6	16.5′	58.4′
16	58°00.4	46.2	63°09.1	12.9′	01°36.1	16.5′	58.4′
17	73°00.6	45.3	77°41.0	12.8′	01°19.6	16.5′	58.4′
18	88°00.8	S00°44.3	92°12.8	12.8′	S01°03.1	16.6′	58.5′
19	103°01.0	43.3	106°44.7	12.8′	00°46.5	16.5′	58.5′
20	118°01.1	42.3	121°16.5	12.8′	00°30.0	16.6′	58.5′
21	133°01.3	·· 41.3	135°48.2	12.8′	S00°13.4	16.6′	58.6′
22	148°01.5	40.3	150°20.0	12.7′	N00°03.2	16.7′	58.6′
23	163°01.7	39.3	164°51.7	12.7′	00°19.9	16.6′	58.6′
	SD = 16.1′	d = 1.0′		SD = 15.8′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°01.9	S00°38.3	179°23.4	12.7′	N00°36.5	16.6′	58.6′
1	193°02.1	37.3	193°55.1	12.6′	00°53.1	16.7′	58.7′
2	208°02.2	36.4	208°26.7	12.6′	01°09.8	16.6′	58.7′
3	223°02.4	·· 35.4	222°58.3	12.6′	01°26.4	16.7′	58.7′
4	238°02.6	34.4	237°29.9	12.5′	01°43.1	16.7′	58.7′
5	253°02.8	33.4	252°01.4	12.5′	01°59.8	16.6′	58.7′
6	268°03.0	S00°32.4	266°32.9	12.5′	N02°16.4	16.7′	58.8′
7	283°03.1	31.4	281°04.4	12.4′	02°33.1	16.7′	58.8′
8	298°03.3	30.4	295°35.8	12.4′	02°49.8	16.7′	58.8′
9	313°03.5	·· 29.4	310°07.2	12.4′	03°06.5	16.6′	58.8′
10	328°03.7	28.4	324°38.6	12.3′	03°23.1	16.7′	58.9′
11	343°03.9	27.4	339°09.9	12.3′	03°39.8	16.6′	58.9′
12	358°04.1	S00°26.5	353°41.2	12.2′	N03°56.4	16.7′	58.9′
13	13°04.2	25.5	8°12.4	12.2′	04°13.1	16.6′	58.9′
14	28°04.4	24.5	22°43.6	12.1′	04°29.7	16.7′	58.9′
15	43°04.6	·· 23.5	37°14.7	12.1′	04°46.4	16.6′	59.0′
16	58°04.8	22.5	51°45.8	12.0′	05°03.0	16.6′	59.0′
17	73°05.0	21.5	66°16.8	12.0′	05°19.6	16.6′	59.0′
18	88°05.2	S00°20.5	80°47.8	11.9′	N05°36.2	16.6′	59.0′
19	103°05.3	19.5	95°18.7	11.9′	05°52.8	16.5′	59.1′
20	118°05.5	18.5	109°49.6	11.8′	06°09.3	16.6′	59.1′
21	133°05.7	·· 17.6	124°20.5	11.8′	06°25.9	16.5′	59.1′
22	148°05.9	16.6	138°51.2	11.7′	06°42.4	16.5′	59.1′
23	163°06.1	15.6	153°22.0	11.7′	06°58.9	16.4′	59.1′
	SD = 16.1′	d = 1.0′		SD = 16.0′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:35	05:01	06:09	18:10	19:18	20:46
N 70°	03:52	05:08	06:09	18:10	19:11	20:28
68°	04:05	05:13	06:08	18:10	19:05	20:15
66°	04:15	05:17	06:08	18:10	19:01	20:04
64°	04:24	05:21	06:08	18:09	18:57	19:55
62°	04:31	05:24	06:08	18:09	18:54	19:47
60°	04:37	05:27	06:08	18:09	18:51	19:41
N 58°	04:42	05:29	06:08	18:10	18:49	19:35
56°	04:47	05:31	06:08	18:10	18:47	19:31
54°	04:51	05:32	06:08	18:10	18:45	19:27
52°	04:54	05:34	06:07	18:10	18:43	19:23
50°	04:57	05:35	06:07	18:10	18:42	19:20
45°	05:04	05:38	06:07	18:10	18:39	19:13
N 40°	05:08	05:40	06:07	18:10	18:37	19:08
35°	05:12	05:41	06:07	18:10	18:35	19:05
30°	05:15	05:43	06:06	18:10	18:34	19:02
20°	05:18	05:44	06:06	18:10	18:32	18:58
N 10°	05:20	05:44	06:05	18:11	18:32	18:56
0°	05:20	05:44	06:05	18:11	18:32	18:56
S 10°	05:19	05:43	06:04	18:12	18:33	18:57
20°	05:16	05:41	06:03	18:13	18:35	19:00
30°	05:10	05:38	06:02	18:13	18:37	19:05
35°	05:07	05:36	06:01	18:14	18:39	19:09
40°	05:02	05:34	06:01	18:15	18:42	19:13
45°	04:56	05:30	06:00	18:16	18:45	19:19
S 50°	04:48	05:26	05:58	18:17	18:49	19:27
52°	04:44	05:24	05:58	18:17	18:51	19:31
54°	04:40	05:22	05:57	18:18	18:53	19:35
56°	04:35	05:19	05:57	18:18	18:55	19:40
58°	04:29	05:16	05:56	18:19	18:58	19:45
S 60°	04:22	05:13	05:55	18:20	19:01	19:52

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	07:04	06:24	05:48	15:13	17:34	19:56
N 70°	06:48	06:18	05:51	15:27	17:36	19:47
68°	06:35	06:13	05:53	15:37	17:37	19:39
66°	06:24	06:09	05:55	15:46	17:39	19:33
64°	06:15	06:06	05:56	15:54	17:40	19:28
62°	06:07	06:03	05:58	16:00	17:41	19:24
60°	06:01	06:00	05:59	16:05	17:42	19:20
N 58°	05:55	05:58	06:00	16:10	17:42	19:17
56°	05:49	05:55	06:01	16:14	17:43	19:14
54°	05:44	05:54	06:02	16:18	17:43	19:11
52°	05:40	05:52	06:03	16:21	17:44	19:09
50°	05:36	05:50	06:04	16:24	17:44	19:06
45°	05:27	05:47	06:06	16:31	17:45	19:02
N 40°	05:20	05:44	06:07	16:36	17:46	18:58
35°	05:14	05:41	06:08	16:41	17:47	18:54
30°	05:08	05:39	06:09	16:45	17:48	18:51
20°	04:59	05:35	06:11	16:52	17:49	18:46
N 10°	04:50	05:32	06:13	16:58	17:49	18:42
0°	04:42	05:28	06:15	17:04	17:50	18:37
S 10°	04:34	05:25	06:17	17:10	17:51	18:33
20°	04:25	05:22	06:18	17:16	17:52	18:29
30°	04:15	05:18	06:21	17:22	17:53	18:24
35°	04:10	05:15	06:22	17:26	17:53	18:21
40°	04:03	05:13	06:23	17:31	17:54	18:17
45°	03:56	05:10	06:25	17:36	17:54	18:14
S 50°	03:46	05:06	06:27	17:42	17:55	18:09
52°	03:42	05:04	06:28	17:44	17:56	18:07
54°	03:37	05:02	06:29	17:47	17:56	18:05
56°	03:32	05:00	06:30	17:50	17:56	18:02
58°	03:26	04:58	06:31	17:54	17:57	18:00
S 60°	03:19	04:56	06:33	17:58	17:57	17:56

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Age
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	28-0 5-0%
17	08:27	08:19	12:08	10:53	23:16	
18	08:10	08:01	12:08	11:39	–:–	
19	07:53	07:44	12:08	12:26	00:03	

March 20, 21, 22 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	177°32.6	161°41.7	N05°47.2	192°08.3	S07°24.1	70°59.3	N22°55.8	172°59.0	S00°20.4
1	192°35.0	176°41.3	48.5	207°09.0	23.4	86°01.6	55.8	188°01.1	20.2
2	207°37.5	191°40.9	49.7	222°09.6	22.6	101°04.0	55.8	203°03.3	20.1
3	222°40.0	206°40.6	·· 51.0	237°10.2	·· 21.8	116°06.4	·· 55.8	218°05.5	·· 20.0
4	237°42.4	221°40.2	52.3	252°10.9	21.1	131°08.8	55.8	233°07.7	19.9
5	252°44.9	236°39.8	53.5	267°11.5	20.3	146°11.2	55.8	248°09.9	19.7
6	267°47.4	251°39.4	N05°54.8	282°12.2	S07°19.6	161°13.6	N22°55.8	263°12.0	S00°19.6
7	282°49.8	266°39.0	56.0	297°12.8	18.8	176°16.0	55.8	278°14.2	19.5
8	297°52.3	281°38.7	57.3	312°13.4	18.0	191°18.3	55.8	293°16.4	19.4
9	312°54.8	296°38.3	·· 58.5	327°14.1	·· 17.3	206°20.7	·· 55.8	308°18.6	·· 19.2
10	327°57.2	311°37.9	05°59.8	342°14.7	16.5	221°23.1	55.8	323°20.7	19.1
11	342°59.7	326°37.5	06°01.1	357°15.3	15.7	236°25.5	55.8	338°22.9	19.0
12	358°02.1	341°37.1	N06°02.3	12°16.0	S07°15.0	251°27.9	N22°55.8	353°25.1	S00°18.9
13	13°04.6	356°36.8	03.6	27°16.6	14.2	266°30.3	55.8	8°27.3	18.7
14	28°07.1	11°36.4	04.8	42°17.3	13.5	281°32.6	55.7	23°29.5	18.6
15	43°09.5	26°36.0	·· 06.1	57°17.9	·· 12.7	296°35.0	·· 55.7	38°31.6	·· 18.5
16	58°12.0	41°35.6	07.4	72°18.5	11.9	311°37.4	55.7	53°33.8	18.4
17	73°14.5	56°35.2	08.6	87°19.2	11.2	326°39.8	55.7	68°36.0	18.3
18	88°16.9	71°34.9	N06°09.9	102°19.8	S07°10.4	341°42.2	N22°55.7	83°38.2	S00°18.1
19	103°19.4	86°34.5	11.1	117°20.5	09.6	356°44.5	55.7	98°40.3	18.0
20	118°21.9	101°34.1	12.4	132°21.1	08.9	11°46.9	55.7	113°42.5	17.9
21	133°24.3	116°33.7	·· 13.6	147°21.7	·· 08.1	26°49.3	·· 55.7	128°44.7	·· 17.8
22	148°26.8	131°33.3	14.9	162°22.4	07.4	41°51.7	55.7	143°46.9	17.6
23	163°29.2	146°33.0	16.2	177°23.0	06.6	56°54.1	55.7	158°49.1	17.5
Mer.pass. 12:08		ν -0.4′	d 1.3′	ν 0.6′	d 0.8′	ν 2.4′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.17		m -2.29		m 0.93	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	178°31.7	161°32.6	N06°17.4	192°23.7	S07°05.8	71°56.4	N22°55.7	173°51.2	S00°17.4
1	193°34.2	176°32.2	18.7	207°24.3	05.1	86°58.8	55.7	188°53.4	17.3
2	208°36.6	191°31.8	19.9	222°24.9	04.3	102°01.2	55.7	203°55.6	17.1
3	223°39.1	206°31.4	·· 21.2	237°25.6	·· 03.5	117°03.6	·· 55.7	218°57.8	·· 17.0
4	238°41.6	221°31.0	22.4	252°26.2	02.8	132°05.9	55.6	233°59.9	16.9
5	253°44.0	236°30.7	23.7	267°26.9	02.0	147°08.3	55.6	249°02.1	16.8
6	268°46.5	251°30.3	N06°24.9	282°27.5	S07°01.2	162°10.7	N22°55.6	264°04.3	S00°16.7
7	283°49.0	266°29.9	26.2	297°28.1	07°00.5	177°13.1	55.6	279°06.5	16.5
8	298°51.4	281°29.5	27.4	312°28.8	06°59.7	192°15.4	55.6	294°08.7	16.4
9	313°53.9	296°29.1	·· 28.7	327°29.4	·· 58.9	207°17.8	·· 55.6	309°10.8	·· 16.3
10	328°56.4	311°28.7	30.0	342°30.1	58.2	222°20.2	55.6	324°13.0	16.2
11	343°58.8	326°28.4	31.2	357°30.7	57.4	237°22.6	55.6	339°15.2	16.0
12	359°01.3	341°28.0	N06°32.5	12°31.4	S06°56.7	252°24.9	N22°55.6	354°17.4	S00°15.9
13	14°03.7	356°27.6	33.7	27°32.0	55.9	267°27.3	55.6	9°19.5	15.8
14	29°06.2	11°27.2	35.0	42°32.6	55.1	282°29.7	55.6	24°21.7	15.7
15	44°08.7	26°26.8	·· 36.2	57°33.3	·· 54.4	297°32.1	·· 55.6	39°23.9	·· 15.5
16	59°11.1	41°26.4	37.5	72°33.9	53.6	312°34.4	55.6	54°26.1	15.4
17	74°13.6	56°26.1	38.7	87°34.6	52.8	327°36.8	55.5	69°28.3	15.3
18	89°16.1	71°25.7	N06°40.0	102°35.2	S06°52.1	342°39.2	N22°55.5	84°30.4	S00°15.2
19	104°18.5	86°25.3	41.2	117°35.8	51.3	357°41.6	55.5	99°32.6	15.1
20	119°21.0	101°24.9	42.5	132°36.5	50.5	12°43.9	55.5	114°34.8	14.9
21	134°23.5	116°24.5	·· 43.7	147°37.1	·· 49.8	27°46.3	·· 55.5	129°37.0	·· 14.8
22	149°25.9	131°24.1	45.0	162°37.8	49.0	42°48.7	55.5	144°39.1	14.7
23	164°28.4	146°23.7	46.2	177°38.4	48.2	57°51.0	55.5	159°41.3	14.6
Mer.pass. 12:04		ν -0.4′	d 1.3′	ν 0.6′	d 0.8′	ν 2.4′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.17		m -2.28		m 0.92	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	179°30.9	161°23.3	N06°47.5	192°39.1	S06°47.5	72°53.4	N22°55.5	174°43.5	S00°14.4
1	194°33.3	176°23.0	48.7	207°39.7	46.7	87°55.8	55.5	189°45.7	14.3
2	209°35.8	191°22.6	50.0	222°40.3	45.9	102°58.1	55.5	204°47.9	14.2
3	224°38.2	206°22.2	·· 51.2	237°41.0	·· 45.2	118°00.5	·· 55.5	219°50.0	·· 14.1
4	239°40.7	221°21.8	52.5	252°41.6	44.4	133°02.9	55.5	234°52.2	13.9
5	254°43.2	236°21.4	53.7	267°42.3	43.6	148°05.2	55.5	249°54.4	13.8
6	269°45.6	251°21.0	N06°55.0	282°42.9	S06°42.9	163°07.6	N22°55.4	264°56.6	S00°13.7
7	284°48.1	266°20.6	56.2	297°43.6	42.1	178°10.0	55.4	279°58.7	13.6
8	299°50.6	281°20.3	57.5	312°44.2	41.3	193°12.4	55.4	295°00.9	13.5
9	314°53.0	296°19.9	06°58.7	327°44.9	·· 40.6	208°14.7	·· 55.4	310°03.1	·· 13.3
10	329°55.5	311°19.5	07°00.0	342°45.5	39.8	223°17.1	55.4	325°05.3	13.2
11	344°58.0	326°19.1	01.2	357°46.1	39.0	238°19.4	55.4	340°07.5	13.1
12	0°00.4	341°18.7	N07°02.4	12°46.8	S06°38.3	253°21.8	N22°55.4	355°09.6	S00°13.0
13	15°02.9	356°18.3	03.7	27°47.4	37.5	268°24.2	55.4	10°11.8	12.8
14	30°05.3	11°17.9	04.9	42°48.1	36.7	283°26.5	55.4	25°14.0	12.7
15	45°07.8	26°17.5	·· 06.2	57°48.7	·· 36.0	298°28.9	·· 55.4	40°16.2	·· 12.6
16	60°10.3	41°17.1	07.4	72°49.4	35.2	313°31.3	55.4	55°18.3	12.5
17	75°12.7	56°16.8	08.7	87°50.0	34.4	328°33.6	55.4	70°20.5	12.3
18	90°15.2	71°16.4	N07°09.9	102°50.7	S06°33.7	343°36.0	N22°55.3	85°22.7	S00°12.2
19	105°17.7	86°16.0	11.2	117°51.3	32.9	358°38.4	55.3	100°24.9	12.1
20	120°20.1	101°15.6	12.4	132°51.9	32.1	13°40.7	55.3	115°27.1	12.0
21	135°22.6	116°15.2	·· 13.7	147°52.6	·· 31.4	28°43.1	·· 55.3	130°29.2	·· 11.9
22	150°25.1	131°14.8	14.9	162°53.2	30.6	43°45.5	55.3	145°31.4	11.7
23	165°27.5	146°14.4	16.1	177°53.9	29.8	58°47.8	55.3	160°33.6	11.6
Mer.pass. 12:00		ν -0.4′	d 1.2′	ν 0.6′	d 0.8′	ν 2.4′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.17		m -2.28		m 0.92	

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°19.9	-57°06.3
Hamal	327°50.4	23°35.2
Polaris	313°52.2	89°22.7
Acamar	315°11.3	-40°12.2
Menkar	314°05.3	4°11.5
Mirfak	308°27.1	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.5	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.9	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°15.9	27°57.8
Avior	234°14.0	-59°35.9
Suhail	222°45.3	-43°32.5
Miaplacidus	221°37.4	-69°49.7
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.5
Denebola	182°23.6	14°25.4
Gienah	175°42.3	-17°41.4
Acrux	172°58.3	-63°14.7
Gacrux	171°50.0	-57°15.7
Alioth	166°11.5	55°48.9
Spica	158°21.0	-11°18.0
Alkaid	152°50.8	49°10.7
Hadar	148°34.1	-60°29.9
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.5	-60°56.5
Kochab	137°18.9	74°02.5
Zuben'ubi	136°54.7	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.5	-26°29.4
Atria	107°07.7	-69°04.2
Sabik	102°01.6	-15°45.5
Shaula	96°09.0	-37°07.3
Rasalhague	95°57.6	12°32.2
Eltanin	90°41.7	51°28.7
Kaus Aust.	83°31.2	-34°22.3
Vega	80°32.6	38°48.1
Nunki	75°46.6	-26°15.8
Altair	61°59.1	8°56.1
Peacock	53°04.5	-56°38.9
Deneb	49°25.4	45°22.2
Enif	33°38.1	9°59.6
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.8	-29°29.0
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Mar 20 Fri	SHA	Mer.pass
Venus	344°09.1	13:14
Mars	14°35.8	11:11
Jupiter	253°26.7	19:13
Saturn	355°26.4	12:26

Mar 21 Sat	SHA	Mer.pass
Venus	343°00.9	13:14
Mars	13°51.9	11:10
Jupiter	253°24.7	19:09
Saturn	355°19.5	12:23

Mar 22 Sun	SHA	Mer.pass
Venus	341°52.5	13:15
Mars	13°08.2	11:09
Jupiter	253°22.6	19:05
Saturn	355°12.7	12:19

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°06.3	S00°14.6	167°52.6	11.6′	N07°15.3	16.5′	59.1′
1	193°06.4	13.6	182°23.2	11.6′	07°31.8	16.4′	59.2′
2	208°06.6	12.6	196°53.8	11.5′	07°48.2	16.3′	59.2′
3	223°06.8	·· 11.6	211°24.3	11.4′	08°04.5	16.4′	59.2′
4	238°07.0	10.6	225°54.7	11.4′	08°20.9	16.3′	59.2′
5	253°07.2	09.6	240°25.1	11.3′	08°37.2	16.3′	59.2′
6	268°07.4	S00°08.7	254°55.4	11.2′	N08°53.5	16.2′	59.3′
7	283°07.5	07.7	269°25.6	11.2′	09°09.7	16.2′	59.3′
8	298°07.7	06.7	283°55.8	11.1′	09°25.9	16.1′	59.3′
9	313°07.9	·· 05.7	298°25.9	11.0′	09°42.0	16.2′	59.3′
10	328°08.1	04.7	312°56.0	11.0′	09°58.2	16.0′	59.3′
11	343°08.3	03.7	327°25.9	10.9′	10°14.2	16.0′	59.3′
12	358°08.5	S00°02.7	341°55.8	10.8′	N10°30.2	16.0′	59.3′
13	13°08.6	01.7	356°25.7	10.8′	10°46.2	15.9′	59.4′
14	28°08.8	S00°00.8	10°55.4	10.7′	11°02.1	15.9′	59.4′
15	43°09.0	N00°00.2	25°25.1	10.6′	11°18.0	15.8′	59.4′
16	58°09.2	01.2	39°54.7	10.5′	11°33.8	15.8′	59.4′
17	73°09.4	02.2	54°24.2	10.5′	11°49.6	15.7′	59.4′
18	88°09.6	N00°03.2	68°53.7	10.4′	N12°05.3	15.6′	59.4′
19	103°09.7	04.2	83°23.1	10.3′	12°20.9	15.6′	59.4′
20	118°09.9	05.2	97°52.4	10.2′	12°36.5	15.5′	59.5′
21	133°10.1	·· 06.2	112°21.6	10.1′	12°52.0	15.5′	59.5′
22	148°10.3	07.2	126°50.8	10.1′	13°07.5	15.4′	59.5′
23	163°10.5	08.1	141°19.8	10.0′	13°22.9	15.3′	59.5′
	SD = 16.1′	d = 1.0′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°10.7	N00°09.1	155°48.8	9.9′	N13°38.2	15.2′	59.5′
1	193°10.8	10.1	170°17.7	9.8′	13°53.4	15.2′	59.5′
2	208°11.0	11.1	184°46.5	9.7′	14°08.6	15.1′	59.5′
3	223°11.2	·· 12.1	199°15.2	9.6′	14°23.7	15.0′	59.5′
4	238°11.4	13.1	213°43.9	9.6′	14°38.7	15.0′	59.5′
5	253°11.6	14.1	228°12.4	9.5′	14°53.7	14.9′	59.6′
6	268°11.8	N00°15.1	242°40.9	9.4′	N15°08.6	14.7′	59.6′
7	283°12.0	16.0	257°09.3	9.3′	15°23.3	14.7′	59.6′
8	298°12.1	17.0	271°37.6	9.2′	15°38.0	14.7′	59.6′
9	313°12.3	·· 18.0	286°05.8	9.1′	15°52.7	14.5′	59.6′
10	328°12.5	19.0	300°33.9	9.0′	16°07.2	14.4′	59.6′
11	343°12.7	20.0	315°02.0	8.9′	16°21.6	14.4′	59.6′
12	358°12.9	N00°21.0	329°29.9	8.8′	N16°36.0	14.3′	59.6′
13	13°13.1	22.0	343°57.7	8.8′	16°50.3	14.1′	59.6′
14	28°13.3	23.0	358°25.5	8.7′	17°04.4	14.1′	59.6′
15	43°13.4	·· 24.0	12°53.1	8.6′	17°18.5	14.0′	59.6′
16	58°13.6	24.9	27°20.7	8.5′	17°32.5	13.8′	59.6′
17	73°13.8	25.9	41°48.2	8.4′	17°46.3	13.8′	59.6′
18	88°14.0	N00°26.9	56°15.5	8.3′	N18°00.1	13.7′	59.6′
19	103°14.2	27.9	70°42.8	8.2′	18°13.8	13.5′	59.7′
20	118°14.4	28.9	85°10.0	8.1′	18°27.3	13.5′	59.7′
21	133°14.6	·· 29.9	99°37.1	8.0′	18°40.8	13.3′	59.7′
22	148°14.7	30.9	114°04.1	7.9′	18°54.1	13.2′	59.7′
23	163°14.9	31.9	128°31.0	7.8′	19°07.3	13.1′	59.7′
	SD = 16.1′	d = 1.0′	SD = 16.2′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°15.1	N00°32.8	142°57.8	7.7′	N19°20.4	13.0′	59.7′
1	193°15.3	33.8	157°24.5	7.6′	19°33.4	12.9′	59.7′
2	208°15.5	34.8	171°51.1	7.5′	19°46.3	12.8′	59.7′
3	223°15.7	·· 35.8	186°17.6	7.4′	19°59.1	12.6′	59.7′
4	238°15.9	36.8	200°44.0	7.3′	20°11.7	12.5′	59.7′
5	253°16.0	37.8	215°10.4	7.2′	20°24.2	12.4′	59.7′
6	268°16.2	N00°38.8	229°36.6	7.1′	N20°36.6	12.3′	59.7′
7	283°16.4	39.8	244°02.7	7.0′	20°48.9	12.1′	59.7′
8	298°16.6	40.7	258°28.7	6.9′	21°01.0	12.0′	59.7′
9	313°16.8	·· 41.7	272°54.6	6.8′	21°13.0	11.9′	59.7′
10	328°17.0	42.7	287°20.5	6.7′	21°24.9	11.7′	59.7′
11	343°17.2	43.7	301°46.2	6.6′	21°36.6	11.7′	59.7′
12	358°17.3	N00°44.7	316°11.8	6.5′	N21°48.3	11.4′	59.7′
13	13°17.5	45.7	330°37.4	6.4′	21°59.7	11.3′	59.7′
14	28°17.7	46.7	345°02.8	6.3′	22°11.0	11.2′	59.7′
15	43°17.9	·· 47.6	359°28.2	6.3′	22°22.2	11.1′	59.7′
16	58°18.1	48.6	13°53.4	6.2′	22°33.3	10.9′	59.7′
17	73°18.3	49.6	28°18.6	6.1′	22°44.2	10.7′	59.7′
18	88°18.5	N00°50.6	42°43.7	6.0′	N22°54.9	10.6′	59.7′
19	103°18.6	51.6	57°08.6	5.9′	23°05.5	10.5′	59.7′
20	118°18.8	52.6	71°33.5	5.8′	23°16.0	10.3′	59.7′
21	133°19.0	·· 53.6	85°58.3	5.7′	23°26.3	10.2′	59.7′
22	148°19.2	54.6	100°23.0	5.6′	23°36.5	10.0′	59.7′
23	163°19.4	55.5	114°47.6	5.5′	23°46.5	9.8′	59.7′
	SD = 16.0′	d = 1.0′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:15	04:45	05:53	18:23	19:32	21:05
N 70°	03:35	04:53	05:55	18:22	19:24	20:44
68°	03:50	05:00	05:56	18:20	19:17	20:28
66°	04:02	05:05	05:57	18:19	19:11	20:15
64°	04:12	05:10	05:58	18:18	19:06	20:05
62°	04:20	05:14	05:58	18:18	19:02	19:56
60°	04:27	05:17	05:59	18:17	18:59	19:49
N 58°	04:33	05:20	05:59	18:16	18:56	19:43
56°	04:38	05:23	06:00	18:16	18:53	19:37
54°	04:43	05:25	06:00	18:15	18:51	19:33
52°	04:47	05:27	06:01	18:15	18:49	19:29
50°	04:51	05:29	06:01	18:14	18:47	19:25
45°	04:58	05:32	06:02	18:14	18:43	19:17
N 40°	05:03	05:35	06:02	18:13	18:40	19:12
35°	05:08	05:37	06:02	18:12	18:38	19:07
30°	05:11	05:39	06:03	18:12	18:36	19:04
20°	05:16	05:41	06:03	18:11	18:33	18:59
N 10°	05:18	05:43	06:04	18:11	18:32	18:56
0°	05:19	05:43	06:04	18:10	18:31	18:55
S 10°	05:19	05:43	06:04	18:10	18:31	18:55
20°	05:16	05:42	06:04	18:10	18:32	18:57
30°	05:12	05:40	06:04	18:10	18:34	19:02
35°	05:09	05:39	06:04	18:10	18:35	19:05
40°	05:05	05:37	06:04	18:10	18:37	19:08
45°	05:00	05:34	06:04	18:10	18:39	19:13
S 50°	04:53	05:31	06:03	18:10	18:42	19:20
52°	04:50	05:29	06:03	18:10	18:44	19:23
54°	04:46	05:28	06:03	18:10	18:45	19:27
56°	04:41	05:26	06:03	18:10	18:47	19:31
58°	04:36	05:23	06:03	18:10	18:50	19:36
S 60°	04:31	05:21	06:02	18:11	18:52	19:42

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	05:09	04:14	▭	22:37	▭	▭
N 70°	05:21	04:43	03:05	22:11	·· ··	01:41
68°	05:31	05:05	04:18	21:51	·· ··	00:29
66°	05:40	05:22	04:56	21:35	23:53	▭
64°	05:47	05:36	05:23	21:22	23:27	·· ··
62°	05:53	05:49	05:44	21:12	23:07	·· ··
60°	05:59	05:59	06:01	21:03	22:51	·· ··
N 58°	06:04	06:08	06:15	20:55	22:38	·· ··
56°	06:08	06:16	06:28	20:48	22:26	·· ··
54°	06:12	06:23	06:39	20:42	22:16	23:52
52°	06:15	06:30	06:48	20:36	22:07	23:39
50°	06:18	06:36	06:57	20:31	21:59	23:28
45°	06:26	06:48	07:16	20:20	21:42	23:05
N 40°	06:31	06:59	07:31	20:12	21:28	22:46
35°	06:37	07:08	07:44	20:04	21:16	22:30
30°	06:41	07:16	07:55	19:57	21:06	22:17
20°	06:49	07:30	08:15	19:46	20:49	21:54
N 10°	06:56	07:42	08:32	19:36	20:33	21:34
0°	07:03	07:54	08:49	19:27	20:19	21:16
S 10°	07:10	08:06	09:05	19:18	20:05	20:58
20°	07:17	08:18	09:23	19:08	19:50	20:38
30°	07:25	08:33	09:43	18:57	19:33	20:16
35°	07:30	08:41	09:55	18:50	19:24	20:03
40°	07:36	08:51	10:09	18:43	19:12	19:48
45°	07:42	09:03	10:25	18:35	18:59	19:30
S 50°	07:50	09:17	10:46	18:25	18:43	19:08
52°	07:54	09:24	10:56	18:20	18:36	18:58
54°	07:58	09:31	11:07	18:15	18:28	18:46
56°	08:03	09:39	11:20	18:09	18:19	18:33
58°	08:08	09:49	11:34	18:03	18:08	18:17
S 60°	08:13	09:59	11:52	17:56	17:56	17:59

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 1-3 1-11%
20	07:35	07:26	12:07	13:15	00:50	
21	07:17	07:08	12:07	14:07	01:40	
22	07:00	06:51	12:07	15:02	02:34	

March 23, 24, 25 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	180°30.0	161°14.0	N07°17.4	192°54.5	S06°29.0	73°50.2	N22°55.3	175°35.8	S00°11.5
1	195°32.5	176°13.6	18.6	207°55.2	28.3	88°52.5	55.3	190°37.9	11.4
2	210°34.9	191°13.2	19.9	222°55.8	27.5	103°54.9	55.3	205°40.1	11.2
3	225°37.4	206°12.9	·· 21.1	237°56.5	·· 26.7	118°57.3	·· 55.3	220°42.3	·· 11.1
4	240°39.8	221°12.5	22.4	252°57.1	26.0	133°59.6	55.3	235°44.5	11.0
5	255°42.3	236°12.1	23.6	267°57.8	25.2	149°02.0	55.2	250°46.7	10.9
6	270°44.8	251°11.7	N07°24.8	282°58.4	S06°24.4	164°04.3	N22°55.2	265°48.8	S00°10.7
7	285°47.2	266°11.3	26.1	297°59.1	23.7	179°06.7	55.2	280°51.0	10.6
8	300°49.7	281°10.9	27.3	312°59.7	22.9	194°09.1	55.2	295°53.2	10.5
9	315°52.2	296°10.5	·· 28.6	328°00.3	·· 22.1	209°11.4	·· 55.2	310°55.4	·· 10.4
10	330°54.6	311°10.1	29.8	343°01.0	21.4	224°13.8	55.2	325°57.5	10.3
11	345°57.1	326°09.7	31.0	358°01.6	20.6	239°16.1	55.2	340°59.7	10.1
12	0°59.6	341°09.3	N07°32.3	13°02.3	S06°19.8	254°18.5	N22°55.2	356°01.9	S00°10.0
13	16°02.0	356°08.9	33.5	28°02.9	19.1	269°20.8	55.2	11°04.1	09.9
14	31°04.5	11°08.5	34.8	43°03.6	18.3	284°23.2	55.2	26°06.3	09.8
15	46°07.0	26°08.1	·· 36.0	58°04.2	·· 17.5	299°25.6	·· 55.2	41°08.4	·· 09.6
16	61°09.4	41°07.7	37.2	73°04.9	16.7	314°27.9	55.1	56°10.6	09.5
17	76°11.9	56°07.3	38.5	88°05.5	16.0	329°30.3	55.1	71°12.8	09.4
18	91°14.3	71°07.0	N07°39.7	103°06.2	S06°15.2	344°32.6	N22°55.1	86°15.0	S00°09.3
19	106°16.8	86°06.6	40.9	118°06.8	14.4	359°35.0	55.1	101°17.1	09.1
20	121°19.3	101°06.2	42.2	133°07.5	13.7	14°37.3	55.1	116°19.3	09.0
21	136°21.7	116°05.8	·· 43.4	148°08.1	·· 12.9	29°39.7	·· 55.1	131°21.5	·· 08.9
22	151°24.2	131°05.4	44.7	163°08.8	12.1	44°42.0	55.1	146°23.7	08.8
23	166°26.7	146°05.0	45.9	178°09.4	11.4	59°44.4	55.1	161°25.8	08.7
Mer.pass. 11:56		ν -0.4′	d 1.2′	m -3.92	ν 0.6′	d 0.8′	m 1.17	ν 2.4′	d 0.0′ m -2.27	ν 2.2′	d 0.1′ m 0.91

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	181°29.1	161°04.6	N07°47.1	193°10.1	S06°10.6	74°46.7	N22°55.1	176°28.0	S00°08.5
1	196°31.6	176°04.2	48.4	208°10.7	09.8	89°49.1	55.1	191°30.2	08.4
2	211°34.1	191°03.8	49.6	223°11.4	09.0	104°51.4	55.0	206°32.4	08.3
3	226°36.5	206°03.4	·· 50.8	238°12.0	·· 08.3	119°53.8	·· 55.0	221°34.6	·· 08.2
4	241°39.0	221°03.0	52.1	253°12.7	07.5	134°56.1	55.0	236°36.7	08.0
5	256°41.5	236°02.6	53.3	268°13.3	06.7	149°58.5	55.0	251°38.9	07.9
6	271°43.9	251°02.2	N07°54.5	283°14.0	S06°06.0	165°00.9	N22°55.0	266°41.1	S00°07.8
7	286°46.4	266°01.8	55.8	298°14.6	05.2	180°03.2	55.0	281°43.3	07.7
8	301°48.8	281°01.4	57.0	313°15.3	04.4	195°05.6	55.0	296°45.4	07.5
9	316°51.3	296°01.0	·· 58.2	328°15.9	·· 03.6	210°07.9	·· 55.0	311°47.6	·· 07.4
10	331°53.8	311°00.6	07°59.5	343°16.6	02.9	225°10.3	55.0	326°49.8	07.3
11	346°56.2	326°00.2	08°00.7	358°17.2	02.1	240°12.6	55.0	341°52.0	07.2
12	1°58.7	340°59.8	N08°01.9	13°17.9	S06°01.3	255°14.9	N22°54.9	356°54.2	S00°07.1
13	17°01.2	355°59.4	03.2	28°18.5	06°00.6	270°17.3	54.9	11°56.3	06.9
14	32°03.6	10°59.0	04.4	43°19.2	05°59.8	285°19.6	54.9	26°58.5	06.8
15	47°06.1	25°58.6	·· 05.6	58°19.8	·· 59.0	300°22.0	·· 54.9	42°00.7	·· 06.7
16	62°08.6	40°58.2	06.9	73°20.5	58.2	315°24.3	54.9	57°02.9	06.6
17	77°11.0	55°57.8	08.1	88°21.1	57.5	330°26.7	54.9	72°05.0	06.4
18	92°13.5	70°57.4	N08°09.3	103°21.8	S05°56.7	345°29.0	N22°54.9	87°07.2	S00°06.3
19	107°15.9	85°57.0	10.6	118°22.4	55.9	0°31.4	54.9	102°09.4	06.2
20	122°18.4	100°56.6	11.8	133°23.1	55.2	15°33.7	54.9	117°11.6	06.1
21	137°20.9	115°56.2	·· 13.0	148°23.7	·· 54.4	30°36.1	·· 54.8	132°13.8	·· 05.9
22	152°23.3	130°55.8	14.2	163°24.4	53.6	45°38.4	54.8	147°15.9	05.8
23	167°25.8	145°55.4	15.5	178°25.0	52.8	60°40.8	54.8	162°18.1	05.7
Mer.pass. 11:52		ν -0.4′	d 1.2′	m -3.92	ν 0.6′	d 0.8′	m 1.17	ν 2.4′	d 0.0′ m -2.26	ν 2.2′	d 0.1′ m 0.91

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	182°28.3	160°55.0	N08°16.7	193°25.7	S05°52.1	75°43.1	N22°54.8	177°20.3	S00°05.6
1	197°30.7	175°54.6	17.9	208°26.3	51.3	90°45.5	54.8	192°22.5	05.5
2	212°33.2	190°54.2	19.2	223°27.0	50.5	105°47.8	54.8	207°24.6	05.3
3	227°35.7	205°53.8	·· 20.4	238°27.6	·· 49.8	120°50.1	·· 54.8	222°26.8	·· 05.2
4	242°38.1	220°53.4	21.6	253°28.3	49.0	135°52.5	54.8	237°29.0	05.1
5	257°40.6	235°53.0	22.8	268°28.9	48.2	150°54.8	54.8	252°31.2	05.0
6	272°43.1	250°52.6	N08°24.1	283°29.6	S05°47.4	165°57.2	N22°54.7	267°33.3	S00°04.8
7	287°45.5	265°52.2	25.3	298°30.2	46.7	180°59.5	54.7	282°35.5	04.7
8	302°48.0	280°51.8	26.5	313°30.9	45.9	196°01.9	54.7	297°37.7	04.6
9	317°50.4	295°51.4	·· 27.7	328°31.5	·· 45.1	211°04.2	·· 54.7	312°39.9	·· 04.5
10	332°52.9	310°51.0	29.0	343°32.2	44.3	226°06.5	54.7	327°42.1	04.3
11	347°55.4	325°50.6	30.2	358°32.8	43.6	241°08.9	54.7	342°44.2	04.2
12	2°57.8	340°50.2	N08°31.4	13°33.5	S05°42.8	256°11.2	N22°54.7	357°46.4	S00°04.1
13	18°00.3	355°49.8	32.6	28°34.1	42.0	271°13.6	54.7	12°48.6	04.0
14	33°02.8	10°49.4	33.9	43°34.8	41.3	286°15.9	54.7	27°50.8	03.9
15	48°05.2	25°49.0	·· 35.1	58°35.5	·· 40.5	301°18.2	·· 54.6	42°52.9	·· 03.7
16	63°07.7	40°48.6	36.3	73°36.1	39.7	316°20.6	54.6	57°55.1	03.6
17	78°10.2	55°48.2	37.5	88°36.8	38.9	331°22.9	54.6	72°57.3	03.5
18	93°12.6	70°47.8	N08°38.8	103°37.4	S05°38.2	346°25.3	N22°54.6	87°59.5	S00°03.4
19	108°15.1	85°47.4	40.0	118°38.1	37.4	1°27.6	54.6	103°01.7	03.2
20	123°17.6	100°47.0	41.2	133°38.7	36.6	16°29.9	54.6	118°03.8	03.1
21	138°20.0	115°46.5	·· 42.4	148°39.4	·· 35.8	31°32.3	·· 54.6	133°06.0	·· 03.0
22	153°22.5	130°46.1	43.6	163°40.0	35.1	46°34.6	54.6	148°08.2	02.9
23	168°24.9	145°45.7	44.9	178°40.7	34.3	61°36.9	54.6	163°10.4	02.8
Mer.pass. 11:48		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.17	ν 2.3′	d 0.0′ m -2.25	ν 2.2′	d 0.1′ m 0.91

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.7
Achernar	335°20.0	-57°06.3
Hamal	327°50.4	23°35.2
Polaris	313°53.0	89°22.7
Acamar	315°11.3	-40°12.1
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.5	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°51.9	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.0	-59°35.9
Suhail	222°45.3	-43°32.5
Miaplacidus	221°37.5	-69°49.7
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.4
Acrux	172°58.3	-63°14.7
Gacrux	171°50.0	-57°15.7
Alioth	166°11.5	55°48.9
Spica	158°21.0	-11°18.1
Alkaid	152°50.8	49°10.7
Hadar	148°34.1	-60°29.9
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.4	-60°56.6
Kochab	137°18.9	74°02.5
Zuben'ubi	136°54.7	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.5	-26°29.4
Atria	107°07.6	-69°04.2
Sabik	102°01.6	-15°45.5
Shaula	96°09.0	-37°07.3
Rasalhague	95°57.6	12°32.2
Eltanin	90°41.7	51°28.7
Kaus Aust.	83°31.2	-34°22.3
Vega	80°32.6	38°48.1
Nunki	75°46.6	-26°15.8
Altair	61°59.1	8°56.1
Peacock	53°04.5	-56°38.9
Deneb	49°25.4	45°22.1
Enif	33°38.1	9°59.6
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.8	-29°29.0
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Mar 23 Mon	SHA	Mer.pass
Venus	340°44.0	13:15
Mars	12°24.5	11:08
Jupiter	253°20.2	19:02
Saturn	355°05.8	12:16

Mar 24 Tue	SHA	Mer.pass
Venus	339°35.5	13:16
Mars	11°40.9	11:07
Jupiter	253°17.6	18:58
Saturn	354°58.9	12:12

Mar 25 Wed	SHA	Mer.pass
Venus	338°26.8	13:17
Mars	10°57.4	11:06
Jupiter	253°14.8	18:54
Saturn	354°52.0	12:09

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°19.6	N00°56.5	129°12.1	5.4′	N23°56.3	9.7′	59.7′
1	193°19.8	57.5	143°36.5	5.3′	24°06.0	9.5′	59.7′
2	208°20.0	58.5	158°00.9	5.3′	24°15.5	9.4′	59.7′
3	223°20.1	00°59.5	172°25.1	5.2′	24°24.9	9.2′	59.7′
4	238°20.3	01°00.5	186°49.3	5.1′	24°34.1	9.0′	59.7′
5	253°20.5	01.5	201°13.4	5.0′	24°43.1	8.9′	59.6′
6	268°20.7	N01°02.4	215°37.4	4.9′	N24°52.0	8.7′	59.6′
7	283°20.9	03.4	230°01.3	4.8′	25°00.7	8.5′	59.6′
8	298°21.1	04.4	244°25.1	4.8′	25°09.2	8.4′	59.6′
9	313°21.3	·· 05.4	258°48.9	4.7′	25°17.6	8.2′	59.6′
10	328°21.5	06.4	273°12.6	4.6′	25°25.8	8.0′	59.6′
11	343°21.6	07.4	287°36.2	4.5′	25°33.8	7.9′	59.6′
12	358°21.8	N01°08.4	301°59.7	4.4′	N25°41.7	7.7′	59.6′
13	13°22.0	09.3	316°23.1	4.4′	25°49.4	7.5′	59.6′
14	28°22.2	10.3	330°46.5	4.3′	25°56.9	7.3′	59.6′
15	43°22.4	·· 11.3	345°09.8	4.2′	26°04.2	7.1′	59.6′
16	58°22.6	12.3	359°33.1	4.2′	26°11.3	7.0′	59.6′
17	73°22.8	13.3	13°56.2	4.1′	26°18.3	6.8′	59.6′
18	88°23.0	N01°14.3	28°19.3	4.0′	N26°25.1	6.6′	59.6′
19	103°23.1	15.3	42°42.4	4.0′	26°31.7	6.4′	59.6′
20	118°23.3	16.2	57°05.3	3.9′	26°38.1	6.2′	59.6′
21	133°23.5	·· 17.2	71°28.3	3.9′	26°44.3	6.1′	59.5′
22	148°23.7	18.2	85°51.1	3.8′	26°50.4	5.9′	59.5′
23	163°23.9	19.2	100°13.9	3.8′	26°56.3	5.6′	59.5′
	SD = 16.0′	d = 1.0′	SD = 16.3′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°24.1	N01°20.2	114°36.7	3.7′	N27°01.9	5.5′	59.5′
1	193°24.3	21.2	128°59.4	3.6′	27°07.4	5.3′	59.5′
2	208°24.5	22.2	143°22.0	3.6′	27°12.7	5.1′	59.5′
3	223°24.6	·· 23.1	157°44.6	3.6′	27°17.8	4.9′	59.5′
4	238°24.8	24.1	172°07.2	3.5′	27°22.7	4.8′	59.5′
5	253°25.0	25.1	186°29.7	3.5′	27°27.5	4.5′	59.5′
6	268°25.2	N01°26.1	200°52.2	3.4′	N27°32.0	4.4′	59.5′
7	283°25.4	27.1	215°14.6	3.4′	27°36.4	4.1′	59.5′
8	298°25.6	28.1	229°37.0	3.4′	27°40.5	4.0′	59.4′
9	313°25.8	·· 29.0	243°59.4	3.3′	27°44.5	3.7′	59.4′
10	328°26.0	30.0	258°21.7	3.3′	27°48.2	3.6′	59.4′
11	343°26.1	31.0	272°44.0	3.3′	27°51.8	3.4′	59.4′
12	358°26.3	N01°32.0	287°06.3	3.3′	N27°55.2	3.1′	59.4′
13	13°26.5	33.0	301°28.5	3.2′	27°58.3	3.0′	59.4′
14	28°26.7	34.0	315°50.8	3.2′	28°01.3	2.8′	59.4′
15	43°26.9	·· 34.9	330°13.0	3.2′	28°04.1	2.6′	59.4′
16	58°27.1	35.9	344°35.2	3.2′	28°06.7	2.4′	59.4′
17	73°27.3	36.9	358°57.4	3.2′	28°09.1	2.2′	59.3′
18	88°27.5	N01°37.9	13°19.5	3.2′	N28°11.3	2.0′	59.3′
19	103°27.6	38.9	27°41.7	3.2′	28°13.3	1.8′	59.3′
20	118°27.8	39.9	42°03.9	3.2′	28°15.1	1.6′	59.3′
21	133°28.0	·· 40.9	56°26.0	3.2′	28°16.7	1.4′	59.3′
22	148°28.2	41.8	70°48.2	3.2′	28°18.1	1.2′	59.3′
23	163°28.4	42.8	85°10.3	3.2′	28°19.3	1.0′	59.3′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°28.6	N01°43.8	99°32.5	3.2′	N28°20.3	0.8′	59.3′
1	193°28.8	44.8	113°54.7	3.2′	28°21.1	0.6′	59.2′
2	208°29.0	45.8	128°16.8	3.2′	28°21.7	0.4′	59.2′
3	223°29.2	·· 46.8	142°39.0	3.2′	28°22.1	0.2′	59.2′
4	238°29.3	47.7	157°01.2	3.2′	28°22.3	0.0′	59.2′
5	253°29.5	48.7	171°23.4	3.2′	28°22.3	0.2′	59.2′
6	268°29.7	N01°49.7	185°45.7	3.3′	N28°22.1	0.3′	59.2′
7	283°29.9	50.7	200°08.0	3.3′	28°21.8	0.6′	59.2′
8	298°30.1	51.7	214°30.2	3.3′	28°21.2	0.8′	59.1′
9	313°30.3	·· 52.7	228°52.6	3.4′	28°20.4	0.9′	59.1′
10	328°30.5	53.6	243°14.9	3.4′	28°19.5	1.2′	59.1′
11	343°30.7	54.6	257°37.3	3.4′	28°18.3	1.4′	59.1′
12	358°30.9	N01°55.6	271°59.7	3.5′	N28°16.9	1.5′	59.1′
13	13°31.0	56.6	286°22.2	3.5′	28°15.4	1.7′	59.1′
14	28°31.2	57.6	300°44.7	3.5′	28°13.7	2.0′	59.1′
15	43°31.4	·· 58.5	315°07.2	3.6′	28°11.7	2.1′	59.0′
16	58°31.6	01°59.5	329°29.8	3.6′	28°09.6	2.3′	59.0′
17	73°31.8	02°00.5	343°52.4	3.7′	28°07.3	2.5′	59.0′
18	88°32.0	N02°01.5	358°15.1	3.7′	N28°04.8	2.7′	59.0′
19	103°32.2	02.5	12°37.9	3.8′	28°02.1	2.9′	59.0′
20	118°32.4	03.5	27°00.6	3.8′	27°59.2	3.1′	59.0′
21	133°32.5	·· 04.4	41°23.5	3.9′	27°56.1	3.2′	59.0′
22	148°32.7	05.4	55°46.4	4.0′	27°52.9	3.5′	58.9′
23	163°32.9	06.4	70°09.4	4.0′	27°49.4	3.6′	58.9′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:53	04:29	05:38	18:37	19:47	21:25
N 70°	03:17	04:39	05:41	18:34	19:37	21:00
68°	03:34	04:47	05:43	18:31	19:28	20:42
66°	03:48	04:53	05:45	18:29	19:21	20:27
64°	04:00	04:59	05:47	18:27	19:15	20:15
62°	04:09	05:04	05:48	18:26	19:10	20:06
60°	04:17	05:08	05:50	18:24	19:06	19:57
N 58°	04:24	05:12	05:51	18:23	19:02	19:50
56°	04:30	05:15	05:52	18:22	18:59	19:44
54°	04:35	05:17	05:53	18:21	18:56	19:39
52°	04:40	05:20	05:54	18:20	18:54	19:34
50°	04:44	05:22	05:54	18:19	18:52	19:30
45°	04:52	05:27	05:56	18:17	18:47	19:22
N 40°	04:58	05:30	05:57	18:16	18:43	19:15
35°	05:03	05:33	05:58	18:15	18:40	19:10
30°	05:07	05:35	05:59	18:14	18:38	19:06
20°	05:13	05:39	06:01	18:12	18:34	19:00
N 10°	05:17	05:41	06:02	18:11	18:32	18:56
0°	05:18	05:42	06:03	18:09	18:30	18:54
S 10°	05:19	05:43	06:04	18:08	18:29	18:54
20°	05:17	05:43	06:05	18:07	18:29	18:55
30°	05:14	05:42	06:06	18:06	18:30	18:58
35°	05:12	05:41	06:06	18:06	18:31	19:00
40°	05:08	05:40	06:07	18:05	18:32	19:03
45°	05:04	05:38	06:07	18:04	18:34	19:08
S 50°	04:58	05:36	06:08	18:04	18:36	19:13
52°	04:55	05:35	06:08	18:03	18:37	19:16
54°	04:52	05:33	06:09	18:03	18:38	19:19
56°	04:48	05:32	06:09	18:02	18:39	19:23
58°	04:44	05:30	06:09	18:02	18:41	19:27
S 60°	04:39	05:28	06:10	18:02	18:43	19:32

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	04:57	▭	▭	01:53	▭	▭
62°	05:38	05:29	▭	01:13	03:30	▭
60°	06:06	06:22	07:07	00:45	02:38	04:06
N 58°	06:28	06:54	07:45	00:24	02:06	03:27
56°	06:46	07:18	08:12	00:07	01:42	03:00
54°	07:02	07:38	08:33	·· ··	01:23	02:39
52°	07:15	07:54	08:51	·· ··	01:07	02:21
50°	07:27	08:08	09:06	·· ··	00:53	02:06
45°	07:51	08:37	09:37	·· ··	00:24	01:35
N 40°	08:11	09:00	10:00	·· ··	00:02	01:12
35°	08:27	09:19	10:20	23:44	·· ··	00:52
30°	08:42	09:36	10:37	23:28	·· ··	00:35
20°	09:06	10:03	11:05	23:01	·· ··	00:07
N 10°	09:27	10:27	11:30	22:38	23:42	·· ··
0°	09:47	10:49	11:52	22:17	23:19	·· ··
S 10°	10:07	11:12	12:15	21:55	22:57	·· ··
20°	10:29	11:36	12:40	21:32	22:32	23:36
30°	10:54	12:04	13:08	21:06	22:04	23:08
35°	11:09	12:21	13:25	20:50	21:47	22:51
40°	11:27	12:40	13:44	20:32	21:27	22:32
45°	11:48	13:04	14:08	20:10	21:03	22:08
S 50°	12:14	13:34	14:39	19:43	20:32	21:38
52°	12:27	13:49	14:54	19:30	20:17	21:23
54°	12:42	14:07	15:12	19:14	19:59	21:06
56°	13:00	14:28	15:33	18:56	19:38	20:44
58°	13:21	14:56	16:00	18:34	19:10	20:17
S 60°	13:48	15:35	16:39	18:07	18:31	19:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 4-6 20-41%
23	06:42	06:33	12:07	16:02	03:32	
24	06:24	06:15	12:06	17:04	04:33	
25	06:06	05:57	12:06	18:07	05:36	

March 26, 27, 28 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	183°27.4	160°45.3	N08°46.1	193°41.3	S05°33.5	76°39.3	N22°54.5	178°12.5	S00°02.6
1	198°29.9	175°44.9	47.3	208°42.0	32.7	91°41.6	54.5	193°14.7	02.5
2	213°32.3	190°44.5	48.5	223°42.6	32.0	106°43.9	54.5	208°16.9	02.4
3	228°34.8	205°44.1	·· 49.7	238°43.3	·· 31.2	121°46.3	·· 54.5	223°19.1	·· 02.3
4	243°37.3	220°43.7	51.0	253°44.0	30.4	136°48.6	54.5	238°21.3	02.1
5	258°39.7	235°43.3	52.2	268°44.6	29.6	151°51.0	54.5	253°23.4	02.0
6	273°42.2	250°42.9	N08°53.4	283°45.3	S05°28.9	166°53.3	N22°54.5	268°25.6	S00°01.9
7	288°44.7	265°42.5	54.6	298°45.9	28.1	181°55.6	54.5	283°27.8	01.8
8	303°47.1	280°42.1	55.8	313°46.6	27.3	196°58.0	54.4	298°30.0	01.6
9	318°49.6	295°41.7	·· 57.0	328°47.2	·· 26.5	212°00.3	·· 54.4	313°32.1	·· 01.5
10	333°52.1	310°41.3	58.3	343°47.9	25.8	227°02.6	54.4	328°34.3	01.4
11	348°54.5	325°40.8	08°59.5	358°48.5	25.0	242°05.0	54.4	343°36.5	01.3
12	3°57.0	340°40.4	N09°00.7	13°49.2	S05°24.2	257°07.3	N22°54.4	358°38.7	S00°01.2
13	18°59.4	355°40.0	01.9	28°49.8	23.4	272°09.6	54.4	13°40.8	01.0
14	34°01.9	10°39.6	03.1	43°50.5	22.7	287°11.9	54.4	28°43.0	00.9
15	49°04.4	25°39.2	·· 04.3	58°51.2	·· 21.9	302°14.3	·· 54.4	43°45.2	·· 00.8
16	64°06.8	40°38.8	05.6	73°51.8	21.1	317°16.6	54.3	58°47.4	00.7
17	79°09.3	55°38.4	06.8	88°52.5	20.3	332°18.9	54.3	73°49.6	00.5
18	94°11.8	70°38.0	N09°08.0	103°53.1	S05°19.6	347°21.3	N22°54.3	88°51.7	S00°00.4
19	109°14.2	85°37.6	09.2	118°53.8	18.8	2°23.6	54.3	103°53.9	00.3
20	124°16.7	100°37.1	10.4	133°54.4	18.0	17°25.9	54.3	118°56.1	00.2
21	139°19.2	115°36.7	·· 11.6	148°55.1	·· 17.2	32°28.3	·· 54.3	133°58.3	S00°00.1
22	154°21.6	130°36.3	12.8	163°55.8	16.5	47°30.6	54.3	149°00.4	N00°00.1
23	169°24.1	145°35.9	14.1	178°56.4	15.7	62°32.9	54.3	164°02.6	00.2
Mer.pass. 11:44		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.17	ν 2.3′	d 0.0′ m -2.25	ν 2.2′	d 0.1′ m 0.91

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	184°26.6	160°35.5	N09°15.3	193°57.1	S05°14.9	77°35.2	N22°54.2	179°04.8	N00°00.3
1	199°29.0	175°35.1	16.5	208°57.7	14.1	92°37.6	54.2	194°07.0	00.4
2	214°31.5	190°34.7	17.7	223°58.4	13.4	107°39.9	54.2	209°09.2	00.6
3	229°33.9	205°34.3	·· 18.9	238°59.0	·· 12.6	122°42.2	·· 54.2	224°11.3	·· 00.7
4	244°36.4	220°33.8	20.1	253°59.7	11.8	137°44.6	54.2	239°13.5	00.8
5	259°38.9	235°33.4	21.3	269°00.4	11.0	152°46.9	54.2	254°15.7	00.9
6	274°41.3	250°33.0	N09°22.5	284°01.0	S05°10.3	167°49.2	N22°54.2	269°17.9	N00°01.0
7	289°43.8	265°32.6	23.7	299°01.7	09.5	182°51.5	54.2	284°20.0	01.2
8	304°46.3	280°32.2	24.9	314°02.3	08.7	197°53.9	54.1	299°22.2	01.3
9	319°48.7	295°31.8	·· 26.1	329°03.0	·· 07.9	212°56.2	·· 54.1	314°24.4	·· 01.4
10	334°51.2	310°31.4	27.4	344°03.6	07.2	227°58.5	54.1	329°26.6	01.5
11	349°53.7	325°30.9	28.6	359°04.3	06.4	243°00.8	54.1	344°28.7	01.7
12	4°56.1	340°30.5	N09°29.8	14°05.0	S05°05.6	258°03.2	N22°54.1	359°30.9	N00°01.8
13	19°58.6	355°30.1	31.0	29°05.6	04.8	273°05.5	54.1	14°33.1	01.9
14	35°01.0	10°29.7	32.2	44°06.3	04.1	288°07.8	54.1	29°35.3	02.0
15	50°03.5	25°29.3	·· 33.4	59°06.9	·· 03.3	303°10.1	·· 54.1	44°37.5	·· 02.2
16	65°06.0	40°28.9	34.6	74°07.6	02.5	318°12.4	54.0	59°39.6	02.3
17	80°08.4	55°28.4	35.8	89°08.2	01.7	333°14.8	54.0	74°41.8	02.4
18	95°10.9	70°28.0	N09°37.0	104°08.9	S05°00.9	348°17.1	N22°54.0	89°44.0	N00°02.5
19	110°13.4	85°27.6	38.2	119°09.6	05°00.2	3°19.4	54.0	104°46.2	02.6
20	125°15.8	100°27.2	39.4	134°10.2	04°59.4	18°21.7	54.0	119°48.3	02.8
21	140°18.3	115°26.8	·· 40.6	149°10.9	·· 58.6	33°24.1	·· 54.0	134°50.5	·· 02.9
22	155°20.8	130°26.4	41.8	164°11.5	57.8	48°26.4	54.0	149°52.7	03.0
23	170°23.2	145°25.9	43.0	179°12.2	57.1	63°28.7	53.9	164°54.9	03.1
Mer.pass. 11:40		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.24	ν 2.2′	d 0.1′ m 0.91

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	185°25.7	160°25.5	N09°44.2	194°12.9	S04°56.3	78°31.0	N22°53.9	179°57.1	N00°03.3
1	200°28.2	175°25.1	45.4	209°13.5	55.5	93°33.3	53.9	194°59.2	03.4
2	215°30.6	190°24.7	46.6	224°14.2	54.7	108°35.7	53.9	210°01.4	03.5
3	230°33.1	205°24.3	·· 47.8	239°14.8	·· 54.0	123°38.0	·· 53.9	225°03.6	·· 03.6
4	245°35.5	220°23.8	49.0	254°15.5	53.2	138°40.3	53.9	240°05.8	03.7
5	260°38.0	235°23.4	50.2	269°16.2	52.4	153°42.6	53.9	255°07.9	03.9
6	275°40.5	250°23.0	N09°51.4	284°16.8	S04°51.6	168°44.9	N22°53.8	270°10.1	N00°04.0
7	290°42.9	265°22.6	52.6	299°17.5	50.8	183°47.2	53.8	285°12.3	04.1
8	305°45.4	280°22.2	53.8	314°18.1	50.1	198°49.6	53.8	300°14.5	04.2
9	320°47.9	295°21.7	·· 55.0	329°18.8	·· 49.3	213°51.9	·· 53.8	315°16.7	·· 04.4
10	335°50.3	310°21.3	56.2	344°19.5	48.5	228°54.2	53.8	330°18.8	04.5
11	350°52.8	325°20.9	57.4	359°20.1	47.7	243°56.5	53.8	345°21.0	04.6
12	5°55.3	340°20.5	N09°58.6	14°20.8	S04°47.0	258°58.8	N22°53.8	0°23.2	N00°04.7
13	20°57.7	355°20.0	09°59.8	29°21.4	46.2	274°01.1	53.8	15°25.4	04.8
14	36°00.2	10°19.6	10°01.0	44°22.1	45.4	289°03.5	53.7	30°27.5	05.0
15	51°02.7	25°19.2	·· 02.2	59°22.8	·· 44.6	304°05.8	·· 53.7	45°29.7	·· 05.1
16	66°05.1	40°18.8	03.4	74°23.4	43.8	319°08.1	53.7	60°31.9	05.2
17	81°07.6	55°18.3	04.6	89°24.1	43.1	334°10.4	53.7	75°34.1	05.3
18	96°10.0	70°17.9	N10°05.8	104°24.7	S04°42.3	349°12.7	N22°53.7	90°36.2	N00°05.5
19	111°12.5	85°17.5	07.0	119°25.4	41.5	4°15.0	53.7	105°38.4	05.6
20	126°15.0	100°17.1	08.2	134°26.1	40.7	19°17.4	53.7	120°40.6	05.7
21	141°17.4	115°16.7	·· 09.4	149°26.7	·· 40.0	34°19.7	·· 53.6	135°42.8	·· 05.8
22	156°19.9	130°16.2	10.6	164°27.4	39.2	49°22.0	53.6	150°45.0	05.9
23	171°22.4	145°15.8	11.8	179°28.0	38.4	64°24.3	53.6	165°47.1	06.1
Mer.pass. 11:36		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.23	ν 2.2′	d 0.1′ m 0.91

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.6	-42°09.9
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.3
Hamal	327°50.4	23°35.2
Polaris	313°53.7	89°22.7
Acamar	315°11.3	-40°12.1
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.5	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.0	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.1	-59°35.9
Suhail	222°45.3	-43°32.6
Miaplacidus	221°37.5	-69°49.7
Alphard	217°46.5	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.4
Acrux	172°58.3	-63°14.8
Gacrux	171°50.0	-57°15.7
Alioth	166°11.5	55°48.9
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.7
Hadar	148°34.0	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.4	-60°56.6
Kochab	137°18.9	74°02.5
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.4	-26°29.4
Atria	107°07.6	-69°04.2
Sabik	102°01.5	-15°45.5
Shaula	96°08.9	-37°07.3
Rasalhague	95°57.5	12°32.2
Eltanin	90°41.6	51°28.7
Kaus Aust.	83°31.2	-34°22.3
Vega	80°32.6	38°48.1
Nunki	75°46.6	-26°15.8
Altair	61°59.1	8°56.1
Peacock	53°04.4	-56°38.9
Deneb	49°25.4	45°22.1
Enif	33°38.1	9°59.6
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Mar 26 Thu	SHA	Mer.pass
Venus	337°17.9	13:17
Mars	10°13.9	11:05
Jupiter	253°11.9	18:50
Saturn	354°45.1	12:05

Mar 27 Fri	SHA	Mer.pass
Venus	336°08.9	13:18
Mars	9°30.5	11:04
Jupiter	253°08.7	18:47
Saturn	354°38.2	12:02

Mar 28 Sat	SHA	Mer.pass
Venus	334°59.8	13:19
Mars	8°47.2	11:03
Jupiter	253°05.3	18:43
Saturn	354°31.4	11:58

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°33.1	N02°07.4	84°32.4	4.1′	N27°45.8	3.8′	58.9′
1	193°33.3	08.4	98°55.5	4.2′	27°42.0	4.0′	58.9′
2	208°33.5	09.3	113°18.7	4.2′	27°38.0	4.2′	58.9′
3	223°33.7	·· 10.3	127°41.9	4.3′	27°33.8	4.4′	58.9′
4	238°33.9	11.3	142°05.2	4.4′	27°29.4	4.5′	58.8′
5	253°34.1	12.3	156°28.6	4.5′	27°24.9	4.7′	58.8′
6	268°34.2	N02°13.3	170°52.0	4.5′	N27°20.2	4.9′	58.8′
7	283°34.4	14.2	185°15.6	4.6′	27°15.3	5.1′	58.8′
8	298°34.6	15.2	199°39.2	4.7′	27°10.2	5.2′	58.8′
9	313°34.8	·· 16.2	214°02.9	4.8′	27°05.0	5.5′	58.8′
10	328°35.0	17.2	228°26.7	4.9′	26°59.5	5.6′	58.7′
11	343°35.2	18.2	242°50.5	4.9′	26°53.9	5.7′	58.7′
12	358°35.4	N02°19.2	257°14.5	5.0′	N26°48.2	6.0′	58.7′
13	13°35.6	20.1	271°38.5	5.1′	26°42.2	6.1′	58.7′
14	28°35.8	21.1	286°02.6	5.2′	26°36.1	6.2′	58.7′
15	43°35.9	·· 22.1	300°26.8	5.3′	26°29.9	6.5′	58.7′
16	58°36.1	23.1	314°51.1	5.4′	26°23.4	6.6′	58.6′
17	73°36.3	24.1	329°15.5	5.5′	26°16.8	6.8′	58.6′
18	88°36.5	N02°25.0	343°40.0	5.6′	N26°10.0	6.9′	58.6′
19	103°36.7	26.0	358°04.6	5.7′	26°03.1	7.1′	58.6′
20	118°36.9	27.0	12°29.3	5.8′	25°56.0	7.2′	58.6′
21	133°37.1	·· 28.0	26°54.0	5.9′	25°48.8	7.4′	58.6′
22	148°37.3	29.0	41°18.9	6.0′	25°41.4	7.6′	58.5′
23	163°37.5	29.9	55°43.9	6.1′	25°33.8	7.7′	58.5′
	SD = 16.0′	d = 1.0′	SD = 16.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°37.6	N02°30.9	70°09.0	6.2′	N25°26.1	7.9′	58.5′
1	193°37.8	31.9	84°34.1	6.3′	25°18.2	8.0′	58.5′
2	208°38.0	32.9	98°59.4	6.4′	25°10.2	8.2′	58.5′
3	223°38.2	·· 33.8	113°24.8	6.5′	25°02.0	8.3′	58.5′
4	238°38.4	34.8	127°50.3	6.6′	24°53.7	8.4′	58.4′
5	253°38.6	35.8	142°15.9	6.7′	24°45.3	8.7′	58.4′
6	268°38.8	N02°36.8	156°41.5	6.8′	N24°36.6	8.7′	58.4′
7	283°39.0	37.8	171°07.3	6.9′	24°27.9	8.9′	58.4′
8	298°39.2	38.7	185°33.2	7.0′	24°19.0	9.0′	58.4′
9	313°39.3	·· 39.7	199°59.3	7.1′	24°10.0	9.2′	58.4′
10	328°39.5	40.7	214°25.4	7.2′	24°00.8	9.3′	58.3′
11	343°39.7	41.7	228°51.6	7.3′	23°51.5	9.5′	58.3′
12	358°39.9	N02°42.7	243°17.9	7.4′	N23°42.0	9.6′	58.3′
13	13°40.1	43.6	257°44.4	7.5′	23°32.4	9.7′	58.3′
14	28°40.3	44.6	272°10.9	7.7′	23°22.7	9.8′	58.3′
15	43°40.5	·· 45.6	286°37.6	7.8′	23°12.9	10.0′	58.2′
16	58°40.7	46.6	301°04.4	7.9′	23°02.9	10.1′	58.2′
17	73°40.9	47.5	315°31.2	8.0′	22°52.8	10.2′	58.2′
18	88°41.0	N02°48.5	329°58.2	8.1′	N22°42.6	10.4′	58.2′
19	103°41.2	49.5	344°25.3	8.2′	22°32.2	10.4′	58.2′
20	118°41.4	50.5	358°52.5	8.3′	22°21.8	10.6′	58.2′
21	133°41.6	·· 51.5	13°19.8	8.4′	22°11.2	10.8′	58.1′
22	148°41.8	52.4	27°47.2	8.5′	22°00.4	10.8′	58.1′
23	163°42.0	53.4	42°14.8	8.6′	21°49.6	10.9′	58.1′
	SD = 16.0′	d = 1.0′	SD = 16.0′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°42.2	N02°54.4	56°42.4	8.7′	N21°38.7	11.1′	58.1′
1	193°42.4	55.4	71°10.1	8.9′	21°27.6	11.2′	58.1′
2	208°42.6	56.3	85°38.0	9.0′	21°16.4	11.2′	58.0′
3	223°42.8	·· 57.3	100°06.0	9.1′	21°05.2	11.4′	58.0′
4	238°42.9	58.3	114°34.0	9.2′	20°53.8	11.5′	58.0′
5	253°43.1	02°59.3	129°02.2	9.3′	20°42.3	11.6′	58.0′
6	268°43.3	N03°00.2	143°30.5	9.4′	N20°30.7	11.8′	58.0′
7	283°43.5	01.2	157°58.9	9.5′	20°18.9	11.8′	57.9′
8	298°43.7	02.2	172°27.4	9.6′	20°07.1	11.9′	57.9′
9	313°43.9	·· 03.2	186°56.0	9.7′	19°55.2	12.0′	57.9′
10	328°44.1	04.2	201°24.7	9.8′	19°43.2	12.1′	57.9′
11	343°44.3	05.1	215°53.5	9.9′	19°31.1	12.2′	57.9′
12	358°44.5	N03°06.1	230°22.4	10.0′	N19°18.9	12.3′	57.9′
13	13°44.6	07.1	244°51.4	10.1′	19°06.6	12.4′	57.8′
14	28°44.8	08.1	259°20.5	10.2′	18°54.2	12.5′	57.8′
15	43°45.0	·· 09.0	273°49.7	10.3′	18°41.7	12.6′	57.8′
16	58°45.2	10.0	288°19.1	10.4′	18°29.1	12.6′	57.8′
17	73°45.4	11.0	302°48.5	10.5′	18°16.5	12.8′	57.8′
18	88°45.6	N03°12.0	317°18.0	10.6′	N18°03.7	12.8′	57.7′
19	103°45.8	12.9	331°47.6	10.7′	17°50.9	13.0′	57.7′
20	118°46.0	13.9	346°17.4	10.8′	17°37.9	13.0′	57.7′
21	133°46.2	·· 14.9	0°47.2	10.9′	17°24.9	13.0′	57.7′
22	148°46.3	15.9	15°17.1	11.0′	17°11.9	13.2′	57.7′
23	163°46.5	16.8	29°47.1	11.1′	16°58.7	13.2′	57.6′
	SD = 16.0′	d = 1.0′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:29	04:11	05:22	18:51	20:03	21:49
N 70°	02:57	04:24	05:27	18:46	19:50	21:18
68°	03:18	04:33	05:31	18:42	19:40	20:56
66°	03:34	04:41	05:34	18:39	19:32	20:40
64°	03:47	04:48	05:36	18:36	19:25	20:26
62°	03:58	04:54	05:39	18:34	19:19	20:15
60°	04:07	04:59	05:41	18:32	19:14	20:06
N 58°	04:15	05:03	05:42	18:30	19:09	19:58
56°	04:21	05:06	05:44	18:28	19:06	19:51
54°	04:27	05:10	05:45	18:26	19:02	19:45
52°	04:32	05:13	05:47	18:25	18:59	19:40
50°	04:37	05:15	05:48	18:24	18:56	19:35
45°	04:46	05:21	05:50	18:21	18:51	19:26
N 40°	04:53	05:25	05:52	18:19	18:46	19:18
35°	04:59	05:29	05:54	18:17	18:43	19:12
30°	05:04	05:32	05:56	18:16	18:40	19:08
20°	05:10	05:36	05:58	18:13	18:35	19:01
N 10°	05:15	05:39	06:00	18:11	18:32	18:56
0°	05:17	05:41	06:02	18:09	18:29	18:53
S 10°	05:19	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:05	18:27	18:52
30°	05:16	05:44	06:08	18:03	18:26	18:54
35°	05:14	05:43	06:09	18:01	18:27	18:56
40°	05:11	05:43	06:10	18:00	18:27	18:59
45°	05:08	05:42	06:11	17:59	18:28	19:02
S 50°	05:03	05:41	06:13	17:57	18:29	19:07
52°	05:00	05:40	06:13	17:56	18:30	19:09
54°	04:58	05:39	06:14	17:55	18:31	19:12
56°	04:54	05:38	06:15	17:55	18:31	19:15
58°	04:51	05:37	06:16	17:54	18:33	19:18
S 60°	04:46	05:35	06:17	17:52	18:34	19:22

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	09:10	▭	▭	08:13
68°	▭	▭	10:31	▭	▭	06:50
66°	▭	▭	11:08	▭	▭	06:12
64°	▭	09:18	11:35	▭	06:09	05:44
62°	07:46	09:57	11:55	05:37	05:29	05:23
60°	08:36	10:24	12:11	04:47	05:01	05:06
N 58°	09:07	10:45	12:25	04:15	04:39	04:51
56°	09:30	11:02	12:37	03:52	04:21	04:39
54°	09:49	11:17	12:47	03:32	04:06	04:28
52°	10:05	11:30	12:56	03:16	03:53	04:18
50°	10:19	11:41	13:04	03:02	03:41	04:09
45°	10:47	12:04	13:21	02:33	03:17	03:50
N 40°	11:09	12:22	13:35	02:10	02:58	03:35
35°	11:28	12:38	13:47	01:52	02:41	03:22
30°	11:43	12:51	13:58	01:35	02:27	03:11
20°	12:10	13:14	14:15	01:08	02:03	02:51
N 10°	12:33	13:33	14:30	00:44	01:42	02:34
0°	12:54	13:52	14:45	00:22	01:22	02:17
S 10°	13:15	14:10	14:59	00:00	01:02	02:01
20°	13:38	14:29	15:14	·· ··	00:41	01:44
30°	14:04	14:51	15:31	·· ··	00:16	01:23
35°	14:19	15:04	15:41	·· ··	00:01	01:11
40°	14:37	15:19	15:53	23:44	·· ··	00:57
45°	14:59	15:37	16:06	23:23	·· ··	00:41
S 50°	15:26	15:59	16:22	22:57	·· ··	00:20
52°	15:39	16:09	16:29	22:44	·· ··	00:11
54°	15:54	16:21	16:38	22:29	·· ··	00:00
56°	16:12	16:34	16:47	22:12	23:47	·· ··
58°	16:33	16:49	16:58	21:51	23:32	·· ··
S 60°	17:01	17:08	17:10	21:24	23:15	·· ··

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 52-74%
26	05:48	05:38	12:06	19:08	06:38	
27	05:29	05:20	12:05	20:05	07:37	
28	05:11	05:02	12:05	20:57	08:31	

March 29, 30, 31 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	186°24.8	160°15.4	N10°13.0	194°28.7	S04°37.6	79°26.6	N22°53.6	180°49.3	N00°06.2
1	201°27.3	175°14.9	14.2	209°29.4	36.8	94°28.9	53.6	195°51.5	06.3
2	216°29.8	190°14.5	15.4	224°30.0	36.1	109°31.2	53.6	210°53.7	06.4
3	231°32.2	205°14.1	·· 16.5	239°30.7	·· 35.3	124°33.5	·· 53.5	225°55.8	·· 06.6
4	246°34.7	220°13.7	17.7	254°31.4	34.5	139°35.8	53.5	240°58.0	06.7
5	261°37.2	235°13.2	18.9	269°32.0	33.7	154°38.2	53.5	256°00.2	06.8
6	276°39.6	250°12.8	N10°20.1	284°32.7	S04°32.9	169°40.5	N22°53.5	271°02.4	N00°06.9
7	291°42.1	265°12.4	21.3	299°33.3	32.2	184°42.8	53.5	286°04.6	07.0
8	306°44.5	280°12.0	22.5	314°34.0	31.4	199°45.1	53.5	301°06.7	07.2
9	321°47.0	295°11.5	·· 23.7	329°34.7	·· 30.6	214°47.4	·· 53.5	316°08.9	·· 07.3
10	336°49.5	310°11.1	24.9	344°35.3	29.8	229°49.7	53.4	331°11.1	07.4
11	351°51.9	325°10.7	26.1	359°36.0	29.1	244°52.0	53.4	346°13.3	07.5
12	6°54.4	340°10.2	N10°27.2	14°36.6	S04°28.3	259°54.3	N22°53.4	1°15.4	N00°07.7
13	21°56.9	355°09.8	28.4	29°37.3	27.5	274°56.6	53.4	16°17.6	07.8
14	36°59.3	10°09.4	29.6	44°38.0	26.7	289°58.9	53.4	31°19.8	07.9
15	52°01.8	25°09.0	·· 30.8	59°38.6	·· 25.9	305°01.2	·· 53.4	46°22.0	·· 08.0
16	67°04.3	40°08.5	32.0	74°39.3	25.2	320°03.5	53.4	61°24.2	08.1
17	82°06.7	55°08.1	33.2	89°40.0	24.4	335°05.9	53.3	76°26.3	08.3
18	97°09.2	70°07.7	N10°34.4	104°40.6	S04°23.6	350°08.2	N22°53.3	91°28.5	N00°08.4
19	112°11.6	85°07.2	35.6	119°41.3	22.8	5°10.5	53.3	106°30.7	08.5
20	127°14.1	100°06.8	36.7	134°42.0	22.0	20°12.8	53.3	121°32.9	08.6
21	142°16.6	115°06.4	·· 37.9	149°42.6	·· 21.3	35°15.1	·· 53.3	136°35.0	·· 08.8
22	157°19.0	130°05.9	39.1	164°43.3	20.5	50°17.4	53.3	151°37.2	08.9
23	172°21.5	145°05.5	40.3	179°43.9	19.7	65°19.7	53.2	166°39.4	09.0
Mer.pass. 11:32		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.22	ν 2.2′	d 0.1′ m 0.91

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	187°24.0	160°05.1	N10°41.5	194°44.6	S04°18.9	80°22.0	N22°53.2	181°41.6	N00°09.1
1	202°26.4	175°04.6	42.6	209°45.3	18.1	95°24.3	53.2	196°43.8	09.2
2	217°28.9	190°04.2	43.8	224°45.9	17.4	110°26.6	53.2	211°45.9	09.4
3	232°31.4	205°03.8	·· 45.0	239°46.6	·· 16.6	125°28.9	·· 53.2	226°48.1	·· 09.5
4	247°33.8	220°03.3	46.2	254°47.3	15.8	140°31.2	53.2	241°50.3	09.6
5	262°36.3	235°02.9	47.4	269°47.9	15.0	155°33.5	53.2	256°52.5	09.7
6	277°38.8	250°02.5	N10°48.6	284°48.6	S04°14.2	170°35.8	N22°53.1	271°54.6	N00°09.8
7	292°41.2	265°02.0	49.7	299°49.3	13.5	185°38.1	53.1	286°56.8	10.0
8	307°43.7	280°01.6	50.9	314°49.9	12.7	200°40.4	53.1	301°59.0	10.1
9	322°46.1	295°01.2	·· 52.1	329°50.6	·· 11.9	215°42.7	·· 53.1	317°01.2	·· 10.2
10	337°48.6	310°00.7	53.3	344°51.3	11.1	230°45.0	53.1	332°03.4	10.3
11	352°51.1	325°00.3	54.4	359°51.9	10.3	245°47.3	53.1	347°05.5	10.5
12	7°53.5	339°59.9	N10°55.6	14°52.6	S04°09.6	260°49.6	N22°53.0	2°07.7	N00°10.6
13	22°56.0	354°59.4	56.8	29°53.2	08.8	275°51.9	53.0	17°09.9	10.7
14	37°58.5	9°59.0	58.0	44°53.9	08.0	290°54.2	53.0	32°12.1	10.8
15	53°00.9	24°58.5	10°59.2	59°54.6	·· 07.2	305°56.5	·· 53.0	47°14.2	·· 10.9
16	68°03.4	39°58.1	11°00.3	74°55.2	06.4	320°58.8	53.0	62°16.4	11.1
17	83°05.9	54°57.7	01.5	89°55.9	05.7	336°01.1	53.0	77°18.6	11.2
18	98°08.3	69°57.2	N11°02.7	104°56.6	S04°04.9	351°03.4	N22°52.9	92°20.8	N00°11.3
19	113°10.8	84°56.8	03.9	119°57.2	04.1	6°05.7	52.9	107°22.9	11.4
20	128°13.2	99°56.3	05.0	134°57.9	03.3	21°08.0	52.9	122°25.1	11.6
21	143°15.7	114°55.9	·· 06.2	149°58.6	·· 02.5	36°10.3	·· 52.9	137°27.3	·· 11.7
22	158°18.2	129°55.5	07.4	164°59.2	01.8	51°12.6	52.9	152°29.5	11.8
23	173°20.6	144°55.0	08.5	179°59.9	01.0	66°14.9	52.9	167°31.7	11.9
Mer.pass. 11:29		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.22	ν 2.2′	d 0.1′ m 0.92

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	188°23.1	159°54.6	N11°09.7	195°00.6	S04°00.2	81°17.2	N22°52.8	182°33.8	N00°12.0
1	203°25.6	174°54.1	10.9	210°01.2	03°59.4	96°19.5	52.8	197°36.0	12.2
2	218°28.0	189°53.7	12.1	225°01.9	58.6	111°21.8	52.8	212°38.2	12.3
3	233°30.5	204°53.3	·· 13.2	240°02.6	·· 57.9	126°24.1	·· 52.8	227°40.4	·· 12.4
4	248°33.0	219°52.8	14.4	255°03.2	57.1	141°26.4	52.8	242°42.5	12.5
5	263°35.4	234°52.4	15.6	270°03.9	56.3	156°28.7	52.8	257°44.7	12.6
6	278°37.9	249°51.9	N11°16.7	285°04.6	S03°55.5	171°31.0	N22°52.7	272°46.9	N00°12.8
7	293°40.4	264°51.5	17.9	300°05.2	54.7	186°33.3	52.7	287°49.1	12.9
8	308°42.8	279°51.1	19.1	315°05.9	53.9	201°35.5	52.7	302°51.3	13.0
9	323°45.3	294°50.6	·· 20.2	330°06.6	·· 53.2	216°37.8	·· 52.7	317°53.4	·· 13.1
10	338°47.7	309°50.2	21.4	345°07.2	52.4	231°40.1	52.7	332°55.6	13.3
11	353°50.2	324°49.7	22.6	0°07.9	51.6	246°42.4	52.7	347°57.8	13.4
12	8°52.7	339°49.3	N11°23.7	15°08.6	S03°50.8	261°44.7	N22°52.6	3°00.0	N00°13.5
13	23°55.1	354°48.8	24.9	30°09.2	50.0	276°47.0	52.6	18°02.1	13.6
14	38°57.6	9°48.4	26.1	45°09.9	49.3	291°49.3	52.6	33°04.3	13.7
15	54°00.1	24°47.9	·· 27.2	60°10.6	·· 48.5	306°51.6	·· 52.6	48°06.5	·· 13.9
16	69°02.5	39°47.5	28.4	75°11.2	47.7	321°53.9	52.6	63°08.7	14.0
17	84°05.0	54°47.1	29.6	90°11.9	46.9	336°56.2	52.6	78°10.9	14.1
18	99°07.5	69°46.6	N11°30.7	105°12.6	S03°46.1	351°58.5	N22°52.5	93°13.0	N00°14.2
19	114°09.9	84°46.2	31.9	120°13.2	45.4	7°00.8	52.5	108°15.2	14.4
20	129°12.4	99°45.7	33.1	135°13.9	44.6	22°03.0	52.5	123°17.4	14.5
21	144°14.8	114°45.3	·· 34.2	150°14.6	·· 43.8	37°05.3	·· 52.5	138°19.6	·· 14.6
22	159°17.3	129°44.8	35.4	165°15.2	43.0	52°07.6	52.5	153°21.8	14.7
23	174°19.8	144°44.4	36.5	180°15.9	42.2	67°09.9	52.5	168°23.9	14.8
Mer.pass. 11:25		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.21	ν 2.2′	d 0.1′ m 0.92

Stars

	SHA	**Dec**
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.6	-42°09.8
Schedar	349°30.5	56°40.9
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.3
Hamal	327°50.4	23°35.2
Polaris	313°54.7	89°22.7
Acamar	315°11.3	-40°12.1
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.4
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.6	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°25.3	-16°45.3
Adhara	255°05.0	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.1	-59°35.9
Suhail	222°45.3	-43°32.6
Miaplacidus	221°37.6	-69°49.7
Alphard	217°46.6	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.1	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.4
Acrux	172°58.3	-63°14.8
Gacrux	171°50.0	-57°15.7
Alioth	166°11.5	55°48.9
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.7
Hadar	148°34.0	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.4	-60°56.6
Kochab	137°18.8	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.4	-26°29.4
Atria	107°07.5	-69°04.3
Sabik	102°01.5	-15°45.5
Shaula	96°08.9	-37°07.3
Rasalhague	95°57.5	12°32.2
Eltanin	90°41.6	51°28.7
Kaus Aust.	83°31.2	-34°22.3
Vega	80°32.5	38°48.1
Nunki	75°46.5	-26°15.8
Altair	61°59.1	8°56.1
Peacock	53°04.4	-56°38.8
Deneb	49°25.4	45°22.1
Enif	33°38.0	9°59.6
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Mar 29 Sun	**SHA**	**Mer.pass**
Venus	333°50.5	13:19
Mars	8°03.9	11:02
Jupiter	253°01.8	18:39
Saturn	354°24.5	11:55

Mar 30 Mon	**SHA**	**Mer.pass**
Venus	332°41.1	13:20
Mars	7°20.6	11:01
Jupiter	252°58.0	18:36
Saturn	354°17.6	11:52

Mar 31 Tue	**SHA**	**Mer.pass**
Venus	331°31.5	13:21
Mars	6°37.5	10:59
Jupiter	252°54.1	18:32
Saturn	354°10.7	11:48

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.7	N03°17.8	44°17.2	11.2′	N16°45.5	13.4′	57.6′
1	193°46.9	18.8	58°47.4	11.3′	16°32.1	13.3′	57.6′
2	208°47.1	19.8	73°17.7	11.4′	16°18.8	13.5′	57.6′
3	223°47.3	·· 20.7	87°48.1	11.5′	16°05.3	13.5′	57.6′
4	238°47.5	21.7	102°18.6	11.6′	15°51.8	13.6′	57.5′
5	253°47.7	22.7	116°49.1	11.7′	15°38.2	13.7′	57.5′
6	268°47.8	N03°23.6	131°19.8	11.7′	N15°24.5	13.7′	57.5′
7	283°48.0	24.6	145°50.5	11.8′	15°10.8	13.9′	57.5′
8	298°48.2	25.6	160°21.4	11.9′	14°56.9	13.8′	57.5′
9	313°48.4	·· 26.6	174°52.3	12.0′	14°43.1	13.9′	57.4′
10	328°48.6	27.5	189°23.3	12.1′	14°29.2	14.0′	57.4′
11	343°48.8	28.5	203°54.4	12.2′	14°15.2	14.1′	57.4′
12	358°49.0	N03°29.5	218°25.6	12.3′	N14°01.1	14.1′	57.4′
13	13°49.2	30.5	232°56.8	12.3′	13°47.0	14.2′	57.4′
14	28°49.4	31.4	247°28.2	12.4′	13°32.8	14.2′	57.4′
15	43°49.5	·· 32.4	261°59.6	12.5′	13°18.6	14.2′	57.3′
16	58°49.7	33.4	276°31.1	12.6′	13°04.4	14.4′	57.3′
17	73°49.9	34.4	291°02.7	12.7′	12°50.0	14.3′	57.3′
18	88°50.1	N03°35.3	305°34.3	12.7′	N12°35.7	14.5′	57.3′
19	103°50.3	36.3	320°06.1	12.8′	12°21.2	14.4′	57.3′
20	118°50.5	37.3	334°37.9	12.9′	12°06.8	14.6′	57.2′
21	133°50.7	·· 38.2	349°09.8	13.0′	11°52.2	14.5′	57.2′
22	148°50.9	39.2	3°41.7	13.0′	11°37.7	14.6′	57.2′
23	163°51.1	40.2	18°13.8	13.1′	11°23.1	14.7′	57.2′
	SD = 16.0′	d = 1.0′		SD = 15.7′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.2	N03°41.2	32°45.9	13.2′	N11°08.4	14.7′	57.2′
1	193°51.4	42.1	47°18.0	13.2′	10°53.7	14.7′	57.1′
2	208°51.6	43.1	61°50.3	13.3′	10°39.0	14.8′	57.1′
3	223°51.8	·· 44.1	76°22.6	13.4′	10°24.2	14.8′	57.1′
4	238°52.0	45.0	90°55.0	13.4′	10°09.4	14.9′	57.1′
5	253°52.2	46.0	105°27.4	13.5′	09°54.5	14.8′	57.1′
6	268°52.4	N03°47.0	119°59.9	13.6′	N09°39.7	14.9′	57.0′
7	283°52.6	48.0	134°32.5	13.6′	09°24.8	15.0′	57.0′
8	298°52.7	48.9	149°05.1	13.7′	09°09.8	15.0′	57.0′
9	313°52.9	·· 49.9	163°37.8	13.7′	08°54.8	15.0′	57.0′
10	328°53.1	50.9	178°10.5	13.8′	08°39.8	15.0′	56.9′
11	343°53.3	51.8	192°43.3	13.9′	08°24.8	15.1′	56.9′
12	358°53.5	N03°52.8	207°16.2	13.9′	N08°09.7	15.1′	56.9′
13	13°53.7	53.8	221°49.1	14.0′	07°54.6	15.1′	56.9′
14	28°53.9	54.7	236°22.1	14.0′	07°39.5	15.1′	56.9′
15	43°54.1	·· 55.7	250°55.1	14.1′	07°24.4	15.2′	56.8′
16	58°54.3	56.7	265°28.2	14.1′	07°09.2	15.2′	56.8′
17	73°54.4	57.7	280°01.3	14.2′	06°54.0	15.2′	56.8′
18	88°54.6	N03°58.6	294°34.5	14.2′	N06°38.8	15.2′	56.8′
19	103°54.8	03°59.6	309°07.8	14.3′	06°23.6	15.2′	56.8′
20	118°55.0	04°00.6	323°41.0	14.3′	06°08.4	15.3′	56.7′
21	133°55.2	·· 01.5	338°14.4	14.4′	05°53.1	15.2′	56.7′
22	148°55.4	02.5	352°47.7	14.4′	05°37.9	15.3′	56.7′
23	163°55.6	03.5	7°21.2	14.5′	05°22.6	15.3′	56.7′
	SD = 16.0′	d = 1.0′		SD = 15.6′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.8	N04°04.4	21°54.6	14.5′	N05°07.3	15.3′	56.7′
1	193°55.9	05.4	36°28.1	14.5′	04°52.0	15.3′	56.6′
2	208°56.1	06.4	51°01.7	14.6′	04°36.7	15.3′	56.6′
3	223°56.3	·· 07.3	65°35.3	14.6′	04°21.4	15.4′	56.6′
4	238°56.5	08.3	80°08.9	14.7′	04°06.0	15.3′	56.6′
5	253°56.7	09.3	94°42.5	14.7′	03°50.7	15.3′	56.6′
6	268°56.9	N04°10.2	109°16.2	14.7′	N03°35.4	15.4′	56.5′
7	283°57.1	11.2	123°50.0	14.8′	03°20.0	15.3′	56.5′
8	298°57.3	12.2	138°23.7	14.8′	03°04.7	15.4′	56.5′
9	313°57.4	·· 13.1	152°57.5	14.8′	02°49.3	15.4′	56.5′
10	328°57.6	14.1	167°31.4	14.9′	02°33.9	15.3′	56.5′
11	343°57.8	15.1	182°05.2	14.9′	02°18.6	15.4′	56.4′
12	358°58.0	N04°16.0	196°39.1	14.9′	N02°03.2	15.3′	56.4′
13	13°58.2	17.0	211°13.1	14.9′	01°47.9	15.4′	56.4′
14	28°58.4	18.0	225°47.0	15.0′	01°32.5	15.3′	56.4′
15	43°58.6	·· 18.9	240°21.0	15.0′	01°17.2	15.3′	56.4′
16	58°58.8	19.9	254°55.0	15.0′	01°01.9	15.4′	56.3′
17	73°58.9	20.9	269°29.0	15.0′	00°46.5	15.3′	56.3′
18	88°59.1	N04°21.8	284°03.1	15.1′	N00°31.2	15.3′	56.3′
19	103°59.3	22.8	298°37.1	15.1′	00°15.9	15.3′	56.3′
20	118°59.5	23.8	313°11.2	15.1′	N00°00.6	15.3′	56.3′
21	133°59.7	·· 24.7	327°45.3	15.1′	S00°14.7	15.3′	56.2′
22	148°59.9	25.7	342°19.4	15.1′	00°30.0	15.3′	56.2′
23	164°00.1	26.7	356°53.6	15.2′	00°45.3	15.2′	56.2′
	SD = 16.0′	d = 1.0′		SD = 15.5′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:01	03:54	05:07	19:05	20:19	22:17
N 70°	02:37	04:08	05:13	18:59	20:04	21:38
68°	03:01	04:20	05:18	18:53	19:52	21:12
66°	03:20	04:29	05:22	18:49	19:42	20:53
64°	03:34	04:37	05:26	18:45	19:34	20:37
62°	03:46	04:43	05:29	18:42	19:27	20:25
60°	03:56	04:49	05:32	18:39	19:22	20:15
N 58°	04:05	04:54	05:34	18:36	19:16	20:06
56°	04:12	04:58	05:36	18:34	19:12	19:58
54°	04:19	05:02	05:38	18:32	19:08	19:52
52°	04:25	05:06	05:40	18:30	19:05	19:46
50°	04:30	05:09	05:41	18:29	19:01	19:41
45°	04:40	05:15	05:45	18:25	18:55	19:30
N 40°	04:48	05:20	05:47	18:22	18:49	19:22
35°	04:55	05:24	05:50	18:20	18:45	19:15
30°	05:00	05:28	05:52	18:17	18:41	19:10
20°	05:08	05:33	05:55	18:14	18:36	19:02
N 10°	05:13	05:37	05:58	18:11	18:32	18:56
0°	05:16	05:40	06:01	18:08	18:28	18:52
S 10°	05:18	05:43	06:04	18:05	18:26	18:50
20°	05:19	05:44	06:06	18:02	18:24	18:50
30°	05:18	05:46	06:09	17:59	18:23	18:51
35°	05:16	05:46	06:11	17:57	18:23	18:52
40°	05:14	05:46	06:13	17:55	18:22	18:54
45°	05:12	05:46	06:15	17:53	18:22	18:56
S 50°	05:08	05:45	06:17	17:51	18:23	19:00
52°	05:06	05:45	06:19	17:49	18:23	19:02
54°	05:03	05:44	06:20	17:48	18:23	19:04
56°	05:01	05:44	06:21	17:47	18:24	19:07
58°	04:58	05:43	06:23	17:45	18:24	19:10
S 60°	04:54	05:43	06:24	17:43	18:25	19:13

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	12:09	14:42	16:53	07:00	06:04	05:27
N 70°	12:39	14:54	16:54	06:28	05:50	05:22
68°	13:00	15:03	16:55	06:05	05:39	05:18
66°	13:17	15:10	16:56	05:46	05:29	05:15
64°	13:31	15:17	16:57	05:31	05:21	05:12
62°	13:42	15:22	16:57	05:18	05:14	05:09
60°	13:52	15:27	16:57	05:07	05:08	05:07
N 58°	14:00	15:31	16:58	04:58	05:02	05:05
56°	14:08	15:35	16:58	04:50	04:57	05:03
54°	14:14	15:38	16:58	04:42	04:53	05:02
52°	14:20	15:41	16:59	04:35	04:49	05:00
50°	14:26	15:44	16:59	04:29	04:45	04:59
45°	14:37	15:49	17:00	04:16	04:37	04:56
N 40°	14:46	15:54	17:00	04:05	04:31	04:53
35°	14:54	15:58	17:00	03:56	04:25	04:51
30°	15:01	16:02	17:01	03:48	04:20	04:49
20°	15:13	16:08	17:01	03:33	04:11	04:46
N 10°	15:24	16:14	17:02	03:21	04:03	04:43
0°	15:34	16:19	17:03	03:09	03:56	04:40
S 10°	15:43	16:24	17:03	02:56	03:48	04:37
20°	15:54	16:30	17:04	02:43	03:40	04:34
30°	16:05	16:36	17:04	02:28	03:31	04:31
35°	16:12	16:40	17:05	02:20	03:25	04:28
40°	16:20	16:44	17:05	02:10	03:19	04:26
45°	16:29	16:48	17:06	01:58	03:12	04:23
S 50°	16:39	16:54	17:07	01:43	03:03	04:20
52°	16:44	16:56	17:07	01:37	02:59	04:19
54°	16:50	16:59	17:07	01:29	02:55	04:17
56°	16:56	17:02	17:08	01:21	02:50	04:15
58°	17:02	17:06	17:08	01:11	02:44	04:13
S 60°	17:10	17:09	17:08	01:00	02:38	04:11

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 83-95%
29	04:53	04:44	12:05	21:45	09:21	
30	04:35	04:26	12:04	22:30	10:08	
31	04:17	04:08	12:04	23:13	10:51	

April 01, 02, 03 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	189°22.2	159°43.9	N11°37.7	195°16.6	S03°41.4	82°12.2	N22°52.4	183°26.1	N00°15.0
1	204°24.7	174°43.5	38.9	210°17.2	40.7	97°14.5	52.4	198°28.3	15.1
2	219°27.2	189°43.0	40.0	225°17.9	39.9	112°16.8	52.4	213°30.5	15.2
3	234°29.6	204°42.6	·· 41.2	240°18.6	·· 39.1	127°19.1	·· 52.4	228°32.6	·· 15.3
4	249°32.1	219°42.1	42.3	255°19.2	38.3	142°21.4	52.4	243°34.8	15.4
5	264°34.6	234°41.7	43.5	270°19.9	37.5	157°23.6	52.4	258°37.0	15.6
6	279°37.0	249°41.2	N11°44.7	285°20.6	S03°36.8	172°25.9	N22°52.3	273°39.2	N00°15.7
7	294°39.5	264°40.8	45.8	300°21.3	36.0	187°28.2	52.3	288°41.4	15.8
8	309°42.0	279°40.3	47.0	315°21.9	35.2	202°30.5	52.3	303°43.5	15.9
9	324°44.4	294°39.9	·· 48.1	330°22.6	·· 34.4	217°32.8	·· 52.3	318°45.7	·· 16.1
10	339°46.9	309°39.4	49.3	345°23.3	33.6	232°35.1	52.3	333°47.9	16.2
11	354°49.3	324°39.0	50.4	0°23.9	32.8	247°37.4	52.2	348°50.1	16.3
12	9°51.8	339°38.5	N11°51.6	15°24.6	S03°32.1	262°39.6	N22°52.2	3°52.2	N00°16.4
13	24°54.3	354°38.1	52.7	30°25.3	31.3	277°41.9	52.2	18°54.4	16.5
14	39°56.7	9°37.6	53.9	45°25.9	30.5	292°44.2	52.2	33°56.6	16.7
15	54°59.2	24°37.2	·· 55.1	60°26.6	·· 29.7	307°46.5	·· 52.2	48°58.8	·· 16.8
16	70°01.7	39°36.7	56.2	75°27.3	28.9	322°48.8	52.2	64°01.0	16.9
17	85°04.1	54°36.3	57.4	90°27.9	28.1	337°51.1	52.1	79°03.1	17.0
18	100°06.6	69°35.8	N11°58.5	105°28.6	S03°27.4	352°53.3	N22°52.1	94°05.3	N00°17.1
19	115°09.1	84°35.3	11°59.7	120°29.3	26.6	7°55.6	52.1	109°07.5	17.3
20	130°11.5	99°34.9	12°00.8	135°30.0	25.8	22°57.9	52.1	124°09.7	17.4
21	145°14.0	114°34.4	·· 02.0	150°30.6	·· 25.0	38°00.2	·· 52.1	139°11.8	·· 17.5
22	160°16.4	129°34.0	03.1	165°31.3	24.2	53°02.5	52.0	154°14.0	17.6
23	175°18.9	144°33.5	04.3	180°32.0	23.5	68°04.8	52.0	169°16.2	17.7
Mer.pass. 11:21		ν -0.4′	d 1.2′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.20	ν 2.2′	d 0.1′ m 0.92

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	190°21.4	159°33.1	N12°05.4	195°32.6	S03°22.7	83°07.0	N22°52.0	184°18.4	N00°17.9
1	205°23.8	174°32.6	06.6	210°33.3	21.9	98°09.3	52.0	199°20.6	18.0
2	220°26.3	189°32.2	07.7	225°34.0	21.1	113°11.6	52.0	214°22.7	18.1
3	235°28.8	204°31.7	·· 08.9	240°34.6	·· 20.3	128°13.9	·· 52.0	229°24.9	·· 18.2
4	250°31.2	219°31.2	10.0	255°35.3	19.5	143°16.2	51.9	244°27.1	18.4
5	265°33.7	234°30.8	11.2	270°36.0	18.8	158°18.4	51.9	259°29.3	18.5
6	280°36.2	249°30.3	N12°12.3	285°36.7	S03°18.0	173°20.7	N22°51.9	274°31.4	N00°18.6
7	295°38.6	264°29.9	13.4	300°37.3	17.2	188°23.0	51.9	289°33.6	18.7
8	310°41.1	279°29.4	14.6	315°38.0	16.4	203°25.3	51.9	304°35.8	18.8
9	325°43.6	294°28.9	·· 15.7	330°38.7	·· 15.6	218°27.5	·· 51.8	319°38.0	·· 19.0
10	340°46.0	309°28.5	16.9	345°39.3	14.8	233°29.8	51.8	334°40.2	19.1
11	355°48.5	324°28.0	18.0	0°40.0	14.1	248°32.1	51.8	349°42.3	19.2
12	10°50.9	339°27.6	N12°19.2	15°40.7	S03°13.3	263°34.4	N22°51.8	4°44.5	N00°19.3
13	25°53.4	354°27.1	20.3	30°41.3	12.5	278°36.7	51.8	19°46.7	19.4
14	40°55.9	9°26.6	21.4	45°42.0	11.7	293°38.9	51.8	34°48.9	19.6
15	55°58.3	24°26.2	·· 22.6	60°42.7	·· 10.9	308°41.2	·· 51.7	49°51.1	·· 19.7
16	71°00.8	39°25.7	23.7	75°43.4	10.1	323°43.5	51.7	64°53.2	19.8
17	86°03.3	54°25.3	24.9	90°44.0	09.4	338°45.8	51.7	79°55.4	19.9
18	101°05.7	69°24.8	N12°26.0	105°44.7	S03°08.6	353°48.0	N22°51.7	94°57.6	N00°20.0
19	116°08.2	84°24.3	27.1	120°45.4	07.8	8°50.3	51.7	109°59.8	20.2
20	131°10.7	99°23.9	28.3	135°46.0	07.0	23°52.6	51.6	125°01.9	20.3
21	146°13.1	114°23.4	·· 29.4	150°46.7	·· 06.2	38°54.9	·· 51.6	140°04.1	·· 20.4
22	161°15.6	129°22.9	30.6	165°47.4	05.4	53°57.1	51.6	155°06.3	20.5
23	176°18.1	144°22.5	31.7	180°48.1	04.7	68°59.4	51.6	170°08.5	20.7
Mer.pass. 11:17		ν -0.5′	d 1.1′	m -3.92	ν 0.7′	d 0.8′	m 1.18	ν 2.3′	d 0.0′ m -2.20	ν 2.2′	d 0.1′ m 0.92

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	191°20.5	159°22.0	N12°32.8	195°48.7	S03°03.9	84°01.7	N22°51.6	185°10.7	N00°20.8
1	206°23.0	174°21.6	34.0	210°49.4	03.1	99°03.9	51.5	200°12.8	20.9
2	221°25.4	189°21.1	35.1	225°50.1	02.3	114°06.2	51.5	215°15.0	21.0
3	236°27.9	204°20.6	·· 36.2	240°50.8	·· 01.5	129°08.5	·· 51.5	230°17.2	·· 21.1
4	251°30.4	219°20.2	37.4	255°51.4	00.7	144°10.8	51.5	245°19.4	21.3
5	266°32.8	234°19.7	38.5	270°52.1	03°00.0	159°13.0	51.5	260°21.6	21.4
6	281°35.3	249°19.2	N12°39.6	285°52.8	S02°59.2	174°15.3	N22°51.4	275°23.7	N00°21.5
7	296°37.8	264°18.8	40.8	300°53.4	58.4	189°17.6	51.4	290°25.9	21.6
8	311°40.2	279°18.3	41.9	315°54.1	57.6	204°19.8	51.4	305°28.1	21.7
9	326°42.7	294°17.8	·· 43.0	330°54.8	·· 56.8	219°22.1	·· 51.4	320°30.3	·· 21.9
10	341°45.2	309°17.4	44.2	345°55.5	56.0	234°24.4	51.4	335°32.4	22.0
11	356°47.6	324°16.9	45.3	0°56.1	55.3	249°26.7	51.3	350°34.6	22.1
12	11°50.1	339°16.4	N12°46.4	15°56.8	S02°54.5	264°28.9	N22°51.3	5°36.8	N00°22.2
13	26°52.5	354°15.9	47.6	30°57.5	53.7	279°31.2	51.3	20°39.0	22.3
14	41°55.0	9°15.5	48.7	45°58.2	52.9	294°33.5	51.3	35°41.2	22.5
15	56°57.5	24°15.0	·· 49.8	60°58.8	·· 52.1	309°35.7	·· 51.3	50°43.3	·· 22.6
16	71°59.9	39°14.5	51.0	75°59.5	51.3	324°38.0	51.2	65°45.5	22.7
17	87°02.4	54°14.1	52.1	91°00.2	50.6	339°40.3	51.2	80°47.7	22.8
18	102°04.9	69°13.6	N12°53.2	106°00.8	S02°49.8	354°42.5	N22°51.2	95°49.9	N00°22.9
19	117°07.3	84°13.1	54.3	121°01.5	49.0	9°44.8	51.2	110°52.1	23.1
20	132°09.8	99°12.6	55.5	136°02.2	48.2	24°47.1	51.2	125°54.2	23.2
21	147°12.3	114°12.2	·· 56.6	151°02.9	·· 47.4	39°49.3	·· 51.1	140°56.4	·· 23.3
22	162°14.7	129°11.7	57.7	166°03.5	46.6	54°51.6	51.1	155°58.6	23.4
23	177°17.2	144°11.2	58.8	181°04.2	45.9	69°53.9	51.1	171°00.8	23.6
Mer.pass. 11:13		ν -0.5′	d 1.1′	m -3.92	ν 0.7′	d 0.8′	m 1.19	ν 2.3′	d 0.0′ m -2.19	ν 2.2′	d 0.1′ m 0.92

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.6	-42°09.8
Schedar	349°30.5	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.3
Hamal	327°50.4	23°35.2
Polaris	313°55.6	89°22.7
Acamar	315°11.3	-40°12.1
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.6	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.1	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.1	-59°35.9
Suhail	222°45.3	-43°32.6
Miaplacidus	221°37.6	-69°49.7
Alphard	217°46.6	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.4
Acrux	172°58.3	-63°14.8
Gacrux	171°50.0	-57°15.7
Alioth	166°11.5	55°48.9
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.7
Hadar	148°34.0	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.3	-60°56.6
Kochab	137°18.8	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.4	-26°29.4
Atria	107°07.5	-69°04.3
Sabik	102°01.5	-15°45.5
Shaula	96°08.9	-37°07.3
Rasalhague	95°57.5	12°32.2
Eltanin	90°41.6	51°28.7
Kaus Aust.	83°31.1	-34°22.3
Vega	80°32.5	38°48.1
Nunki	75°46.5	-26°15.8
Altair	61°59.1	8°56.1
Peacock	53°04.4	-56°38.8
Deneb	49°25.3	45°22.1
Enif	33°38.0	9°59.6
Al Na'ir	27°32.0	-46°49.9
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.6	28°13.4
Markab	13°29.2	15°20.7

Apr 01 Wed	SHA	Mer.pass
Venus	330°21.7	13:21
Mars	5°54.3	10:58
Jupiter	252°50.0	18:28
Saturn	354°03.9	11:45

Apr 02 Thu	SHA	Mer.pass
Venus	329°11.7	13:22
Mars	5°11.3	10:57
Jupiter	252°45.7	18:25
Saturn	353°57.0	11:41

Apr 03 Fri	SHA	Mer.pass
Venus	328°01.5	13:23
Mars	4°28.2	10:56
Jupiter	252°41.2	18:21
Saturn	353°50.1	11:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Wed	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°00.2	N04°27.6	11°27.8	15.2′	S01°00.5	15.3′	56.2′
1	194°00.4	28.6	26°01.9	15.2′	01°15.8	15.2′	56.2′
2	209°00.6	29.6	40°36.1	15.2′	01°31.0	15.2′	56.1′
3	224°00.8	·· 30.5	55°10.3	15.2′	01°46.2	15.2′	56.1′
4	239°01.0	31.5	69°44.5	15.2′	02°01.4	15.2′	56.1′
5	254°01.2	32.5	84°18.8	15.2′	02°16.6	15.1′	56.1′
6	269°01.4	N04°33.4	98°53.0	15.2′	S02°31.7	15.1′	56.0′
7	284°01.6	34.4	113°27.2	15.3′	02°46.8	15.1′	56.0′
8	299°01.7	35.4	128°01.5	15.3′	03°01.9	15.1′	56.0′
9	314°01.9	·· 36.3	142°35.8	15.3′	03°17.0	15.1′	56.0′
10	329°02.1	37.3	157°10.0	15.3′	03°32.1	15.0′	56.0′
11	344°02.3	38.2	171°44.3	15.3′	03°47.1	15.0′	55.9′
12	359°02.5	N04°39.2	186°18.6	15.3′	S04°02.1	15.0′	55.9′
13	14°02.7	40.2	200°52.8	15.3′	04°17.1	15.0′	55.9′
14	29°02.9	41.1	215°27.1	15.3′	04°32.1	14.9′	55.9′
15	44°03.0	·· 42.1	230°01.4	15.3′	04°47.0	14.9′	55.9′
16	59°03.2	43.1	244°35.7	15.3′	05°01.9	14.9′	55.8′
17	74°03.4	44.0	259°09.9	15.3′	05°16.8	14.8′	55.8′
18	89°03.6	N04°45.0	273°44.2	15.3′	S05°31.6	14.8′	55.8′
19	104°03.8	46.0	288°18.5	15.3′	05°46.4	14.8′	55.8′
20	119°04.0	46.9	302°52.7	15.3′	06°01.2	14.7′	55.8′
21	134°04.2	·· 47.9	317°27.0	15.3′	06°15.9	14.7′	55.7′
22	149°04.3	48.8	332°01.3	15.2′	06°30.6	14.6′	55.7′
23	164°04.5	49.8	346°35.5	15.2′	06°45.2	14.7′	55.7′
	SD = 16.0′	d = 1.0′		SD = 15.3′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°04.7	N04°50.8	1°09.7	15.2′	S06°59.9	14.5′	55.7′
1	194°04.9	51.7	15°44.0	15.2′	07°14.4	14.6′	55.7′
2	209°05.1	52.7	30°18.2	15.2′	07°29.0	14.5′	55.6′
3	224°05.3	·· 53.6	44°52.4	15.2′	07°43.5	14.4′	55.6′
4	239°05.5	54.6	59°26.6	15.2′	07°57.9	14.5′	55.6′
5	254°05.6	55.6	74°00.8	15.2′	08°12.4	14.3′	55.6′
6	269°05.8	N04°56.5	88°34.9	15.2′	S08°26.7	14.4′	55.6′
7	284°06.0	57.5	103°09.1	15.1′	08°41.1	14.2′	55.5′
8	299°06.2	58.5	117°43.2	15.1′	08°55.3	14.3′	55.5′
9	314°06.4	04°59.4	132°17.3	15.1′	09°09.6	14.2′	55.5′
10	329°06.6	05°00.4	146°51.4	15.1′	09°23.8	14.1′	55.5′
11	344°06.7	01.3	161°25.5	15.1′	09°37.9	14.1′	55.5′
12	359°06.9	N05°02.3	175°59.6	15.0′	S09°52.0	14.0′	55.4′
13	14°07.1	03.3	190°33.6	15.0′	10°06.0	14.0′	55.4′
14	29°07.3	04.2	205°07.7	15.0′	10°20.0	14.0′	55.4′
15	44°07.5	·· 05.2	219°41.7	15.0′	10°34.0	13.9′	55.4′
16	59°07.7	06.1	234°15.6	15.0′	10°47.9	13.8′	55.4′
17	74°07.9	07.1	248°49.6	14.9′	11°01.7	13.8′	55.4′
18	89°08.0	N05°08.1	263°23.5	14.9′	S11°15.5	13.7′	55.3′
19	104°08.2	09.0	277°57.4	14.9′	11°29.2	13.7′	55.3′
20	119°08.4	10.0	292°31.3	14.9′	11°42.9	13.6′	55.3′
21	134°08.6	·· 10.9	307°05.1	14.8′	11°56.5	13.5′	55.3′
22	149°08.8	11.9	321°39.0	14.8′	12°10.0	13.5′	55.3′
23	164°09.0	12.8	336°12.8	14.8′	12°23.5	13.5′	55.2′
	SD = 16.0′	d = 1.0′		SD = 15.2′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.1	N05°13.8	350°46.5	14.7′	S12°37.0	13.3′	55.2′
1	194°09.3	14.8	5°20.3	14.7′	12°50.3	13.4′	55.2′
2	209°09.5	15.7	19°54.0	14.7′	13°03.7	13.2′	55.2′
3	224°09.7	·· 16.7	34°27.6	14.6′	13°16.9	13.2′	55.2′
4	239°09.9	17.6	49°01.3	14.6′	13°30.1	13.1′	55.1′
5	254°10.1	18.6	63°34.9	14.6′	13°43.2	13.1′	55.1′
6	269°10.3	N05°19.5	78°08.5	14.5′	S13°56.3	13.0′	55.1′
7	284°10.4	20.5	92°42.0	14.5′	14°09.3	12.9′	55.1′
8	299°10.6	21.5	107°15.5	14.5′	14°22.2	12.8′	55.1′
9	314°10.8	·· 22.4	121°49.0	14.4′	14°35.0	12.8′	55.1′
10	329°11.0	23.4	136°22.4	14.4′	14°47.8	12.7′	55.0′
11	344°11.2	24.3	150°55.8	14.4′	15°00.5	12.7′	55.0′
12	359°11.4	N05°25.3	165°29.2	14.3′	S15°13.2	12.6′	55.0′
13	14°11.5	26.2	180°02.5	14.3′	15°25.8	12.5′	55.0′
14	29°11.7	27.2	194°35.8	14.2′	15°38.3	12.4′	55.0′
15	44°11.9	·· 28.2	209°09.0	14.2′	15°50.7	12.4′	55.0′
16	59°12.1	29.1	223°42.2	14.2′	16°03.1	12.2′	54.9′
17	74°12.3	30.1	238°15.4	14.1′	16°15.3	12.2′	54.9′
18	89°12.5	N05°31.0	252°48.5	14.1′	S16°27.5	12.2′	54.9′
19	104°12.6	32.0	267°21.5	14.0′	16°39.7	12.0′	54.9′
20	119°12.8	32.9	281°54.6	14.0′	16°51.7	12.0′	54.9′
21	134°13.0	·· 33.9	296°27.6	13.9′	17°03.7	11.9′	54.9′
22	149°13.2	34.8	311°00.5	13.9′	17°15.6	11.8′	54.8′
23	164°13.4	35.8	325°33.4	13.9′	17°27.4	11.7′	54.8′
	SD = 16.0′	d = 1.0′		SD = 15.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:25	03:35	04:51	19:19	20:36	22:55
N 70°	02:13	03:52	04:59	19:11	20:18	22:01
68°	02:43	04:06	05:05	19:04	20:04	21:29
66°	03:04	04:16	05:11	18:59	19:53	21:07
64°	03:21	04:25	05:15	18:54	19:44	20:49
62°	03:35	04:33	05:19	18:50	19:36	20:35
60°	03:46	04:40	05:22	18:46	19:29	20:24
N 58°	03:55	04:45	05:25	18:43	19:24	20:14
56°	04:04	04:50	05:28	18:40	19:18	20:05
54°	04:11	04:55	05:31	18:38	19:14	19:58
52°	04:17	04:58	05:33	18:35	19:10	19:52
50°	04:22	05:02	05:35	18:33	19:06	19:46
45°	04:34	05:09	05:39	18:29	18:59	19:34
N 40°	04:43	05:15	05:43	18:25	18:53	19:25
35°	04:50	05:20	05:46	18:22	18:48	19:18
30°	04:56	05:24	05:48	18:19	18:43	19:12
20°	05:05	05:31	05:53	18:15	18:37	19:03
N 10°	05:11	05:36	05:57	18:10	18:32	18:56
0°	05:15	05:40	06:00	18:07	18:28	18:52
S 10°	05:18	05:43	06:04	18:03	18:24	18:49
20°	05:20	05:45	06:07	18:00	18:22	18:47
30°	05:20	05:47	06:11	17:55	18:19	18:47
35°	05:19	05:48	06:13	17:53	18:18	18:48
40°	05:17	05:49	06:16	17:51	18:18	18:49
45°	05:15	05:49	06:19	17:48	18:17	18:51
S 50°	05:12	05:50	06:22	17:44	18:16	18:54
52°	05:11	05:50	06:24	17:43	18:16	18:55
54°	05:09	05:50	06:25	17:41	18:16	18:57
56°	05:07	05:50	06:27	17:39	18:16	18:59
58°	05:04	05:50	06:29	17:37	18:16	19:01
S 60°	05:01	05:50	06:31	17:34	18:16	19:04

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	19:01	21:17	·· ··	04:53	04:18	03:32
N 70°	18:52	20:55	23:22	04:56	04:30	03:57
68°	18:45	20:38	22:42	04:59	04:39	04:16
66°	18:39	20:24	22:16	05:01	04:47	04:32
64°	18:34	20:12	21:55	05:03	04:54	04:45
62°	18:30	20:03	21:39	05:05	05:00	04:55
60°	18:26	19:55	21:25	05:06	05:05	05:05
N 58°	18:23	19:48	21:13	05:07	05:10	05:13
56°	18:20	19:41	21:03	05:08	05:14	05:20
54°	18:17	19:36	20:55	05:09	05:18	05:27
52°	18:15	19:31	20:47	05:10	05:21	05:32
50°	18:13	19:26	20:40	05:11	05:24	05:38
45°	18:08	19:16	20:25	05:13	05:31	05:49
N 40°	18:04	19:08	20:12	05:15	05:36	05:59
35°	18:01	19:01	20:02	05:16	05:41	06:07
30°	17:58	18:55	19:53	05:17	05:45	06:14
20°	17:53	18:45	19:37	05:19	05:53	06:27
N 10°	17:49	18:36	19:24	05:21	05:59	06:38
0°	17:45	18:28	19:11	05:23	06:05	06:48
S 10°	17:41	18:19	18:59	05:25	06:12	06:59
20°	17:37	18:11	18:46	05:26	06:18	07:10
30°	17:32	18:01	18:31	05:29	06:26	07:23
35°	17:30	17:55	18:22	05:30	06:30	07:31
40°	17:27	17:48	18:12	05:31	06:35	07:39
45°	17:23	17:41	18:01	05:33	06:41	07:49
S 50°	17:19	17:32	17:47	05:35	06:48	08:01
52°	17:17	17:28	17:40	05:35	06:51	08:07
54°	17:15	17:23	17:33	05:36	06:55	08:14
56°	17:13	17:18	17:25	05:37	06:59	08:21
58°	17:10	17:13	17:17	05:39	07:03	08:29
S 60°	17:07	17:07	17:07	05:40	07:08	08:38

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 99-99%
01	03:59	03:50	12:04	23:55	11:34	
02	03:41	03:32	12:04	–:–	12:17	
03	03:23	03:15	12:03	00:38	13:00	

April 04, 05, 06 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	192°19.7	159°10.8	N13°00.0	196°04.9	S02°45.1	84°56.1	N22°51.1	186°02.9	N00°23.7
1	207°22.1	174°10.3	01.1	211°05.6	44.3	99°58.4	51.1	201°05.1	23.8
2	222°24.6	189°09.8	02.2	226°06.2	43.5	115°00.7	51.0	216°07.3	23.9
3	237°27.0	204°09.3	·· 03.3	241°06.9	·· 42.7	130°02.9	·· 51.0	231°09.5	·· 24.0
4	252°29.5	219°08.9	04.5	256°07.6	41.9	145°05.2	51.0	246°11.7	24.2
5	267°32.0	234°08.4	05.6	271°08.3	41.1	160°07.5	51.0	261°13.8	24.3
6	282°34.4	249°07.9	N13°06.7	286°08.9	S02°40.4	175°09.7	N22°51.0	276°16.0	N00°24.4
7	297°36.9	264°07.4	07.8	301°09.6	39.6	190°12.0	50.9	291°18.2	24.5
8	312°39.4	279°07.0	08.9	316°10.3	38.8	205°14.2	50.9	306°20.4	24.6
9	327°41.8	294°06.5	·· 10.1	331°11.0	·· 38.0	220°16.5	·· 50.9	321°22.6	·· 24.8
10	342°44.3	309°06.0	11.2	346°11.6	37.2	235°18.8	50.9	336°24.7	24.9
11	357°46.8	324°05.5	12.3	1°12.3	36.4	250°21.0	50.9	351°26.9	25.0
12	12°49.2	339°05.0	N13°13.4	16°13.0	S02°35.7	265°23.3	N22°50.8	6°29.1	N00°25.1
13	27°51.7	354°04.6	14.5	31°13.6	34.9	280°25.6	50.8	21°31.3	25.2
14	42°54.1	9°04.1	15.6	46°14.3	34.1	295°27.8	50.8	36°33.4	25.4
15	57°56.6	24°03.6	·· 16.8	61°15.0	·· 33.3	310°30.1	·· 50.8	51°35.6	·· 25.5
16	72°59.1	39°03.1	17.9	76°15.7	32.5	325°32.3	50.8	66°37.8	25.6
17	88°01.5	54°02.6	19.0	91°16.3	31.7	340°34.6	50.7	81°40.0	25.7
18	103°04.0	69°02.2	N13°20.1	106°17.0	S02°31.0	355°36.9	N22°50.7	96°42.2	N00°25.8
19	118°06.5	84°01.7	21.2	121°17.7	30.2	10°39.1	50.7	111°44.3	26.0
20	133°08.9	99°01.2	22.3	136°18.4	29.4	25°41.4	50.7	126°46.5	26.1
21	148°11.4	114°00.7	·· 23.4	151°19.0	·· 28.6	40°43.6	·· 50.7	141°48.7	·· 26.2
22	163°13.9	129°00.2	24.6	166°19.7	27.8	55°45.9	50.6	156°50.9	26.3
23	178°16.3	143°59.8	25.7	181°20.4	27.0	70°48.2	50.6	171°53.1	26.4
Mer.pass. 11:09		ν -0.5′	d 1.1′	m -3.92	ν 0.7′	d 0.8′	m 1.19	ν 2.3′	d 0.0′ m -2.18	ν 2.2′	d 0.1′ m 0.93

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	193°18.8	158°59.3	N13°26.8	196°21.1	S02°26.2	85°50.4	N22°50.6	186°55.2	N00°26.6
1	208°21.3	173°58.8	27.9	211°21.8	25.5	100°52.7	50.6	201°57.4	26.7
2	223°23.7	188°58.3	29.0	226°22.4	24.7	115°54.9	50.5	216°59.6	26.8
3	238°26.2	203°57.8	·· 30.1	241°23.1	·· 23.9	130°57.2	·· 50.5	232°01.8	·· 26.9
4	253°28.6	218°57.3	31.2	256°23.8	23.1	145°59.4	50.5	247°04.0	27.0
5	268°31.1	233°56.9	32.3	271°24.5	22.3	161°01.7	50.5	262°06.1	27.2
6	283°33.6	248°56.4	N13°33.4	286°25.1	S02°21.5	176°04.0	N22°50.5	277°08.3	N00°27.3
7	298°36.0	263°55.9	34.5	301°25.8	20.8	191°06.2	50.4	292°10.5	27.4
8	313°38.5	278°55.4	35.6	316°26.5	20.0	206°08.5	50.4	307°12.7	27.5
9	328°41.0	293°54.9	·· 36.7	331°27.2	·· 19.2	221°10.7	·· 50.4	322°14.9	·· 27.6
10	343°43.4	308°54.4	37.8	346°27.8	18.4	236°13.0	50.4	337°17.0	27.8
11	358°45.9	323°53.9	39.0	1°28.5	17.6	251°15.2	50.4	352°19.2	27.9
12	13°48.4	338°53.5	N13°40.1	16°29.2	S02°16.8	266°17.5	N22°50.3	7°21.4	N00°28.0
13	28°50.8	353°53.0	41.2	31°29.9	16.0	281°19.7	50.3	22°23.6	28.1
14	43°53.3	8°52.5	42.3	46°30.5	15.3	296°22.0	50.3	37°25.7	28.2
15	58°55.8	23°52.0	·· 43.4	61°31.2	·· 14.5	311°24.2	·· 50.3	52°27.9	·· 28.4
16	73°58.2	38°51.5	44.5	76°31.9	13.7	326°26.5	50.2	67°30.1	28.5
17	89°00.7	53°51.0	45.6	91°32.6	12.9	341°28.8	50.2	82°32.3	28.6
18	104°03.1	68°50.5	N13°46.7	106°33.2	S02°12.1	356°31.0	N22°50.2	97°34.5	N00°28.7
19	119°05.6	83°50.0	47.8	121°33.9	11.3	11°33.3	50.2	112°36.6	28.8
20	134°08.1	98°49.5	48.9	136°34.6	10.6	26°35.5	50.2	127°38.8	29.0
21	149°10.5	113°49.1	·· 50.0	151°35.3	·· 09.8	41°37.8	·· 50.1	142°41.0	·· 29.1
22	164°13.0	128°48.6	51.1	166°36.0	09.0	56°40.0	50.1	157°43.2	29.2
23	179°15.5	143°48.1	52.2	181°36.6	08.2	71°42.3	50.1	172°45.4	29.3
Mer.pass. 11:05		ν -0.5′	d 1.1′	m -3.92	ν 0.7′	d 0.8′	m 1.19	ν 2.3′	d 0.0′ m -2.17	ν 2.2′	d 0.1′ m 0.93

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	194°17.9	158°47.6	N13°53.3	196°37.3	S02°07.4	86°44.5	N22°50.1	187°47.5	N00°29.4
1	209°20.4	173°47.1	54.4	211°38.0	06.6	101°46.8	50.0	202°49.7	29.6
2	224°22.9	188°46.6	55.5	226°38.7	05.8	116°49.0	50.0	217°51.9	29.7
3	239°25.3	203°46.1	·· 56.5	241°39.3	·· 05.1	131°51.3	·· 50.0	232°54.1	·· 29.8
4	254°27.8	218°45.6	57.6	256°40.0	04.3	146°53.5	50.0	247°56.3	29.9
5	269°30.2	233°45.1	58.7	271°40.7	03.5	161°55.8	50.0	262°58.4	30.0
6	284°32.7	248°44.6	N13°59.8	286°41.4	S02°02.7	176°58.0	N22°49.9	278°00.6	N00°30.2
7	299°35.2	263°44.1	14°00.9	301°42.0	01.9	192°00.3	49.9	293°02.8	30.3
8	314°37.6	278°43.6	02.0	316°42.7	01.1	207°02.5	49.9	308°05.0	30.4
9	329°40.1	293°43.1	·· 03.1	331°43.4	02°00.4	222°04.8	·· 49.9	323°07.2	·· 30.5
10	344°42.6	308°42.6	04.2	346°44.1	01°59.6	237°07.0	49.8	338°09.3	30.6
11	359°45.0	323°42.1	05.3	1°44.8	58.8	252°09.2	49.8	353°11.5	30.8
12	14°47.5	338°41.6	N14°06.4	16°45.4	S01°58.0	267°11.5	N22°49.8	8°13.7	N00°30.9
13	29°50.0	353°41.2	07.5	31°46.1	57.2	282°13.7	49.8	23°15.9	31.0
14	44°52.4	8°40.7	08.6	46°46.8	56.4	297°16.0	49.8	38°18.1	31.1
15	59°54.9	23°40.2	·· 09.6	61°47.5	·· 55.6	312°18.2	·· 49.7	53°20.2	·· 31.2
16	74°57.4	38°39.7	10.7	76°48.1	54.9	327°20.5	49.7	68°22.4	31.4
17	89°59.8	53°39.2	11.8	91°48.8	54.1	342°22.7	49.7	83°24.6	31.5
18	105°02.3	68°38.7	N14°12.9	106°49.5	S01°53.3	357°25.0	N22°49.7	98°26.8	N00°31.6
19	120°04.7	83°38.2	14.0	121°50.2	52.5	12°27.2	49.6	113°29.0	31.7
20	135°07.2	98°37.7	15.1	136°50.9	51.7	27°29.5	49.6	128°31.1	31.8
21	150°09.7	113°37.2	·· 16.2	151°51.5	·· 50.9	42°31.7	·· 49.6	143°33.3	·· 32.0
22	165°12.1	128°36.7	17.2	166°52.2	50.1	57°33.9	49.6	158°35.5	32.1
23	180°14.6	143°36.2	18.3	181°52.9	49.4	72°36.2	49.5	173°37.7	32.2
Mer.pass. 11:01		ν -0.5′	d 1.1′	m -3.92	ν 0.7′	d 0.8′	m 1.19	ν 2.3′	d 0.0′ m -2.17	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	**Dec**
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.5	-42°09.8
Schedar	349°30.5	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.3
Hamal	327°50.4	23°35.1
Polaris	313°56.3	89°22.6
Acamar	315°11.4	-40°12.1
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.6	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.0	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.1	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.1	-59°35.9
Suhail	222°45.4	-43°32.6
Miaplacidus	221°37.6	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.4
Acrux	172°58.3	-63°14.8
Gacrux	171°50.0	-57°15.8
Alioth	166°11.5	55°48.9
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.7
Hadar	148°34.0	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.3	-60°56.6
Kochab	137°18.8	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.4	-26°29.4
Atria	107°07.4	-69°04.3
Sabik	102°01.5	-15°45.5
Shaula	96°08.8	-37°07.3
Rasalhague	95°57.5	12°32.2
Eltanin	90°41.6	51°28.7
Kaus Aust.	83°31.1	-34°22.3
Vega	80°32.5	38°48.1
Nunki	75°46.5	-26°15.8
Altair	61°59.0	8°56.1
Peacock	53°04.3	-56°38.8
Deneb	49°25.3	45°22.1
Enif	33°38.0	9°59.6
Al Na'ir	27°32.0	-46°49.9
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.4
Markab	13°29.2	15°20.7

Apr 04 Sat	**SHA**	**Mer.pass**
Venus	326°51.1	13:24
Mars	3°45.2	10:55
Jupiter	252°36.5	18:17
Saturn	353°43.3	11:34

Apr 05 Sun	**SHA**	**Mer.pass**
Venus	325°40.5	13:24
Mars	3°02.3	10:54
Jupiter	252°31.6	18:14
Saturn	353°36.4	11:31

Apr 06 Mon	**SHA**	**Mer.pass**
Venus	324°29.7	13:25
Mars	2°19.4	10:53
Jupiter	252°26.6	18:10
Saturn	353°29.6	11:27

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°13.5	N05°36.7	340°06.3	13.8′	S17°39.1	11.7′	54.8′
1	194°13.7	37.7	354°39.1	13.8′	17°50.8	11.6′	54.8′
2	209°13.9	38.7	9°11.9	13.7′	18°02.4	11.4′	54.8′
3	224°14.1	·· 39.6	23°44.6	13.7′	18°13.8	11.4′	54.8′
4	239°14.3	40.6	38°17.3	13.6′	18°25.2	11.4′	54.7′
5	254°14.5	41.5	52°49.9	13.6′	18°36.6	11.2′	54.7′
6	269°14.6	N05°42.5	67°22.5	13.5′	S18°47.8	11.1′	54.7′
7	284°14.8	43.4	81°55.0	13.5′	18°58.9	11.1′	54.7′
8	299°15.0	44.4	96°27.5	13.4′	19°10.0	11.0′	54.7′
9	314°15.2	·· 45.3	110°59.9	13.4′	19°21.0	10.8′	54.7′
10	329°15.4	46.3	125°32.3	13.3′	19°31.8	10.8′	54.7′
11	344°15.6	47.2	140°04.6	13.3′	19°42.6	10.7′	54.6′
12	359°15.7	N05°48.2	154°36.9	13.2′	S19°53.3	10.6′	54.6′
13	14°15.9	49.1	169°09.2	13.2′	20°03.9	10.6′	54.6′
14	29°16.1	50.1	183°41.4	13.1′	20°14.5	10.4′	54.6′
15	44°16.3	·· 51.0	198°13.5	13.1′	20°24.9	10.3′	54.6′
16	59°16.5	52.0	212°45.6	13.0′	20°35.2	10.2′	54.6′
17	74°16.6	52.9	227°17.6	13.0′	20°45.4	10.2′	54.6′
18	89°16.8	N05°53.9	241°49.6	12.9′	S20°55.6	10.0′	54.5′
19	104°17.0	54.8	256°21.5	12.9′	21°05.6	10.0′	54.5′
20	119°17.2	55.8	270°53.4	12.8′	21°15.6	9.8′	54.5′
21	134°17.4	·· 56.7	285°25.3	12.8′	21°25.4	9.8′	54.5′
22	149°17.5	57.7	299°57.0	12.7′	21°35.2	9.6′	54.5′
23	164°17.7	58.6	314°28.8	12.7′	21°44.8	9.6′	54.5′
	SD = 16.0′	d = 1.0′		SD = 14.9′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.9	N05°59.6	329°00.5	12.6′	S21°54.4	9.4′	54.5′
1	194°18.1	06°00.5	343°32.1	12.6′	22°03.8	9.4′	54.4′
2	209°18.3	01.5	358°03.7	12.5′	22°13.2	9.2′	54.4′
3	224°18.4	·· 02.4	12°35.2	12.5′	22°22.4	9.1′	54.4′
4	239°18.6	03.4	27°06.7	12.4′	22°31.5	9.1′	54.4′
5	254°18.8	04.3	41°38.1	12.4′	22°40.6	8.9′	54.4′
6	269°19.0	N06°05.3	56°09.4	12.3′	S22°49.5	8.8′	54.4′
7	284°19.2	06.2	70°40.7	12.3′	22°58.3	8.8′	54.4′
8	299°19.3	07.2	85°12.0	12.2′	23°07.1	8.6′	54.4′
9	314°19.5	·· 08.1	99°43.2	12.2′	23°15.7	8.5′	54.4′
10	329°19.7	09.1	114°14.4	12.1′	23°24.2	8.4′	54.3′
11	344°19.9	10.0	128°45.5	12.1′	23°32.6	8.3′	54.3′
12	359°20.1	N06°11.0	143°16.5	12.0′	S23°40.9	8.1′	54.3′
13	14°20.2	11.9	157°47.5	12.0′	23°49.0	8.1′	54.3′
14	29°20.4	12.9	172°18.5	11.9′	23°57.1	8.0′	54.3′
15	44°20.6	·· 13.8	186°49.4	11.9′	24°05.1	7.8′	54.3′
16	59°20.8	14.8	201°20.2	11.8′	24°12.9	7.8′	54.3′
17	74°21.0	15.7	215°51.0	11.7′	24°20.7	7.6′	54.3′
18	89°21.1	N06°16.7	230°21.8	11.7′	S24°28.3	7.5′	54.3′
19	104°21.3	17.6	244°52.5	11.6′	24°35.8	7.4′	54.3′
20	119°21.5	18.6	259°23.1	11.6′	24°43.2	7.2′	54.2′
21	134°21.7	·· 19.5	273°53.7	11.6′	24°50.4	7.2′	54.2′
22	149°21.9	20.5	288°24.3	11.5′	24°57.6	7.0′	54.2′
23	164°22.0	21.4	302°54.8	11.5′	25°04.6	7.0′	54.2′
	SD = 16.0′	d = 0.9′		SD = 14.9′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°22.2	N06°22.3	317°25.2	11.4′	S25°11.6	6.8′	54.2′
1	194°22.4	23.3	331°55.7	11.4′	25°18.4	6.7′	54.2′
2	209°22.6	24.2	346°26.0	11.3′	25°25.1	6.5′	54.2′
3	224°22.8	·· 25.2	0°56.3	11.3′	25°31.6	6.5′	54.2′
4	239°22.9	26.1	15°26.6	11.2′	25°38.1	6.3′	54.2′
5	254°23.1	27.1	29°56.8	11.2′	25°44.4	6.2′	54.2′
6	269°23.3	N06°28.0	44°27.0	11.1′	S25°50.6	6.1′	54.2′
7	284°23.5	29.0	58°57.1	11.1′	25°56.7	6.0′	54.2′
8	299°23.6	29.9	73°27.2	11.0′	26°02.7	5.8′	54.2′
9	314°23.8	·· 30.8	87°57.2	11.0′	26°08.5	5.8′	54.2′
10	329°24.0	31.8	102°27.2	10.9′	26°14.3	5.6′	54.1′
11	344°24.2	32.7	116°57.1	10.9′	26°19.9	5.4′	54.1′
12	359°24.4	N06°33.7	131°27.1	10.9′	S26°25.3	5.4′	54.1′
13	14°24.5	34.6	145°56.9	10.8′	26°30.7	5.2′	54.1′
14	29°24.7	35.6	160°26.7	10.8′	26°35.9	5.1′	54.1′
15	44°24.9	·· 36.5	174°56.5	10.7′	26°41.0	5.0′	54.1′
16	59°25.1	37.5	189°26.3	10.7′	26°46.0	4.8′	54.1′
17	74°25.2	38.4	203°56.0	10.7′	26°50.8	4.7′	54.1′
18	89°25.4	N06°39.3	218°25.6	10.6′	S26°55.5	4.6′	54.1′
19	104°25.6	40.3	232°55.3	10.6′	27°00.1	4.5′	54.1′
20	119°25.8	41.2	247°24.8	10.6′	27°04.6	4.3′	54.1′
21	134°25.9	·· 42.2	261°54.4	10.5′	27°08.9	4.2′	54.1′
22	149°26.1	43.1	276°23.9	10.5′	27°13.1	4.1′	54.1′
23	164°26.3	44.0	290°53.4	10.4′	27°17.2	3.9′	54.1′
	SD = 16.0′	d = 0.9′		SD = 14.8′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	00:09	03:16	04:35	19:34	20:54	////
N 70°	01:46	03:36	04:45	19:24	20:33	22:29
68°	02:23	03:51	04:52	19:15	20:17	21:48
66°	02:48	04:04	04:59	19:08	20:04	21:22
64°	03:07	04:14	05:04	19:03	19:54	21:02
62°	03:22	04:23	05:09	18:58	19:45	20:46
60°	03:35	04:30	05:13	18:53	19:37	20:33
N 58°	03:45	04:36	05:17	18:50	19:31	20:22
56°	03:54	04:42	05:20	18:46	19:25	20:13
54°	04:02	04:47	05:23	18:43	19:20	20:05
52°	04:09	04:51	05:26	18:41	19:15	19:58
50°	04:15	04:55	05:28	18:38	19:11	19:51
45°	04:28	05:04	05:34	18:33	19:03	19:38
N 40°	04:38	05:10	05:38	18:28	18:56	19:28
35°	04:46	05:16	05:42	18:24	18:50	19:20
30°	04:52	05:21	05:45	18:21	18:45	19:14
20°	05:02	05:28	05:50	18:15	18:38	19:03
N 10°	05:09	05:34	05:55	18:10	18:32	18:56
0°	05:14	05:39	05:59	18:06	18:27	18:51
S 10°	05:18	05:43	06:04	18:02	18:23	18:47
20°	05:20	05:46	06:08	17:57	18:19	18:45
30°	05:21	05:49	06:13	17:52	18:16	18:44
35°	05:21	05:50	06:16	17:49	18:14	18:44
40°	05:20	05:52	06:19	17:46	18:13	18:44
45°	05:19	05:53	06:22	17:42	18:11	18:45
S 50°	05:17	05:54	06:27	17:38	18:10	18:47
52°	05:16	05:55	06:29	17:36	18:09	18:48
54°	05:14	05:55	06:31	17:34	18:09	18:50
56°	05:13	05:56	06:33	17:31	18:08	18:51
58°	05:11	05:56	06:36	17:28	18:08	18:53
S 60°	05:09	05:57	06:39	17:26	18:07	18:55

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	01:07	▬	▬	01:16	▬	▬
N 70°	▬	▬	▬	03:03	▬	▬
68°	▬	▬	▬	03:43	▬	▬
66°	·· ··	00:27	▬	04:11	03:35	▬
64°	23:47	·· ··	02:07	04:33	04:17	03:36
62°	23:19	·· ··	01:06	04:50	04:45	04:38
60°	22:58	·· ··	00:32	05:05	05:07	05:12
N 58°	22:41	·· ··	00:07	05:17	05:25	05:37
56°	22:26	23:48	·· ··	05:28	05:40	05:58
54°	22:14	23:31	·· ··	05:38	05:53	06:14
52°	22:03	23:17	·· ··	05:46	06:04	06:29
50°	21:53	23:05	·· ··	05:54	06:14	06:41
45°	21:33	22:40	23:43	06:10	06:36	07:07
N 40°	21:16	22:20	23:20	06:24	06:53	07:28
35°	21:03	22:03	23:02	06:36	07:08	07:45
30°	20:51	21:49	22:46	06:46	07:21	08:00
20°	20:31	21:25	22:19	07:03	07:43	08:26
N 10°	20:13	21:04	21:55	07:19	08:02	08:48
0°	19:57	20:44	21:34	07:33	08:19	09:08
S 10°	19:41	20:25	21:12	07:47	08:37	09:29
20°	19:23	20:04	20:49	08:03	08:57	09:51
30°	19:04	19:41	20:23	08:21	09:19	10:16
35°	18:52	19:27	20:07	08:31	09:32	10:32
40°	18:39	19:11	19:49	08:43	09:47	10:49
45°	18:24	18:52	19:27	08:58	10:05	11:11
S 50°	18:05	18:28	19:00	09:15	10:28	11:38
52°	17:56	18:17	18:46	09:23	10:39	11:51
54°	17:46	18:04	18:30	09:33	10:51	12:06
56°	17:35	17:50	18:12	09:43	11:05	12:24
58°	17:23	17:32	17:50	09:55	11:22	12:46
S 60°	17:08	17:12	17:21	10:09	11:42	13:15

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 96-86%
04	03:06	02:57	12:03	01:22	13:45	
05	02:48	02:40	12:03	02:08	14:32	
06	02:31	02:23	12:02	02:56	15:21	

April 07, 08, 09 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	195°17.1	158°35.7	N14°19.4	196°53.6	S01°48.6	87°38.4	N22°49.5	188°39.9	N00°32.3
1	210°19.5	173°35.2	20.5	211°54.3	47.8	102°40.7	49.5	203°42.0	32.4
2	225°22.0	188°34.7	21.6	226°54.9	47.0	117°42.9	49.5	218°44.2	32.6
3	240°24.5	203°34.2	·· 22.7	241°55.6	·· 46.2	132°45.2	·· 49.5	233°46.4	·· 32.7
4	255°26.9	218°33.6	23.7	256°56.3	45.4	147°47.4	49.4	248°48.6	32.8
5	270°29.4	233°33.1	24.8	271°57.0	44.7	162°49.6	49.4	263°50.8	32.9
6	285°31.9	248°32.6	N14°25.9	286°57.6	S01°43.9	177°51.9	N22°49.4	278°52.9	N00°33.0
7	300°34.3	263°32.1	27.0	301°58.3	43.1	192°54.1	49.4	293°55.1	33.2
8	315°36.8	278°31.6	28.1	316°59.0	42.3	207°56.4	49.3	308°57.3	33.3
9	330°39.2	293°31.1	·· 29.1	331°59.7	·· 41.5	222°58.6	·· 49.3	323°59.5	·· 33.4
10	345°41.7	308°30.6	30.2	347°00.4	40.7	238°00.8	49.3	339°01.7	33.5
11	0°44.2	323°30.1	31.3	2°01.0	39.9	253°03.1	49.3	354°03.8	33.6
12	15°46.6	338°29.6	N14°32.4	17°01.7	S01°39.2	268°05.3	N22°49.2	9°06.0	N00°33.8
13	30°49.1	353°29.1	33.4	32°02.4	38.4	283°07.6	49.2	24°08.2	33.9
14	45°51.6	8°28.6	34.5	47°03.1	37.6	298°09.8	49.2	39°10.4	34.0
15	60°54.0	23°28.1	·· 35.6	62°03.8	·· 36.8	313°12.0	·· 49.2	54°12.6	·· 34.1
16	75°56.5	38°27.6	36.7	77°04.4	36.0	328°14.3	49.1	69°14.7	34.2
17	90°59.0	53°27.1	37.7	92°05.1	35.2	343°16.5	49.1	84°16.9	34.4
18	106°01.4	68°26.6	N14°38.8	107°05.8	S01°34.4	358°18.8	N22°49.1	99°19.1	N00°34.5
19	121°03.9	83°26.1	39.9	122°06.5	33.7	13°21.0	49.1	114°21.3	34.6
20	136°06.4	98°25.5	40.9	137°07.2	32.9	28°23.2	49.1	129°23.5	34.7
21	151°08.8	113°25.0	·· 42.0	152°07.8	·· 32.1	43°25.5	·· 49.0	144°25.6	·· 34.8
22	166°11.3	128°24.5	43.1	167°08.5	31.3	58°27.7	49.0	159°27.8	34.9
23	181°13.7	143°24.0	44.1	182°09.2	30.5	73°29.9	49.0	174°30.0	35.1
Mer.pass. 10:57		ν -0.5′ d 1.1′	m -3.92	ν 0.7′ d 0.8′	m 1.19	ν 2.2′ d 0.0′	m -2.16	ν 2.2′ d 0.1′	m 0.93

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	196°16.2	158°23.5	N14°45.2	197°09.9	S01°29.7	88°32.2	N22°49.0	189°32.2	N00°35.2
1	211°18.7	173°23.0	46.3	212°10.6	29.0	103°34.4	48.9	204°34.4	35.3
2	226°21.1	188°22.5	47.4	227°11.2	28.2	118°36.6	48.9	219°36.5	35.4
3	241°23.6	203°22.0	·· 48.4	242°11.9	·· 27.4	133°38.9	·· 48.9	234°38.7	·· 35.5
4	256°26.1	218°21.4	49.5	257°12.6	26.6	148°41.1	48.9	249°40.9	35.7
5	271°28.5	233°20.9	50.5	272°13.3	25.8	163°43.4	48.8	264°43.1	35.8
6	286°31.0	248°20.4	N14°51.6	287°14.0	S01°25.0	178°45.6	N22°48.8	279°45.3	N00°35.9
7	301°33.5	263°19.9	52.7	302°14.6	24.2	193°47.8	48.8	294°47.4	36.0
8	316°35.9	278°19.4	53.7	317°15.3	23.5	208°50.1	48.8	309°49.6	36.1
9	331°38.4	293°18.9	·· 54.8	332°16.0	·· 22.7	223°52.3	·· 48.7	324°51.8	·· 36.3
10	346°40.8	308°18.4	55.9	347°16.7	21.9	238°54.5	48.7	339°54.0	36.4
11	1°43.3	323°17.8	56.9	2°17.4	21.1	253°56.8	48.7	354°56.2	36.5
12	16°45.8	338°17.3	N14°58.0	17°18.0	S01°20.3	268°59.0	N22°48.7	9°58.3	N00°36.6
13	31°48.2	353°16.8	14°59.0	32°18.7	19.5	284°01.2	48.6	25°00.5	36.7
14	46°50.7	8°16.3	15°00.1	47°19.4	18.7	299°03.4	48.6	40°02.7	36.9
15	61°53.2	23°15.8	·· 01.2	62°20.1	·· 18.0	314°05.7	·· 48.6	55°04.9	·· 37.0
16	76°55.6	38°15.3	02.2	77°20.8	17.2	329°07.9	48.6	70°07.1	37.1
17	91°58.1	53°14.7	03.3	92°21.4	16.4	344°10.1	48.5	85°09.2	37.2
18	107°00.6	68°14.2	N15°04.3	107°22.1	S01°15.6	359°12.4	N22°48.5	100°11.4	N00°37.3
19	122°03.0	83°13.7	05.4	122°22.8	14.8	14°14.6	48.5	115°13.6	37.4
20	137°05.5	98°13.2	06.4	137°23.5	14.0	29°16.8	48.5	130°15.8	37.6
21	152°08.0	113°12.7	·· 07.5	152°24.2	·· 13.3	44°19.1	·· 48.4	145°18.0	·· 37.7
22	167°10.4	128°12.1	08.6	167°24.9	12.5	59°21.3	48.4	160°20.2	37.8
23	182°12.9	143°11.6	09.6	182°25.5	11.7	74°23.5	48.4	175°22.3	37.9
Mer.pass. 10:53		ν -0.5′ d 1.1′	m -3.92	ν 0.7′ d 0.8′	m 1.19	ν 2.2′ d 0.0′	m -2.15	ν 2.2′ d 0.1′	m 0.93

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	197°15.3	158°11.1	N15°10.7	197°26.2	S01°10.9	89°25.7	N22°48.4	190°24.5	N00°38.0
1	212°17.8	173°10.6	11.7	212°26.9	10.1	104°28.0	48.3	205°26.7	38.2
2	227°20.3	188°10.1	12.8	227°27.6	09.3	119°30.2	48.3	220°28.9	38.3
3	242°22.7	203°09.5	·· 13.8	242°28.3	·· 08.5	134°32.4	·· 48.3	235°31.1	·· 38.4
4	257°25.2	218°09.0	14.9	257°28.9	07.8	149°34.7	48.3	250°33.2	38.5
5	272°27.7	233°08.5	15.9	272°29.6	07.0	164°36.9	48.2	265°35.4	38.6
6	287°30.1	248°08.0	N15°17.0	287°30.3	S01°06.2	179°39.1	N22°48.2	280°37.6	N00°38.8
7	302°32.6	263°07.4	18.0	302°31.0	05.4	194°41.3	48.2	295°39.8	38.9
8	317°35.1	278°06.9	19.1	317°31.7	04.6	209°43.6	48.2	310°42.0	39.0
9	332°37.5	293°06.4	·· 20.1	332°32.4	·· 03.8	224°45.8	·· 48.1	325°44.1	·· 39.1
10	347°40.0	308°05.9	21.2	347°33.0	03.0	239°48.0	48.1	340°46.3	39.2
11	2°42.5	323°05.3	22.2	2°33.7	02.3	254°50.2	48.1	355°48.5	39.4
12	17°44.9	338°04.8	N15°23.2	17°34.4	S01°01.5	269°52.5	N22°48.1	10°50.7	N00°39.5
13	32°47.4	353°04.3	24.3	32°35.1	01°00.7	284°54.7	48.0	25°52.9	39.6
14	47°49.8	8°03.8	25.3	47°35.8	00°59.9	299°56.9	48.0	40°55.1	39.7
15	62°52.3	23°03.2	·· 26.4	62°36.4	·· 59.1	314°59.1	·· 48.0	55°57.2	·· 39.8
16	77°54.8	38°02.7	27.4	77°37.1	58.3	330°01.4	48.0	70°59.4	39.9
17	92°57.2	53°02.2	28.5	92°37.8	57.6	345°03.6	47.9	86°01.6	40.1
18	107°59.7	68°01.6	N15°29.5	107°38.5	S00°56.8	0°05.8	N22°47.9	101°03.8	N00°40.2
19	123°02.2	83°01.1	30.5	122°39.2	56.0	15°08.0	47.9	116°06.0	40.3
20	138°04.6	98°00.6	31.6	137°39.9	55.2	30°10.3	47.9	131°08.1	40.4
21	153°07.1	113°00.1	·· 32.6	152°40.5	·· 54.4	45°12.5	·· 47.8	146°10.3	·· 40.5
22	168°09.6	127°59.5	33.7	167°41.2	53.6	60°14.7	47.8	161°12.5	40.7
23	183°12.0	142°59.0	34.7	182°41.9	52.8	75°16.9	47.8	176°14.7	40.8
Mer.pass. 10:49		ν -0.5′ d 1.1′	m -3.92	ν 0.7′ d 0.8′	m 1.19	ν 2.2′ d 0.0′	m -2.15	ν 2.2′ d 0.1′	m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.5	-42°09.8
Schedar	349°30.5	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.2
Hamal	327°50.4	23°35.1
Polaris	313°56.7	89°22.6
Acamar	315°11.4	-40°12.1
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.0	-8°10.4
Capella	280°20.6	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.1	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.1	-29°00.7
Procyon	244°49.7	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.2	-59°35.9
Suhail	222°45.4	-43°32.6
Miaplacidus	221°37.7	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.8
Gacrux	171°50.0	-57°15.8
Alioth	166°11.5	55°48.9
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.0
Menkent	147°56.0	-36°30.0
Arcturus	145°46.7	19°02.5
Rigil Kent.	139°38.3	-60°56.6
Kochab	137°18.7	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.4	-26°29.4
Atria	107°07.4	-69°04.3
Sabik	102°01.4	-15°45.5
Shaula	96°08.8	-37°07.3
Rasalhague	95°57.5	12°32.2
Eltanin	90°41.5	51°28.7
Kaus Aust.	83°31.1	-34°22.2
Vega	80°32.5	38°48.1
Nunki	75°46.5	-26°15.8
Altair	61°59.0	8°56.1
Peacock	53°04.3	-56°38.8
Deneb	49°25.3	45°22.1
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°49.9
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.4
Markab	13°29.2	15°20.7

Apr 07 Tue	SHA	Mer.pass
Venus	323°18.6	13:26
Mars	1°36.5	10:52
Jupiter	252°21.4	18:07
Saturn	353°22.8	11:24

Apr 08 Wed	SHA	Mer.pass
Venus	322°07.3	13:27
Mars	0°53.7	10:51
Jupiter	252°16.0	18:03
Saturn	353°16.0	11:20

Apr 09 Thu	SHA	Mer.pass
Venus	320°55.8	13:28
Mars	0°10.9	10:50
Jupiter	252°10.4	18:00
Saturn	353°09.2	11:17

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°26.5	N06°45.0	305°22.9	10.4′	S27°21.1	3.9′	54.1′
1	194°26.7	45.9	319°52.3	10.4′	27°25.0	3.6′	54.1′
2	209°26.8	46.9	334°21.6	10.4′	27°28.6	3.6′	54.1′
3	224°27.0	·· 47.8	348°51.0	10.3′	27°32.2	3.4′	54.1′
4	239°27.2	48.7	3°20.3	10.3′	27°35.6	3.3′	54.1′
5	254°27.4	49.7	17°49.6	10.3′	27°38.9	3.2′	54.1′
6	269°27.5	N06°50.6	32°18.9	10.2′	S27°42.1	3.0′	54.1′
7	284°27.7	51.6	46°48.1	10.2′	27°45.1	2.9′	54.1′
8	299°27.9	52.5	61°17.3	10.2′	27°48.0	2.7′	54.1′
9	314°28.1	·· 53.4	75°46.5	10.2′	27°50.7	2.7′	54.1′
10	329°28.2	54.4	90°15.7	10.1′	27°53.4	2.4′	54.1′
11	344°28.4	55.3	104°44.8	10.1′	27°55.8	2.4′	54.1′
12	359°28.6	N06°56.3	119°13.9	10.1′	S27°58.2	2.2′	54.1′
13	14°28.8	57.2	133°43.0	10.1′	28°00.4	2.1′	54.1′
14	29°28.9	58.1	148°12.1	10.0′	28°02.5	2.0′	54.1′
15	44°29.1	06°59.1	162°41.1	10.0′	28°04.5	1.8′	54.1′
16	59°29.3	07°00.0	177°10.1	10.0′	28°06.3	1.7′	54.1′
17	74°29.5	01.0	191°39.1	10.0′	28°08.0	1.5′	54.1′
18	89°29.6	N07°01.9	206°08.1	10.0′	S28°09.5	1.4′	54.1′
19	104°29.8	02.8	220°37.1	10.0′	28°10.9	1.3′	54.1′
20	119°30.0	03.8	235°06.1	9.9′	28°12.2	1.1′	54.1′
21	134°30.2	·· 04.7	249°35.0	9.9′	28°13.3	1.0′	54.1′
22	149°30.3	05.6	264°03.9	9.9′	28°14.3	0.9′	54.1′
23	164°30.5	06.6	278°32.9	9.9′	28°15.2	0.7′	54.1′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°30.7	N07°07.5	293°01.8	9.9′	S28°15.9	0.6′	54.1′
1	194°30.9	08.4	307°30.7	9.9′	28°16.5	0.5′	54.1′
2	209°31.0	09.4	321°59.6	9.9′	28°17.0	0.3′	54.1′
3	224°31.2	·· 10.3	336°28.4	9.9′	28°17.3	0.2′	54.1′
4	239°31.4	11.3	350°57.3	9.9′	28°17.5	0.0′	54.1′
5	254°31.5	12.2	5°26.2	9.9′	28°17.5	0.1′	54.1′
6	269°31.7	N07°13.1	19°55.0	9.9′	S28°17.4	0.2′	54.1′
7	284°31.9	14.1	34°23.9	9.9′	28°17.2	0.4′	54.2′
8	299°32.1	15.0	48°52.8	9.9′	28°16.8	0.5′	54.2′
9	314°32.2	·· 15.9	63°21.6	9.9′	28°16.3	0.6′	54.2′
10	329°32.4	16.9	77°50.5	9.9′	28°15.7	0.8′	54.2′
11	344°32.6	17.8	92°19.3	9.9′	28°14.9	0.9′	54.2′
12	359°32.8	N07°18.7	106°48.2	9.9′	S28°14.0	1.1′	54.2′
13	14°32.9	19.7	121°17.1	9.9′	28°12.9	1.1′	54.2′
14	29°33.1	20.6	135°45.9	9.9′	28°11.8	1.4′	54.2′
15	44°33.3	·· 21.5	150°14.8	9.9′	28°10.4	1.4′	54.2′
16	59°33.4	22.5	164°43.7	9.9′	28°09.0	1.6′	54.2′
17	74°33.6	23.4	179°12.6	9.9′	28°07.4	1.8′	54.2′
18	89°33.8	N07°24.3	193°41.5	9.9′	S28°05.6	1.8′	54.2′
19	104°34.0	25.3	208°10.4	9.9′	28°03.8	2.1′	54.2′
20	119°34.1	26.2	222°39.3	9.9′	28°01.7	2.1′	54.3′
21	134°34.3	·· 27.1	237°08.2	9.9′	27°59.6	2.3′	54.3′
22	149°34.5	28.1	251°37.1	9.9′	27°57.3	2.4′	54.3′
23	164°34.6	29.0	266°06.1	10.0′	27°54.9	2.6′	54.3′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°34.8	N07°29.9	280°35.0	10.0′	S27°52.3	2.7′	54.3′
1	194°35.0	30.8	295°04.0	10.0′	27°49.6	2.8′	54.3′
2	209°35.2	31.8	309°33.0	10.0′	27°46.8	3.0′	54.3′
3	224°35.3	·· 32.7	324°02.0	10.0′	27°43.8	3.1′	54.3′
4	239°35.5	33.6	338°31.0	10.0′	27°40.7	3.2′	54.3′
5	254°35.7	34.6	353°00.0	10.1′	27°37.5	3.4′	54.4′
6	269°35.8	N07°35.5	7°29.1	10.1′	S27°34.1	3.5′	54.4′
7	284°36.0	36.4	21°58.2	10.1′	27°30.6	3.6′	54.4′
8	299°36.2	37.4	36°27.3	10.1′	27°27.0	3.8′	54.4′
9	314°36.4	·· 38.3	50°56.4	10.1′	27°23.2	3.9′	54.4′
10	329°36.5	39.2	65°25.6	10.2′	27°19.3	4.0′	54.4′
11	344°36.7	40.1	79°54.7	10.2′	27°15.3	4.2′	54.4′
12	359°36.9	N07°41.1	94°23.9	10.2′	S27°11.1	4.3′	54.5′
13	14°37.0	42.0	108°53.1	10.2′	27°06.8	4.4′	54.5′
14	29°37.2	42.9	123°22.4	10.3′	27°02.4	4.6′	54.5′
15	44°37.4	·· 43.9	137°51.7	10.3′	26°57.8	4.7′	54.5′
16	59°37.5	44.8	152°20.9	10.3′	26°53.1	4.9′	54.5′
17	74°37.7	45.7	166°50.3	10.4′	26°48.2	4.9′	54.5′
18	89°37.9	N07°46.6	181°19.6	10.4′	S26°43.3	5.1′	54.5′
19	104°38.0	47.6	195°49.0	10.4′	26°38.2	5.3′	54.6′
20	119°38.2	48.5	210°18.4	10.4′	26°32.9	5.3′	54.6′
21	134°38.4	·· 49.4	224°47.9	10.5′	26°27.6	5.5′	54.6′
22	149°38.6	50.3	239°17.3	10.5′	26°22.1	5.6′	54.6′
23	164°38.7	51.3	253°46.9	10.5′	26°16.5	5.8′	54.6′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	02:55	04:19	19:48	21:14	////
N 70°	01:10	03:19	04:30	19:36	20:49	23:09
68°	02:00	03:36	04:40	19:27	20:31	22:10
66°	02:30	03:51	04:47	19:18	20:16	21:38
64°	02:52	04:02	04:54	19:12	20:04	21:15
62°	03:10	04:12	05:00	19:06	19:54	20:57
60°	03:24	04:20	05:04	19:01	19:45	20:43
N 58°	03:35	04:27	05:09	18:56	19:38	20:31
56°	03:45	04:34	05:13	18:52	19:31	20:20
54°	03:54	04:39	05:16	18:49	19:26	20:11
52°	04:01	04:44	05:19	18:46	19:21	20:04
50°	04:08	04:49	05:22	18:43	19:16	19:57
45°	04:22	04:58	05:28	18:36	19:07	19:43
N 40°	04:33	05:06	05:33	18:31	18:59	19:32
35°	04:41	05:12	05:37	18:27	18:53	19:23
30°	04:48	05:17	05:41	18:23	18:47	19:16
20°	04:59	05:26	05:48	18:16	18:38	19:05
N 10°	05:08	05:32	05:53	18:10	18:32	18:56
0°	05:14	05:38	05:59	18:05	18:26	18:50
S 10°	05:18	05:42	06:04	18:00	18:21	18:46
20°	05:21	05:47	06:09	17:54	18:17	18:42
30°	05:23	05:51	06:15	17:48	18:12	18:40
35°	05:23	05:53	06:18	17:45	18:10	18:40
40°	05:23	05:55	06:22	17:41	18:08	18:40
45°	05:23	05:57	06:26	17:37	18:06	18:40
S 50°	05:22	05:59	06:31	17:31	18:04	18:41
52°	05:21	06:00	06:34	17:29	18:03	18:42
54°	05:20	06:01	06:36	17:26	18:02	18:43
56°	05:19	06:02	06:39	17:23	18:01	18:44
58°	05:17	06:03	06:42	17:20	18:00	18:45
S 60°	05:16	06:04	06:46	17:17	17:58	18:46

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	03:04	▬	04:53	04:24	▬	06:10
60°	02:02	03:12	03:49	05:27	06:03	07:13
N 58°	01:28	02:32	03:15	06:01	06:42	07:47
56°	01:03	02:05	02:50	06:26	07:10	08:12
54°	00:43	01:44	02:29	06:46	07:31	08:32
52°	00:26	01:26	02:13	07:03	07:49	08:49
50°	00:12	01:11	01:58	07:17	08:04	09:03
45°	·· ··	00:40	01:29	07:47	08:35	09:32
N 40°	·· ··	00:16	01:06	08:10	08:59	09:55
35°	23:57	·· ··	00:47	08:29	09:18	10:13
30°	23:40	·· ··	00:30	08:45	09:35	10:29
20°	23:12	·· ··	00:03	09:13	10:03	10:57
N 10°	22:48	23:39	·· ··	09:36	10:27	11:20
0°	22:25	23:17	·· ··	09:58	10:50	11:41
S 10°	22:03	22:54	23:47	10:21	11:12	12:03
20°	21:38	22:31	23:25	10:45	11:37	12:26
30°	21:10	22:03	22:59	11:12	12:05	12:52
35°	20:54	21:46	22:44	11:29	12:21	13:08
40°	20:34	21:27	22:26	11:48	12:41	13:26
45°	20:11	21:04	22:05	12:11	13:04	13:48
S 50°	19:41	20:34	21:38	12:41	13:34	14:16
52°	19:26	20:19	21:25	12:56	13:49	14:29
54°	19:09	20:02	21:09	13:13	14:06	14:45
56°	18:48	19:41	20:51	13:34	14:27	15:03
58°	18:22	19:15	20:29	14:00	14:53	15:26
S 60°	17:45	18:39	20:01	14:36	15:30	15:54

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 19-21 79-62%
07	02:14	02:06	12:02	03:46	16:12	
08	01:57	01:49	12:02	04:37	17:03	
09	01:41	01:33	12:02	05:29	17:55	

April 10, 11, 12 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	198°14.5	157°58.5	N15°35.7	197°42.6	S00°52.1	90°19.1	N22°47.8	191°16.9	N00°40.9
1	213°17.0	172°57.9	36.8	212°43.3	51.3	105°21.4	47.7	206°19.0	41.0
2	228°19.4	187°57.4	37.8	227°44.0	50.5	120°23.6	47.7	221°21.2	41.1
3	243°21.9	202°56.9	·· 38.8	242°44.6	·· 49.7	135°25.8	·· 47.7	236°23.4	·· 41.2
4	258°24.3	217°56.3	39.9	257°45.3	48.9	150°28.0	47.7	251°25.6	41.4
5	273°26.8	232°55.8	40.9	272°46.0	48.1	165°30.3	47.6	266°27.8	41.5
6	288°29.3	247°55.3	N15°41.9	287°46.7	S00°47.3	180°32.5	N22°47.6	281°30.0	N00°41.6
7	303°31.7	262°54.7	43.0	302°47.4	46.6	195°34.7	47.6	296°32.1	41.7
8	318°34.2	277°54.2	44.0	317°48.0	45.8	210°36.9	47.5	311°34.3	41.8
9	333°36.7	292°53.7	·· 45.0	332°48.7	·· 45.0	225°39.1	·· 47.5	326°36.5	·· 42.0
10	348°39.1	307°53.1	46.1	347°49.4	44.2	240°41.3	47.5	341°38.7	42.1
11	3°41.6	322°52.6	47.1	2°50.1	43.4	255°43.6	47.5	356°40.9	42.2
12	18°44.1	337°52.0	N15°48.1	17°50.8	S00°42.6	270°45.8	N22°47.4	11°43.0	N00°42.3
13	33°46.5	352°51.5	49.1	32°51.5	41.9	285°48.0	47.4	26°45.2	42.4
14	48°49.0	7°51.0	50.2	47°52.1	41.1	300°50.2	47.4	41°47.4	42.5
15	63°51.4	22°50.4	·· 51.2	62°52.8	·· 40.3	315°52.4	·· 47.4	56°49.6	·· 42.7
16	78°53.9	37°49.9	52.2	77°53.5	39.5	330°54.7	47.3	71°51.8	42.8
17	93°56.4	52°49.4	53.3	92°54.2	38.7	345°56.9	47.3	86°54.0	42.9
18	108°58.8	67°48.8	N15°54.3	107°54.9	S00°37.9	0°59.1	N22°47.3	101°56.1	N00°43.0
19	124°01.3	82°48.3	55.3	122°55.6	37.1	16°01.3	47.3	116°58.3	43.1
20	139°03.8	97°47.7	56.3	137°56.3	36.4	31°03.5	47.2	132°00.5	43.3
21	154°06.2	112°47.2	·· 57.3	152°56.9	·· 35.6	46°05.7	·· 47.2	147°02.7	·· 43.4
22	169°08.7	127°46.6	58.4	167°57.6	34.8	61°07.9	47.2	162°04.9	43.5
23	184°11.2	142°46.1	59.4	182°58.3	34.0	76°10.2	47.2	177°07.0	43.6
Mer.pass. 10:45		ν -0.5′	d 1.0′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.14	ν 2.2′	d 0.1′ m 0.93

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	199°13.6	157°45.6	N16°00.4	197°59.0	S00°33.2	91°12.4	N22°47.1	192°09.2	N00°43.7
1	214°16.1	172°45.0	01.4	212°59.7	32.4	106°14.6	47.1	207°11.4	43.8
2	229°18.6	187°44.5	02.5	228°00.4	31.7	121°16.8	47.1	222°13.6	44.0
3	244°21.0	202°43.9	·· 03.5	243°01.0	·· 30.9	136°19.0	·· 47.0	237°15.8	·· 44.1
4	259°23.5	217°43.4	04.5	258°01.7	30.1	151°21.2	47.0	252°18.0	44.2
5	274°25.9	232°42.8	05.5	273°02.4	29.3	166°23.4	47.0	267°20.1	44.3
6	289°28.4	247°42.3	N16°06.5	288°03.1	S00°28.5	181°25.7	N22°47.0	282°22.3	N00°44.4
7	304°30.9	262°41.8	07.5	303°03.8	27.7	196°27.9	46.9	297°24.5	44.6
8	319°33.3	277°41.2	08.6	318°04.5	26.9	211°30.1	46.9	312°26.7	44.7
9	334°35.8	292°40.7	·· 09.6	333°05.1	·· 26.2	226°32.3	·· 46.9	327°28.9	·· 44.8
10	349°38.3	307°40.1	10.6	348°05.8	25.4	241°34.5	46.9	342°31.0	44.9
11	4°40.7	322°39.6	11.6	3°06.5	24.6	256°36.7	46.8	357°33.2	45.0
12	19°43.2	337°39.0	N16°12.6	18°07.2	S00°23.8	271°38.9	N22°46.8	12°35.4	N00°45.1
13	34°45.7	352°38.5	13.6	33°07.9	23.0	286°41.1	46.8	27°37.6	45.3
14	49°48.1	7°37.9	14.6	48°08.6	22.2	301°43.3	46.7	42°39.8	45.4
15	64°50.6	22°37.4	·· 15.6	63°09.2	·· 21.5	316°45.6	·· 46.7	57°42.0	·· 45.5
16	79°53.1	37°36.8	16.6	78°09.9	20.7	331°47.8	46.7	72°44.1	45.6
17	94°55.5	52°36.3	17.7	93°10.6	19.9	346°50.0	46.7	87°46.3	45.7
18	109°58.0	67°35.7	N16°18.7	108°11.3	S00°19.1	1°52.2	N22°46.6	102°48.5	N00°45.9
19	125°00.4	82°35.2	19.7	123°12.0	18.3	16°54.4	46.6	117°50.7	46.0
20	140°02.9	97°34.6	20.7	138°12.7	17.5	31°56.6	46.6	132°52.9	46.1
21	155°05.4	112°34.1	·· 21.7	153°13.4	·· 16.8	46°58.8	·· 46.6	147°55.1	·· 46.2
22	170°07.8	127°33.5	22.7	168°14.0	16.0	62°01.0	46.5	162°57.2	46.3
23	185°10.3	142°33.0	23.7	183°14.7	15.2	77°03.2	46.5	177°59.4	46.4
Mer.pass. 10:41		ν -0.5′	d 1.0′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.13	ν 2.2′	d 0.1′ m 0.93

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	200°12.8	157°32.4	N16°24.7	198°15.4	S00°14.4	92°05.4	N22°46.5	193°01.6	N00°46.6
1	215°15.2	172°31.9	25.7	213°16.1	13.6	107°07.6	46.4	208°03.8	46.7
2	230°17.7	187°31.3	26.7	228°16.8	12.8	122°09.9	46.4	223°06.0	46.8
3	245°20.2	202°30.8	·· 27.7	243°17.5	·· 12.0	137°12.1	·· 46.4	238°08.2	·· 46.9
4	260°22.6	217°30.2	28.7	258°18.2	11.3	152°14.3	46.4	253°10.3	47.0
5	275°25.1	232°29.6	29.7	273°18.8	10.5	167°16.5	46.3	268°12.5	47.1
6	290°27.6	247°29.1	N16°30.7	288°19.5	S00°09.7	182°18.7	N22°46.3	283°14.7	N00°47.3
7	305°30.0	262°28.5	31.7	303°20.2	08.9	197°20.9	46.3	298°16.9	47.4
8	320°32.5	277°28.0	32.7	318°20.9	08.1	212°23.1	46.2	313°19.1	47.5
9	335°34.9	292°27.4	·· 33.7	333°21.6	·· 07.3	227°25.3	·· 46.2	328°21.2	·· 47.6
10	350°37.4	307°26.9	34.7	348°22.3	06.6	242°27.5	46.2	343°23.4	47.7
11	5°39.9	322°26.3	35.7	3°23.0	05.8	257°29.7	46.2	358°25.6	47.9
12	20°42.3	337°25.7	N16°36.7	18°23.6	S00°05.0	272°31.9	N22°46.1	13°27.8	N00°48.0
13	35°44.8	352°25.2	37.7	33°24.3	04.2	287°34.1	46.1	28°30.0	48.1
14	50°47.3	7°24.6	38.7	48°25.0	03.4	302°36.3	46.1	43°32.2	48.2
15	65°49.7	22°24.1	·· 39.7	63°25.7	·· 02.6	317°38.5	·· 46.0	58°34.3	·· 48.3
16	80°52.2	37°23.5	40.7	78°26.4	01.9	332°40.7	46.0	73°36.5	48.4
17	95°54.7	52°23.0	41.7	93°27.1	01.1	347°42.9	46.0	88°38.7	48.6
18	110°57.1	67°22.4	N16°42.6	108°27.8	S00°00.3	2°45.1	N22°46.0	103°40.9	N00°48.7
19	125°59.6	82°21.8	43.6	123°28.4	N00°00.5	17°47.3	45.9	118°43.1	48.8
20	141°02.0	97°21.3	44.6	138°29.1	01.3	32°49.5	45.9	133°45.3	48.9
21	156°04.5	112°20.7	·· 45.6	153°29.8	·· 02.1	47°51.7	·· 45.9	148°47.4	·· 49.0
22	171°07.0	127°20.1	46.6	168°30.5	02.8	62°53.9	45.8	163°49.6	49.1
23	186°09.4	142°19.6	47.6	183°31.2	03.6	77°56.1	45.8	178°51.8	49.3
Mer.pass. 10:37		ν -0.6′	d 1.0′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.13	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.1	29°14.0
Ankaa	353°06.5	-42°09.8
Schedar	349°30.4	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.2
Hamal	327°50.4	23°35.1
Polaris	313°57.3	89°22.6
Acamar	315°11.4	-40°12.1
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.6	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.1	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.1	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.2	-59°35.9
Suhail	222°45.4	-43°32.6
Miaplacidus	221°37.7	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.8
Alioth	166°11.5	55°48.9
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.0
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.5
Rigil Kent.	139°38.3	-60°56.6
Kochab	137°18.7	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.3	-26°29.4
Atria	107°07.3	-69°04.3
Sabik	102°01.4	-15°45.5
Shaula	96°08.8	-37°07.3
Rasalhague	95°57.4	12°32.2
Eltanin	90°41.5	51°28.8
Kaus Aust.	83°31.0	-34°22.2
Vega	80°32.4	38°48.1
Nunki	75°46.4	-26°15.8
Altair	61°59.0	8°56.1
Peacock	53°04.2	-56°38.8
Deneb	49°25.3	45°22.1
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°49.9
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.4
Markab	13°29.1	15°20.7

Apr 10 Fri	SHA	Mer.pass
Venus	319°44.0	13:29
Mars	359°28.1	10:49
Jupiter	252°04.7	17:56
Saturn	353°02.4	11:13

Apr 11 Sat	SHA	Mer.pass
Venus	318°31.9	13:29
Mars	358°45.4	10:48
Jupiter	251°58.7	17:53
Saturn	352°55.6	11:10

Apr 12 Sun	SHA	Mer.pass
Venus	317°19.7	13:30
Mars	358°02.6	10:46
Jupiter	251°52.7	17:49
Saturn	352°48.8	11:06

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°38.9	N07°52.2	268°16.4	10.6′	S26°10.7	5.8′	54.7′
1	194°39.1	53.1	282°46.0	10.6′	26°04.9	6.0′	54.7′
2	209°39.2	54.1	297°15.6	10.6′	25°58.9	6.2′	54.7′
3	224°39.4	·· 55.0	311°45.2	10.7′	25°52.7	6.2′	54.7′
4	239°39.6	55.9	326°14.9	10.7′	25°46.5	6.4′	54.7′
5	254°39.7	56.8	340°44.6	10.7′	25°40.1	6.5′	54.7′
6	269°39.9	N07°57.8	355°14.3	10.8′	S25°33.6	6.7′	54.8′
7	284°40.1	58.7	9°44.1	10.8′	25°26.9	6.7′	54.8′
8	299°40.2	07°59.6	24°13.9	10.9′	25°20.2	6.9′	54.8′
9	314°40.4	08°00.5	38°43.8	10.9′	25°13.3	7.0′	54.8′
10	329°40.6	01.4	53°13.7	10.9′	25°06.3	7.2′	54.8′
11	344°40.7	02.4	67°43.6	11.0′	24°59.1	7.2′	54.9′
12	359°40.9	N08°03.3	82°13.6	11.0′	S24°51.9	7.4′	54.9′
13	14°41.1	04.2	96°43.6	11.0′	24°44.5	7.5′	54.9′
14	29°41.2	05.1	111°13.6	11.1′	24°37.0	7.6′	54.9′
15	44°41.4	·· 06.1	125°43.7	11.1′	24°29.4	7.8′	55.0′
16	59°41.6	07.0	140°13.8	11.2′	24°21.6	7.9′	55.0′
17	74°41.7	07.9	154°44.0	11.2′	24°13.7	7.9′	55.0′
18	89°41.9	N08°08.8	169°14.2	11.2′	S24°05.8	8.1′	55.0′
19	104°42.1	09.7	183°44.4	11.3′	23°57.7	8.3′	55.0′
20	119°42.2	10.7	198°14.7	11.3′	23°49.4	8.3′	55.1′
21	134°42.4	·· 11.6	212°45.0	11.4′	23°41.1	8.5′	55.1′
22	149°42.6	12.5	227°15.4	11.4′	23°32.6	8.6′	55.1′
23	164°42.7	13.4	241°45.8	11.4′	23°24.0	8.7′	55.1′
	SD = 16.0′	d = 0.9′	SD = 14.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°42.9	N08°14.4	256°16.2	11.5′	S23°15.3	8.8′	55.2′
1	194°43.1	15.3	270°46.7	11.5′	23°06.5	8.9′	55.2′
2	209°43.2	16.2	285°17.2	11.6′	22°57.6	9.1′	55.2′
3	224°43.4	·· 17.1	299°47.8	11.6′	22°48.5	9.1′	55.2′
4	239°43.6	18.0	314°18.4	11.6′	22°39.4	9.3′	55.3′
5	254°43.7	19.0	328°49.0	11.7′	22°30.1	9.4′	55.3′
6	269°43.9	N08°19.9	343°19.7	11.7′	S22°20.7	9.5′	55.3′
7	284°44.0	20.8	357°50.4	11.8′	22°11.2	9.6′	55.4′
8	299°44.2	21.7	12°21.2	11.8′	22°01.6	9.7′	55.4′
9	314°44.4	·· 22.6	26°52.0	11.8′	21°51.9	9.8′	55.4′
10	329°44.5	23.5	41°22.8	11.9′	21°42.1	10.0′	55.4′
11	344°44.7	24.5	55°53.7	11.9′	21°32.1	10.0′	55.5′
12	359°44.9	N08°25.4	70°24.6	12.0′	S21°22.1	10.2′	55.5′
13	14°45.0	26.3	84°55.6	12.0′	21°11.9	10.3′	55.5′
14	29°45.2	27.2	99°26.6	12.0′	21°01.6	10.3′	55.5′
15	44°45.4	·· 28.1	113°57.6	12.1′	20°51.3	10.5′	55.6′
16	59°45.5	29.0	128°28.7	12.1′	20°40.8	10.6′	55.6′
17	74°45.7	30.0	142°59.8	12.2′	20°30.2	10.7′	55.6′
18	89°45.8	N08°30.9	157°31.0	12.2′	S20°19.5	10.8′	55.7′
19	104°46.0	31.8	172°02.2	12.2′	20°08.7	10.9′	55.7′
20	119°46.2	32.7	186°33.4	12.3′	19°57.8	11.0′	55.7′
21	134°46.3	·· 33.6	201°04.7	12.3′	19°46.8	11.1′	55.8′
22	149°46.5	34.5	215°36.0	12.3′	19°35.7	11.2′	55.8′
23	164°46.7	35.5	230°07.3	12.4′	19°24.5	11.3′	55.8′
	SD = 16.0′	d = 0.9′	SD = 15.0′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°46.8	N08°36.4	244°38.7	12.4′	S19°13.2	11.4′	55.8′
1	194°47.0	37.3	259°10.1	12.4′	19°01.8	11.5′	55.9′
2	209°47.1	38.2	273°41.6	12.5′	18°50.3	11.7′	55.9′
3	224°47.3	·· 39.1	288°13.0	12.5′	18°38.6	11.7′	55.9′
4	239°47.5	40.0	302°44.6	12.5′	18°26.9	11.8′	56.0′
5	254°47.6	40.9	317°16.1	12.6′	18°15.1	11.9′	56.0′
6	269°47.8	N08°41.9	331°47.7	12.6′	S18°03.2	12.0′	56.0′
7	284°47.9	42.8	346°19.3	12.6′	17°51.2	12.1′	56.1′
8	299°48.1	43.7	0°50.9	12.7′	17°39.1	12.1′	56.1′
9	314°48.3	·· 44.6	15°22.6	12.7′	17°27.0	12.3′	56.1′
10	329°48.4	45.5	29°54.3	12.7′	17°14.7	12.4′	56.2′
11	344°48.6	46.4	44°26.1	12.8′	17°02.3	12.5′	56.2′
12	359°48.8	N08°47.3	58°57.8	12.8′	S16°49.8	12.5′	56.2′
13	14°48.9	48.2	73°29.6	12.8′	16°37.3	12.7′	56.3′
14	29°49.1	49.1	88°01.5	12.9′	16°24.6	12.7′	56.3′
15	44°49.2	·· 50.1	102°33.3	12.9′	16°11.9	12.8′	56.3′
16	59°49.4	51.0	117°05.2	12.9′	15°59.1	12.9′	56.4′
17	74°49.6	51.9	131°37.1	12.9′	15°46.2	13.0′	56.4′
18	89°49.7	N08°52.8	146°09.1	13.0′	S15°33.2	13.1′	56.4′
19	104°49.9	53.7	160°41.0	13.0′	15°20.1	13.2′	56.5′
20	119°50.0	54.6	175°13.0	13.0′	15°06.9	13.2′	56.5′
21	134°50.2	·· 55.5	189°45.0	13.0′	14°53.7	13.4′	56.5′
22	149°50.3	56.4	204°17.1	13.1′	14°40.3	13.4′	56.6′
23	164°50.5	57.3	218°49.1	13.1′	14°26.9	13.5′	56.6′
	SD = 16.0′	d = 0.9′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	02:33	04:02	20:04	21:36	////
N 70°	////	03:01	04:16	19:49	21:06	////
68°	01:33	03:21	04:27	19:38	20:44	22:38
66°	02:11	03:37	04:36	19:29	20:28	21:56
64°	02:37	03:50	04:43	19:21	20:14	21:29
62°	02:56	04:01	04:50	19:14	20:03	21:09
60°	03:12	04:11	04:55	19:08	19:53	20:53
N 58°	03:25	04:18	05:00	19:03	19:45	20:39
56°	03:36	04:25	05:05	18:59	19:38	20:28
54°	03:45	04:32	05:09	18:54	19:32	20:18
52°	03:54	04:37	05:12	18:51	19:26	20:10
50°	04:01	04:42	05:16	18:47	19:21	20:03
45°	04:16	04:52	05:23	18:40	19:11	19:47
N 40°	04:28	05:01	05:28	18:34	19:02	19:35
35°	04:37	05:08	05:33	18:29	18:55	19:26
30°	04:45	05:13	05:38	18:25	18:49	19:18
20°	04:57	05:23	05:45	18:17	18:39	19:06
N 10°	05:06	05:31	05:52	18:10	18:32	18:56
0°	05:13	05:37	05:58	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:58	18:19	18:44
20°	05:22	05:48	06:10	17:52	18:14	18:40
30°	05:25	05:53	06:17	17:45	18:09	18:37
35°	05:26	05:55	06:21	17:41	18:06	18:36
40°	05:26	05:58	06:25	17:37	18:04	18:35
45°	05:26	06:00	06:30	17:31	18:01	18:35
S 50°	05:26	06:03	06:36	17:25	17:58	18:35
52°	05:26	06:05	06:39	17:22	17:56	18:35
54°	05:25	06:06	06:42	17:19	17:55	18:36
56°	05:25	06:08	06:45	17:16	17:53	18:36
58°	05:24	06:09	06:49	17:12	17:52	18:37
S 60°	05:23	06:11	06:53	17:08	17:50	18:38

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▬	▬	07:27	▬	▬	08:48
N 70°	▬	▬	06:10	▬	▬	10:04
68°	▬	▬	05:31	▬	▬	10:41
66°	▬	05:40	05:04	▬	08:52	11:07
64°	05:40	04:59	04:43	07:08	09:32	11:27
62°	04:38	04:31	04:26	08:10	09:59	11:43
60°	04:04	04:09	04:11	08:44	10:20	11:56
N 58°	03:38	03:51	03:59	09:09	10:37	12:08
56°	03:18	03:36	03:48	09:28	10:52	12:18
54°	03:02	03:23	03:39	09:45	11:04	12:26
52°	02:47	03:12	03:31	09:59	11:15	12:34
50°	02:35	03:02	03:23	10:11	11:25	12:41
45°	02:09	02:41	03:07	10:36	11:45	12:56
N 40°	01:48	02:23	02:53	10:56	12:01	13:08
35°	01:31	02:09	02:42	11:13	12:15	13:18
30°	01:16	01:56	02:32	11:27	12:27	13:27
20°	00:50	01:34	02:15	11:51	12:47	13:42
N 10°	00:28	01:15	01:59	12:12	13:04	13:55
0°	00:08	00:57	01:45	12:32	13:20	14:08
S 10°	·· ··	00:39	01:31	12:51	13:37	14:20
20°	·· ··	00:20	01:16	13:12	13:54	14:33
30°	23:58	·· ··	00:58	13:35	14:13	14:48
35°	23:45	·· ··	00:47	13:49	14:25	14:56
40°	23:30	·· ··	00:36	14:05	14:38	15:06
45°	23:12	·· ··	00:22	14:24	14:53	15:17
S 50°	22:49	·· ··	00:04	14:48	15:12	15:30
52°	22:38	23:56	·· ··	14:59	15:20	15:37
54°	22:26	23:47	·· ··	15:12	15:30	15:44
56°	22:12	23:37	·· ··	15:26	15:41	15:51
58°	21:55	23:25	·· ··	15:43	15:54	16:00
S 60°	21:35	23:11	·· ··	16:04	16:08	16:10

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 22-24 52-33%
10	01:24	01:16	12:01	06:20	18:45	
11	01:08	01:01	12:01	07:09	19:33	
12	00:53	00:45	12:01	07:56	20:20	

April 13, 14, 15 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	201°11.9	157°19.0	N16°48.6	198°31.9	N00°04.4	92°58.3	N22°45.8	193°54.0	N00°49.4
1	216°14.4	172°18.4	49.6	213°32.6	05.2	108°00.5	45.8	208°56.2	49.5
2	231°16.8	187°17.9	50.5	228°33.2	06.0	123°02.7	45.7	223°58.4	49.6
3	246°19.3	202°17.3	·· 51.5	243°33.9	·· 06.8	138°04.9	·· 45.7	239°00.5	·· 49.7
4	261°21.8	217°16.8	52.5	258°34.6	07.5	153°07.1	45.7	254°02.7	49.8
5	276°24.2	232°16.2	53.5	273°35.3	08.3	168°09.3	45.6	269°04.9	50.0
6	291°26.7	247°15.6	N16°54.5	288°36.0	N00°09.1	183°11.5	N22°45.6	284°07.1	N00°50.1
7	306°29.2	262°15.1	55.5	303°36.7	09.9	198°13.7	45.6	299°09.3	50.2
8	321°31.6	277°14.5	56.4	318°37.4	10.7	213°15.9	45.6	314°11.5	50.3
9	336°34.1	292°13.9	·· 57.4	333°38.0	·· 11.5	228°18.1	·· 45.5	329°13.6	·· 50.4
10	351°36.5	307°13.4	58.4	348°38.7	12.2	243°20.3	45.5	344°15.8	50.5
11	6°39.0	322°12.8	16°59.4	3°39.4	13.0	258°22.5	45.5	359°18.0	50.7
12	21°41.5	337°12.2	N17°00.4	18°40.1	N00°13.8	273°24.7	N22°45.4	14°20.2	N00°50.8
13	36°43.9	352°11.6	01.3	33°40.8	14.6	288°26.9	45.4	29°22.4	50.9
14	51°46.4	7°11.1	02.3	48°41.5	15.4	303°29.1	45.4	44°24.6	51.0
15	66°48.9	22°10.5	·· 03.3	63°42.2	·· 16.2	318°31.3	·· 45.3	59°26.7	·· 51.1
16	81°51.3	37°09.9	04.3	78°42.8	16.9	333°33.5	45.3	74°28.9	51.2
17	96°53.8	52°09.4	05.2	93°43.5	17.7	348°35.7	45.3	89°31.1	51.4
18	111°56.3	67°08.8	N17°06.2	108°44.2	N00°18.5	3°37.9	N22°45.3	104°33.3	N00°51.5
19	126°58.7	82°08.2	07.2	123°44.9	19.3	18°40.1	45.2	119°35.5	51.6
20	142°01.2	97°07.6	08.1	138°45.6	20.1	33°42.3	45.2	134°37.7	51.7
21	157°03.6	112°07.1	·· 09.1	153°46.3	·· 20.9	48°44.5	·· 45.2	149°39.9	·· 51.8
22	172°06.1	127°06.5	10.1	168°47.0	21.6	63°46.7	45.1	164°42.0	51.9
23	187°08.6	142°05.9	11.1	183°47.7	22.4	78°48.9	45.1	179°44.2	52.1
Mer.pass. 10:33		ν -0.6′	d 1.0′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.12	ν 2.2′	d 0.1′ m 0.93

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	202°11.0	157°05.3	N17°12.0	198°48.3	N00°23.2	93°51.1	N22°45.1	194°46.4	N00°52.2
1	217°13.5	172°04.8	13.0	213°49.0	24.0	108°53.2	45.1	209°48.6	52.3
2	232°16.0	187°04.2	14.0	228°49.7	24.8	123°55.4	45.0	224°50.8	52.4
3	247°18.4	202°03.6	·· 14.9	243°50.4	·· 25.5	138°57.6	·· 45.0	239°53.0	·· 52.5
4	262°20.9	217°03.0	15.9	258°51.1	26.3	153°59.8	45.0	254°55.1	52.6
5	277°23.4	232°02.5	16.9	273°51.8	27.1	169°02.0	44.9	269°57.3	52.8
6	292°25.8	247°01.9	N17°17.8	288°52.5	N00°27.9	184°04.2	N22°44.9	284°59.5	N00°52.9
7	307°28.3	262°01.3	18.8	303°53.2	28.7	199°06.4	44.9	300°01.7	53.0
8	322°30.8	277°00.7	19.7	318°53.8	29.5	214°08.6	44.8	315°03.9	53.1
9	337°33.2	292°00.2	·· 20.7	333°54.5	·· 30.2	229°10.8	·· 44.8	330°06.1	·· 53.2
10	352°35.7	306°59.6	21.7	348°55.2	31.0	244°13.0	44.8	345°08.2	53.3
11	7°38.1	321°59.0	22.6	3°55.9	31.8	259°15.2	44.8	0°10.4	53.5
12	22°40.6	336°58.4	N17°23.6	18°56.6	N00°32.6	274°17.4	N22°44.7	15°12.6	N00°53.6
13	37°43.1	351°57.8	24.5	33°57.3	33.4	289°19.5	44.7	30°14.8	53.7
14	52°45.5	6°57.3	25.5	48°58.0	34.2	304°21.7	44.7	45°17.0	53.8
15	67°48.0	21°56.7	·· 26.5	63°58.7	·· 34.9	319°23.9	·· 44.6	60°19.2	·· 53.9
16	82°50.5	36°56.1	27.4	78°59.3	35.7	334°26.1	44.6	75°21.4	54.0
17	97°52.9	51°55.5	28.4	94°00.0	36.5	349°28.3	44.6	90°23.5	54.2
18	112°55.4	66°54.9	N17°29.3	109°00.7	N00°37.3	4°30.5	N22°44.5	105°25.7	N00°54.3
19	127°57.9	81°54.3	30.3	124°01.4	38.1	19°32.7	44.5	120°27.9	54.4
20	143°00.3	96°53.8	31.2	139°02.1	38.8	34°34.9	44.5	135°30.1	54.5
21	158°02.8	111°53.2	·· 32.2	154°02.8	·· 39.6	49°37.1	·· 44.4	150°32.3	·· 54.6
22	173°05.3	126°52.6	33.1	169°03.5	40.4	64°39.2	44.4	165°34.5	54.7
23	188°07.7	141°52.0	34.1	184°04.2	41.2	79°41.4	44.4	180°36.6	54.9
Mer.pass. 10:30		ν -0.6′	d 1.0′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.11	ν 2.2′	d 0.1′ m 0.93

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	203°10.2	156°51.4	N17°35.0	199°04.8	N00°42.0	94°43.6	N22°44.4	195°38.8	N00°55.0
1	218°12.6	171°50.8	36.0	214°05.5	42.8	109°45.8	44.3	210°41.0	55.1
2	233°15.1	186°50.2	36.9	229°06.2	43.5	124°48.0	44.3	225°43.2	55.2
3	248°17.6	201°49.7	·· 37.9	244°06.9	·· 44.3	139°50.2	·· 44.3	240°45.4	·· 55.3
4	263°20.0	216°49.1	38.8	259°07.6	45.1	154°52.4	44.2	255°47.6	55.4
5	278°22.5	231°48.5	39.8	274°08.3	45.9	169°54.6	44.2	270°49.8	55.6
6	293°25.0	246°47.9	N17°40.7	289°09.0	N00°46.7	184°56.7	N22°44.2	285°51.9	N00°55.7
7	308°27.4	261°47.3	41.7	304°09.7	47.4	199°58.9	44.1	300°54.1	55.8
8	323°29.9	276°46.7	42.6	319°10.3	48.2	215°01.1	44.1	315°56.3	55.9
9	338°32.4	291°46.1	·· 43.6	334°11.0	·· 49.0	230°03.3	·· 44.1	330°58.5	·· 56.0
10	353°34.8	306°45.5	44.5	349°11.7	49.8	245°05.5	44.0	346°00.7	56.1
11	8°37.3	321°44.9	45.4	4°12.4	50.6	260°07.7	44.0	1°02.9	56.2
12	23°39.7	336°44.4	N17°46.4	19°13.1	N00°51.4	275°09.8	N22°44.0	16°05.1	N00°56.4
13	38°42.2	351°43.8	47.3	34°13.8	52.1	290°12.0	44.0	31°07.2	56.5
14	53°44.7	6°43.2	48.3	49°14.5	52.9	305°14.2	43.9	46°09.4	56.6
15	68°47.1	21°42.6	·· 49.2	64°15.2	·· 53.7	320°16.4	·· 43.9	61°11.6	·· 56.7
16	83°49.6	36°42.0	50.1	79°15.9	54.5	335°18.6	43.9	76°13.8	56.8
17	98°52.1	51°41.4	51.1	94°16.5	55.3	350°20.8	43.8	91°16.0	56.9
18	113°54.5	66°40.8	N17°52.0	109°17.2	N00°56.0	5°22.9	N22°43.8	106°18.2	N00°57.1
19	128°57.0	81°40.2	52.9	124°17.9	56.8	20°25.1	43.8	121°20.3	57.2
20	143°59.5	96°39.6	53.9	139°18.6	57.6	35°27.3	43.7	136°22.5	57.3
21	159°01.9	111°39.0	·· 54.8	154°19.3	·· 58.4	50°29.5	·· 43.7	151°24.7	·· 57.4
22	174°04.4	126°38.4	55.7	169°20.0	59.2	65°31.7	43.7	166°26.9	57.5
23	189°06.9	141°37.8	56.7	184°20.7	59.9	80°33.8	43.6	181°29.1	57.6
Mer.pass. 10:26		ν -0.6′	d 0.9′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.11	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.5	-42°09.8
Schedar	349°30.4	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.2
Hamal	327°50.4	23°35.1
Polaris	313°57.9	89°22.6
Acamar	315°11.4	-40°12.1
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.6	46°01.6
Bellatrix	278°21.9	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.8	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.1	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.1	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.0	27°57.8
Avior	234°14.2	-59°35.9
Suhail	222°45.4	-43°32.6
Miaplacidus	221°37.8	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.1	11°50.2
Dubhe	193°39.2	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.8
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.0
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.5
Rigil Kent.	139°38.3	-60°56.7
Kochab	137°18.7	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.5	26°37.3
Antares	112°14.3	-26°29.4
Atria	107°07.3	-69°04.3
Sabik	102°01.4	-15°45.5
Shaula	96°08.8	-37°07.3
Rasalhague	95°57.4	12°32.2
Eltanin	90°41.5	51°28.8
Kaus Aust.	83°31.0	-34°22.2
Vega	80°32.4	38°48.1
Nunki	75°46.4	-26°15.8
Altair	61°59.0	8°56.1
Peacock	53°04.2	-56°38.8
Deneb	49°25.2	45°22.1
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°49.9
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.5	28°13.3
Markab	13°29.1	15°20.7

Apr 13 Mon	SHA	Mer.pass
Venus	316°07.1	13:31
Mars	357°20.0	10:45
Jupiter	251°46.4	17:46
Saturn	352°42.1	11:03

Apr 14 Tue	SHA	Mer.pass
Venus	314°54.3	13:32
Mars	356°37.3	10:44
Jupiter	251°40.0	17:42
Saturn	352°35.4	10:59

Apr 15 Wed	SHA	Mer.pass
Venus	313°41.2	13:33
Mars	355°54.7	10:43
Jupiter	251°33.4	17:39
Saturn	352°28.7	10:56

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.7	N08°58.2	233°21.2	13.1′	S14°13.4	13.6′	56.6′
1	194°50.8	08°59.2	247°53.3	13.1′	13°59.8	13.7′	56.7′
2	209°51.0	09°00.1	262°25.4	13.1′	13°46.1	13.7′	56.7′
3	224°51.1	·· 01.0	276°57.5	13.2′	13°32.4	13.9′	56.7′
4	239°51.3	01.9	291°29.7	13.2′	13°18.5	13.9′	56.8′
5	254°51.5	02.8	306°01.9	13.2′	13°04.6	13.9′	56.8′
6	269°51.6	N09°03.7	320°34.1	13.2′	S12°50.7	14.1′	56.8′
7	284°51.8	04.6	335°06.3	13.2′	12°36.6	14.1′	56.9′
8	299°51.9	05.5	349°38.5	13.2′	12°22.5	14.3′	56.9′
9	314°52.1	·· 06.4	4°10.7	13.2′	12°08.2	14.2′	57.0′
10	329°52.2	07.3	18°43.0	13.3′	11°54.0	14.4′	57.0′
11	344°52.4	08.2	33°15.2	13.3′	11°39.6	14.4′	57.0′
12	359°52.6	N09°09.1	47°47.5	13.3′	S11°25.2	14.5′	57.1′
13	14°52.7	10.0	62°19.8	13.3′	11°10.7	14.6′	57.1′
14	29°52.9	10.9	76°52.1	13.3′	10°56.1	14.6′	57.1′
15	44°53.0	·· 11.8	91°24.4	13.3′	10°41.5	14.7′	57.2′
16	59°53.2	12.7	105°56.7	13.3′	10°26.8	14.8′	57.2′
17	74°53.3	13.6	120°29.0	13.3′	10°12.0	14.8′	57.2′
18	89°53.5	N09°14.6	135°01.3	13.3′	S09°57.2	14.9′	57.3′
19	104°53.7	15.5	149°33.7	13.3′	09°42.3	15.0′	57.3′
20	119°53.8	16.4	164°06.0	13.3′	09°27.3	15.0′	57.4′
21	134°54.0	·· 17.3	178°38.3	13.3′	09°12.3	15.1′	57.4′
22	149°54.1	18.2	193°10.7	13.3′	08°57.2	15.2′	57.4′
23	164°54.3	19.1	207°43.0	13.3′	08°42.0	15.2′	57.5′
	SD = 15.9′	d = 0.9′		SD = 15.4′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.4	N09°20.0	222°15.3	13.3′	S08°26.8	15.3′	57.5′
1	194°54.6	20.9	236°47.7	13.3′	08°11.5	15.3′	57.5′
2	209°54.7	21.8	251°20.0	13.3′	07°56.2	15.4′	57.6′
3	224°54.9	·· 22.7	265°52.3	13.3′	07°40.8	15.4′	57.6′
4	239°55.0	23.6	280°24.6	13.3′	07°25.4	15.5′	57.7′
5	254°55.2	24.5	294°56.9	13.3′	07°09.9	15.6′	57.7′
6	269°55.4	N09°25.4	309°29.3	13.3′	S06°54.3	15.6′	57.7′
7	284°55.5	26.3	324°01.6	13.3′	06°38.7	15.6′	57.8′
8	299°55.7	27.2	338°33.8	13.3′	06°23.1	15.7′	57.8′
9	314°55.8	·· 28.1	353°06.1	13.3′	06°07.4	15.8′	57.8′
10	329°56.0	29.0	7°38.4	13.3′	05°51.6	15.8′	57.9′
11	344°56.1	29.9	22°10.7	13.2′	05°35.8	15.8′	57.9′
12	359°56.3	N09°30.8	36°42.9	13.2′	S05°20.0	15.9′	57.9′
13	14°56.4	31.7	51°15.1	13.2′	05°04.1	16.0′	58.0′
14	29°56.6	32.6	65°47.3	13.2′	04°48.1	16.0′	58.0′
15	44°56.7	·· 33.5	80°19.5	13.2′	04°32.1	16.0′	58.1′
16	59°56.9	34.4	94°51.7	13.2′	04°16.1	16.1′	58.1′
17	74°57.0	35.3	109°23.9	13.1′	04°00.0	16.1′	58.1′
18	89°57.2	N09°36.2	123°56.0	13.1′	S03°43.9	16.1′	58.2′
19	104°57.3	37.1	138°28.1	13.1′	03°27.8	16.2′	58.2′
20	119°57.5	38.0	153°00.2	13.1′	03°11.6	16.2′	58.2′
21	134°57.7	·· 38.9	167°32.3	13.0′	02°55.4	16.3′	58.3′
22	149°57.8	39.7	182°04.3	13.0′	02°39.1	16.2′	58.3′
23	164°58.0	40.6	196°36.3	13.0′	02°22.9	16.4′	58.3′
	SD = 15.9′	d = 0.9′		SD = 15.7′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°58.1	N09°41.5	211°08.3	13.0′	S02°06.5	16.3′	58.4′
1	194°58.3	42.4	225°40.3	12.9′	01°50.2	16.4′	58.4′
2	209°58.4	43.3	240°12.2	12.9′	01°33.8	16.4′	58.5′
3	224°58.6	·· 44.2	254°44.1	12.9′	01°17.4	16.4′	58.5′
4	239°58.7	45.1	269°16.0	12.8′	01°01.0	16.5′	58.5′
5	254°58.9	46.0	283°47.8	12.8′	00°44.5	16.5′	58.6′
6	269°59.0	N09°46.9	298°19.6	12.8′	S00°28.0	16.5′	58.6′
7	284°59.2	47.8	312°51.3	12.7′	S00°11.5	16.5′	58.6′
8	299°59.3	48.7	327°23.1	12.7′	N00°05.0	16.6′	58.7′
9	314°59.5	·· 49.6	341°54.7	12.6′	00°21.6	16.5′	58.7′
10	329°59.6	50.5	356°26.4	12.6′	00°38.1	16.6′	58.7′
11	344°59.8	51.4	10°58.0	12.6′	00°54.7	16.6′	58.8′
12	359°59.9	N09°52.3	25°29.5	12.5′	N01°11.3	16.6′	58.8′
13	15°00.1	53.2	40°01.0	12.5′	01°27.9	16.7′	58.8′
14	30°00.2	54.1	54°32.5	12.4′	01°44.6	16.6′	58.9′
15	45°00.4	·· 54.9	69°03.9	12.4′	02°01.2	16.6′	58.9′
16	60°00.5	55.8	83°35.3	12.3′	02°17.8	16.7′	58.9′
17	75°00.7	56.7	98°06.6	12.3′	02°34.5	16.7′	59.0′
18	90°00.8	N09°57.6	112°37.9	12.2′	N02°51.2	16.6′	59.0′
19	105°01.0	58.5	127°09.1	12.2′	03°07.8	16.7′	59.0′
20	120°01.1	09°59.4	141°40.3	12.1′	03°24.5	16.7′	59.1′
21	135°01.2	10°00.3	156°11.4	12.1′	03°41.2	16.7′	59.1′
22	150°01.4	01.2	170°42.4	12.0′	03°57.9	16.6′	59.1′
23	165°01.5	02.1	185°13.4	11.9′	04°14.5	16.7′	59.2′
	SD = 15.9′	d = 0.9′		SD = 15.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:07	03:45	20:19	22:01	////
N 70°	////	02:41	04:01	20:03	21:24	////
68°	00:57	03:05	04:14	19:50	20:59	23:21
66°	01:50	03:24	04:24	19:39	20:40	22:17
64°	02:20	03:38	04:33	19:30	20:25	21:45
62°	02:43	03:51	04:40	19:22	20:12	21:21
60°	03:00	04:01	04:47	19:16	20:02	21:03
N 58°	03:15	04:10	04:52	19:10	19:53	20:48
56°	03:27	04:17	04:57	19:05	19:45	20:36
54°	03:37	04:24	05:02	19:00	19:38	20:25
52°	03:46	04:30	05:06	18:56	19:32	20:16
50°	03:54	04:35	05:09	18:52	19:26	20:08
45°	04:10	04:47	05:17	18:44	19:15	19:52
N 40°	04:23	04:56	05:24	18:37	19:05	19:39
35°	04:33	05:04	05:29	18:32	18:58	19:29
30°	04:41	05:10	05:34	18:27	18:51	19:20
20°	04:54	05:20	05:43	18:18	18:40	19:07
N 10°	05:04	05:29	05:50	18:10	18:32	18:57
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:57	18:18	18:43
20°	05:23	05:48	06:11	17:50	18:12	18:38
30°	05:26	05:54	06:18	17:42	18:06	18:34
35°	05:28	05:57	06:23	17:37	18:03	18:32
40°	05:29	06:01	06:28	17:32	17:59	18:31
45°	05:30	06:04	06:34	17:26	17:56	18:30
S 50°	05:30	06:08	06:41	17:19	17:52	18:29
52°	05:30	06:10	06:44	17:16	17:50	18:29
54°	05:30	06:11	06:47	17:12	17:48	18:29
56°	05:30	06:13	06:51	17:08	17:46	18:29
58°	05:30	06:15	06:55	17:04	17:44	18:29
S 60°	05:29	06:18	07:00	16:59	17:42	18:30

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	05:39	04:53	04:17	12:14	14:38	16:57
N 70°	05:16	04:43	04:15	12:35	14:46	16:54
68°	04:58	04:35	04:14	12:51	14:51	16:51
66°	04:43	04:27	04:13	13:04	14:56	16:48
64°	04:31	04:21	04:12	13:15	15:00	16:46
62°	04:21	04:16	04:12	13:24	15:03	16:45
60°	04:12	04:12	04:11	13:31	15:06	16:43
N 58°	04:04	04:08	04:11	13:38	15:09	16:42
56°	03:57	04:04	04:10	13:44	15:11	16:41
54°	03:51	04:01	04:10	13:49	15:13	16:40
52°	03:45	03:58	04:09	13:54	15:15	16:39
50°	03:40	03:55	04:09	13:58	15:17	16:38
45°	03:29	03:49	04:08	14:08	15:21	16:36
N 40°	03:20	03:44	04:07	14:15	15:24	16:34
35°	03:12	03:40	04:07	14:22	15:26	16:33
30°	03:05	03:36	04:06	14:27	15:29	16:32
20°	02:53	03:29	04:05	14:37	15:33	16:29
N 10°	02:42	03:23	04:04	14:46	15:36	16:28
0°	02:32	03:18	04:04	14:54	15:39	16:26
S 10°	02:22	03:12	04:03	15:02	15:43	16:24
20°	02:11	03:06	04:02	15:10	15:46	16:22
30°	01:58	02:59	04:01	15:19	15:50	16:20
35°	01:51	02:55	04:01	15:25	15:52	16:19
40°	01:43	02:51	04:00	15:31	15:54	16:17
45°	01:33	02:46	04:00	15:38	15:57	16:16
S 50°	01:21	02:39	03:59	15:46	16:00	16:14
52°	01:16	02:36	03:59	15:50	16:02	16:13
54°	01:10	02:33	03:58	15:54	16:03	16:12
56°	01:03	02:30	03:58	15:59	16:05	16:11
58°	00:55	02:26	03:57	16:04	16:07	16:10
S 60°	00:46	02:21	03:57	16:10	16:09	16:09

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 24-8%
13	00:37	00:30	12:00	08:43	21:06	
14	00:22	00:15	12:00	09:28	21:51	
15	00:08	00:00	12:00	10:15	22:38	

April 16, 17, 18 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	204°09.3	156°37.2	N17°57.6	199°21.4	N01°00.7	95°36.0	N22°43.6	196°31.3	N00°57.8
1	219°11.8	171°36.6	58.5	214°22.1	01.5	110°38.2	43.6	211°33.5	57.9
2	234°14.2	186°36.0	17°59.5	229°22.7	02.3	125°40.4	43.5	226°35.6	58.0
3	249°16.7	201°35.4	18°00.4	244°23.4	·· 03.1	140°42.6	·· 43.5	241°37.8	·· 58.1
4	264°19.2	216°34.8	01.3	259°24.1	03.9	155°44.7	43.5	256°40.0	58.2
5	279°21.6	231°34.2	02.3	274°24.8	04.6	170°46.9	43.4	271°42.2	58.3
6	294°24.1	246°33.6	N18°03.2	289°25.5	N01°05.4	185°49.1	N22°43.4	286°44.4	N00°58.4
7	309°26.6	261°33.0	04.1	304°26.2	06.2	200°51.3	43.4	301°46.6	58.6
8	324°29.0	276°32.4	05.0	319°26.9	07.0	215°53.5	43.3	316°48.8	58.7
9	339°31.5	291°31.8	·· 06.0	334°27.6	·· 07.8	230°55.6	·· 43.3	331°50.9	·· 58.8
10	354°34.0	306°31.2	06.9	349°28.3	08.5	245°57.8	43.3	346°53.1	58.9
11	9°36.4	321°30.6	07.8	4°28.9	09.3	261°00.0	43.3	1°55.3	59.0
12	24°38.9	336°30.0	N18°08.7	19°29.6	N01°10.1	276°02.2	N22°43.2	16°57.5	N00°59.1
13	39°41.3	351°29.4	09.6	34°30.3	10.9	291°04.3	43.2	31°59.7	59.3
14	54°43.8	6°28.8	10.6	49°31.0	11.7	306°06.5	43.2	47°01.9	59.4
15	69°46.3	21°28.2	·· 11.5	64°31.7	·· 12.4	321°08.7	·· 43.1	62°04.1	·· 59.5
16	84°48.7	36°27.6	12.4	79°32.4	13.2	336°10.9	43.1	77°06.3	59.6
17	99°51.2	51°27.0	13.3	94°33.1	14.0	351°13.0	43.1	92°08.4	59.7
18	114°53.7	66°26.4	N18°14.2	109°33.8	N01°14.8	6°15.2	N22°43.0	107°10.6	N00°59.8
19	129°56.1	81°25.8	15.2	124°34.5	15.6	21°17.4	43.0	122°12.8	00°59.9
20	144°58.6	96°25.2	16.1	139°35.1	16.3	36°19.6	43.0	137°15.0	01°00.1
21	160°01.1	111°24.6	·· 17.0	154°35.8	·· 17.1	51°21.7	·· 42.9	152°17.2	·· 00.2
22	175°03.5	126°24.0	17.9	169°36.5	17.9	66°23.9	42.9	167°19.4	00.3
23	190°06.0	141°23.4	18.8	184°37.2	18.7	81°26.1	42.9	182°21.6	00.4
Mer.pass. 10:22		ν -0.6′	d 0.9′	m -3.92	ν 0.7′	d 0.8′	m 1.20	ν 2.2′	d 0.0′ m -2.10	ν 2.2′	d 0.1′ m 0.93

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	205°08.5	156°22.8	N18°19.7	199°37.9	N01°19.5	96°28.3	N22°42.8	197°23.7	N01°00.5
1	220°10.9	171°22.2	20.6	214°38.6	20.2	111°30.4	42.8	212°25.9	00.6
2	235°13.4	186°21.5	21.5	229°39.3	21.0	126°32.6	42.8	227°28.1	00.7
3	250°15.8	201°20.9	·· 22.4	244°40.0	·· 21.8	141°34.8	·· 42.7	242°30.3	·· 00.9
4	265°18.3	216°20.3	23.4	259°40.7	22.6	156°37.0	42.7	257°32.5	01.0
5	280°20.8	231°19.7	24.3	274°41.4	23.4	171°39.1	42.7	272°34.7	01.1
6	295°23.2	246°19.1	N18°25.2	289°42.0	N01°24.1	186°41.3	N22°42.6	287°36.9	N01°01.2
7	310°25.7	261°18.5	26.1	304°42.7	24.9	201°43.5	42.6	302°39.0	01.3
8	325°28.2	276°17.9	27.0	319°43.4	25.7	216°45.6	42.6	317°41.2	01.4
9	340°30.6	291°17.3	·· 27.9	334°44.1	·· 26.5	231°47.8	·· 42.5	332°43.4	·· 01.6
10	355°33.1	306°16.7	28.8	349°44.8	27.2	246°50.0	42.5	347°45.6	01.7
11	10°35.6	321°16.0	29.7	4°45.5	28.0	261°52.2	42.5	2°47.8	01.8
12	25°38.0	336°15.4	N18°30.6	19°46.2	N01°28.8	276°54.3	N22°42.4	17°50.0	N01°01.9
13	40°40.5	351°14.8	31.5	34°46.9	29.6	291°56.5	42.4	32°52.2	02.0
14	55°42.9	6°14.2	32.4	49°47.6	30.4	306°58.7	42.4	47°54.4	02.1
15	70°45.4	21°13.6	·· 33.3	64°48.3	·· 31.1	322°00.8	·· 42.3	62°56.5	·· 02.2
16	85°47.9	36°13.0	34.2	79°48.9	31.9	337°03.0	42.3	77°58.7	02.4
17	100°50.3	51°12.4	35.1	94°49.6	32.7	352°05.2	42.3	93°00.9	02.5
18	115°52.8	66°11.7	N18°36.0	109°50.3	N01°33.5	7°07.3	N22°42.2	108°03.1	N01°02.6
19	130°55.3	81°11.1	36.9	124°51.0	34.3	22°09.5	42.2	123°05.3	02.7
20	145°57.7	96°10.5	37.8	139°51.7	35.0	37°11.7	42.2	138°07.5	02.8
21	161°00.2	111°09.9	·· 38.7	154°52.4	·· 35.8	52°13.8	·· 42.1	153°09.7	·· 02.9
22	176°02.7	126°09.3	39.6	169°53.1	36.6	67°16.0	42.1	168°11.9	03.0
23	191°05.1	141°08.7	40.5	184°53.8	37.4	82°18.2	42.1	183°14.0	03.2
Mer.pass. 10:18		ν -0.6′	d 0.9′	m -3.92	ν 0.7′	d 0.8′	m 1.21	ν 2.2′	d 0.0′ m -2.09	ν 2.2′	d 0.1′ m 0.93

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	206°07.6	156°08.0	N18°41.4	199°54.5	N01°38.2	97°20.3	N22°42.0	198°16.2	N01°03.3
1	221°10.1	171°07.4	42.2	214°55.2	38.9	112°22.5	42.0	213°18.4	03.4
2	236°12.5	186°06.8	43.1	229°55.8	39.7	127°24.7	42.0	228°20.6	03.5
3	251°15.0	201°06.2	·· 44.0	244°56.5	·· 40.5	142°26.8	·· 41.9	243°22.8	·· 03.6
4	266°17.4	216°05.6	44.9	259°57.2	41.3	157°29.0	41.9	258°25.0	03.7
5	281°19.9	231°04.9	45.8	274°57.9	42.0	172°31.2	41.9	273°27.2	03.8
6	296°22.4	246°04.3	N18°46.7	289°58.6	N01°42.8	187°33.3	N22°41.8	288°29.4	N01°04.0
7	311°24.8	261°03.7	47.6	304°59.3	43.6	202°35.5	41.8	303°31.5	04.1
8	326°27.3	276°03.1	48.5	320°00.0	44.4	217°37.7	41.8	318°33.7	04.2
9	341°29.8	291°02.4	·· 49.3	335°00.7	·· 45.2	232°39.8	·· 41.7	333°35.9	·· 04.3
10	356°32.2	306°01.8	50.2	350°01.4	45.9	247°42.0	41.7	348°38.1	04.4
11	11°34.7	321°01.2	51.1	5°02.1	46.7	262°44.2	41.7	3°40.3	04.5
12	26°37.2	336°00.6	N18°52.0	20°02.8	N01°47.5	277°46.3	N22°41.6	18°42.5	N01°04.6
13	41°39.6	350°59.9	52.9	35°03.4	48.3	292°48.5	41.6	33°44.7	04.8
14	56°42.1	5°59.3	53.8	50°04.1	49.0	307°50.7	41.5	48°46.9	04.9
15	71°44.6	20°58.7	·· 54.6	65°04.8	·· 49.8	322°52.8	·· 41.5	63°49.0	·· 05.0
16	86°47.0	35°58.1	55.5	80°05.5	50.6	337°55.0	41.5	78°51.2	05.1
17	101°49.5	50°57.4	56.4	95°06.2	51.4	352°57.1	41.4	93°53.4	05.2
18	116°51.9	65°56.8	N18°57.3	110°06.9	N01°52.2	7°59.3	N22°41.4	108°55.6	N01°05.3
19	131°54.4	80°56.2	58.1	125°07.6	52.9	23°01.5	41.4	123°57.8	05.4
20	146°56.9	95°55.6	59.0	140°08.3	53.7	38°03.6	41.3	139°00.0	05.6
21	161°59.3	110°54.9	18°59.9	155°09.0	·· 54.5	53°05.8	·· 41.3	154°02.2	·· 05.7
22	177°01.8	125°54.3	19°00.8	170°09.7	55.3	68°08.0	41.3	169°04.4	05.8
23	192°04.3	140°53.7	01.6	185°10.4	56.0	83°10.1	41.2	184°06.5	05.9
Mer.pass. 10:14		ν -0.6′	d 0.9′	m -3.92	ν 0.7′	d 0.8′	m 1.21	ν 2.2′	d 0.0′ m -2.09	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.5	-42°09.8
Schedar	349°30.4	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.2
Hamal	327°50.4	23°35.1
Polaris	313°58.4	89°22.6
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.6
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.1	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.1	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.3	-59°35.9
Suhail	222°45.4	-43°32.6
Miaplacidus	221°37.8	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.2	61°36.6
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.8
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.7
Kochab	137°18.7	74°02.6
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.5	26°37.3
Antares	112°14.3	-26°29.5
Atria	107°07.2	-69°04.3
Sabik	102°01.4	-15°45.5
Shaula	96°08.7	-37°07.3
Rasalhague	95°57.4	12°32.2
Eltanin	90°41.4	51°28.8
Kaus Aust.	83°31.0	-34°22.2
Vega	80°32.4	38°48.2
Nunki	75°46.4	-26°15.8
Altair	61°58.9	8°56.1
Peacock	53°04.2	-56°38.8
Deneb	49°25.2	45°22.1
Enif	33°37.9	9°59.6
Al Na'ir	27°31.9	-46°49.9
Fomalhaut	15°13.6	-29°28.9
Scheat	13°44.5	28°13.3
Markab	13°29.1	15°20.7

Apr 16 Thu	SHA	Mer.pass
Venus	312°27.9	13:34
Mars	355°12.0	10:42
Jupiter	251°26.7	17:35
Saturn	352°22.0	10:52

Apr 17 Fri	SHA	Mer.pass
Venus	311°14.3	13:35
Mars	354°29.5	10:41
Jupiter	251°19.8	17:32
Saturn	352°15.3	10:49

Apr 18 Sat	SHA	Mer.pass
Venus	310°00.4	13:36
Mars	353°46.9	10:40
Jupiter	251°12.8	17:28
Saturn	352°08.6	10:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.0585 sec ΔT = TT-UT1 = +69.1255 sec

2026 April 16 to Apr. 18 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°01.7	N10°03.0	199°44.4	11.9′	N04°31.2	16.7′	59.2′
1	195°01.8	03.8	214°15.3	11.8′	04°47.9	16.6′	59.2′
2	210°02.0	04.7	228°46.1	11.8′	05°04.5	16.7′	59.3′
3	225°02.1	·· 05.6	243°16.8	11.7′	05°21.2	16.6′	59.3′
4	240°02.3	06.5	257°47.5	11.6′	05°37.8	16.7′	59.3′
5	255°02.4	07.4	272°18.2	11.6′	05°54.5	16.6′	59.4′
6	270°02.6	N10°08.3	286°48.7	11.5′	N06°11.1	16.6′	59.4′
7	285°02.7	09.2	301°19.2	11.4′	06°27.7	16.6′	59.4′
8	300°02.9	10.1	315°49.7	11.4′	06°44.3	16.5′	59.4′
9	315°03.0	·· 10.9	330°20.0	11.3′	07°00.8	16.6′	59.5′
10	330°03.2	11.8	344°50.3	11.2′	07°17.4	16.5′	59.5′
11	345°03.3	12.7	359°20.5	11.1′	07°33.9	16.5′	59.5′
12	0°03.5	N10°13.6	13°50.7	11.1′	N07°50.4	16.5′	59.6′
13	15°03.6	14.5	28°20.7	11.0′	08°06.9	16.5′	59.6′
14	30°03.7	15.4	42°50.7	10.9′	08°23.4	16.4′	59.6′
15	45°03.9	·· 16.3	57°20.6	10.8′	08°39.8	16.4′	59.6′
16	60°04.0	17.1	71°50.5	10.8′	08°56.2	16.3′	59.7′
17	75°04.2	18.0	86°20.2	10.7′	09°12.5	16.4′	59.7′
18	90°04.3	N10°18.9	100°49.9	10.6′	N09°28.9	16.3′	59.7′
19	105°04.5	19.8	115°19.5	10.5′	09°45.2	16.2′	59.7′
20	120°04.6	20.7	129°49.0	10.4′	10°01.4	16.2′	59.8′
21	135°04.8	·· 21.6	144°18.4	10.3′	10°17.6	16.2′	59.8′
22	150°04.9	22.4	158°47.8	10.3′	10°33.8	16.1′	59.8′
23	165°05.0	23.3	173°17.0	10.2′	10°49.9	16.1′	59.8′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°05.2	N10°24.2	187°46.2	10.1′	N11°06.0	16.0′	59.9′
1	195°05.3	25.1	202°15.3	10.0′	11°22.0	16.0′	59.9′
2	210°05.5	26.0	216°44.2	9.9′	11°38.0	15.9′	59.9′
3	225°05.6	·· 26.8	231°13.1	9.8′	11°53.9	15.9′	59.9′
4	240°05.8	27.7	245°42.0	9.7′	12°09.8	15.8′	60.0′
5	255°05.9	28.6	260°10.7	9.6′	12°25.6	15.8′	60.0′
6	270°06.0	N10°29.5	274°39.3	9.5′	N12°41.4	15.7′	60.0′
7	285°06.2	30.4	289°07.8	9.4′	12°57.1	15.6′	60.0′
8	300°06.3	31.2	303°36.2	9.3′	13°12.7	15.6′	60.1′
9	315°06.5	·· 32.1	318°04.6	9.2′	13°28.3	15.5′	60.1′
10	330°06.6	33.0	332°32.8	9.1′	13°43.8	15.4′	60.1′
11	345°06.8	33.9	347°00.9	9.0′	13°59.2	15.4′	60.1′
12	0°06.9	N10°34.8	1°29.0	8.9′	N14°14.6	15.3′	60.1′
13	15°07.0	35.6	15°56.9	8.8′	14°29.9	15.2′	60.2′
14	30°07.2	36.5	30°24.7	8.7′	14°45.1	15.1′	60.2′
15	45°07.3	·· 37.4	44°52.5	8.6′	15°00.2	15.1′	60.2′
16	60°07.5	38.3	59°20.1	8.5′	15°15.3	15.0′	60.2′
17	75°07.6	39.1	73°47.6	8.4′	15°30.3	14.9′	60.2′
18	90°07.7	N10°40.0	88°15.0	8.3′	N15°45.2	14.8′	60.2′
19	105°07.9	40.9	102°42.3	8.2′	16°00.0	14.7′	60.3′
20	120°08.0	41.8	117°09.6	8.1′	16°14.7	14.6′	60.3′
21	135°08.2	·· 42.6	131°36.7	8.0′	16°29.3	14.6′	60.3′
22	150°08.3	43.5	146°03.7	7.9′	16°43.9	14.4′	60.3′
23	165°08.4	44.4	160°30.5	7.8′	16°58.3	14.4′	60.3′
	SD = 15.9′	d = 0.9′	SD = 16.3′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°08.6	N10°45.3	174°57.3	7.7′	N17°12.7	14.2′	60.3′
1	195°08.7	46.1	189°24.0	7.6′	17°26.9	14.2′	60.4′
2	210°08.9	47.0	203°50.6	7.5′	17°41.1	14.0′	60.4′
3	225°09.0	·· 47.9	218°17.0	7.3′	17°55.1	14.0′	60.4′
4	240°09.1	48.8	232°43.4	7.2′	18°09.1	13.8′	60.4′
5	255°09.3	49.6	247°09.6	7.1′	18°22.9	13.7′	60.4′
6	270°09.4	N10°50.5	261°35.7	7.0′	N18°36.6	13.6′	60.4′
7	285°09.6	51.4	276°01.7	6.9′	18°50.2	13.5′	60.4′
8	300°09.7	52.3	290°27.6	6.8′	19°03.7	13.4′	60.4′
9	315°09.8	·· 53.1	304°53.4	6.7′	19°17.1	13.3′	60.4′
10	330°10.0	54.0	319°19.1	6.6′	19°30.4	13.1′	60.5′
11	345°10.1	54.9	333°44.7	6.5′	19°43.5	13.0′	60.5′
12	0°10.2	N10°55.7	348°10.1	6.3′	N19°56.5	12.9′	60.5′
13	15°10.4	56.6	2°35.5	6.2′	20°09.4	12.8′	60.5′
14	30°10.5	57.5	17°00.7	6.1′	20°22.2	12.6′	60.5′
15	45°10.7	·· 58.4	31°25.8	6.0′	20°34.8	12.5′	60.5′
16	60°10.8	10°59.2	45°50.9	5.9′	20°47.3	12.4′	60.5′
17	75°10.9	11°00.1	60°15.8	5.8′	20°59.7	12.2′	60.5′
18	90°11.1	N11°01.0	74°40.6	5.7′	N21°11.9	12.1′	60.5′
19	105°11.2	01.8	89°05.2	5.6′	21°24.0	12.0′	60.5′
20	120°11.3	02.7	103°29.8	5.5′	21°36.0	11.8′	60.5′
21	135°11.5	·· 03.6	117°54.3	5.4′	21°47.8	11.7′	60.5′
22	150°11.6	04.4	132°18.6	5.3′	21°59.5	11.5′	60.5′
23	165°11.7	05.3	146°42.9	5.1′	22°11.0	11.4′	60.5′
	SD = 15.9′	d = 0.9′	SD = 16.5′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	01:38	03:28	20:36	22:32	////
N 70°	////	02:21	03:46	20:16	21:44	////
68°	////	02:49	04:01	20:01	21:15	////
66°	01:24	03:10	04:12	19:49	20:53	22:44
64°	02:03	03:26	04:22	19:39	20:36	22:02
62°	02:28	03:40	04:31	19:30	20:22	21:35
60°	02:48	03:51	04:38	19:23	20:10	21:14
N 58°	03:04	04:01	04:44	19:17	20:00	20:58
56°	03:17	04:09	04:50	19:11	19:52	20:44
54°	03:28	04:16	04:55	19:06	19:44	20:33
52°	03:38	04:23	04:59	19:01	19:37	20:23
50°	03:46	04:29	05:03	18:57	19:31	20:14
45°	04:04	04:41	05:12	18:48	19:19	19:56
N 40°	04:18	04:51	05:19	18:40	19:09	19:43
35°	04:28	05:00	05:26	18:34	19:00	19:31
30°	04:37	05:07	05:31	18:28	18:53	19:22
20°	04:52	05:18	05:41	18:19	18:41	19:08
N 10°	05:02	05:27	05:49	18:11	18:32	18:57
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:18	05:42	06:04	17:55	18:17	18:41
20°	05:23	05:49	06:11	17:47	18:10	18:35
30°	05:28	05:56	06:20	17:38	18:03	18:31
35°	05:30	06:00	06:25	17:33	17:59	18:28
40°	05:32	06:03	06:31	17:28	17:55	18:27
45°	05:33	06:08	06:37	17:21	17:51	18:25
S 50°	05:35	06:12	06:45	17:13	17:46	18:23
52°	05:35	06:14	06:49	17:09	17:44	18:23
54°	05:36	06:17	06:53	17:05	17:42	18:23
56°	05:36	06:19	06:57	17:01	17:39	18:22
58°	05:36	06:22	07:02	16:56	17:36	18:22
S 60°	05:36	06:24	07:07	16:51	17:33	18:22

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	03:41	02:56	01:25	19:27	22:50	▭
N 70°	03:48	03:16	02:23	19:10	21:54	▭
68°	03:54	03:31	02:57	18:57	21:21	▭
66°	03:59	03:43	03:23	18:47	20:58	23:39
64°	04:04	03:54	03:42	18:38	20:39	22:57
62°	04:07	04:03	03:59	18:31	20:24	22:28
60°	04:11	04:11	04:12	18:24	20:12	22:07
N 58°	04:14	04:18	04:24	18:19	20:01	21:49
56°	04:16	04:24	04:34	18:14	19:52	21:35
54°	04:19	04:30	04:44	18:09	19:44	21:22
52°	04:21	04:35	04:52	18:05	19:36	21:11
50°	04:23	04:39	04:59	18:02	19:30	21:01
45°	04:27	04:49	05:15	17:54	19:16	20:40
N 40°	04:31	04:57	05:28	17:47	19:04	20:24
35°	04:34	05:05	05:39	17:42	18:54	20:10
30°	04:37	05:11	05:49	17:37	18:46	19:58
20°	04:42	05:22	06:06	17:29	18:31	19:37
N 10°	04:47	05:32	06:21	17:21	18:18	19:20
0°	04:51	05:41	06:36	17:14	18:07	19:03
S 10°	04:55	05:51	06:50	17:08	17:55	18:47
20°	05:00	06:01	07:05	17:00	17:42	18:29
30°	05:05	06:13	07:23	16:52	17:28	18:09
35°	05:09	06:19	07:34	16:48	17:20	17:57
40°	05:12	06:27	07:46	16:42	17:10	17:44
45°	05:16	06:36	08:00	16:36	16:59	17:28
S 50°	05:21	06:47	08:18	16:29	16:46	17:09
52°	05:24	06:53	08:26	16:25	16:40	17:00
54°	05:26	06:58	08:35	16:22	16:34	16:50
56°	05:29	07:05	08:46	16:18	16:26	16:38
58°	05:32	07:12	08:58	16:13	16:18	16:25
S 60°	05:36	07:20	09:12	16:08	16:08	16:10

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-1 3-1%
16	00:07	00:14	12:00	11:03	23:28	
17	00:21	00:28	12:00	11:54	–:–	
18	00:34	00:41	11:59	12:49	00:21	

April 19, 20, 21 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	207°06.7	155°53.0	N19°02.5	200°11.0	N01°56.8	98°12.3	N22°41.2	199°08.7	N01°06.0
1	222°09.2	170°52.4	03.4	215°11.7	57.6	113°14.4	41.2	214°10.9	06.1
2	237°11.7	185°51.8	04.2	230°12.4	58.4	128°16.6	41.1	229°13.1	06.2
3	252°14.1	200°51.1	·· 05.1	245°13.1	·· 59.1	143°18.8	·· 41.1	244°15.3	·· 06.4
4	267°16.6	215°50.5	06.0	260°13.8	01°59.9	158°20.9	41.1	259°17.5	06.5
5	282°19.0	230°49.9	06.9	275°14.5	02°00.7	173°23.1	41.0	274°19.7	06.6
6	297°21.5	245°49.2	N19°07.7	290°15.2	N02°01.5	188°25.2	N22°41.0	289°21.9	N01°06.7
7	312°24.0	260°48.6	08.6	305°15.9	02.3	203°27.4	41.0	304°24.1	06.8
8	327°26.4	275°48.0	09.5	320°16.6	03.0	218°29.6	40.9	319°26.2	06.9
9	342°28.9	290°47.3	·· 10.3	335°17.3	·· 03.8	233°31.7	·· 40.9	334°28.4	·· 07.0
10	357°31.4	305°46.7	11.2	350°18.0	04.6	248°33.9	40.9	349°30.6	07.2
11	12°33.8	320°46.1	12.0	5°18.6	05.4	263°36.0	40.8	4°32.8	07.3
12	27°36.3	335°45.4	N19°12.9	20°19.3	N02°06.1	278°38.2	N22°40.8	19°35.0	N01°07.4
13	42°38.8	350°44.8	13.8	35°20.0	06.9	293°40.3	40.7	34°37.2	07.5
14	57°41.2	5°44.2	14.6	50°20.7	07.7	308°42.5	40.7	49°39.4	07.6
15	72°43.7	20°43.5	·· 15.5	65°21.4	·· 08.5	323°44.7	·· 40.7	64°41.6	·· 07.7
16	87°46.2	35°42.9	16.3	80°22.1	09.2	338°46.8	40.6	79°43.8	07.8
17	102°48.6	50°42.3	17.2	95°22.8	10.0	353°49.0	40.6	94°45.9	07.9
18	117°51.1	65°41.6	N19°18.0	110°23.5	N02°10.8	8°51.1	N22°40.6	109°48.1	N01°08.1
19	132°53.5	80°41.0	18.9	125°24.2	11.6	23°53.3	40.5	124°50.3	08.2
20	147°56.0	95°40.3	19.8	140°24.9	12.3	38°55.4	40.5	139°52.5	08.3
21	162°58.5	110°39.7	·· 20.6	155°25.6	·· 13.1	53°57.6	·· 40.5	154°54.7	·· 08.4
22	178°00.9	125°39.1	21.5	170°26.3	13.9	68°59.7	40.4	169°56.9	08.5
23	193°03.4	140°38.4	22.3	185°26.9	14.7	84°01.9	40.4	184°59.1	08.6
Mer.pass. 10:10		ν -0.6′	d 0.9′	m -3.92	ν 0.7′	d 0.8′	m 1.21	ν 2.2′	d 0.0′ m -2.08	ν 2.2′	d 0.1′ m 0.93

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	208°05.9	155°37.8	N19°23.2	200°27.6	N02°15.4	99°04.1	N22°40.4	200°01.3	N01°08.7
1	223°08.3	170°37.1	24.0	215°28.3	16.2	114°06.2	40.3	215°03.5	08.9
2	238°10.8	185°36.5	24.9	230°29.0	17.0	129°08.4	40.3	230°05.6	09.0
3	253°13.3	200°35.9	·· 25.7	245°29.7	·· 17.8	144°10.5	·· 40.2	245°07.8	·· 09.1
4	268°15.7	215°35.2	26.6	260°30.4	18.5	159°12.7	40.2	260°10.0	09.2
5	283°18.2	230°34.6	27.4	275°31.1	19.3	174°14.8	40.2	275°12.2	09.3
6	298°20.7	245°33.9	N19°28.3	290°31.8	N02°20.1	189°17.0	N22°40.1	290°14.4	N01°09.4
7	313°23.1	260°33.3	29.1	305°32.5	20.9	204°19.1	40.1	305°16.6	09.5
8	328°25.6	275°32.6	29.9	320°33.2	21.6	219°21.3	40.1	320°18.8	09.6
9	343°28.0	290°32.0	·· 30.8	335°33.9	·· 22.4	234°23.4	·· 40.0	335°21.0	·· 09.8
10	358°30.5	305°31.3	31.6	350°34.6	23.2	249°25.6	40.0	350°23.2	09.9
11	13°33.0	320°30.7	32.5	5°35.2	24.0	264°27.7	40.0	5°25.4	10.0
12	28°35.4	335°30.0	N19°33.3	20°35.9	N02°24.7	279°29.9	N22°39.9	20°27.5	N01°10.1
13	43°37.9	350°29.4	34.1	35°36.6	25.5	294°32.0	39.9	35°29.7	10.2
14	58°40.4	5°28.8	35.0	50°37.3	26.3	309°34.2	39.8	50°31.9	10.3
15	73°42.8	20°28.1	·· 35.8	65°38.0	·· 27.1	324°36.3	·· 39.8	65°34.1	·· 10.4
16	88°45.3	35°27.5	36.7	80°38.7	27.8	339°38.5	39.8	80°36.3	10.6
17	103°47.8	50°26.8	37.5	95°39.4	28.6	354°40.6	39.7	95°38.5	10.7
18	118°50.2	65°26.2	N19°38.3	110°40.1	N02°29.4	9°42.8	N22°39.7	110°40.7	N01°10.8
19	133°52.7	80°25.5	39.2	125°40.8	30.2	24°44.9	39.7	125°42.9	10.9
20	148°55.2	95°24.9	40.0	140°41.5	30.9	39°47.1	39.6	140°45.1	11.0
21	163°57.6	110°24.2	·· 40.8	155°42.2	·· 31.7	54°49.2	·· 39.6	155°47.3	·· 11.1
22	179°00.1	125°23.6	41.7	170°42.9	32.5	69°51.4	39.6	170°49.4	11.2
23	194°02.5	140°22.9	42.5	185°43.5	33.3	84°53.5	39.5	185°51.6	11.3
Mer.pass. 10:06		ν -0.6′	d 0.8′	m -3.92	ν 0.7′	d 0.8′	m 1.21	ν 2.2′	d 0.0′ m -2.08	ν 2.2′	d 0.1′ m 0.93

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	209°05.0	155°22.3	N19°43.3	200°44.2	N02°34.0	99°55.7	N22°39.5	200°53.8	N01°11.5
1	224°07.5	170°21.6	44.1	215°44.9	34.8	114°57.8	39.4	215°56.0	11.6
2	239°09.9	185°20.9	45.0	230°45.6	35.6	130°00.0	39.4	230°58.2	11.7
3	254°12.4	200°20.3	·· 45.8	245°46.3	·· 36.4	145°02.1	·· 39.4	246°00.4	·· 11.8
4	269°14.9	215°19.6	46.6	260°47.0	37.1	160°04.3	39.3	261°02.6	11.9
5	284°17.3	230°19.0	47.4	275°47.7	37.9	175°06.4	39.3	276°04.8	12.0
6	299°19.8	245°18.3	N19°48.3	290°48.4	N02°38.7	190°08.6	N22°39.3	291°07.0	N01°12.1
7	314°22.3	260°17.7	49.1	305°49.1	39.5	205°10.7	39.2	306°09.2	12.2
8	329°24.7	275°17.0	49.9	320°49.8	40.2	220°12.9	39.2	321°11.4	12.4
9	344°27.2	290°16.4	·· 50.7	335°50.5	·· 41.0	235°15.0	·· 39.1	336°13.5	·· 12.5
10	359°29.7	305°15.7	51.6	350°51.2	41.8	250°17.1	39.1	351°15.7	12.6
11	14°32.1	320°15.0	52.4	5°51.9	42.5	265°19.3	39.1	6°17.9	12.7
12	29°34.6	335°14.4	N19°53.2	20°52.5	N02°43.3	280°21.4	N22°39.0	21°20.1	N01°12.8
13	44°37.0	350°13.7	54.0	35°53.2	44.1	295°23.6	39.0	36°22.3	12.9
14	59°39.5	5°13.1	54.8	50°53.9	44.9	310°25.7	39.0	51°24.5	13.0
15	74°42.0	20°12.4	·· 55.6	65°54.6	·· 45.6	325°27.9	·· 38.9	66°26.7	·· 13.1
16	89°44.4	35°11.8	56.5	80°55.3	46.4	340°30.0	38.9	81°28.9	13.3
17	104°46.9	50°11.1	57.3	95°56.0	47.2	355°32.2	38.8	96°31.1	13.4
18	119°49.4	65°10.4	N19°58.1	110°56.7	N02°48.0	10°34.3	N22°38.8	111°33.3	N01°13.5
19	134°51.8	80°09.8	58.9	125°57.4	48.7	25°36.4	38.8	126°35.5	13.6
20	149°54.3	95°09.1	19°59.7	140°58.1	49.5	40°38.6	38.7	141°37.6	13.7
21	164°56.8	110°08.5	20°00.5	155°58.8	·· 50.3	55°40.7	·· 38.7	156°39.8	·· 13.8
22	179°59.2	125°07.8	01.3	170°59.5	51.0	70°42.9	38.7	171°42.0	13.9
23	195°01.7	140°07.1	02.1	186°00.2	51.8	85°45.0	38.6	186°44.2	14.0
Mer.pass. 10:02		ν -0.7′	d 0.8′	m -3.92	ν 0.7′	d 0.8′	m 1.21	ν 2.1′	d 0.0′ m -2.07	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	**Dec**
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.5	-42°09.7
Schedar	349°30.4	56°40.8
Diphda	348°46.6	-17°50.6
Achernar	335°20.0	-57°06.2
Hamal	327°50.4	23°35.1
Polaris	313°58.5	89°22.6
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.2	-52°42.8
Sirius	258°25.4	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.3	-59°35.9
Suhail	222°45.4	-43°32.6
Miaplacidus	221°37.8	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.8
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.7
Kochab	137°18.7	74°02.7
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.3	-26°29.5
Atria	107°07.2	-69°04.3
Sabik	102°01.4	-15°45.5
Shaula	96°08.7	-37°07.3
Rasalhague	95°57.4	12°32.3
Eltanin	90°41.4	51°28.8
Kaus Aust.	83°31.0	-34°22.2
Vega	80°32.4	38°48.2
Nunki	75°46.4	-26°15.8
Altair	61°58.9	8°56.1
Peacock	53°04.1	-56°38.8
Deneb	49°25.2	45°22.1
Enif	33°37.9	9°59.6
Al Na'ir	27°31.8	-46°49.9
Fomalhaut	15°13.6	-29°28.9
Scheat	13°44.5	28°13.3
Markab	13°29.1	15°20.7

Apr 19 Sun	**SHA**	**Mer.pass**
Venus	308°46.3	13:37
Mars	353°04.3	10:39
Jupiter	251°05.5	17:25
Saturn	352°02.0	10:42

Apr 20 Mon	**SHA**	**Mer.pass**
Venus	307°31.9	13:38
Mars	352°21.8	10:38
Jupiter	250°58.2	17:21
Saturn	351°55.4	10:38

Apr 21 Tue	**SHA**	**Mer.pass**
Venus	306°17.2	13:39
Mars	351°39.2	10:37
Jupiter	250°50.7	17:18
Saturn	351°48.8	10:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°11.9	N11°06.2	161°07.0	5.0′	N22°22.4	11.2′	60.5′
1	195°12.0	07.0	175°31.1	4.9′	22°33.6	11.1′	60.5′
2	210°12.2	07.9	189°55.0	4.8′	22°44.7	10.9′	60.6′
3	225°12.3	·· 08.8	204°18.8	4.7′	22°55.6	10.7′	60.6′
4	240°12.4	09.6	218°42.6	4.6′	23°06.3	10.6′	60.6′
5	255°12.6	10.5	233°06.2	4.5′	23°16.9	10.5′	60.6′
6	270°12.7	N11°11.4	247°29.7	4.4′	N23°27.4	10.3′	60.6′
7	285°12.8	12.2	261°53.1	4.3′	23°37.7	10.1′	60.6′
8	300°13.0	13.1	276°16.5	4.2′	23°47.8	9.9′	60.6′
9	315°13.1	·· 14.0	290°39.7	4.1′	23°57.7	9.8′	60.6′
10	330°13.2	14.8	305°02.8	4.0′	24°07.5	9.6′	60.6′
11	345°13.4	15.7	319°25.8	3.9′	24°17.1	9.5′	60.6′
12	0°13.5	N11°16.5	333°48.8	3.8′	N24°26.6	9.2′	60.5′
13	15°13.6	17.4	348°11.6	3.8′	24°35.8	9.1′	60.5′
14	30°13.8	18.3	2°34.4	3.7′	24°44.9	8.9′	60.5′
15	45°13.9	·· 19.1	16°57.0	3.6′	24°53.8	8.8′	60.5′
16	60°14.0	20.0	31°19.6	3.5′	25°02.6	8.5′	60.5′
17	75°14.2	20.9	45°42.1	3.4′	25°11.1	8.4′	60.5′
18	90°14.3	N11°21.7	60°04.5	3.3′	N25°19.5	8.2′	60.5′
19	105°14.4	22.6	74°26.8	3.2′	25°27.7	8.0′	60.5′
20	120°14.6	23.4	88°49.1	3.2′	25°35.7	7.9′	60.5′
21	135°14.7	·· 24.3	103°11.2	3.1′	25°43.6	7.6′	60.5′
22	150°14.8	25.2	117°33.3	3.0′	25°51.2	7.4′	60.5′
23	165°15.0	26.0	131°55.3	2.9′	25°58.6	7.3′	60.5′
	SD = 15.9′	d = 0.9′		SD = 16.5′			

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°15.1	N11°26.9	146°17.3	2.9′	N26°05.9	7.1′	60.5′
1	195°15.2	27.7	160°39.1	2.8′	26°13.0	6.8′	60.5′
2	210°15.3	28.6	175°00.9	2.7′	26°19.8	6.7′	60.5′
3	225°15.5	·· 29.5	189°22.7	2.7′	26°26.5	6.5′	60.5′
4	240°15.6	30.3	203°44.3	2.6′	26°33.0	6.3′	60.5′
5	255°15.7	31.2	218°06.0	2.6′	26°39.3	6.1′	60.4′
6	270°15.9	N11°32.0	232°27.5	2.5′	N26°45.4	5.9′	60.4′
7	285°16.0	32.9	246°49.0	2.4′	26°51.3	5.7′	60.4′
8	300°16.1	33.7	261°10.5	2.4′	26°57.0	5.4′	60.4′
9	315°16.3	·· 34.6	275°31.8	2.3′	27°02.4	5.3′	60.4′
10	330°16.4	35.5	289°53.2	2.3′	27°07.7	5.1′	60.4′
11	345°16.5	36.3	304°14.5	2.3′	27°12.8	4.9′	60.4′
12	0°16.6	N11°37.2	318°35.8	2.2′	N27°17.7	4.7′	60.4′
13	15°16.8	38.0	332°57.0	2.2′	27°22.4	4.5′	60.4′
14	30°16.9	38.9	347°18.2	2.1′	27°26.9	4.2′	60.3′
15	45°17.0	·· 39.7	1°39.3	2.1′	27°31.1	4.1′	60.3′
16	60°17.2	40.6	16°00.4	2.1′	27°35.2	3.9′	60.3′
17	75°17.3	41.4	30°21.5	2.1′	27°39.1	3.6′	60.3′
18	90°17.4	N11°42.3	44°42.6	2.0′	N27°42.7	3.4′	60.3′
19	105°17.5	43.1	59°03.6	2.0′	27°46.1	3.3′	60.3′
20	120°17.7	44.0	73°24.6	2.0′	27°49.4	3.0′	60.3′
21	135°17.8	·· 44.8	87°45.6	2.0′	27°52.4	2.8′	60.2′
22	150°17.9	45.7	102°06.6	2.0′	27°55.2	2.6′	60.2′
23	165°18.1	46.5	116°27.6	2.0′	27°57.8	2.4′	60.2′
	SD = 15.9′	d = 0.9′		SD = 16.5′			

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°18.2	N11°47.4	130°48.6	2.0′	N28°00.2	2.2′	60.2′
1	195°18.3	48.3	145°09.6	2.0′	28°02.4	2.0′	60.2′
2	210°18.4	49.1	159°30.5	2.0′	28°04.4	1.8′	60.2′
3	225°18.6	·· 50.0	173°51.5	2.0′	28°06.2	1.5′	60.1′
4	240°18.7	50.8	188°12.5	2.0′	28°07.7	1.4′	60.1′
5	255°18.8	51.7	202°33.5	2.0′	28°09.1	1.1′	60.1′
6	270°18.9	N11°52.5	216°54.5	2.0′	N28°10.2	1.0′	60.1′
7	285°19.1	53.3	231°15.5	2.0′	28°11.2	0.7′	60.1′
8	300°19.2	54.2	245°36.5	2.1′	28°11.9	0.5′	60.1′
9	315°19.3	·· 55.0	259°57.6	2.1′	28°12.4	0.3′	60.0′
10	330°19.4	55.9	274°18.6	2.1′	28°12.7	0.1′	60.0′
11	345°19.6	56.7	288°39.7	2.1′	28°12.8	0.1′	60.0′
12	0°19.7	N11°57.6	303°00.9	2.2′	N28°12.7	0.3′	60.0′
13	15°19.8	58.4	317°22.0	2.2′	28°12.4	0.5′	60.0′
14	30°19.9	11°59.3	331°43.2	2.2′	28°11.9	0.8′	59.9′
15	45°20.1	12°00.1	346°04.5	2.3′	28°11.1	0.9′	59.9′
16	60°20.2	01.0	0°25.8	2.3′	28°10.2	1.1′	59.9′
17	75°20.3	01.8	14°47.1	2.4′	28°09.1	1.4′	59.9′
18	90°20.4	N12°02.7	29°08.5	2.4′	N28°07.7	1.5′	59.9′
19	105°20.6	03.5	43°29.9	2.5′	28°06.2	1.7′	59.8′
20	120°20.7	04.4	57°51.4	2.5′	28°04.5	2.0′	59.8′
21	135°20.8	·· 05.2	72°12.9	2.6′	28°02.5	2.1′	59.8′
22	150°20.9	06.0	86°34.5	2.7′	28°00.4	2.4′	59.8′
23	165°21.0	06.9	100°56.1	2.7′	27°58.0	2.5′	59.7′
	SD = 15.9′	d = 0.9′		SD = 16.4′			

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	00:56	03:10	20:53	23:22	////
N 70°	////	01:57	03:31	20:30	22:07	////
68°	////	02:31	03:47	20:13	21:31	////
66°	00:48	02:55	04:01	20:00	21:06	23:27
64°	01:42	03:14	04:12	19:48	20:47	22:22
62°	02:13	03:29	04:21	19:39	20:32	21:49
60°	02:35	03:41	04:29	19:30	20:19	21:26
N 58°	02:53	03:52	04:36	19:23	20:08	21:08
56°	03:07	04:01	04:42	19:17	19:58	20:53
54°	03:20	04:09	04:48	19:11	19:50	20:40
52°	03:30	04:16	04:53	19:06	19:43	20:29
50°	03:39	04:22	04:57	19:02	19:37	20:20
45°	03:58	04:36	05:07	18:52	19:23	20:01
N 40°	04:13	04:47	05:15	18:43	19:12	19:46
35°	04:24	04:56	05:22	18:36	19:03	19:34
30°	04:34	05:03	05:28	18:30	18:55	19:24
20°	04:49	05:16	05:38	18:20	18:42	19:09
N 10°	05:01	05:26	05:47	18:11	18:32	18:57
0°	05:10	05:34	05:56	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:54	18:15	18:40
20°	05:24	05:50	06:12	17:45	18:08	18:33
30°	05:30	05:58	06:22	17:35	18:00	18:28
35°	05:32	06:02	06:28	17:30	17:55	18:25
40°	05:35	06:06	06:34	17:23	17:51	18:23
45°	05:37	06:11	06:41	17:16	17:46	18:20
S 50°	05:39	06:17	06:50	17:07	17:40	18:18
52°	05:40	06:19	06:54	17:03	17:38	18:17
54°	05:41	06:22	06:58	16:59	17:35	18:16
56°	05:41	06:25	07:03	16:54	17:32	18:15
58°	05:42	06:28	07:09	16:48	17:29	18:15
S 60°	05:43	06:31	07:15	16:42	17:25	18:14

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	02:42	▭	▭	▭	▭	▭
64°	03:25	▭	▭	▭	▭	▭
62°	03:54	03:50	03:40	·· ··	00:43	03:09
60°	04:17	04:29	05:02	·· ··	00:05	01:47
N 58°	04:35	04:56	05:38	23:38	·· ··	01:11
56°	04:51	05:18	06:04	23:16	·· ··	00:45
54°	05:04	05:35	06:25	22:59	·· ··	00:24
52°	05:16	05:51	06:43	22:44	·· ··	00:07
50°	05:26	06:04	06:58	22:31	23:52	·· ··
45°	05:48	06:31	07:28	22:05	23:22	·· ··
N 40°	06:06	06:53	07:51	21:44	22:59	·· ··
35°	06:21	07:11	08:11	21:26	22:40	23:44
30°	06:34	07:27	08:28	21:12	22:23	23:28
20°	06:56	07:53	08:56	20:46	21:55	23:00
N 10°	07:16	08:16	09:20	20:24	21:31	22:36
0°	07:35	08:38	09:43	20:04	21:09	22:14
S 10°	07:53	08:59	10:05	19:44	20:46	21:51
20°	08:13	09:23	10:30	19:22	20:22	21:27
30°	08:37	09:50	10:58	18:57	19:54	20:59
35°	08:50	10:06	11:15	18:43	19:38	20:42
40°	09:06	10:25	11:35	18:26	19:19	20:22
45°	09:25	10:47	11:59	18:06	18:55	19:58
S 50°	09:50	11:17	12:30	17:40	18:26	19:28
52°	10:01	11:31	12:45	17:28	18:11	19:13
54°	10:15	11:48	13:03	17:15	17:54	18:55
56°	10:30	12:08	13:24	16:59	17:34	18:33
58°	10:48	12:33	13:52	16:40	17:08	18:06
S 60°	11:11	13:07	14:31	16:16	16:34	17:27

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 2-4 3-17%
19	00:48	00:54	11:59	13:49	01:19	
20	01:00	01:07	11:59	14:53	02:21	
21	01:13	01:19	11:59	15:58	03:26	

April 22, 23, 24 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	210°04.2	155°06.5	N20°02.9	201°00.9	N02°52.6	100°47.2	N22°38.6	201°46.4	N01°14.2
1	225°06.6	170°05.8	03.8	216°01.6	53.4	115°49.3	38.5	216°48.6	14.3
2	240°09.1	185°05.1	04.6	231°02.2	54.1	130°51.4	38.5	231°50.8	14.4
3	255°11.5	200°04.5	·· 05.4	246°02.9	·· 54.9	145°53.6	·· 38.5	246°53.0	·· 14.5
4	270°14.0	215°03.8	06.2	261°03.6	55.7	160°55.7	38.4	261°55.2	14.6
5	285°16.5	230°03.1	07.0	276°04.3	56.4	175°57.9	38.4	276°57.4	14.7
6	300°18.9	245°02.5	N20°07.8	291°05.0	N02°57.2	191°00.0	N22°38.4	291°59.6	N01°14.8
7	315°21.4	260°01.8	08.6	306°05.7	58.0	206°02.1	38.3	307°01.7	14.9
8	330°23.9	275°01.1	09.4	321°06.4	58.8	221°04.3	38.3	322°03.9	15.1
9	345°26.3	290°00.5	·· 10.2	336°07.1	02°59.5	236°06.4	·· 38.2	337°06.1	·· 15.2
10	0°28.8	304°59.8	11.0	351°07.8	03°00.3	251°08.6	38.2	352°08.3	15.3
11	15°31.3	319°59.1	11.8	6°08.5	01.1	266°10.7	38.2	7°10.5	15.4
12	30°33.7	334°58.5	N20°12.6	21°09.2	N03°01.8	281°12.8	N22°38.1	22°12.7	N01°15.5
13	45°36.2	349°57.8	13.4	36°09.9	02.6	296°15.0	38.1	37°14.9	15.6
14	60°38.7	4°57.1	14.2	51°10.6	03.4	311°17.1	38.0	52°17.1	15.7
15	75°41.1	19°56.5	·· 14.9	66°11.3	·· 04.2	326°19.2	·· 38.0	67°19.3	·· 15.8
16	90°43.6	34°55.8	15.7	81°11.9	04.9	341°21.4	38.0	82°21.5	15.9
17	105°46.0	49°55.1	16.5	96°12.6	05.7	356°23.5	37.9	97°23.7	16.1
18	120°48.5	64°54.5	N20°17.3	111°13.3	N03°06.5	11°25.7	N22°37.9	112°25.9	N01°16.2
19	135°51.0	79°53.8	18.1	126°14.0	07.2	26°27.8	37.9	127°28.1	16.3
20	150°53.4	94°53.1	18.9	141°14.7	08.0	41°29.9	37.8	142°30.2	16.4
21	165°55.9	109°52.4	·· 19.7	156°15.4	·· 08.8	56°32.1	·· 37.8	157°32.4	·· 16.5
22	180°58.4	124°51.8	20.5	171°16.1	09.5	71°34.2	37.7	172°34.6	16.6
23	196°00.8	139°51.1	21.3	186°16.8	10.3	86°36.3	37.7	187°36.8	16.7
Mer.pass. 09:58		ν -0.7′	d 0.8′	ν 0.7′	d 0.8′ m 1.21	ν 2.1′	d 0.0′ m -2.06	ν 2.2′	d 0.1′ m 0.93

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	211°03.3	154°50.4	N20°22.0	201°17.5	N03°11.1	101°38.5	N22°37.7	202°39.0	N01°16.8
1	226°05.8	169°49.7	22.8	216°18.2	11.9	116°40.6	37.6	217°41.2	16.9
2	241°08.2	184°49.1	23.6	231°18.9	12.6	131°42.8	37.6	232°43.4	17.1
3	256°10.7	199°48.4	·· 24.4	246°19.6	·· 13.4	146°44.9	·· 37.5	247°45.6	·· 17.2
4	271°13.1	214°47.7	25.2	261°20.3	14.2	161°47.0	37.5	262°47.8	17.3
5	286°15.6	229°47.0	26.0	276°21.0	14.9	176°49.2	37.5	277°50.0	17.4
6	301°18.1	244°46.4	N20°26.7	291°21.6	N03°15.7	191°51.3	N22°37.4	292°52.2	N01°17.5
7	316°20.5	259°45.7	27.5	306°22.3	16.5	206°53.4	37.4	307°54.4	17.6
8	331°23.0	274°45.0	28.3	321°23.0	17.2	221°55.6	37.3	322°56.6	17.7
9	346°25.5	289°44.3	·· 29.1	336°23.7	·· 18.0	236°57.7	·· 37.3	337°58.8	·· 17.8
10	1°27.9	304°43.7	29.8	351°24.4	18.8	251°59.8	37.3	353°00.9	18.0
11	16°30.4	319°43.0	30.6	6°25.1	19.6	267°02.0	37.2	8°03.1	18.1
12	31°32.9	334°42.3	N20°31.4	21°25.8	N03°20.3	282°04.1	N22°37.2	23°05.3	N01°18.2
13	46°35.3	349°41.6	32.2	36°26.5	21.1	297°06.2	37.2	38°07.5	18.3
14	61°37.8	4°40.9	32.9	51°27.2	21.9	312°08.4	37.1	53°09.7	18.4
15	76°40.3	19°40.3	·· 33.7	66°27.9	·· 22.6	327°10.5	·· 37.1	68°11.9	·· 18.5
16	91°42.7	34°39.6	34.5	81°28.6	23.4	342°12.6	37.0	83°14.1	18.6
17	106°45.2	49°38.9	35.3	96°29.3	24.2	357°14.8	37.0	98°16.3	18.7
18	121°47.6	64°38.2	N20°36.0	111°30.0	N03°24.9	12°16.9	N22°37.0	113°18.5	N01°18.8
19	136°50.1	79°37.5	36.8	126°30.7	25.7	27°19.0	36.9	128°20.7	19.0
20	151°52.6	94°36.9	37.6	141°31.4	26.5	42°21.1	36.9	143°22.9	19.1
21	166°55.0	109°36.2	·· 38.3	156°32.0	·· 27.2	57°23.3	·· 36.8	158°25.1	·· 19.2
22	181°57.5	124°35.5	39.1	171°32.7	28.0	72°25.4	36.8	173°27.3	19.3
23	197°00.0	139°34.8	39.8	186°33.4	28.8	87°27.5	36.8	188°29.5	19.4
Mer.pass. 09:54		ν -0.7′	d 0.8′	ν 0.7′	d 0.8′ m 1.21	ν 2.1′	d 0.0′ m -2.06	ν 2.2′	d 0.1′ m 0.93

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	212°02.4	154°34.1	N20°40.6	201°34.1	N03°29.5	102°29.7	N22°36.7	203°31.7	N01°19.5
1	227°04.9	169°33.4	41.4	216°34.8	30.3	117°31.8	36.7	218°33.8	19.6
2	242°07.4	184°32.8	42.1	231°35.5	31.1	132°33.9	36.6	233°36.0	19.7
3	257°09.8	199°32.1	·· 42.9	246°36.2	·· 31.8	147°36.1	·· 36.6	248°38.2	·· 19.8
4	272°12.3	214°31.4	43.6	261°36.9	32.6	162°38.2	36.6	263°40.4	19.9
5	287°14.8	229°30.7	44.4	276°37.6	33.4	177°40.3	36.5	278°42.6	20.1
6	302°17.2	244°30.0	N20°45.2	291°38.3	N03°34.2	192°42.4	N22°36.5	293°44.8	N01°20.2
7	317°19.7	259°29.3	45.9	306°39.0	34.9	207°44.6	36.4	308°47.0	20.3
8	332°22.1	274°28.6	46.7	321°39.7	35.7	222°46.7	36.4	323°49.2	20.4
9	347°24.6	289°27.9	·· 47.4	336°40.4	·· 36.5	237°48.8	·· 36.4	338°51.4	·· 20.5
10	2°27.1	304°27.3	48.2	351°41.1	37.2	252°50.9	36.3	353°53.6	20.6
11	17°29.5	319°26.6	48.9	6°41.8	38.0	267°53.1	36.3	8°55.8	20.7
12	32°32.0	334°25.9	N20°49.7	21°42.4	N03°38.8	282°55.2	N22°36.2	23°58.0	N01°20.8
13	47°34.5	349°25.2	50.4	36°43.1	39.5	297°57.3	36.2	39°00.2	20.9
14	62°36.9	4°24.5	51.2	51°43.8	40.3	312°59.5	36.2	54°02.4	21.1
15	77°39.4	19°23.8	·· 51.9	66°44.5	·· 41.1	328°01.6	·· 36.1	69°04.6	·· 21.2
16	92°41.9	34°23.1	52.7	81°45.2	41.8	343°03.7	36.1	84°06.8	21.3
17	107°44.3	49°22.4	53.4	96°45.9	42.6	358°05.8	36.0	99°09.0	21.4
18	122°46.8	64°21.7	N20°54.2	111°46.6	N03°43.4	13°08.0	N22°36.0	114°11.1	N01°21.5
19	137°49.3	79°21.0	54.9	126°47.3	44.1	28°10.1	36.0	129°13.3	21.6
20	152°51.7	94°20.3	55.7	141°48.0	44.9	43°12.2	35.9	144°15.5	21.7
21	167°54.2	109°19.7	·· 56.4	156°48.7	·· 45.7	58°14.3	·· 35.9	159°17.7	·· 21.8
22	182°56.6	124°19.0	57.1	171°49.4	46.4	73°16.5	35.8	174°19.9	21.9
23	197°59.1	139°18.3	57.9	186°50.1	47.2	88°18.6	35.8	189°22.1	22.0
Mer.pass. 09:50		ν -0.7′	d 0.8′	ν 0.7′	d 0.8′ m 1.22	ν 2.1′	d 0.0′ m -2.05	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.5	-42°09.7
Schedar	349°30.4	56°40.8
Diphda	348°46.5	-17°50.6
Achernar	335°20.0	-57°06.2
Hamal	327°50.4	23°35.1
Polaris	313°58.5	89°22.6
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.1	7°24.6
Canopus	263°52.2	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.3	-59°35.9
Suhail	222°45.5	-43°32.6
Miaplacidus	221°37.9	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.7
Kochab	137°18.6	74°02.7
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.2	-26°29.5
Atria	107°07.1	-69°04.3
Sabik	102°01.3	-15°45.5
Shaula	96°08.7	-37°07.3
Rasalhague	95°57.4	12°32.3
Eltanin	90°41.4	51°28.8
Kaus Aust.	83°30.9	-34°22.2
Vega	80°32.3	38°48.2
Nunki	75°46.3	-26°15.8
Altair	61°58.9	8°56.1
Peacock	53°04.1	-56°38.8
Deneb	49°25.1	45°22.1
Enif	33°37.9	9°59.6
Al Na'ir	27°31.8	-46°49.8
Fomalhaut	15°13.6	-29°28.9
Scheat	13°44.4	28°13.3
Markab	13°29.1	15°20.7

Apr 22 Wed	SHA	Mer.pass
Venus	305°02.3	13:40
Mars	350°56.7	10:35
Jupiter	250°43.0	17:14
Saturn	351°42.3	10:31

Apr 23 Thu	SHA	Mer.pass
Venus	303°47.1	13:41
Mars	350°14.2	10:34
Jupiter	250°35.2	17:11
Saturn	351°35.7	10:28

Apr 24 Fri	SHA	Mer.pass
Venus	302°31.7	13:42
Mars	349°31.7	10:33
Jupiter	250°27.2	17:08
Saturn	351°29.2	10:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.2	N12°07.7	115°17.8	2.8′	N27°55.5	2.8′	59.7′
1	195°21.3	08.6	129°39.6	2.9′	27°52.7	2.9′	59.7′
2	210°21.4	09.4	144°01.5	2.9′	27°49.8	3.1′	59.7′
3	225°21.5	·· 10.3	158°23.4	3.0′	27°46.7	3.4′	59.7′
4	240°21.7	11.1	172°45.4	3.1′	27°43.3	3.5′	59.6′
5	255°21.8	11.9	187°07.5	3.2′	27°39.8	3.7′	59.6′
6	270°21.9	N12°12.8	201°29.6	3.2′	N27°36.1	3.9′	59.6′
7	285°22.0	13.6	215°51.9	3.3′	27°32.2	4.1′	59.6′
8	300°22.1	14.5	230°14.2	3.4′	27°28.1	4.3′	59.5′
9	315°22.3	·· 15.3	244°36.6	3.5′	27°23.8	4.4′	59.5′
10	330°22.4	16.1	258°59.1	3.6′	27°19.4	4.7′	59.5′
11	345°22.5	17.0	273°21.7	3.7′	27°14.7	4.8′	59.5′
12	0°22.6	N12°17.8	287°44.4	3.8′	N27°09.9	5.1′	59.4′
13	15°22.7	18.7	302°07.1	3.9′	27°04.8	5.1′	59.4′
14	30°22.9	19.5	316°30.0	4.0′	26°59.7	5.4′	59.4′
15	45°23.0	·· 20.3	330°52.9	4.1′	26°54.3	5.6′	59.4′
16	60°23.1	21.2	345°16.0	4.2′	26°48.7	5.7′	59.3′
17	75°23.2	22.0	359°39.2	4.3′	26°43.0	5.9′	59.3′
18	90°23.3	N12°22.8	14°02.4	4.4′	N26°37.1	6.1′	59.3′
19	105°23.5	23.7	28°25.8	4.5′	26°31.0	6.3′	59.3′
20	120°23.6	24.5	42°49.3	4.6′	26°24.7	6.4′	59.2′
21	135°23.7	·· 25.3	57°12.9	4.7′	26°18.3	6.6′	59.2′
22	150°23.8	26.2	71°36.6	4.8′	26°11.7	6.7′	59.2′
23	165°23.9	27.0	86°00.4	4.9′	26°05.0	7.0′	59.2′
	SD = 15.9′	d = 0.8′	SD = 16.3′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°24.1	N12°27.8	100°24.3	5.0′	N25°58.0	7.0′	59.1′
1	195°24.2	28.7	114°48.3	5.1′	25°51.0	7.3′	59.1′
2	210°24.3	29.5	129°12.4	5.3′	25°43.7	7.4′	59.1′
3	225°24.4	·· 30.4	143°36.7	5.4′	25°36.3	7.6′	59.0′
4	240°24.5	31.2	158°01.0	5.5′	25°28.7	7.7′	59.0′
5	255°24.6	32.0	172°25.5	5.6′	25°21.0	7.9′	59.0′
6	270°24.8	N12°32.8	186°50.1	5.7′	N25°13.1	8.0′	59.0′
7	285°24.9	33.7	201°14.8	5.8′	25°05.1	8.2′	58.9′
8	300°25.0	34.5	215°39.7	6.0′	24°56.9	8.3′	58.9′
9	315°25.1	·· 35.3	230°04.6	6.1′	24°48.6	8.5′	58.9′
10	330°25.2	36.2	244°29.7	6.2′	24°40.1	8.6′	58.9′
11	345°25.3	37.0	258°54.9	6.3′	24°31.5	8.8′	58.8′
12	0°25.5	N12°37.8	273°20.2	6.4′	N24°22.7	8.9′	58.8′
13	15°25.6	38.7	287°45.7	6.6′	24°13.8	9.0′	58.8′
14	30°25.7	39.5	302°11.2	6.7′	24°04.8	9.2′	58.7′
15	45°25.8	·· 40.3	316°36.9	6.8′	23°55.6	9.3′	58.7′
16	60°25.9	41.2	331°02.7	6.9′	23°46.3	9.5′	58.7′
17	75°26.0	42.0	345°28.7	7.1′	23°36.8	9.6′	58.7′
18	90°26.1	N12°42.8	359°54.7	7.2′	N23°27.2	9.7′	58.6′
19	105°26.3	43.6	14°20.9	7.3′	23°17.5	9.8′	58.6′
20	120°26.4	44.5	28°47.2	7.4′	23°07.7	10.0′	58.6′
21	135°26.5	·· 45.3	43°13.6	7.6′	22°57.7	10.1′	58.6′
22	150°26.6	46.1	57°40.2	7.7′	22°47.6	10.3′	58.5′
23	165°26.7	46.9	72°06.9	7.8′	22°37.3	10.3′	58.5′
	SD = 15.9′	d = 0.8′	SD = 16.1′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°26.8	N12°47.8	86°33.7	7.9′	N22°27.0	10.5′	58.5′
1	195°26.9	48.6	101°00.6	8.0′	22°16.5	10.6′	58.4′
2	210°27.1	49.4	115°27.6	8.2′	22°05.9	10.7′	58.4′
3	225°27.2	·· 50.2	129°54.8	8.3′	21°55.2	10.8′	58.4′
4	240°27.3	51.1	144°22.1	8.4′	21°44.4	10.9′	58.4′
5	255°27.4	51.9	158°49.5	8.5′	21°33.5	11.1′	58.3′
6	270°27.5	N12°52.7	173°17.0	8.7′	N21°22.4	11.1′	58.3′
7	285°27.6	53.5	187°44.7	8.8′	21°11.3	11.3′	58.3′
8	300°27.7	54.4	202°12.5	8.9′	21°00.0	11.3′	58.2′
9	315°27.8	·· 55.2	216°40.4	9.0′	20°48.7	11.5′	58.2′
10	330°28.0	56.0	231°08.4	9.1′	20°37.2	11.6′	58.2′
11	345°28.1	56.8	245°36.5	9.3′	20°25.6	11.7′	58.2′
12	0°28.2	N12°57.6	260°04.8	9.4′	N20°13.9	11.7′	58.1′
13	15°28.3	58.5	274°33.1	9.5′	20°02.2	11.9′	58.1′
14	30°28.4	12°59.3	289°01.6	9.6′	19°50.3	12.0′	58.1′
15	45°28.5	13°00.1	303°30.2	9.7′	19°38.3	12.0′	58.0′
16	60°28.6	00.9	317°59.0	9.8′	19°26.3	12.2′	58.0′
17	75°28.7	01.7	332°27.8	10.0′	19°14.1	12.2′	58.0′
18	90°28.8	N13°02.6	346°56.8	10.1′	N19°01.9	12.3′	58.0′
19	105°28.9	03.4	1°25.8	10.2′	18°49.6	12.5′	57.9′
20	120°29.1	04.2	15°55.0	10.3′	18°37.1	12.5′	57.9′
21	135°29.2	·· 05.0	30°24.3	10.4′	18°24.6	12.6′	57.9′
22	150°29.3	05.8	44°53.7	10.5′	18°12.0	12.6′	57.9′
23	165°29.4	06.7	59°23.2	10.6′	17°59.4	12.8′	57.8′
	SD = 15.9′	d = 0.8′	SD = 15.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	02:51	21:11	////	////
N 70°	////	01:30	03:15	20:45	22:36	////
68°	////	02:12	03:34	20:26	21:50	////
66°	////	02:40	03:49	20:10	21:20	////
64°	01:18	03:01	04:01	19:58	20:59	22:46
62°	01:56	03:18	04:12	19:47	20:42	22:05
60°	02:22	03:31	04:20	19:38	20:27	21:38
N 58°	02:42	03:43	04:28	19:30	20:16	21:18
56°	02:58	03:53	04:35	19:23	20:05	21:01
54°	03:11	04:02	04:41	19:17	19:57	20:48
52°	03:22	04:09	04:46	19:11	19:49	20:36
50°	03:32	04:16	04:51	19:06	19:42	20:26
45°	03:52	04:31	05:02	18:55	19:27	20:06
N 40°	04:08	04:42	05:11	18:46	19:15	19:50
35°	04:20	04:52	05:18	18:39	19:05	19:37
30°	04:30	05:00	05:25	18:32	18:57	19:27
20°	04:47	05:13	05:36	18:21	18:44	19:10
N 10°	04:59	05:24	05:46	18:11	18:32	18:58
0°	05:09	05:34	05:55	18:02	18:23	18:47
S 10°	05:18	05:42	06:04	17:53	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:06	18:32
30°	05:31	05:59	06:24	17:32	17:57	18:25
35°	05:34	06:04	06:30	17:26	17:52	18:22
40°	05:37	06:09	06:37	17:19	17:47	18:19
45°	05:40	06:15	06:45	17:11	17:41	18:16
S 50°	05:43	06:21	06:54	17:01	17:35	18:13
52°	05:44	06:24	06:59	16:57	17:32	18:11
54°	05:45	06:27	07:04	16:52	17:29	18:10
56°	05:47	06:30	07:09	16:47	17:25	18:09
58°	05:48	06:34	07:15	16:41	17:22	18:08
S 60°	05:49	06:38	07:22	16:34	17:18	18:06

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°						
68°			07:47			05:26
66°			08:40			04:33
64°		06:43	09:12		04:31	04:00
62°	05:20	07:34	09:35	03:45	03:40	03:35
60°	06:19	08:05	09:54	02:46	03:08	03:15
N 58°	06:52	08:29	10:09	02:12	02:44	02:59
56°	07:17	08:47	10:22	01:47	02:24	02:45
54°	07:37	09:03	10:34	01:27	02:08	02:33
52°	07:53	09:17	10:44	01:11	01:54	02:23
50°	08:08	09:29	10:53	00:56	01:42	02:13
45°	08:37	09:53	11:12	00:27	01:16	01:53
N 40°	08:59	10:13	11:27	00:04	00:56	01:36
35°	09:18	10:29	11:40	·· ··	00:39	01:22
30°	09:34	10:43	11:51	·· ··	00:24	01:10
20°	10:02	11:07	12:10	23:58	·· ··	00:49
N 10°	10:25	11:28	12:26	23:37	·· ··	00:31
0°	10:47	11:47	12:42	23:16	·· ··	00:14
S 10°	11:08	12:06	12:57	22:55	23:56	·· ··
20°	11:32	12:26	13:13	22:33	23:38	·· ··
30°	11:59	12:50	13:32	22:07	23:16	·· ··
35°	12:15	13:03	13:43	21:52	23:03	·· ··
40°	12:33	13:19	13:55	21:34	22:48	·· ··
45°	12:56	13:38	14:10	21:12	22:31	23:48
S 50°	13:24	14:01	14:27	20:45	22:08	23:32
52°	13:38	14:12	14:35	20:31	21:58	23:25
54°	13:54	14:25	14:45	20:16	21:46	23:16
56°	14:12	14:39	14:55	19:57	21:32	23:07
58°	14:35	14:56	15:07	19:34	21:16	22:56
S 60°	15:05	15:16	15:20	19:05	20:56	22:43

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 5-7 27-49%
22	01:25	01:31	11:58	17:01	04:30	
23	01:36	01:42	11:58	18:00	05:32	
24	01:47	01:53	11:58	18:54	06:28	

April 25, 26, 27 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	213°01.6	154°17.6	N20°58.6	201°50.8	N03°48.0	103°20.7	N22°35.7	204°24.3	N01°22.2
1	228°04.0	169°16.9	20°59.4	216°51.5	48.7	118°22.8	35.7	219°26.5	22.3
2	243°06.5	184°16.2	21°00.1	231°52.2	49.5	133°25.0	35.7	234°28.7	22.4
3	258°09.0	199°15.5	·· 00.8	246°52.9	·· 50.2	148°27.1	·· 35.6	249°30.9	·· 22.5
4	273°11.4	214°14.8	01.6	261°53.5	51.0	163°29.2	35.6	264°33.1	22.6
5	288°13.9	229°14.1	02.3	276°54.2	51.8	178°31.3	35.5	279°35.3	22.7
6	303°16.4	244°13.4	N21°03.0	291°54.9	N03°52.5	193°33.4	N22°35.5	294°37.5	N01°22.8
7	318°18.8	259°12.7	03.8	306°55.6	53.3	208°35.6	35.5	309°39.7	22.9
8	333°21.3	274°12.0	04.5	321°56.3	54.1	223°37.7	35.4	324°41.9	23.0
9	348°23.7	289°11.3	·· 05.2	336°57.0	·· 54.8	238°39.8	·· 35.4	339°44.1	·· 23.1
10	3°26.2	304°10.6	06.0	351°57.7	55.6	253°41.9	35.3	354°46.3	23.3
11	18°28.7	319°09.9	06.7	6°58.4	56.4	268°44.1	35.3	9°48.5	23.4
12	33°31.1	334°09.2	N21°07.4	21°59.1	N03°57.1	283°46.2	N22°35.3	24°50.7	N01°23.5
13	48°33.6	349°08.5	08.1	36°59.8	57.9	298°48.3	35.2	39°52.9	23.6
14	63°36.1	4°07.8	08.9	52°00.5	58.7	313°50.4	35.2	54°55.0	23.7
15	78°38.5	19°07.1	·· 09.6	67°01.2	03°59.4	328°52.5	·· 35.1	69°57.2	·· 23.8
16	93°41.0	34°06.4	10.3	82°01.9	04°00.2	343°54.7	35.1	84°59.4	23.9
17	108°43.5	49°05.7	11.0	97°02.6	01.0	358°56.8	35.0	100°01.6	24.0
18	123°45.9	64°05.0	N21°11.8	112°03.3	N04°01.7	13°58.9	N22°35.0	115°03.8	N01°24.1
19	138°48.4	79°04.3	12.5	127°04.0	02.5	29°01.0	35.0	130°06.0	24.2
20	153°50.9	94°03.6	13.2	142°04.6	03.2	44°03.1	34.9	145°08.2	24.4
21	168°53.3	109°02.9	·· 13.9	157°05.3	·· 04.0	59°05.3	·· 34.9	160°10.4	·· 24.5
22	183°55.8	124°02.2	14.6	172°06.0	04.8	74°07.4	34.8	175°12.6	24.6
23	198°58.2	139°01.5	15.3	187°06.7	05.5	89°09.5	34.8	190°14.8	24.7
Mer.pass. 09:46		ν -0.7′	d 0.7′	m -3.92	ν 0.7′	d 0.8′	m 1.22	ν 2.1′	d 0.0′ m -2.05	ν 2.2′	d 0.1′ m 0.93

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	214°00.7	154°00.8	N21°16.1	202°07.4	N04°06.3	104°11.6	N22°34.8	205°17.0	N01°24.8
1	229°03.2	169°00.1	16.8	217°08.1	07.1	119°13.7	34.7	220°19.2	24.9
2	244°05.6	183°59.4	17.5	232°08.8	07.8	134°15.8	34.7	235°21.4	25.0
3	259°08.1	198°58.7	·· 18.2	247°09.5	·· 08.6	149°18.0	·· 34.6	250°23.6	·· 25.1
4	274°10.6	213°57.9	18.9	262°10.2	09.4	164°20.1	34.6	265°25.8	25.2
5	289°13.0	228°57.2	19.6	277°10.9	10.1	179°22.2	34.5	280°28.0	25.3
6	304°15.5	243°56.5	N21°20.3	292°11.6	N04°10.9	194°24.3	N22°34.5	295°30.2	N01°25.4
7	319°18.0	258°55.8	21.0	307°12.3	11.6	209°26.4	34.5	310°32.4	25.6
8	334°20.4	273°55.1	21.7	322°13.0	12.4	224°28.5	34.4	325°34.6	25.7
9	349°22.9	288°54.4	·· 22.5	337°13.7	·· 13.2	239°30.7	·· 34.4	340°36.8	·· 25.8
10	4°25.4	303°53.7	23.2	352°14.4	13.9	254°32.8	34.3	355°39.0	25.9
11	19°27.8	318°53.0	23.9	7°15.1	14.7	269°34.9	34.3	10°41.2	26.0
12	34°30.3	333°52.3	N21°24.6	22°15.8	N04°15.5	284°37.0	N22°34.2	25°43.4	N01°26.1
13	49°32.7	348°51.6	25.3	37°16.4	16.2	299°39.1	34.2	40°45.6	26.2
14	64°35.2	3°50.9	26.0	52°17.1	17.0	314°41.2	34.2	55°47.8	26.3
15	79°37.7	18°50.2	·· 26.7	67°17.8	·· 17.7	329°43.4	·· 34.1	70°50.0	·· 26.4
16	94°40.1	33°49.4	27.4	82°18.5	18.5	344°45.5	34.1	85°52.2	26.5
17	109°42.6	48°48.7	28.1	97°19.2	19.3	359°47.6	34.0	100°54.3	26.6
18	124°45.1	63°48.0	N21°28.8	112°19.9	N04°20.0	14°49.7	N22°34.0	115°56.5	N01°26.8
19	139°47.5	78°47.3	29.5	127°20.6	20.8	29°51.8	34.0	130°58.7	26.9
20	154°50.0	93°46.6	30.2	142°21.3	21.6	44°53.9	33.9	146°00.9	27.0
21	169°52.5	108°45.9	·· 30.9	157°22.0	·· 22.3	59°56.0	·· 33.9	161°03.1	·· 27.1
22	184°54.9	123°45.2	31.5	172°22.7	23.1	74°58.1	33.8	176°05.3	27.2
23	199°57.4	138°44.4	32.2	187°23.4	23.8	90°00.3	33.8	191°07.5	27.3
Mer.pass. 09:42		ν -0.7′	d 0.7′	m -3.92	ν 0.7′	d 0.8′	m 1.22	ν 2.1′	d 0.0′ m -2.04	ν 2.2′	d 0.1′ m 0.93

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	214°59.8	153°43.7	N21°32.9	202°24.1	N04°24.6	105°02.4	N22°33.7	206°09.7	N01°27.4
1	230°02.3	168°43.0	33.6	217°24.8	25.4	120°04.5	33.7	221°11.9	27.5
2	245°04.8	183°42.3	34.3	232°25.5	26.1	135°06.6	33.7	236°14.1	27.6
3	260°07.2	198°41.6	·· 35.0	247°26.2	·· 26.9	150°08.7	·· 33.6	251°16.3	·· 27.7
4	275°09.7	213°40.9	35.7	262°26.9	27.6	165°10.8	33.6	266°18.5	27.8
5	290°12.2	228°40.2	36.4	277°27.5	28.4	180°12.9	33.5	281°20.7	27.9
6	305°14.6	243°39.4	N21°37.1	292°28.2	N04°29.2	195°15.0	N22°33.5	296°22.9	N01°28.1
7	320°17.1	258°38.7	37.7	307°28.9	29.9	210°17.2	33.4	311°25.1	28.2
8	335°19.6	273°38.0	38.4	322°29.6	30.7	225°19.3	33.4	326°27.3	28.3
9	350°22.0	288°37.3	·· 39.1	337°30.3	·· 31.4	240°21.4	·· 33.3	341°29.5	·· 28.4
10	5°24.5	303°36.6	39.8	352°31.0	32.2	255°23.5	33.3	356°31.7	28.5
11	20°27.0	318°35.8	40.5	7°31.7	33.0	270°25.6	33.3	11°33.9	28.6
12	35°29.4	333°35.1	N21°41.1	22°32.4	N04°33.7	285°27.7	N22°33.2	26°36.1	N01°28.7
13	50°31.9	348°34.4	41.8	37°33.1	34.5	300°29.8	33.2	41°38.3	28.8
14	65°34.3	3°33.7	42.5	52°33.8	35.2	315°31.9	33.1	56°40.5	28.9
15	80°36.8	18°33.0	·· 43.2	67°34.5	·· 36.0	330°34.0	·· 33.1	71°42.7	·· 29.0
16	95°39.3	33°32.2	43.9	82°35.2	36.8	345°36.1	33.0	86°44.9	29.1
17	110°41.7	48°31.5	44.5	97°35.9	37.5	0°38.3	33.0	101°47.1	29.2
18	125°44.2	63°30.8	N21°45.2	112°36.6	N04°38.3	15°40.4	N22°33.0	116°49.3	N01°29.4
19	140°46.7	78°30.1	45.9	127°37.3	39.0	30°42.5	32.9	131°51.5	29.5
20	155°49.1	93°29.4	46.5	142°38.0	39.8	45°44.6	32.9	146°53.7	29.6
21	170°51.6	108°28.6	·· 47.2	157°38.6	·· 40.6	60°46.7	·· 32.8	161°55.9	·· 29.7
22	185°54.1	123°27.9	47.9	172°39.3	41.3	75°48.8	32.8	176°58.1	29.8
23	200°56.5	138°27.2	48.5	187°40.0	42.1	90°50.9	32.7	192°00.3	29.9
Mer.pass. 09:38		ν -0.7′	d 0.7′	m -3.92	ν 0.7′	d 0.8′	m 1.22	ν 2.1′	d 0.0′ m -2.03	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.5	-42°09.7
Schedar	349°30.4	56°40.8
Diphda	348°46.5	-17°50.6
Achernar	335°20.0	-57°06.1
Hamal	327°50.4	23°35.1
Polaris	313°58.7	89°22.5
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.2	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.3	-59°35.9
Suhail	222°45.5	-43°32.6
Miaplacidus	221°37.9	-69°49.8
Alphard	217°46.6	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.7
Kochab	137°18.6	74°02.7
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.2	-26°29.5
Atria	107°07.1	-69°04.3
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.4	51°28.8
Kaus Aust.	83°30.9	-34°22.2
Vega	80°32.3	38°48.2
Nunki	75°46.3	-26°15.8
Altair	61°58.9	8°56.1
Peacock	53°04.0	-56°38.8
Deneb	49°25.1	45°22.1
Enif	33°37.9	9°59.6
Al Na'ir	27°31.8	-46°49.8
Fomalhaut	15°13.6	-29°28.9
Scheat	13°44.4	28°13.3
Markab	13°29.1	15°20.7

Apr 25 Sat	SHA	Mer.pass
Venus	301°16.0	13:43
Mars	348°49.2	10:32
Jupiter	250°19.1	17:04
Saturn	351°22.7	10:21

Apr 26 Sun	SHA	Mer.pass
Venus	300°00.1	13:45
Mars	348°06.7	10:31
Jupiter	250°10.9	17:01
Saturn	351°16.3	10:17

Apr 27 Mon	SHA	Mer.pass
Venus	298°43.9	13:46
Mars	347°24.2	10:30
Jupiter	250°02.5	16:57
Saturn	351°09.9	10:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°29.5	N13°07.5	73°52.8	10.7′	N17°46.6	12.8′	57.8′
1	195°29.6	08.3	88°22.6	10.8′	17°33.8	12.9′	57.8′
2	210°29.7	09.1	102°52.4	10.9′	17°20.9	13.0′	57.7′
3	225°29.8	·· 09.9	117°22.4	11.1′	17°07.9	13.0′	57.7′
4	240°29.9	10.7	131°52.4	11.2′	16°54.9	13.2′	57.7′
5	255°30.0	11.5	146°22.6	11.3′	16°41.7	13.2′	57.7′
6	270°30.1	N13°12.4	160°52.8	11.4′	N16°28.5	13.2′	57.6′
7	285°30.2	13.2	175°23.2	11.5′	16°15.3	13.4′	57.6′
8	300°30.4	14.0	189°53.6	11.6′	16°01.9	13.4′	57.6′
9	315°30.5	·· 14.8	204°24.2	11.7′	15°48.5	13.5′	57.6′
10	330°30.6	15.6	218°54.9	11.8′	15°35.0	13.5′	57.5′
11	345°30.7	16.4	233°25.6	11.9′	15°21.5	13.6′	57.5′
12	0°30.8	N13°17.2	247°56.5	12.0′	N15°07.9	13.6′	57.5′
13	15°30.9	18.1	262°27.4	12.0′	14°54.3	13.8′	57.4′
14	30°31.0	18.9	276°58.5	12.1′	14°40.5	13.7′	57.4′
15	45°31.1	·· 19.7	291°29.6	12.2′	14°26.8	13.9′	57.4′
16	60°31.2	20.5	306°00.9	12.3′	14°12.9	13.9′	57.4′
17	75°31.3	21.3	320°32.2	12.4′	13°59.0	13.9′	57.3′
18	90°31.4	N13°22.1	335°03.6	12.5′	N13°45.1	14.0′	57.3′
19	105°31.5	22.9	349°35.1	12.6′	13°31.1	14.0′	57.3′
20	120°31.6	23.7	4°06.7	12.7′	13°17.1	14.1′	57.3′
21	135°31.7	·· 24.5	18°38.4	12.8′	13°03.0	14.2′	57.2′
22	150°31.8	25.3	33°10.1	12.8′	12°48.8	14.1′	57.2′
23	165°31.9	26.1	47°42.0	12.9′	12°34.7	14.3′	57.2′
	SD = 15.9′	d = 0.8′	SD = 15.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.0	N13°27.0	62°13.9	13.0′	N12°20.4	14.2′	57.2′
1	195°32.1	27.8	76°45.9	13.1′	12°06.2	14.4′	57.1′
2	210°32.2	28.6	91°18.0	13.2′	11°51.8	14.3′	57.1′
3	225°32.3	·· 29.4	105°50.2	13.2′	11°37.5	14.4′	57.1′
4	240°32.4	30.2	120°22.4	13.3′	11°23.1	14.5′	57.0′
5	255°32.6	31.0	134°54.8	13.4′	11°08.6	14.4′	57.0′
6	270°32.7	N13°31.8	149°27.2	13.5′	N10°54.2	14.6′	57.0′
7	285°32.8	32.6	163°59.6	13.5′	10°39.6	14.5′	57.0′
8	300°32.9	33.4	178°32.2	13.6′	10°25.1	14.6′	56.9′
9	315°33.0	·· 34.2	193°04.8	13.7′	10°10.5	14.6′	56.9′
10	330°33.1	35.0	207°37.5	13.8′	09°55.9	14.6′	56.9′
11	345°33.2	35.8	222°10.2	13.8′	09°41.3	14.7′	56.9′
12	0°33.3	N13°36.6	236°43.1	13.9′	N09°26.6	14.7′	56.8′
13	15°33.4	37.4	251°15.9	14.0′	09°11.9	14.8′	56.8′
14	30°33.5	38.2	265°48.9	14.0′	08°57.1	14.7′	56.8′
15	45°33.6	·· 39.0	280°21.9	14.1′	08°42.4	14.8′	56.8′
16	60°33.7	39.8	294°55.0	14.1′	08°27.6	14.8′	56.7′
17	75°33.8	40.6	309°28.1	14.2′	08°12.8	14.9′	56.7′
18	90°33.9	N13°41.4	324°01.3	14.3′	N07°57.9	14.8′	56.7′
19	105°34.0	42.2	338°34.6	14.3′	07°43.1	14.9′	56.7′
20	120°34.1	43.0	353°07.9	14.4′	07°28.2	14.9′	56.6′
21	135°34.2	·· 43.8	7°41.3	14.4′	07°13.3	14.9′	56.6′
22	150°34.3	44.6	22°14.7	14.5′	06°58.4	14.9′	56.6′
23	165°34.4	45.4	36°48.2	14.5′	06°43.5	15.0′	56.6′
	SD = 15.9′	d = 0.8′	SD = 15.6′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°34.5	N13°46.2	51°21.7	14.6′	N06°28.5	15.0′	56.6′
1	195°34.6	47.0	65°55.3	14.6′	06°13.5	14.9′	56.5′
2	210°34.7	47.8	80°28.9	14.7′	05°58.6	15.0′	56.5′
3	225°34.8	·· 48.6	95°02.6	14.7′	05°43.6	15.0′	56.5′
4	240°34.9	49.4	109°36.3	14.8′	05°28.6	15.1′	56.5′
5	255°35.0	50.2	124°10.1	14.8′	05°13.5	15.0′	56.4′
6	270°35.1	N13°51.0	138°43.9	14.9′	N04°58.5	15.0′	56.4′
7	285°35.1	51.8	153°17.8	14.9′	04°43.5	15.1′	56.4′
8	300°35.2	52.6	167°51.7	14.9′	04°28.4	15.0′	56.4′
9	315°35.3	·· 53.4	182°25.6	15.0′	04°13.4	15.1′	56.3′
10	330°35.4	54.2	196°59.6	15.0′	03°58.3	15.0′	56.3′
11	345°35.5	55.0	211°33.6	15.1′	03°43.3	15.1′	56.3′
12	0°35.6	N13°55.8	226°07.7	15.1′	N03°28.2	15.1′	56.3′
13	15°35.7	56.6	240°41.8	15.1′	03°13.1	15.0′	56.2′
14	30°35.8	57.4	255°15.9	15.2′	02°58.1	15.1′	56.2′
15	45°35.9	·· 58.1	269°50.1	15.2′	02°43.0	15.1′	56.2′
16	60°36.0	58.9	284°24.3	15.2′	02°27.9	15.0′	56.2′
17	75°36.1	13°59.7	298°58.5	15.3′	02°12.9	15.1′	56.2′
18	90°36.2	N14°00.5	313°32.7	15.3′	N01°57.8	15.1′	56.1′
19	105°36.3	01.3	328°07.0	15.3′	01°42.7	15.0′	56.1′
20	120°36.4	02.1	342°41.3	15.3′	01°27.7	15.1′	56.1′
21	135°36.5	·· 02.9	357°15.7	15.4′	01°12.6	15.0′	56.1′
22	150°36.6	03.7	11°50.0	15.4′	00°57.6	15.1′	56.0′
23	165°36.7	04.5	26°24.4	15.4′	00°42.5	15.0′	56.0′
	SD = 15.9′	d = 0.8′	SD = 15.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	02:31	21:30	////	////
N 70°	////	00:52	02:59	21:00	23:21	////
68°	////	01:51	03:21	20:38	22:11	////
66°	////	02:24	03:37	20:21	21:36	////
64°	00:46	02:48	03:51	20:07	21:11	23:26
62°	01:38	03:06	04:02	19:55	20:52	22:23
60°	02:08	03:21	04:12	19:45	20:36	21:51
N 58°	02:30	03:34	04:20	19:37	20:23	21:28
56°	02:48	03:45	04:28	19:29	20:12	21:10
54°	03:02	03:54	04:34	19:22	20:03	20:56
52°	03:14	04:03	04:40	19:16	19:54	20:43
50°	03:25	04:10	04:46	19:11	19:47	20:32
45°	03:46	04:25	04:57	18:59	19:31	20:10
N 40°	04:03	04:38	05:07	18:50	19:18	19:54
35°	04:16	04:48	05:15	18:41	19:08	19:40
30°	04:27	04:57	05:22	18:34	18:59	19:29
20°	04:44	05:11	05:34	18:22	18:45	19:12
N 10°	04:58	05:23	05:45	18:11	18:33	18:58
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:51	18:13	18:38
20°	05:26	05:52	06:14	17:41	18:04	18:30
30°	05:33	06:01	06:26	17:29	17:54	18:22
35°	05:37	06:06	06:32	17:23	17:49	18:19
40°	05:40	06:12	06:40	17:15	17:43	18:15
45°	05:44	06:18	06:49	17:06	17:37	18:11
S 50°	05:47	06:25	06:59	16:56	17:30	18:07
52°	05:49	06:29	07:04	16:51	17:26	18:06
54°	05:50	06:32	07:09	16:46	17:23	18:04
56°	05:52	06:36	07:15	16:40	17:19	18:03
58°	05:54	06:40	07:22	16:33	17:15	18:01
S 60°	05:55	06:44	07:29	16:26	17:10	17:59

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	09:27	12:13	14:26	05:36	04:29	03:49
N 70°	10:07	12:28	14:30	04:54	04:11	03:42
68°	10:35	12:40	14:33	04:25	03:57	03:36
66°	10:55	12:50	14:36	04:03	03:45	03:30
64°	11:12	12:58	14:38	03:45	03:35	03:26
62°	11:25	13:05	14:40	03:31	03:26	03:22
60°	11:36	13:11	14:42	03:18	03:19	03:19
N 58°	11:46	13:17	14:43	03:08	03:13	03:16
56°	11:54	13:21	14:45	02:58	03:07	03:13
54°	12:02	13:26	14:46	02:50	03:02	03:11
52°	12:09	13:29	14:47	02:42	02:57	03:09
50°	12:15	13:33	14:48	02:35	02:53	03:07
45°	12:28	13:40	14:50	02:21	02:43	03:02
N 40°	12:38	13:46	14:52	02:09	02:35	02:58
35°	12:47	13:52	14:53	01:58	02:29	02:55
30°	12:55	13:56	14:55	01:49	02:23	02:52
20°	13:09	14:04	14:57	01:33	02:12	02:47
N 10°	13:21	14:11	14:59	01:19	02:03	02:43
0°	13:32	14:18	15:01	01:06	01:54	02:39
S 10°	13:43	14:24	15:03	00:53	01:45	02:34
20°	13:54	14:31	15:05	00:39	01:36	02:30
30°	14:08	14:39	15:08	00:22	01:25	02:25
35°	14:15	14:43	15:09	00:12	01:19	02:22
40°	14:24	14:49	15:11	00:01	01:11	02:18
45°	14:34	14:54	15:12	·· ··	01:03	02:14
S 50°	14:46	15:01	15:14	·· ··	00:52	02:09
52°	14:52	15:05	15:15	·· ··	00:48	02:07
54°	14:58	15:08	15:17	·· ··	00:42	02:04
56°	15:05	15:12	15:18	·· ··	00:36	02:02
58°	15:13	15:16	15:19	·· ··	00:30	01:59
S 60°	15:21	15:21	15:20	·· ··	00:22	01:55

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 60-79%
25	01:58	02:03	11:58	19:43	07:19	
26	02:08	02:13	11:58	20:28	08:06	
27	02:18	02:23	11:58	21:11	08:50	

April 28, 29, 30 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	215°59.0	153°26.5	N21°49.2	202°40.7	N04°42.8	105°53.0	N22°32.7	207°02.5	N01°30.0
1	231°01.4	168°25.7	49.9	217°41.4	43.6	120°55.1	32.6	222°04.7	30.1
2	246°03.9	183°25.0	50.5	232°42.1	44.3	135°57.2	32.6	237°06.9	30.2
3	261°06.4	198°24.3	·· 51.2	247°42.8	·· 45.1	150°59.3	·· 32.6	252°09.1	·· 30.3
4	276°08.8	213°23.6	51.9	262°43.5	45.9	166°01.4	32.5	267°11.3	30.4
5	291°11.3	228°22.8	52.5	277°44.2	46.6	181°03.5	32.5	282°13.5	30.5
6	306°13.8	243°22.1	N21°53.2	292°44.9	N04°47.4	196°05.6	N22°32.4	297°15.7	N01°30.6
7	321°16.2	258°21.4	53.9	307°45.6	48.1	211°07.7	32.4	312°17.9	30.8
8	336°18.7	273°20.6	54.5	322°46.3	48.9	226°09.9	32.3	327°20.1	30.9
9	351°21.2	288°19.9	·· 55.2	337°47.0	·· 49.7	241°12.0	·· 32.3	342°22.3	·· 31.0
10	6°23.6	303°19.2	55.8	352°47.7	50.4	256°14.1	32.3	357°24.5	31.1
11	21°26.1	318°18.5	56.5	7°48.4	51.2	271°16.2	32.2	12°26.7	31.2
12	36°28.6	333°17.7	N21°57.1	22°49.1	N04°51.9	286°18.3	N22°32.2	27°28.9	N01°31.3
13	51°31.0	348°17.0	57.8	37°49.8	52.7	301°20.4	32.1	42°31.1	31.4
14	66°33.5	3°16.3	58.4	52°50.4	53.4	316°22.5	32.1	57°33.3	31.5
15	81°35.9	18°15.5	·· 59.1	67°51.1	·· 54.2	331°24.6	·· 32.0	72°35.5	·· 31.6
16	96°38.4	33°14.8	21°59.7	82°51.8	55.0	346°26.7	32.0	87°37.7	31.7
17	111°40.9	48°14.1	22°00.4	97°52.5	55.7	1°28.8	31.9	102°39.9	31.8
18	126°43.3	63°13.3	N22°01.0	112°53.2	N04°56.5	16°30.9	N22°31.9	117°42.1	N01°31.9
19	141°45.8	78°12.6	01.7	127°53.9	57.2	31°33.0	31.9	132°44.3	32.0
20	156°48.3	93°11.9	02.3	142°54.6	58.0	46°35.1	31.8	147°46.5	32.2
21	171°50.7	108°11.1	·· 03.0	157°55.3	·· 58.7	61°37.2	·· 31.8	162°48.7	·· 32.3
22	186°53.2	123°10.4	03.6	172°56.0	04°59.5	76°39.3	31.7	177°50.9	32.4
23	201°55.7	138°09.7	04.3	187°56.7	05°00.2	91°41.4	31.7	192°53.1	32.5
Mer.pass. 09:34		ν -0.7′	d 0.7′	m -3.92	ν 0.7′	d 0.8′	m 1.22	ν 2.1′	d 0.0′ m -2.03	ν 2.2′	d 0.1′ m 0.93

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°58.1	153°08.9	N22°04.9	202°57.4	N05°01.0	106°43.5	N22°31.6	207°55.3	N01°32.6
1	232°00.6	168°08.2	05.6	217°58.1	01.8	121°45.6	31.6	222°57.5	32.7
2	247°03.0	183°07.5	06.2	232°58.8	02.5	136°47.7	31.5	237°59.7	32.8
3	262°05.5	198°06.7	·· 06.8	247°59.5	·· 03.3	151°49.8	·· 31.5	253°01.9	·· 32.9
4	277°08.0	213°06.0	07.5	263°00.2	04.0	166°51.9	31.4	268°04.1	33.0
5	292°10.4	228°05.3	08.1	278°00.9	04.8	181°54.0	31.4	283°06.3	33.1
6	307°12.9	243°04.5	N22°08.7	293°01.5	N05°05.5	196°56.1	N22°31.4	298°08.5	N01°33.2
7	322°15.4	258°03.8	09.4	308°02.2	06.3	211°58.2	31.3	313°10.7	33.3
8	337°17.8	273°03.1	10.0	323°02.9	07.0	227°00.3	31.3	328°12.9	33.4
9	352°20.3	288°02.3	·· 10.6	338°03.6	·· 07.8	242°02.4	·· 31.2	343°15.1	·· 33.5
10	7°22.8	303°01.6	11.3	353°04.3	08.6	257°04.5	31.2	358°17.3	33.7
11	22°25.2	318°00.8	11.9	8°05.0	09.3	272°06.6	31.1	13°19.5	33.8
12	37°27.7	333°00.1	N22°12.5	23°05.7	N05°10.1	287°08.7	N22°31.1	28°21.7	N01°33.9
13	52°30.2	347°59.4	13.2	38°06.4	10.8	302°10.8	31.0	43°23.9	34.0
14	67°32.6	2°58.6	13.8	53°07.1	11.6	317°12.9	31.0	58°26.1	34.1
15	82°35.1	17°57.9	·· 14.4	68°07.8	·· 12.3	332°15.0	·· 30.9	73°28.3	·· 34.2
16	97°37.5	32°57.2	15.0	83°08.5	13.1	347°17.1	30.9	88°30.5	34.3
17	112°40.0	47°56.4	15.7	98°09.2	13.8	2°19.2	30.9	103°32.7	34.4
18	127°42.5	62°55.7	N22°16.3	113°09.9	N05°14.6	17°21.3	N22°30.8	118°34.9	N01°34.5
19	142°44.9	77°54.9	16.9	128°10.6	15.3	32°23.4	30.8	133°37.1	34.6
20	157°47.4	92°54.2	17.5	143°11.3	16.1	47°25.5	30.7	148°39.3	34.7
21	172°49.9	107°53.4	·· 18.1	158°12.0	·· 16.9	62°27.6	·· 30.7	163°41.5	·· 34.8
22	187°52.3	122°52.7	18.8	173°12.6	17.6	77°29.7	30.6	178°43.7	34.9
23	202°54.8	137°52.0	19.4	188°13.3	18.4	92°31.8	30.6	193°45.9	35.0
Mer.pass. 09:31		ν -0.7′	d 0.6′	m -3.92	ν 0.7′	d 0.8′	m 1.22	ν 2.1′	d 0.0′ m -2.02	ν 2.2′	d 0.1′ m 0.93

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°57.3	152°51.2	N22°20.0	203°14.0	N05°19.1	107°33.9	N22°30.5	208°48.1	N01°35.1
1	232°59.7	167°50.5	20.6	218°14.7	19.9	122°36.0	30.5	223°50.3	35.3
2	248°02.2	182°49.7	21.2	233°15.4	20.6	137°38.1	30.4	238°52.5	35.4
3	263°04.7	197°49.0	·· 21.8	248°16.1	·· 21.4	152°40.2	·· 30.4	253°54.7	·· 35.5
4	278°07.1	212°48.2	22.5	263°16.8	22.1	167°42.3	30.3	268°56.9	35.6
5	293°09.6	227°47.5	23.1	278°17.5	22.9	182°44.3	30.3	283°59.1	35.7
6	308°12.0	242°46.7	N22°23.7	293°18.2	N05°23.6	197°46.4	N22°30.3	299°01.3	N01°35.8
7	323°14.5	257°46.0	24.3	308°18.9	24.4	212°48.5	30.2	314°03.5	35.9
8	338°17.0	272°45.3	24.9	323°19.6	25.1	227°50.6	30.2	329°05.7	36.0
9	353°19.4	287°44.5	·· 25.5	338°20.3	·· 25.9	242°52.7	·· 30.1	344°07.9	·· 36.1
10	8°21.9	302°43.8	26.1	353°21.0	26.6	257°54.8	30.1	359°10.1	36.2
11	23°24.4	317°43.0	26.7	8°21.7	27.4	272°56.9	30.0	14°12.3	36.3
12	38°26.8	332°42.3	N22°27.3	23°22.4	N05°28.1	287°59.0	N22°30.0	29°14.5	N01°36.4
13	53°29.3	347°41.5	27.9	38°23.0	28.9	303°01.1	29.9	44°16.7	36.5
14	68°31.8	2°40.8	28.5	53°23.7	29.6	318°03.2	29.9	59°18.9	36.6
15	83°34.2	17°40.0	·· 29.1	68°24.4	·· 30.4	333°05.3	·· 29.8	74°21.1	·· 36.7
16	98°36.7	32°39.3	29.7	83°25.1	31.2	348°07.4	29.8	89°23.3	36.8
17	113°39.1	47°38.5	30.3	98°25.8	31.9	3°09.5	29.7	104°25.5	37.0
18	128°41.6	62°37.8	N22°30.9	113°26.5	N05°32.7	18°11.6	N22°29.7	119°27.7	N01°37.1
19	143°44.1	77°37.0	31.5	128°27.2	33.4	33°13.7	29.7	134°29.9	37.2
20	158°46.5	92°36.3	32.1	143°27.9	34.2	48°15.7	29.6	149°32.1	37.3
21	173°49.0	107°35.5	·· 32.7	158°28.6	·· 34.9	63°17.8	·· 29.6	164°34.3	·· 37.4
22	188°51.5	122°34.8	33.3	173°29.3	35.7	78°19.9	29.5	179°36.5	37.5
23	203°53.9	137°34.0	33.9	188°30.0	36.4	93°22.0	29.5	194°38.7	37.6
Mer.pass. 09:27		ν -0.7′	d 0.6′	m -3.92	ν 0.7′	d 0.8′	m 1.22	ν 2.1′	d 0.0′ m -2.02	ν 2.2′	d 0.1′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.4	-42°09.7
Schedar	349°30.3	56°40.7
Diphda	348°46.5	-17°50.5
Achernar	335°20.0	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°59.0	89°22.5
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.2	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.4	-59°35.9
Suhail	222°45.5	-43°32.6
Miaplacidus	221°38.0	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.3	-63°14.9
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.8
Hadar	148°33.9	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.7
Kochab	137°18.6	74°02.7
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.2	-26°29.5
Atria	107°07.0	-69°04.3
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.3	51°28.8
Kaus Aust.	83°30.9	-34°22.2
Vega	80°32.3	38°48.2
Nunki	75°46.3	-26°15.8
Altair	61°58.8	8°56.1
Peacock	53°04.0	-56°38.8
Deneb	49°25.1	45°22.1
Enif	33°37.8	9°59.6
Al Na'ir	27°31.7	-46°49.8
Fomalhaut	15°13.5	-29°28.9
Scheat	13°44.4	28°13.3
Markab	13°29.0	15°20.7

Apr 28 Tue	SHA	Mer.pass
Venus	297°27.5	13:47
Mars	346°41.7	10:29
Jupiter	249°54.0	16:54
Saturn	351°03.5	10:10

Apr 29 Wed	SHA	Mer.pass
Venus	296°10.8	13:48
Mars	345°59.3	10:28
Jupiter	249°45.4	16:51
Saturn	350°57.1	10:07

Apr 30 Thu	SHA	Mer.pass
Venus	294°54.0	13:49
Mars	345°16.8	10:27
Jupiter	249°36.6	16:47
Saturn	350°50.8	10:03

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.0495 sec ΔT = TT-UT1 = +69.1345 sec

2026 April 28 to Apr. 30 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°36.8	N14°05.3	40°58.8	15.4′	N00°27.5	15.1′	56.0′
1	195°36.9	06.0	55°33.2	15.4′	N00°12.4	15.0′	56.0′
2	210°37.0	06.8	70°07.7	15.5′	S00°02.6	15.0′	56.0′
3	225°37.0	·· 07.6	84°42.2	15.5′	00°17.6	15.0′	55.9′
4	240°37.1	08.4	99°16.6	15.5′	00°32.6	15.0′	55.9′
5	255°37.2	09.2	113°51.1	15.5′	00°47.6	14.9′	55.9′
6	270°37.3	N14°10.0	128°25.7	15.5′	S01°02.5	15.0′	55.9′
7	285°37.4	10.8	143°00.2	15.5′	01°17.5	14.9′	55.9′
8	300°37.5	11.5	157°34.7	15.6′	01°32.4	14.9′	55.8′
9	315°37.6	·· 12.3	172°09.3	15.6′	01°47.3	14.9′	55.8′
10	330°37.7	13.1	186°43.9	15.6′	02°02.2	14.9′	55.8′
11	345°37.8	13.9	201°18.4	15.6′	02°17.1	14.9′	55.8′
12	0°37.9	N14°14.7	215°53.0	15.6′	S02°32.0	14.8′	55.8′
13	15°38.0	15.5	230°27.6	15.6′	02°46.8	14.9′	55.7′
14	30°38.1	16.2	245°02.2	15.6′	03°01.7	14.8′	55.7′
15	45°38.1	·· 17.0	259°36.8	15.6′	03°16.5	14.8′	55.7′
16	60°38.2	17.8	274°11.4	15.6′	03°31.3	14.7′	55.7′
17	75°38.3	18.6	288°46.0	15.6′	03°46.0	14.7′	55.7′
18	90°38.4	N14°19.4	303°20.6	15.6′	S04°00.7	14.8′	55.6′
19	105°38.5	20.2	317°55.3	15.6′	04°15.5	14.6′	55.6′
20	120°38.6	20.9	332°29.9	15.6′	04°30.1	14.7′	55.6′
21	135°38.7	·· 21.7	347°04.5	15.6′	04°44.8	14.6′	55.6′
22	150°38.8	22.5	1°39.1	15.6′	04°59.4	14.6′	55.6′
23	165°38.9	23.3	16°13.7	15.6′	05°14.0	14.6′	55.5′
	SD = 15.9′	d = 0.8′	SD = 15.3′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°39.0	N14°24.1	30°48.3	15.6′	S05°28.6	14.5′	55.5′
1	195°39.0	24.8	45°22.9	15.6′	05°43.1	14.5′	55.5′
2	210°39.1	25.6	59°57.5	15.6′	05°57.6	14.5′	55.5′
3	225°39.2	·· 26.4	74°32.1	15.6′	06°12.1	14.4′	55.5′
4	240°39.3	27.2	89°06.6	15.6′	06°26.5	14.4′	55.4′
5	255°39.4	27.9	103°41.2	15.6′	06°40.9	14.4′	55.4′
6	270°39.5	N14°28.7	118°15.8	15.5′	S06°55.3	14.3′	55.4′
7	285°39.6	29.5	132°50.3	15.5′	07°09.6	14.3′	55.4′
8	300°39.6	30.3	147°24.8	15.5′	07°23.9	14.3′	55.4′
9	315°39.7	·· 31.0	161°59.4	15.5′	07°38.2	14.2′	55.3′
10	330°39.8	31.8	176°33.9	15.5′	07°52.4	14.2′	55.3′
11	345°39.9	32.6	191°08.3	15.5′	08°06.6	14.1′	55.3′
12	0°40.0	N14°33.4	205°42.8	15.5′	S08°20.7	14.1′	55.3′
13	15°40.1	34.1	220°17.3	15.4′	08°34.8	14.1′	55.3′
14	30°40.2	34.9	234°51.7	15.4′	08°48.9	14.0′	55.3′
15	45°40.2	·· 35.7	249°26.1	15.4′	09°02.9	14.0′	55.2′
16	60°40.3	36.5	264°00.5	15.4′	09°16.9	13.9′	55.2′
17	75°40.4	37.2	278°34.9	15.4′	09°30.8	13.9′	55.2′
18	90°40.5	N14°38.0	293°09.2	15.3′	S09°44.7	13.8′	55.2′
19	105°40.6	38.8	307°43.6	15.3′	09°58.5	13.8′	55.2′
20	120°40.7	39.5	322°17.9	15.3′	10°12.3	13.7′	55.1′
21	135°40.8	·· 40.3	336°52.2	15.3′	10°26.0	13.7′	55.1′
22	150°40.8	41.1	351°26.4	15.2′	10°39.7	13.6′	55.1′
23	165°40.9	41.8	6°00.6	15.2′	10°53.3	13.6′	55.1′
	SD = 15.9′	d = 0.8′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°41.0	N14°42.6	20°34.8	15.2′	S11°06.9	13.6′	55.1′
1	195°41.1	43.4	35°09.0	15.1′	11°20.5	13.4′	55.1′
2	210°41.2	44.2	49°43.2	15.1′	11°33.9	13.5′	55.0′
3	225°41.3	·· 44.9	64°17.3	15.1′	11°47.4	13.3′	55.0′
4	240°41.3	45.7	78°51.4	15.1′	12°00.7	13.4′	55.0′
5	255°41.4	46.5	93°25.4	15.0′	12°14.1	13.2′	55.0′
6	270°41.5	N14°47.2	107°59.4	15.0′	S12°27.3	13.2′	55.0′
7	285°41.6	48.0	122°33.4	15.0′	12°40.5	13.2′	55.0′
8	300°41.7	48.8	137°07.4	14.9′	12°53.7	13.0′	54.9′
9	315°41.7	·· 49.5	151°41.3	14.9′	13°06.7	13.1′	54.9′
10	330°41.8	50.3	166°15.2	14.8′	13°19.8	12.9′	54.9′
11	345°41.9	51.0	180°49.0	14.8′	13°32.7	12.9′	54.9′
12	0°42.0	N14°51.8	195°22.8	14.8′	S13°45.6	12.9′	54.9′
13	15°42.1	52.6	209°56.6	14.7′	13°58.5	12.8′	54.9′
14	30°42.1	53.3	224°30.3	14.7′	14°11.3	12.7′	54.9′
15	45°42.2	·· 54.1	239°04.0	14.7′	14°24.0	12.6′	54.8′
16	60°42.3	54.9	253°37.7	14.6′	14°36.6	12.6′	54.8′
17	75°42.4	55.6	268°11.3	14.6′	14°49.2	12.5′	54.8′
18	90°42.5	N14°56.4	282°44.9	14.5′	S15°01.7	12.5′	54.8′
19	105°42.5	57.1	297°18.4	14.5′	15°14.2	12.3′	54.8′
20	120°42.6	57.9	311°51.9	14.4′	15°26.5	12.4′	54.8′
21	135°42.7	·· 58.7	326°25.3	14.4′	15°38.9	12.2′	54.8′
22	150°42.8	14°59.4	340°58.7	14.4′	15°51.1	12.2′	54.7′
23	165°42.9	15°00.2	355°32.1	14.3′	16°03.3	12.1′	54.7′
	SD = 15.9′	d = 0.8′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:09	21:52	////	////
N 70°	////	////	02:43	21:16	////	////
68°	////	01:27	03:07	20:51	22:36	////
66°	////	02:08	03:25	20:32	21:52	////
64°	////	02:35	03:40	20:16	21:24	////
62°	01:17	02:55	03:53	20:04	21:02	22:45
60°	01:53	03:12	04:04	19:53	20:45	22:06
N 58°	02:18	03:25	04:13	19:43	20:31	21:40
56°	02:38	03:37	04:21	19:35	20:19	21:20
54°	02:53	03:47	04:28	19:28	20:09	21:03
52°	03:07	03:56	04:34	19:21	20:00	20:50
50°	03:18	04:04	04:40	19:16	19:52	20:38
45°	03:41	04:20	04:53	19:03	19:35	20:15
N 40°	03:58	04:34	05:03	18:53	19:22	19:57
35°	04:12	04:45	05:11	18:44	19:11	19:43
30°	04:24	04:54	05:19	18:36	19:01	19:31
20°	04:42	05:09	05:32	18:23	18:46	19:13
N 10°	04:56	05:22	05:43	18:11	18:33	18:59
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:50	18:12	18:37
20°	05:26	05:53	06:15	17:39	18:02	18:28
30°	05:35	06:03	06:28	17:27	17:51	18:20
35°	05:39	06:09	06:35	17:19	17:46	18:16
40°	05:43	06:15	06:43	17:11	17:39	18:11
45°	05:47	06:22	06:52	17:02	17:32	18:07
S 50°	05:51	06:30	07:04	16:50	17:24	18:03
52°	05:53	06:33	07:09	16:45	17:21	18:01
54°	05:55	06:37	07:15	16:39	17:17	17:59
56°	05:57	06:41	07:21	16:33	17:13	17:57
58°	05:59	06:46	07:28	16:26	17:08	17:54
S 60°	06:01	06:51	07:36	16:18	17:03	17:52

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	16:31	18:40	21:17	03:16	02:43	02:03
N 70°	16:25	18:23	20:35	03:16	02:51	02:22
68°	16:21	18:10	20:07	03:17	02:58	02:38
66°	16:17	17:59	19:46	03:17	03:04	02:50
64°	16:14	17:50	19:30	03:18	03:09	03:00
62°	16:11	17:43	19:16	03:18	03:14	03:09
60°	16:09	17:36	19:05	03:18	03:18	03:17
N 58°	16:07	17:30	18:55	03:19	03:21	03:24
56°	16:05	17:25	18:46	03:19	03:24	03:30
54°	16:04	17:21	18:38	03:19	03:27	03:36
52°	16:02	17:17	18:32	03:19	03:29	03:41
50°	16:01	17:13	18:26	03:19	03:32	03:45
45°	15:58	17:05	18:12	03:20	03:37	03:55
N 40°	15:55	16:58	18:02	03:20	03:41	04:03
35°	15:53	16:53	17:53	03:20	03:45	04:10
30°	15:52	16:48	17:45	03:20	03:48	04:16
20°	15:48	16:39	17:31	03:21	03:54	04:27
N 10°	15:46	16:32	17:19	03:21	03:59	04:37
0°	15:43	16:25	17:08	03:21	04:03	04:45
S 10°	15:41	16:18	16:57	03:22	04:08	04:54
20°	15:38	16:11	16:45	03:22	04:13	05:04
30°	15:35	16:03	16:32	03:22	04:19	05:15
35°	15:33	15:58	16:24	03:22	04:22	05:22
40°	15:32	15:53	16:16	03:23	04:26	05:29
45°	15:29	15:47	16:06	03:23	04:30	05:37
S 50°	15:27	15:40	15:54	03:23	04:36	05:48
52°	15:26	15:36	15:48	03:23	04:38	05:53
54°	15:24	15:33	15:42	03:23	04:41	05:58
56°	15:23	15:29	15:35	03:23	04:44	06:04
58°	15:21	15:24	15:28	03:24	04:47	06:11
S 60°	15:20	15:19	15:19	03:24	04:51	06:18

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 87-97%
28	02:27	02:32	11:57	21:53	09:32	
29	02:36	02:40	11:57	22:35	10:14	
30	02:44	02:48	11:57	23:18	10:57	

May 01, 02, 03 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°56.4	152°33.3	N22°34.5	203°30.7	N05°37.2	108°24.1	N22°29.4	209°40.9	N01°37.7
1	233°58.9	167°32.5	35.1	218°31.4	37.9	123°26.2	29.4	224°43.1	37.8
2	249°01.3	182°31.8	35.7	233°32.1	38.7	138°28.3	29.3	239°45.3	37.9
3	264°03.8	197°31.0	·· 36.2	248°32.8	·· 39.4	153°30.4	·· 29.3	254°47.5	·· 38.0
4	279°06.3	212°30.3	36.8	263°33.5	40.2	168°32.5	29.2	269°49.8	38.1
5	294°08.7	227°29.5	37.4	278°34.1	40.9	183°34.6	29.2	284°52.0	38.2
6	309°11.2	242°28.7	N22°38.0	293°34.8	N05°41.7	198°36.6	N22°29.1	299°54.2	N01°38.3
7	324°13.6	257°28.0	38.6	308°35.5	42.4	213°38.7	29.1	314°56.4	38.4
8	339°16.1	272°27.2	39.2	323°36.2	43.2	228°40.8	29.0	329°58.6	38.5
9	354°18.6	287°26.5	·· 39.7	338°36.9	·· 43.9	243°42.9	·· 29.0	345°00.8	·· 38.6
10	9°21.0	302°25.7	40.3	353°37.6	44.7	258°45.0	28.9	0°03.0	38.7
11	24°23.5	317°25.0	40.9	8°38.3	45.4	273°47.1	28.9	15°05.2	38.9
12	39°26.0	332°24.2	N22°41.5	23°39.0	N05°46.2	288°49.2	N22°28.8	30°07.4	N01°39.0
13	54°28.4	347°23.5	42.1	38°39.7	46.9	303°51.3	28.8	45°09.6	39.1
14	69°30.9	2°22.7	42.6	53°40.4	47.7	318°53.4	28.8	60°11.8	39.2
15	84°33.4	17°21.9	·· 43.2	68°41.1	·· 48.4	333°55.4	·· 28.7	75°14.0	·· 39.3
16	99°35.8	32°21.2	43.8	83°41.8	49.1	348°57.5	28.7	90°16.2	39.4
17	114°38.3	47°20.4	44.4	98°42.5	49.9	3°59.6	28.6	105°18.4	39.5
18	129°40.8	62°19.7	N22°44.9	113°43.2	N05°50.6	19°01.7	N22°28.6	120°20.6	N01°39.6
19	144°43.2	77°18.9	45.5	128°43.8	51.4	34°03.8	28.5	135°22.8	39.7
20	159°45.7	92°18.1	46.1	143°44.5	52.1	49°05.9	28.5	150°25.0	39.8
21	174°48.1	107°17.4	·· 46.6	158°45.2	·· 52.9	64°08.0	·· 28.4	165°27.2	·· 39.9
22	189°50.6	122°16.6	47.2	173°45.9	53.6	79°10.0	28.4	180°29.4	40.0
23	204°53.1	137°15.9	47.8	188°46.6	54.4	94°12.1	28.3	195°31.6	40.1
Mer.pass. 09:23		ν -0.8′	d 0.6′	ν 0.7′	d 0.8′	ν 2.1′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.23		m -2.01		m 0.93	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°55.5	152°15.1	N22°48.3	203°47.3	N05°55.1	109°14.2	N22°28.3	210°33.8	N01°40.2
1	234°58.0	167°14.3	48.9	218°48.0	55.9	124°16.3	28.2	225°36.0	40.3
2	250°00.5	182°13.6	49.5	233°48.7	56.6	139°18.4	28.2	240°38.2	40.4
3	265°02.9	197°12.8	·· 50.0	248°49.4	·· 57.4	154°20.5	·· 28.1	255°40.4	·· 40.5
4	280°05.4	212°12.1	50.6	263°50.1	58.1	169°22.6	28.1	270°42.6	40.6
5	295°07.9	227°11.3	51.1	278°50.8	58.9	184°24.6	28.0	285°44.8	40.7
6	310°10.3	242°10.5	N22°51.7	293°51.5	N05°59.6	199°26.7	N22°28.0	300°47.1	N01°40.8
7	325°12.8	257°09.8	52.3	308°52.2	06°00.4	214°28.8	27.9	315°49.3	40.9
8	340°15.2	272°09.0	52.8	323°52.9	01.1	229°30.9	27.9	330°51.5	41.1
9	355°17.7	287°08.2	·· 53.4	338°53.5	·· 01.9	244°33.0	·· 27.8	345°53.7	·· 41.2
10	10°20.2	302°07.5	53.9	353°54.2	02.6	259°35.1	27.8	0°55.9	41.3
11	25°22.6	317°06.7	54.5	8°54.9	03.3	274°37.1	27.7	15°58.1	41.4
12	40°25.1	332°05.9	N22°55.0	23°55.6	N06°04.1	289°39.2	N22°27.7	31°00.3	N01°41.5
13	55°27.6	347°05.2	55.6	38°56.3	04.8	304°41.3	27.6	46°02.5	41.6
14	70°30.0	2°04.4	56.1	53°57.0	05.6	319°43.4	27.6	61°04.7	41.7
15	85°32.5	17°03.7	·· 56.7	68°57.7	·· 06.3	334°45.5	·· 27.5	76°06.9	·· 41.8
16	100°35.0	32°02.9	57.2	83°58.4	07.1	349°47.6	27.5	91°09.1	41.9
17	115°37.4	47°02.1	57.8	98°59.1	07.8	4°49.6	27.4	106°11.3	42.0
18	130°39.9	62°01.4	N22°58.3	113°59.8	N06°08.6	19°51.7	N22°27.4	121°13.5	N01°42.1
19	145°42.4	77°00.6	58.9	129°00.5	09.3	34°53.8	27.4	136°15.7	42.2
20	160°44.8	91°59.8	59.4	144°01.2	10.1	49°55.9	27.3	151°17.9	42.3
21	175°47.3	106°59.1	22°59.9	159°01.9	·· 10.8	64°58.0	·· 27.3	166°20.1	·· 42.4
22	190°49.7	121°58.3	23°00.5	174°02.6	11.5	80°00.0	27.2	181°22.3	42.5
23	205°52.2	136°57.5	01.0	189°03.2	12.3	95°02.1	27.2	196°24.5	42.6
Mer.pass. 09:19		ν -0.8′	d 0.6′	ν 0.7′	d 0.7′	ν 2.1′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.23		m -2.01		m 0.93	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°54.7	151°56.7	N23°01.6	204°03.9	N06°13.0	110°04.2	N22°27.1	211°26.7	N01°42.7
1	235°57.1	166°56.0	02.1	219°04.6	13.8	125°06.3	27.1	226°29.0	42.8
2	250°59.6	181°55.2	02.6	234°05.3	14.5	140°08.4	27.0	241°31.2	42.9
3	266°02.1	196°54.4	·· 03.2	249°06.0	·· 15.3	155°10.4	·· 27.0	256°33.4	·· 43.0
4	281°04.5	211°53.7	03.7	264°06.7	16.0	170°12.5	26.9	271°35.6	43.1
5	296°07.0	226°52.9	04.2	279°07.4	16.8	185°14.6	26.9	286°37.8	43.2
6	311°09.5	241°52.1	N23°04.8	294°08.1	N06°17.5	200°16.7	N22°26.8	301°40.0	N01°43.3
7	326°11.9	256°51.4	05.3	309°08.8	18.2	215°18.8	26.8	316°42.2	43.5
8	341°14.4	271°50.6	05.8	324°09.5	19.0	230°20.8	26.7	331°44.4	43.6
9	356°16.9	286°49.8	·· 06.4	339°10.2	·· 19.7	245°22.9	·· 26.7	346°46.6	·· 43.7
10	11°19.3	301°49.0	06.9	354°10.9	20.5	260°25.0	26.6	1°48.8	43.8
11	26°21.8	316°48.3	07.4	9°11.6	21.2	275°27.1	26.6	16°51.0	43.9
12	41°24.2	331°47.5	N23°07.9	24°12.2	N06°22.0	290°29.1	N22°26.5	31°53.2	N01°44.0
13	56°26.7	346°46.7	08.5	39°12.9	22.7	305°31.2	26.5	46°55.4	44.1
14	71°29.2	1°45.9	09.0	54°13.6	23.4	320°33.3	26.4	61°57.6	44.2
15	86°31.6	16°45.2	·· 09.5	69°14.3	·· 24.2	335°35.4	·· 26.4	76°59.8	·· 44.3
16	101°34.1	31°44.4	10.0	84°15.0	24.9	350°37.5	26.3	92°02.0	44.4
17	116°36.6	46°43.6	10.6	99°15.7	25.7	5°39.5	26.3	107°04.3	44.5
18	131°39.0	61°42.8	N23°11.1	114°16.4	N06°26.4	20°41.6	N22°26.2	122°06.5	N01°44.6
19	146°41.5	76°42.1	11.6	129°17.1	27.2	35°43.7	26.2	137°08.7	44.7
20	161°44.0	91°41.3	12.1	144°17.8	27.9	50°45.8	26.1	152°10.9	44.8
21	176°46.4	106°40.5	·· 12.6	159°18.5	·· 28.6	65°47.8	·· 26.1	167°13.1	·· 44.9
22	191°48.9	121°39.7	13.1	174°19.2	29.4	80°49.9	26.0	182°15.3	45.0
23	206°51.3	136°39.0	13.6	189°19.9	30.1	95°52.0	26.0	197°17.5	45.1
Mer.pass. 09:15		ν -0.8′	d 0.5′	ν 0.7′	d 0.7′	ν 2.1′	d 0.0′	ν 2.2′	d 0.1′
		m -3.92		m 1.23		m -2.00		m 0.93	

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.0
Ankaa	353°06.4	-42°09.7
Schedar	349°30.3	56°40.7
Diphda	348°46.5	-17°50.5
Achernar	335°19.9	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°58.9	89°22.5
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.3
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.4	-59°35.9
Suhail	222°45.5	-43°32.6
Miaplacidus	221°38.0	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.3	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.0
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.9	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.7
Kochab	137°18.6	74°02.7
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.2	-26°29.5
Atria	107°07.0	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.3	51°28.8
Kaus Aust.	83°30.9	-34°22.2
Vega	80°32.3	38°48.2
Nunki	75°46.3	-26°15.8
Altair	61°58.8	8°56.1
Peacock	53°04.0	-56°38.8
Deneb	49°25.1	45°22.1
Enif	33°37.8	9°59.6
Al Na'ir	27°31.7	-46°49.8
Fomalhaut	15°13.5	-29°28.9
Scheat	13°44.4	28°13.3
Markab	13°29.0	15°20.7

May 01 Fri	SHA	Mer.pass
Venus	293°36.9	13:50
Mars	344°34.3	10:25
Jupiter	249°27.7	16:44
Saturn	350°44.5	10:00

May 02 Sat	SHA	Mer.pass
Venus	292°19.6	13:52
Mars	343°51.8	10:24
Jupiter	249°18.7	16:41
Saturn	350°38.3	09:56

May 03 Sun	SHA	Mer.pass
Venus	291°02.1	13:53
Mars	343°09.3	10:23
Jupiter	249°09.5	16:37
Saturn	350°32.1	09:53

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°42.9	N15°00.9	10°05.4	14.3′	S16°15.4	12.0′	54.7′
1	195°43.0	01.7	24°38.7	14.2′	16°27.4	11.9′	54.7′
2	210°43.1	02.5	39°11.9	14.2′	16°39.3	11.9′	54.7′
3	225°43.2	·· 03.2	53°45.1	14.1′	16°51.2	11.8′	54.7′
4	240°43.2	04.0	68°18.2	14.1′	17°03.0	11.7′	54.7′
5	255°43.3	04.7	82°51.3	14.0′	17°14.7	11.7′	54.6′
6	270°43.4	N15°05.5	97°24.3	14.0′	S17°26.4	11.5′	54.6′
7	285°43.5	06.2	111°57.3	13.9′	17°37.9	11.5′	54.6′
8	300°43.5	07.0	126°30.3	13.9′	17°49.4	11.4′	54.6′
9	315°43.6	·· 07.7	141°03.2	13.8′	18°00.8	11.4′	54.6′
10	330°43.7	08.5	155°36.0	13.8′	18°12.2	11.2′	54.6′
11	345°43.8	09.3	170°08.8	13.7′	18°23.4	11.2′	54.6′
12	0°43.8	N15°10.0	184°41.5	13.7′	S18°34.6	11.1′	54.5′
13	15°43.9	10.8	199°14.2	13.6′	18°45.7	11.0′	54.5′
14	30°44.0	11.5	213°46.8	13.6′	18°56.7	10.9′	54.5′
15	45°44.1	·· 12.3	228°19.4	13.5′	19°07.6	10.8′	54.5′
16	60°44.1	13.0	242°52.0	13.5′	19°18.4	10.7′	54.5′
17	75°44.2	13.8	257°24.4	13.4′	19°29.1	10.7′	54.5′
18	90°44.3	N15°14.5	271°56.9	13.4′	S19°39.8	10.6′	54.5′
19	105°44.4	15.3	286°29.2	13.3′	19°50.4	10.4′	54.5′
20	120°44.4	16.0	301°01.6	13.3′	20°00.8	10.4′	54.4′
21	135°44.5	·· 16.8	315°33.8	13.2′	20°11.2	10.3′	54.4′
22	150°44.6	17.5	330°06.0	13.2′	20°21.5	10.2′	54.4′
23	165°44.6	18.3	344°38.2	13.1′	20°31.7	10.1′	54.4′
	SD = 15.9′	d = 0.8′		SD = 14.9′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.7	N15°19.0	359°10.3	13.1′	S20°41.8	10.0′	54.4′
1	195°44.8	19.8	13°42.4	13.0′	20°51.8	10.0′	54.4′
2	210°44.9	20.5	28°14.4	12.9′	21°01.8	9.8′	54.4′
3	225°44.9	·· 21.3	42°46.3	12.9′	21°11.6	9.7′	54.4′
4	240°45.0	22.0	57°18.2	12.8′	21°21.3	9.6′	54.4′
5	255°45.1	22.7	71°50.0	12.8′	21°30.9	9.6′	54.3′
6	270°45.1	N15°23.5	86°21.8	12.7′	S21°40.5	9.4′	54.3′
7	285°45.2	24.2	100°53.5	12.7′	21°49.9	9.3′	54.3′
8	300°45.3	25.0	115°25.2	12.6′	21°59.2	9.3′	54.3′
9	315°45.4	·· 25.7	129°56.8	12.6′	22°08.5	9.1′	54.3′
10	330°45.4	26.5	144°28.4	12.5′	22°17.6	9.1′	54.3′
11	345°45.5	27.2	158°59.9	12.4′	22°26.7	8.9′	54.3′
12	0°45.6	N15°28.0	173°31.3	12.4′	S22°35.6	8.8′	54.3′
13	15°45.6	28.7	188°02.7	12.3′	22°44.4	8.7′	54.3′
14	30°45.7	29.4	202°34.0	12.3′	22°53.1	8.7′	54.3′
15	45°45.8	·· 30.2	217°05.3	12.2′	23°01.8	8.5′	54.2′
16	60°45.8	30.9	231°36.6	12.2′	23°10.3	8.4′	54.2′
17	75°45.9	31.7	246°07.7	12.1′	23°18.7	8.3′	54.2′
18	90°46.0	N15°32.4	260°38.9	12.1′	S23°27.0	8.2′	54.2′
19	105°46.0	33.1	275°09.9	12.0′	23°35.2	8.1′	54.2′
20	120°46.1	33.9	289°40.9	12.0′	23°43.3	7.9′	54.2′
21	135°46.2	·· 34.6	304°11.9	11.9′	23°51.2	7.9′	54.2′
22	150°46.2	35.4	318°42.8	11.9′	23°59.1	7.7′	54.2′
23	165°46.3	36.1	333°13.7	11.8′	24°06.8	7.7′	54.2′
	SD = 15.9′	d = 0.7′		SD = 14.8′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.4	N15°36.8	347°44.5	11.8′	S24°14.5	7.5′	54.2′
1	195°46.4	37.6	2°15.2	11.7′	24°22.0	7.4′	54.2′
2	210°46.5	38.3	16°45.9	11.6′	24°29.4	7.3′	54.1′
3	225°46.6	·· 39.0	31°16.6	11.6′	24°36.7	7.2′	54.1′
4	240°46.6	39.8	45°47.2	11.5′	24°43.9	7.1′	54.1′
5	255°46.7	40.5	60°17.7	11.5′	24°51.0	7.0′	54.1′
6	270°46.8	N15°41.2	74°48.2	11.4′	S24°58.0	6.8′	54.1′
7	285°46.8	42.0	89°18.7	11.4′	25°04.8	6.7′	54.1′
8	300°46.9	42.7	103°49.0	11.3′	25°11.5	6.6′	54.1′
9	315°47.0	·· 43.4	118°19.4	11.3′	25°18.1	6.5′	54.1′
10	330°47.0	44.2	132°49.7	11.3′	25°24.6	6.4′	54.1′
11	345°47.1	44.9	147°19.9	11.2′	25°31.0	6.2′	54.1′
12	0°47.2	N15°45.6	161°50.2	11.2′	S25°37.2	6.2′	54.1′
13	15°47.2	46.4	176°20.3	11.1′	25°43.4	6.0′	54.1′
14	30°47.3	47.1	190°50.4	11.1′	25°49.4	5.9′	54.1′
15	45°47.3	·· 47.8	205°20.5	11.0′	25°55.3	5.7′	54.1′
16	60°47.4	48.6	219°50.5	11.0′	26°01.0	5.7′	54.1′
17	75°47.5	49.3	234°20.5	10.9′	26°06.7	5.5′	54.0′
18	90°47.5	N15°50.0	248°50.4	10.9′	S26°12.2	5.4′	54.0′
19	105°47.6	50.8	263°20.3	10.9′	26°17.6	5.2′	54.0′
20	120°47.6	51.5	277°50.2	10.8′	26°22.8	5.2′	54.0′
21	135°47.7	·· 52.2	292°20.0	10.8′	26°28.0	5.0′	54.0′
22	150°47.8	52.9	306°49.7	10.7′	26°33.0	4.9′	54.0′
23	165°47.8	53.7	321°19.5	10.7′	26°37.9	4.8′	54.0′
	SD = 15.9′	d = 0.7′		SD = 14.8′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	01:44	22:18	////	////
N 70°	////	////	02:25	21:33	////	////
68°	////	00:55	02:53	21:05	23:12	////
66°	////	01:49	03:14	20:43	22:10	////
64°	////	02:21	03:30	20:26	21:37	////
62°	00:49	02:44	03:44	20:12	21:13	23:17
60°	01:37	03:02	03:55	20:00	20:55	22:22
N 58°	02:06	03:17	04:05	19:50	20:39	21:51
56°	02:27	03:29	04:14	19:41	20:26	21:29
54°	02:45	03:40	04:22	19:33	20:15	21:12
52°	02:59	03:50	04:29	19:26	20:06	20:57
50°	03:11	03:58	04:35	19:20	19:57	20:45
45°	03:35	04:16	04:48	19:07	19:39	20:20
N 40°	03:54	04:30	04:59	18:56	19:25	20:01
35°	04:09	04:41	05:08	18:46	19:13	19:46
30°	04:21	04:51	05:16	18:38	19:03	19:34
20°	04:40	05:07	05:30	18:24	18:47	19:14
N 10°	04:55	05:21	05:42	18:12	18:34	18:59
0°	05:07	05:32	05:54	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:49	18:11	18:36
20°	05:27	05:54	06:16	17:37	18:00	18:26
30°	05:36	06:05	06:30	17:24	17:49	18:17
35°	05:41	06:11	06:37	17:16	17:43	18:13
40°	05:45	06:18	06:46	17:08	17:36	18:08
45°	05:50	06:25	06:56	16:57	17:28	18:03
S 50°	05:55	06:34	07:08	16:45	17:20	17:58
52°	05:57	06:38	07:14	16:40	17:16	17:56
54°	06:00	06:42	07:20	16:33	17:11	17:53
56°	06:02	06:47	07:27	16:26	17:07	17:51
58°	06:05	06:52	07:34	16:19	17:01	17:48
S 60°	06:07	06:57	07:43	16:10	16:56	17:45

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	00:57	▬	▬
N 70°	▬	▬	▬	01:41	▬	▬
68°	22:33	▬	▬	02:10	01:18	▬
66°	21:46	▬	▬	02:33	02:06	▬
64°	21:16	23:17	▬	02:50	02:37	02:14
62°	20:53	22:36	·· ··	03:05	03:00	02:55
60°	20:36	22:09	23:40	03:17	03:19	03:24
N 58°	20:21	21:47	23:10	03:28	03:35	03:46
56°	20:08	21:30	22:47	03:38	03:48	04:04
54°	19:57	21:15	22:29	03:46	04:00	04:19
52°	19:47	21:02	22:13	03:54	04:10	04:32
50°	19:38	20:51	22:00	04:00	04:19	04:44
45°	19:20	20:27	21:32	04:15	04:39	05:08
N 40°	19:05	20:09	21:10	04:27	04:55	05:27
35°	18:53	19:53	20:52	04:37	05:08	05:44
30°	18:42	19:40	20:37	04:47	05:20	05:58
20°	18:23	19:17	20:11	05:02	05:40	06:22
N 10°	18:07	18:57	19:49	05:16	05:58	06:43
0°	17:52	18:39	19:28	05:29	06:15	07:02
S 10°	17:38	18:21	19:07	05:42	06:31	07:22
20°	17:22	18:02	18:45	05:56	06:49	07:43
30°	17:04	17:39	18:20	06:12	07:10	08:08
35°	16:53	17:26	18:05	06:22	07:22	08:22
40°	16:41	17:12	17:47	06:32	07:36	08:39
45°	16:28	16:54	17:27	06:45	07:53	08:59
S 50°	16:11	16:32	17:00	07:01	08:13	09:24
52°	16:03	16:22	16:48	07:08	08:23	09:37
54°	15:54	16:10	16:33	07:16	08:34	09:51
56°	15:44	15:57	16:16	07:25	08:47	10:07
58°	15:33	15:41	15:56	07:36	09:02	10:27
S 60°	15:20	15:23	15:31	07:48	09:20	10:52

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 14-16 99-98%
01	02:52	02:55	11:57	–:–	11:41	
02	02:59	03:02	11:57	00:03	12:27	
03	03:05	03:09	11:57	00:51	13:15	

May 04, 05, 06 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°53.8	151°38.2	N23°14.2	204°20.6	N06°30.9	110°54.1	N22°25.9	212°19.7	N01°45.2
1	236°56.3	166°37.4	14.7	219°21.2	31.6	125°56.1	25.9	227°21.9	45.3
2	251°58.7	181°36.6	15.2	234°21.9	32.3	140°58.2	25.8	242°24.1	45.4
3	267°01.2	196°35.9	·· 15.7	249°22.6	·· 33.1	156°00.3	·· 25.8	257°26.3	·· 45.5
4	282°03.7	211°35.1	16.2	264°23.3	33.8	171°02.4	25.7	272°28.5	45.6
5	297°06.1	226°34.3	16.7	279°24.0	34.6	186°04.4	25.7	287°30.7	45.7
6	312°08.6	241°33.5	N23°17.2	294°24.7	N06°35.3	201°06.5	N22°25.6	302°32.9	N01°45.8
7	327°11.1	256°32.7	17.7	309°25.4	36.0	216°08.6	25.6	317°35.2	45.9
8	342°13.5	271°32.0	18.2	324°26.1	36.8	231°10.7	25.5	332°37.4	46.0
9	357°16.0	286°31.2	·· 18.7	339°26.8	·· 37.5	246°12.7	·· 25.5	347°39.6	·· 46.1
10	12°18.5	301°30.4	19.2	354°27.5	38.3	261°14.8	25.4	2°41.8	46.2
11	27°20.9	316°29.6	19.7	9°28.2	39.0	276°16.9	25.4	17°44.0	46.3
12	42°23.4	331°28.8	N23°20.2	24°28.9	N06°39.7	291°18.9	N22°25.3	32°46.2	N01°46.4
13	57°25.8	346°28.1	20.7	39°29.6	40.5	306°21.0	25.3	47°48.4	46.6
14	72°28.3	1°27.3	21.2	54°30.2	41.2	321°23.1	25.2	62°50.6	46.7
15	87°30.8	16°26.5	·· 21.7	69°30.9	·· 42.0	336°25.2	·· 25.2	77°52.8	·· 46.8
16	102°33.2	31°25.7	22.2	84°31.6	42.7	351°27.2	25.1	92°55.0	46.9
17	117°35.7	46°24.9	22.7	99°32.3	43.4	6°29.3	25.1	107°57.2	47.0
18	132°38.2	61°24.2	N23°23.2	114°33.0	N06°44.2	21°31.4	N22°25.0	122°59.4	N01°47.1
19	147°40.6	76°23.4	23.7	129°33.7	44.9	36°33.4	25.0	138°01.7	47.2
20	162°43.1	91°22.6	24.2	144°34.4	45.7	51°35.5	24.9	153°03.9	47.3
21	177°45.6	106°21.8	·· 24.6	159°35.1	·· 46.4	66°37.6	·· 24.8	168°06.1	·· 47.4
22	192°48.0	121°21.0	25.1	174°35.8	47.1	81°39.7	24.8	183°08.3	47.5
23	207°50.5	136°20.2	25.6	189°36.5	47.9	96°41.7	24.7	198°10.5	47.6
Mer.pass. 09:11		ν -0.8′	d 0.5′	m -3.92	ν 0.7′	d 0.7′	m 1.23	ν 2.1′	d 0.1′ m -2.00	ν 2.2′	d 0.1′ m 0.93

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°53.0	151°19.5	N23°26.1	204°37.2	N06°48.6	111°43.8	N22°24.7	213°12.7	N01°47.7
1	237°55.4	166°18.7	26.6	219°37.9	49.3	126°45.9	24.6	228°14.9	47.8
2	252°57.9	181°17.9	27.1	234°38.5	50.1	141°47.9	24.6	243°17.1	47.9
3	268°00.3	196°17.1	·· 27.6	249°39.2	·· 50.8	156°50.0	·· 24.5	258°19.3	·· 48.0
4	283°02.8	211°16.3	28.0	264°39.9	51.6	171°52.1	24.5	273°21.5	48.1
5	298°05.3	226°15.5	28.5	279°40.6	52.3	186°54.1	24.4	288°23.7	48.2
6	313°07.7	241°14.7	N23°29.0	294°41.3	N06°53.0	201°56.2	N22°24.4	303°26.0	N01°48.3
7	328°10.2	256°14.0	29.5	309°42.0	53.8	216°58.3	24.3	318°28.2	48.4
8	343°12.7	271°13.2	29.9	324°42.7	54.5	232°00.4	24.3	333°30.4	48.5
9	358°15.1	286°12.4	·· 30.4	339°43.4	·· 55.2	247°02.4	·· 24.2	348°32.6	·· 48.6
10	13°17.6	301°11.6	30.9	354°44.1	56.0	262°04.5	24.2	3°34.8	48.7
11	28°20.1	316°10.8	31.4	9°44.8	56.7	277°06.6	24.1	18°37.0	48.8
12	43°22.5	331°10.0	N23°31.8	24°45.5	N06°57.5	292°08.6	N22°24.1	33°39.2	N01°48.9
13	58°25.0	346°09.2	32.3	39°46.1	58.2	307°10.7	24.0	48°41.4	49.0
14	73°27.5	1°08.4	32.8	54°46.8	58.9	322°12.8	24.0	63°43.6	49.1
15	88°29.9	16°07.7	·· 33.2	69°47.5	06°59.7	337°14.8	·· 23.9	78°45.8	·· 49.2
16	103°32.4	31°06.9	33.7	84°48.2	07°00.4	352°16.9	23.9	93°48.0	49.3
17	118°34.8	46°06.1	34.2	99°48.9	01.1	7°19.0	23.8	108°50.3	49.4
18	133°37.3	61°05.3	N23°34.6	114°49.6	N07°01.9	22°21.0	N22°23.8	123°52.5	N01°49.5
19	148°39.8	76°04.5	35.1	129°50.3	02.6	37°23.1	23.7	138°54.7	49.6
20	163°42.2	91°03.7	35.6	144°51.0	03.3	52°25.2	23.7	153°56.9	49.7
21	178°44.7	106°02.9	·· 36.0	159°51.7	·· 04.1	67°27.2	·· 23.6	168°59.1	·· 49.8
22	193°47.2	121°02.1	36.5	174°52.4	04.8	82°29.3	23.6	184°01.3	49.9
23	208°49.6	136°01.3	36.9	189°53.1	05.5	97°31.4	23.5	199°03.5	50.0
Mer.pass. 09:07		ν -0.8′	d 0.5′	m -3.92	ν 0.7′	d 0.7′	m 1.23	ν 2.1′	d 0.1′ m -1.99	ν 2.2′	d 0.1′ m 0.92

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°52.1	151°00.5	N23°37.4	204°53.7	N07°06.3	112°33.4	N22°23.5	214°05.7	N01°50.1
1	238°54.6	165°59.7	37.9	219°54.4	07.0	127°35.5	23.4	229°07.9	50.2
2	253°57.0	180°59.0	38.3	234°55.1	07.7	142°37.6	23.3	244°10.1	50.3
3	268°59.5	195°58.2	·· 38.8	249°55.8	·· 08.5	157°39.6	·· 23.3	259°12.4	·· 50.4
4	284°02.0	210°57.4	39.2	264°56.5	09.2	172°41.7	23.2	274°14.6	50.5
5	299°04.4	225°56.6	39.7	279°57.2	09.9	187°43.7	23.2	289°16.8	50.6
6	314°06.9	240°55.8	N23°40.1	294°57.9	N07°10.7	202°45.8	N22°23.1	304°19.0	N01°50.7
7	329°09.3	255°55.0	40.6	309°58.6	11.4	217°47.9	23.1	319°21.2	50.8
8	344°11.8	270°54.2	41.0	324°59.3	12.1	232°49.9	23.0	334°23.4	50.9
9	359°14.3	285°53.4	·· 41.5	340°00.0	·· 12.9	247°52.0	·· 23.0	349°25.6	·· 51.0
10	14°16.7	300°52.6	41.9	355°00.7	13.6	262°54.1	22.9	4°27.8	51.1
11	29°19.2	315°51.8	42.4	10°01.3	14.3	277°56.1	22.9	19°30.0	51.2
12	44°21.7	330°51.0	N23°42.8	25°02.0	N07°15.1	292°58.2	N22°22.8	34°32.3	N01°51.3
13	59°24.1	345°50.2	43.2	40°02.7	15.8	308°00.3	22.8	49°34.5	51.4
14	74°26.6	0°49.4	43.7	55°03.4	16.5	323°02.3	22.7	64°36.7	51.5
15	89°29.1	15°48.6	·· 44.1	70°04.1	·· 17.3	338°04.4	·· 22.7	79°38.9	·· 51.6
16	104°31.5	30°47.8	44.6	85°04.8	18.0	353°06.4	22.6	94°41.1	51.8
17	119°34.0	45°47.0	45.0	100°05.5	18.7	8°08.5	22.6	109°43.3	51.9
18	134°36.4	60°46.2	N23°45.4	115°06.2	N07°19.5	23°10.6	N22°22.5	124°45.5	N01°52.0
19	149°38.9	75°45.5	45.9	130°06.9	20.2	38°12.6	22.5	139°47.7	52.1
20	164°41.4	90°44.7	46.3	145°07.6	20.9	53°14.7	22.4	154°50.0	52.2
21	179°43.8	105°43.9	·· 46.7	160°08.2	·· 21.7	68°16.7	·· 22.3	169°52.2	·· 52.3
22	194°46.3	120°43.1	47.2	175°08.9	22.4	83°18.8	22.3	184°54.4	52.4
23	209°48.8	135°42.3	47.6	190°09.6	23.1	98°20.9	22.2	199°56.6	52.5
Mer.pass. 09:03		ν -0.8′	d 0.5′	m -3.92	ν 0.7′	d 0.7′	m 1.23	ν 2.1′	d 0.1′ m -1.99	ν 2.2′	d 0.1′ m 0.92

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.4	-42°09.7
Schedar	349°30.3	56°40.7
Diphda	348°46.5	-17°50.5
Achernar	335°19.9	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°58.6	89°22.5
Acamar	315°11.4	-40°12.0
Menkar	314°05.4	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.3
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.4	-59°35.9
Suhail	222°45.5	-43°32.6
Miaplacidus	221°38.1	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.4	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.1
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.2	-60°56.8
Kochab	137°18.6	74°02.7
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.2	-26°29.5
Atria	107°07.0	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.3	51°28.8
Kaus Aust.	83°30.8	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°46.2	-26°15.8
Altair	61°58.8	8°56.1
Peacock	53°03.9	-56°38.8
Deneb	49°25.0	45°22.2
Enif	33°37.8	9°59.6
Al Na'ir	27°31.7	-46°49.8
Fomalhaut	15°13.5	-29°28.9
Scheat	13°44.3	28°13.4
Markab	13°29.0	15°20.7

May 04 Mon	SHA	Mer.pass
Venus	289°44.4	13:54
Mars	342°26.7	10:22
Jupiter	249°00.2	16:34
Saturn	350°25.9	09:49

May 05 Tue	SHA	Mer.pass
Venus	288°26.5	13:55
Mars	341°44.2	10:21
Jupiter	248°50.8	16:31
Saturn	350°19.7	09:46

May 06 Wed	SHA	Mer.pass
Venus	287°08.4	13:57
Mars	341°01.7	10:20
Jupiter	248°41.3	16:28
Saturn	350°13.6	09:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°47.9	N15°54.4	335°49.2	10.7′	S26°42.7	4.6′	54.0′
1	195°48.0	55.1	350°18.8	10.6′	26°47.3	4.5′	54.0′
2	210°48.0	55.8	4°48.4	10.6′	26°51.8	4.4′	54.0′
3	225°48.1	·· 56.6	19°18.0	10.5′	26°56.2	4.2′	54.0′
4	240°48.1	57.3	33°47.6	10.5′	27°00.4	4.2′	54.0′
5	255°48.2	58.0	48°17.1	10.5′	27°04.6	4.0′	54.0′
6	270°48.2	N15°58.7	62°46.5	10.4′	S27°08.6	3.8′	54.0′
7	285°48.3	15°59.5	77°16.0	10.4′	27°12.4	3.8′	54.0′
8	300°48.4	16°00.2	91°45.4	10.4′	27°16.2	3.6′	54.0′
9	315°48.4	·· 00.9	106°14.8	10.4′	27°19.8	3.5′	54.0′
10	330°48.5	01.6	120°44.1	10.3′	27°23.3	3.3′	54.0′
11	345°48.5	02.4	135°13.5	10.3′	27°26.6	3.2′	54.0′
12	0°48.6	N16°03.1	149°42.8	10.3′	S27°29.8	3.1′	54.0′
13	15°48.7	03.8	164°12.0	10.2′	27°32.9	2.9′	54.0′
14	30°48.7	04.5	178°41.3	10.2′	27°35.8	2.9′	54.0′
15	45°48.8	·· 05.2	193°10.5	10.2′	27°38.7	2.6′	54.0′
16	60°48.8	06.0	207°39.7	10.2′	27°41.3	2.6′	54.0′
17	75°48.9	06.7	222°08.9	10.2′	27°43.9	2.4′	54.0′
18	90°48.9	N16°07.4	236°38.0	10.1′	S27°46.3	2.3′	54.0′
19	105°49.0	08.1	251°07.2	10.1′	27°48.6	2.1′	54.0′
20	120°49.0	08.8	265°36.3	10.1′	27°50.7	2.0′	54.0′
21	135°49.1	·· 09.5	280°05.4	10.1′	27°52.7	1.9′	54.0′
22	150°49.2	10.3	294°34.4	10.1′	27°54.6	1.8′	54.0′
23	165°49.2	11.0	309°03.5	10.0′	27°56.4	1.6′	54.0′
	SD = 15.9′	d = 0.7′	SD = 14.7′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°49.3	N16°11.7	323°32.5	10.0′	S27°58.0	1.5′	54.0′
1	195°49.3	12.4	338°01.6	10.0′	27°59.5	1.3′	54.0′
2	210°49.4	13.1	352°30.6	10.0′	28°00.8	1.2′	54.0′
3	225°49.4	·· 13.8	6°59.6	10.0′	28°02.0	1.1′	54.0′
4	240°49.5	14.5	21°28.6	10.0′	28°03.1	0.9′	54.0′
5	255°49.5	15.3	35°57.6	10.0′	28°04.0	0.8′	54.0′
6	270°49.6	N16°16.0	50°26.6	10.0′	S28°04.8	0.7′	54.0′
7	285°49.6	16.7	64°55.6	10.0′	28°05.5	0.5′	54.0′
8	300°49.7	17.4	79°24.5	10.0′	28°06.0	0.4′	54.0′
9	315°49.7	·· 18.1	93°53.5	10.0′	28°06.4	0.2′	54.0′
10	330°49.8	18.8	108°22.5	10.0′	28°06.6	0.2′	54.0′
11	345°49.9	19.5	122°51.4	10.0′	28°06.8	0.1′	54.0′
12	0°49.9	N16°20.2	137°20.4	10.0′	S28°06.7	0.1′	54.0′
13	15°50.0	21.0	151°49.4	10.0′	28°06.6	0.3′	54.0′
14	30°50.0	21.7	166°18.3	10.0′	28°06.3	0.4′	54.0′
15	45°50.1	·· 22.4	180°47.3	10.0′	28°05.9	0.6′	54.0′
16	60°50.1	23.1	195°16.2	10.0′	28°05.3	0.7′	54.0′
17	75°50.2	23.8	209°45.2	10.0′	28°04.6	0.8′	54.0′
18	90°50.2	N16°24.5	224°14.2	10.0′	S28°03.8	1.0′	54.0′
19	105°50.3	25.2	238°43.2	10.0′	28°02.8	1.1′	54.0′
20	120°50.3	25.9	253°12.2	10.0′	28°01.7	1.2′	54.0′
21	135°50.4	·· 26.6	267°41.2	10.0′	28°00.5	1.4′	54.0′
22	150°50.4	27.3	282°10.2	10.0′	27°59.1	1.5′	54.0′
23	165°50.5	28.0	296°39.2	10.0′	27°57.6	1.7′	54.0′
	SD = 15.9′	d = 0.7′	SD = 14.7′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°50.5	N16°28.7	311°08.3	10.1′	S27°55.9	1.8′	54.0′
1	195°50.6	29.4	325°37.3	10.1′	27°54.1	1.9′	54.0′
2	210°50.6	30.1	340°06.4	10.1′	27°52.2	2.0′	54.0′
3	225°50.6	·· 30.8	354°35.5	10.1′	27°50.2	2.2′	54.1′
4	240°50.7	31.5	9°04.6	10.1′	27°48.0	2.3′	54.1′
5	255°50.7	32.2	23°33.7	10.1′	27°45.7	2.5′	54.1′
6	270°50.8	N16°32.9	38°02.8	10.2′	S27°43.2	2.6′	54.1′
7	285°50.8	33.6	52°32.0	10.2′	27°40.6	2.7′	54.1′
8	300°50.9	34.3	67°01.1	10.2′	27°37.9	2.8′	54.1′
9	315°50.9	·· 35.0	81°30.3	10.2′	27°35.1	3.0′	54.1′
10	330°51.0	35.7	95°59.6	10.2′	27°32.1	3.2′	54.1′
11	345°51.0	36.4	110°28.8	10.3′	27°28.9	3.2′	54.1′
12	0°51.1	N16°37.1	124°58.1	10.3′	S27°25.7	3.4′	54.1′
13	15°51.1	37.8	139°27.4	10.3′	27°22.3	3.5′	54.1′
14	30°51.2	38.5	153°56.7	10.3′	27°18.8	3.6′	54.1′
15	45°51.2	·· 39.2	168°26.0	10.4′	27°15.2	3.8′	54.1′
16	60°51.2	39.9	182°55.4	10.4′	27°11.4	3.9′	54.2′
17	75°51.3	40.6	197°24.8	10.4′	27°07.5	4.1′	54.2′
18	90°51.3	N16°41.3	211°54.3	10.5′	S27°03.4	4.1′	54.2′
19	105°51.4	42.0	226°23.7	10.5′	26°59.3	4.3′	54.2′
20	120°51.4	42.7	240°53.2	10.5′	26°55.0	4.5′	54.2′
21	135°51.5	·· 43.4	255°22.8	10.6′	26°50.5	4.5′	54.2′
22	150°51.5	44.1	269°52.3	10.6′	26°46.0	4.7′	54.2′
23	165°51.6	44.8	284°21.9	10.6′	26°41.3	4.8′	54.2′
	SD = 15.9′	d = 0.7′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	01:14	22:50	////	////
N 70°	////	////	02:07	21:52	////	////
68°	////	////	02:39	21:18	////	////
66°	////	01:29	03:02	20:54	22:31	////
64°	////	02:06	03:20	20:36	21:51	////
62°	////	02:32	03:35	20:20	21:24	////
60°	01:19	02:52	03:47	20:08	21:04	22:41
N 58°	01:53	03:08	03:58	19:57	20:47	22:04
56°	02:17	03:22	04:07	19:47	20:34	21:39
54°	02:36	03:33	04:16	19:39	20:22	21:20
52°	02:51	03:43	04:23	19:31	20:11	21:04
50°	03:04	03:52	04:30	19:25	20:02	20:51
45°	03:30	04:11	04:44	19:10	19:43	20:25
N 40°	03:49	04:26	04:55	18:59	19:28	20:05
35°	04:05	04:38	05:05	18:49	19:16	19:49
30°	04:18	04:48	05:14	18:40	19:06	19:36
20°	04:38	05:05	05:29	18:25	18:48	19:16
N 10°	04:54	05:19	05:41	18:12	18:34	19:00
0°	05:07	05:32	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:10	18:35
20°	05:28	05:54	06:17	17:36	17:59	18:25
30°	05:38	06:07	06:31	17:22	17:47	18:15
35°	05:43	06:13	06:40	17:13	17:40	18:10
40°	05:48	06:20	06:49	17:04	17:33	18:05
45°	05:53	06:28	06:59	16:53	17:24	17:59
S 50°	05:59	06:38	07:12	16:40	17:15	17:53
52°	06:02	06:42	07:18	16:34	17:11	17:51
54°	06:04	06:47	07:25	16:28	17:06	17:48
56°	06:07	06:52	07:33	16:20	17:01	17:45
58°	06:10	06:57	07:41	16:12	16:55	17:42
S 60°	06:13	07:04	07:50	16:02	16:49	17:39

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	00:26	▬	03:03	02:49	▬	03:45
60°	·· ··	00:58	01:47	03:35	04:03	05:01
N 58°	·· ··	00:21	01:11	04:05	04:40	05:36
56°	23:54	·· ··	00:45	04:28	05:06	06:02
54°	23:34	·· ··	00:25	04:47	05:27	06:22
52°	23:16	·· ··	00:07	05:03	05:45	06:39
50°	23:01	23:53	·· ··	05:16	05:59	06:54
45°	22:31	23:23	·· ··	05:44	06:30	07:24
N 40°	22:08	23:00	23:44	06:07	06:53	07:47
35°	21:49	22:41	23:26	06:25	07:12	08:06
30°	21:32	22:24	23:11	06:41	07:29	08:22
20°	21:05	21:56	22:45	07:08	07:57	08:49
N 10°	20:41	21:32	22:22	07:31	08:21	09:13
0°	20:19	21:10	22:01	07:52	08:43	09:35
S 10°	19:56	20:48	21:40	08:14	09:06	09:57
20°	19:33	20:24	21:17	08:37	09:30	10:20
30°	19:05	19:56	20:51	09:04	09:58	10:47
35°	18:49	19:39	20:35	09:20	10:14	11:03
40°	18:30	19:20	20:17	09:39	10:34	11:22
45°	18:07	18:57	19:55	10:01	10:57	11:44
S 50°	17:38	18:27	19:27	10:30	11:27	12:13
52°	17:24	18:12	19:13	10:44	11:42	12:26
54°	17:07	17:55	18:57	11:01	11:59	12:43
56°	16:47	17:34	18:38	11:20	12:20	13:02
58°	16:23	17:08	18:15	11:45	12:46	13:25
S 60°	15:50	16:32	17:44	12:18	13:22	13:56

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 17-19 95-84%
04	03:12	03:14	11:57	01:40	14:05	
05	03:17	03:20	11:57	02:31	14:57	
06	03:22	03:24	11:57	03:22	15:48	

May 07, 08, 09 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	224°51.2	150°41.5	N23°48.0	205°10.3	N07°23.9	113°22.9	N22°22.2	214°58.8	N01°52.6
1	239°53.7	165°40.7	48.5	220°11.0	24.6	128°25.0	22.1	230°01.0	52.7
2	254°56.2	180°39.9	48.9	235°11.7	25.3	143°27.0	22.1	245°03.2	52.8
3	269°58.6	195°39.1	·· 49.3	250°12.4	·· 26.1	158°29.1	·· 22.0	260°05.4	·· 52.9
4	285°01.1	210°38.3	49.7	265°13.1	26.8	173°31.2	22.0	275°07.6	53.0
5	300°03.6	225°37.5	50.2	280°13.8	27.5	188°33.2	21.9	290°09.9	53.1
6	315°06.0	240°36.7	N23°50.6	295°14.5	N07°28.2	203°35.3	N22°21.9	305°12.1	N01°53.2
7	330°08.5	255°35.9	51.0	310°15.1	29.0	218°37.3	21.8	320°14.3	53.3
8	345°10.9	270°35.1	51.4	325°15.8	29.7	233°39.4	21.8	335°16.5	53.4
9	0°13.4	285°34.3	·· 51.9	340°16.5	·· 30.4	248°41.5	·· 21.7	350°18.7	·· 53.5
10	15°15.9	300°33.5	52.3	355°17.2	31.2	263°43.5	21.7	5°20.9	53.6
11	30°18.3	315°32.7	52.7	10°17.9	31.9	278°45.6	21.6	20°23.1	53.7
12	45°20.8	330°31.9	N23°53.1	25°18.6	N07°32.6	293°47.6	N22°21.5	35°25.3	N01°53.8
13	60°23.3	345°31.1	53.5	40°19.3	33.4	308°49.7	21.5	50°27.6	53.9
14	75°25.7	0°30.3	53.9	55°20.0	34.1	323°51.7	21.4	65°29.8	54.0
15	90°28.2	15°29.5	·· 54.3	70°20.7	·· 34.8	338°53.8	·· 21.4	80°32.0	·· 54.1
16	105°30.7	30°28.7	54.8	85°21.4	35.5	353°55.9	21.3	95°34.2	54.2
17	120°33.1	45°27.9	55.2	100°22.0	36.3	8°57.9	21.3	110°36.4	54.3
18	135°35.6	60°27.1	N23°55.6	115°22.7	N07°37.0	24°00.0	N22°21.2	125°38.6	N01°54.4
19	150°38.1	75°26.3	56.0	130°23.4	37.7	39°02.0	21.2	140°40.8	54.5
20	165°40.5	90°25.5	56.4	145°24.1	38.5	54°04.1	21.1	155°43.1	54.6
21	180°43.0	105°24.7	·· 56.8	160°24.8	·· 39.2	69°06.1	·· 21.1	170°45.3	·· 54.7
22	195°45.4	120°23.8	57.2	175°25.5	39.9	84°08.2	21.0	185°47.5	54.8
23	210°47.9	135°23.0	57.6	190°26.2	40.6	99°10.3	20.9	200°49.7	54.9
Mer.pass. 08:59		ν -0.8′ d 0.4′		m -3.92	ν 0.7′ d 0.7′		m 1.23	ν 2.1′ d 0.1′	m -1.98	ν 2.2′ d 0.1′	m 0.92

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	225°50.4	150°22.2	N23°58.0	205°26.9	N07°41.4	114°12.3	N22°20.9	215°51.9	N01°55.0
1	240°52.8	165°21.4	58.4	220°27.6	42.1	129°14.4	20.8	230°54.1	55.1
2	255°55.3	180°20.6	58.8	235°28.3	42.8	144°16.4	20.8	245°56.3	55.2
3	270°57.8	195°19.8	·· 59.2	250°28.9	·· 43.5	159°18.5	·· 20.7	260°58.6	·· 55.3
4	286°00.2	210°19.0	23°59.6	265°29.6	44.3	174°20.5	20.7	276°00.8	55.4
5	301°02.7	225°18.2	24°00.0	280°30.3	45.0	189°22.6	20.6	291°03.0	55.5
6	316°05.2	240°17.4	N24°00.4	295°31.0	N07°45.7	204°24.6	N22°20.6	306°05.2	N01°55.6
7	331°07.6	255°16.6	00.8	310°31.7	46.5	219°26.7	20.5	321°07.4	55.7
8	346°10.1	270°15.8	01.2	325°32.4	47.2	234°28.7	20.5	336°09.6	55.8
9	1°12.6	285°15.0	·· 01.6	340°33.1	·· 47.9	249°30.8	·· 20.4	351°11.8	·· 55.9
10	16°15.0	300°14.2	02.0	355°33.8	48.6	264°32.9	20.3	6°14.1	56.0
11	31°17.5	315°13.4	02.3	10°34.5	49.4	279°34.9	20.3	21°16.3	56.1
12	46°19.9	330°12.6	N24°02.7	25°35.1	N07°50.1	294°37.0	N22°20.2	36°18.5	N01°56.2
13	61°22.4	345°11.8	03.1	40°35.8	50.8	309°39.0	20.2	51°20.7	56.3
14	76°24.9	0°11.0	03.5	55°36.5	51.5	324°41.1	20.1	66°22.9	56.4
15	91°27.3	15°10.2	·· 03.9	70°37.2	·· 52.3	339°43.1	·· 20.1	81°25.1	·· 56.5
16	106°29.8	30°09.3	04.3	85°37.9	53.0	354°45.2	20.0	96°27.3	56.6
17	121°32.3	45°08.5	04.7	100°38.6	53.7	9°47.2	20.0	111°29.6	56.7
18	136°34.7	60°07.7	N24°05.0	115°39.3	N07°54.4	24°49.3	N22°19.9	126°31.8	N01°56.8
19	151°37.2	75°06.9	05.4	130°40.0	55.2	39°51.3	19.9	141°34.0	56.9
20	166°39.7	90°06.1	05.8	145°40.7	55.9	54°53.4	19.8	156°36.2	57.0
21	181°42.1	105°05.3	·· 06.2	160°41.3	·· 56.6	69°55.4	·· 19.7	171°38.4	·· 57.1
22	196°44.6	120°04.5	06.5	175°42.0	57.3	84°57.5	19.7	186°40.6	57.2
23	211°47.1	135°03.7	06.9	190°42.7	58.1	99°59.5	19.6	201°42.8	57.3
Mer.pass. 08:55		ν -0.8′ d 0.4′		m -3.92	ν 0.7′ d 0.7′		m 1.24	ν 2.1′ d 0.1′	m -1.98	ν 2.2′ d 0.1′	m 0.92

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	226°49.5	150°02.9	N24°07.3	205°43.4	N07°58.8	115°01.6	N22°19.6	216°45.1	N01°57.4
1	241°52.0	165°02.1	07.7	220°44.1	07°59.5	130°03.6	19.5	231°47.3	57.4
2	256°54.4	180°01.3	08.0	235°44.8	08°00.2	145°05.7	19.5	246°49.5	57.5
3	271°56.9	195°00.4	·· 08.4	250°45.5	·· 00.9	160°07.7	·· 19.4	261°51.7	·· 57.6
4	286°59.4	209°59.6	08.8	265°46.2	01.7	175°09.8	19.4	276°53.9	57.7
5	302°01.8	224°58.8	09.1	280°46.8	02.4	190°11.8	19.3	291°56.1	57.8
6	317°04.3	239°58.0	N24°09.5	295°47.5	N08°03.1	205°13.9	N22°19.2	306°58.4	N01°57.9
7	332°06.8	254°57.2	09.9	310°48.2	03.8	220°15.9	19.2	322°00.6	58.0
8	347°09.2	269°56.4	10.2	325°48.9	04.6	235°18.0	19.1	337°02.8	58.1
9	2°11.7	284°55.6	·· 10.6	340°49.6	·· 05.3	250°20.0	·· 19.1	352°05.0	·· 58.2
10	17°14.2	299°54.8	11.0	355°50.3	06.0	265°22.1	19.0	7°07.2	58.3
11	32°16.6	314°54.0	11.3	10°51.0	06.7	280°24.1	19.0	22°09.4	58.4
12	47°19.1	329°53.1	N24°11.7	25°51.7	N08°07.5	295°26.2	N22°18.9	37°11.7	N01°58.5
13	62°21.5	344°52.3	12.0	40°52.4	08.2	310°28.2	18.9	52°13.9	58.6
14	77°24.0	359°51.5	12.4	55°53.0	08.9	325°30.3	18.8	67°16.1	58.7
15	92°26.5	14°50.7	·· 12.8	70°53.7	·· 09.6	340°32.3	·· 18.7	82°18.3	·· 58.8
16	107°28.9	29°49.9	13.1	85°54.4	10.3	355°34.4	18.7	97°20.5	58.9
17	122°31.4	44°49.1	13.5	100°55.1	11.1	10°36.4	18.6	112°22.7	59.0
18	137°33.9	59°48.3	N24°13.8	115°55.8	N08°11.8	25°38.5	N22°18.6	127°25.0	N01°59.1
19	152°36.3	74°47.5	14.2	130°56.5	12.5	40°40.5	18.5	142°27.2	59.2
20	167°38.8	89°46.6	14.5	145°57.2	13.2	55°42.6	18.5	157°29.4	59.3
21	182°41.3	104°45.8	·· 14.9	160°57.9	·· 13.9	70°44.6	·· 18.4	172°31.6	·· 59.4
22	197°43.7	119°45.0	15.2	175°58.5	14.7	85°46.7	18.3	187°33.8	59.5
23	212°46.2	134°44.2	15.6	190°59.2	15.4	100°48.7	18.3	202°36.0	59.6
Mer.pass. 08:51		ν -0.8′ d 0.4′		m -3.92	ν 0.7′ d 0.7′		m 1.24	ν 2.1′ d 0.1′	m -1.97	ν 2.2′ d 0.1′	m 0.92

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.4	-42°09.6
Schedar	349°30.3	56°40.7
Diphda	348°46.5	-17°50.5
Achernar	335°19.9	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°58.4	89°22.5
Acamar	315°11.4	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.5	-59°35.9
Suhail	222°45.5	-43°32.6
Miaplacidus	221°38.1	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.2
Dubhe	193°39.4	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.6	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.4
Antares	112°14.2	-26°29.5
Atria	107°06.9	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.3	12°32.3
Eltanin	90°41.3	51°28.8
Kaus Aust.	83°30.8	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°46.2	-26°15.8
Altair	61°58.8	8°56.1
Peacock	53°03.9	-56°38.8
Deneb	49°25.0	45°22.2
Enif	33°37.8	9°59.6
Al Na'ir	27°31.7	-46°49.8
Fomalhaut	15°13.5	-29°28.9
Scheat	13°44.3	28°13.4
Markab	13°29.0	15°20.7

May 07 Thu	SHA	Mer.pass
Venus	285°50.2	13:58
Mars	340°19.1	10:19
Jupiter	248°31.7	16:24
Saturn	350°07.6	09:39

May 08 Fri	SHA	Mer.pass
Venus	284°31.9	13:59
Mars	339°36.5	10:18
Jupiter	248°21.9	16:21
Saturn	350°01.5	09:35

May 09 Sat	SHA	Mer.pass
Venus	283°13.4	14:01
Mars	338°53.9	10:17
Jupiter	248°12.1	16:18
Saturn	349°55.5	09:32

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°51.6	N16°45.5	298°51.6	10.7′	S26°36.5	4.9′	54.2′
1	195°51.6	46.2	313°21.2	10.7′	26°31.6	5.1′	54.3′
2	210°51.7	46.9	327°50.9	10.7′	26°26.5	5.2′	54.3′
3	225°51.7	·· 47.6	342°20.7	10.8′	26°21.3	5.3′	54.3′
4	240°51.8	48.2	356°50.4	10.8′	26°16.0	5.5′	54.3′
5	255°51.8	48.9	11°20.3	10.9′	26°10.5	5.5′	54.3′
6	270°51.8	N16°49.6	25°50.1	10.9′	S26°05.0	5.7′	54.3′
7	285°51.9	50.3	40°20.0	10.9′	25°59.3	5.8′	54.3′
8	300°51.9	51.0	54°49.9	11.0′	25°53.5	6.0′	54.3′
9	315°52.0	·· 51.7	69°19.9	11.0′	25°47.5	6.0′	54.4′
10	330°52.0	52.4	83°49.9	11.1′	25°41.5	6.2′	54.4′
11	345°52.0	53.1	98°20.0	11.1′	25°35.3	6.3′	54.4′
12	0°52.1	N16°53.8	112°50.1	11.1′	S25°29.0	6.5′	54.4′
13	15°52.1	54.4	127°20.2	11.2′	25°22.5	6.5′	54.4′
14	30°52.2	55.1	141°50.4	11.2′	25°16.0	6.7′	54.4′
15	45°52.2	·· 55.8	156°20.6	11.3′	25°09.3	6.8′	54.4′
16	60°52.2	56.5	170°50.9	11.3′	25°02.5	6.9′	54.5′
17	75°52.3	57.2	185°21.2	11.4′	24°55.6	7.0′	54.5′
18	90°52.3	N16°57.9	199°51.5	11.4′	S24°48.6	7.2′	54.5′
19	105°52.4	58.6	214°21.9	11.4′	24°41.4	7.2′	54.5′
20	120°52.4	59.2	228°52.4	11.5′	24°34.2	7.4′	54.5′
21	135°52.4	16°59.9	243°22.9	11.5′	24°26.8	7.5′	54.5′
22	150°52.5	17°00.6	257°53.4	11.6′	24°19.3	7.6′	54.6′
23	165°52.5	01.3	272°24.0	11.6′	24°11.7	7.7′	54.6′
	SD = 15.8′	d = 0.7′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°52.5	N17°02.0	286°54.6	11.7′	S24°04.0	7.9′	54.6′
1	195°52.6	02.6	301°25.2	11.7′	23°56.1	7.9′	54.6′
2	210°52.6	03.3	315°56.0	11.8′	23°48.2	8.1′	54.6′
3	225°52.6	·· 04.0	330°26.7	11.8′	23°40.1	8.2′	54.6′
4	240°52.7	04.7	344°57.5	11.8′	23°31.9	8.3′	54.7′
5	255°52.7	05.4	359°28.4	11.9′	23°23.6	8.4′	54.7′
6	270°52.8	N17°06.0	13°59.3	11.9′	S23°15.2	8.5′	54.7′
7	285°52.8	06.7	28°30.2	12.0′	23°06.7	8.6′	54.7′
8	300°52.8	07.4	43°01.2	12.0′	22°58.1	8.8′	54.7′
9	315°52.9	·· 08.1	57°32.2	12.1′	22°49.3	8.8′	54.8′
10	330°52.9	08.7	72°03.3	12.1′	22°40.5	9.0′	54.8′
11	345°52.9	09.4	86°34.4	12.2′	22°31.5	9.0′	54.8′
12	0°53.0	N17°10.1	101°05.6	12.2′	S22°22.5	9.2′	54.8′
13	15°53.0	10.8	115°36.8	12.3′	22°13.3	9.3′	54.8′
14	30°53.0	11.4	130°08.1	12.3′	22°04.0	9.3′	54.9′
15	45°53.1	·· 12.1	144°39.4	12.4′	21°54.7	9.5′	54.9′
16	60°53.1	12.8	159°10.7	12.4′	21°45.2	9.6′	54.9′
17	75°53.1	13.5	173°42.1	12.4′	21°35.6	9.7′	54.9′
18	90°53.2	N17°14.1	188°13.6	12.5′	S21°25.9	9.8′	55.0′
19	105°53.2	14.8	202°45.0	12.5′	21°16.1	9.9′	55.0′
20	120°53.2	15.5	217°16.6	12.6′	21°06.2	10.0′	55.0′
21	135°53.2	·· 16.2	231°48.1	12.6′	20°56.2	10.1′	55.0′
22	150°53.3	16.8	246°19.8	12.7′	20°46.1	10.2′	55.1′
23	165°53.3	17.5	260°51.4	12.7′	20°35.9	10.3′	55.1′
	SD = 15.8′	d = 0.7′	SD = 14.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°53.3	N17°18.2	275°23.1	12.7′	S20°25.6	10.4′	55.1′
1	195°53.4	18.8	289°54.9	12.8′	20°15.2	10.5′	55.1′
2	210°53.4	19.5	304°26.7	12.8′	20°04.7	10.6′	55.2′
3	225°53.4	·· 20.2	318°58.5	12.9′	19°54.1	10.7′	55.2′
4	240°53.5	20.8	333°30.4	12.9′	19°43.4	10.7′	55.2′
5	255°53.5	21.5	348°02.3	13.0′	19°32.7	10.9′	55.2′
6	270°53.5	N17°22.2	2°34.2	13.0′	S19°21.8	11.0′	55.3′
7	285°53.5	22.8	17°06.2	13.0′	19°10.8	11.1′	55.3′
8	300°53.6	23.5	31°38.2	13.1′	18°59.7	11.1′	55.3′
9	315°53.6	·· 24.2	46°10.3	13.1′	18°48.6	11.3′	55.3′
10	330°53.6	24.8	60°42.4	13.1′	18°37.3	11.3′	55.4′
11	345°53.7	25.5	75°14.6	13.2′	18°26.0	11.5′	55.4′
12	0°53.7	N17°26.2	89°46.8	13.2′	S18°14.5	11.5′	55.4′
13	15°53.7	26.8	104°19.0	13.3′	18°03.0	11.6′	55.4′
14	30°53.7	27.5	118°51.2	13.3′	17°51.4	11.7′	55.5′
15	45°53.8	·· 28.1	133°23.5	13.3′	17°39.7	11.8′	55.5′
16	60°53.8	28.8	147°55.9	13.4′	17°27.9	11.9′	55.5′
17	75°53.8	29.5	162°28.2	13.4′	17°16.0	12.0′	55.6′
18	90°53.8	N17°30.1	177°00.6	13.4′	S17°04.0	12.0′	55.6′
19	105°53.9	30.8	191°33.1	13.5′	16°52.0	12.2′	55.6′
20	120°53.9	31.4	206°05.5	13.5′	16°39.8	12.2′	55.6′
21	135°53.9	·· 32.1	220°38.0	13.5′	16°27.6	12.3′	55.7′
22	150°53.9	32.8	235°10.5	13.6′	16°15.3	12.4′	55.7′
23	165°54.0	33.4	249°43.1	13.6′	16°02.9	12.5′	55.7′
	SD = 15.8′	d = 0.7′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	00:25	////	////	////
N 70°	////	////	01:46	22:13	////	////
68°	////	////	02:24	21:33	////	////
66°	////	01:04	02:50	21:06	22:59	////
64°	////	01:51	03:10	20:45	22:07	////
62°	////	02:20	03:26	20:29	21:36	////
60°	00:57	02:42	03:40	20:15	21:13	23:05
N 58°	01:39	03:00	03:51	20:03	20:55	22:18
56°	02:06	03:14	04:01	19:53	20:41	21:49
54°	02:27	03:27	04:10	19:44	20:28	21:28
52°	02:43	03:37	04:18	19:36	20:17	21:11
50°	02:57	03:47	04:25	19:29	20:07	20:57
45°	03:25	04:06	04:40	19:14	19:47	20:29
N 40°	03:45	04:22	04:52	19:02	19:32	20:09
35°	04:02	04:35	05:02	18:51	19:19	19:52
30°	04:15	04:46	05:11	18:42	19:08	19:38
20°	04:36	05:04	05:27	18:26	18:50	19:17
N 10°	04:53	05:18	05:41	18:13	18:35	19:00
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:47	18:09	18:35
20°	05:29	05:55	06:18	17:34	17:57	18:24
30°	05:40	06:08	06:33	17:19	17:44	18:13
35°	05:45	06:15	06:42	17:11	17:37	18:08
40°	05:51	06:23	06:52	17:01	17:29	18:02
45°	05:56	06:32	07:03	16:49	17:21	17:56
S 50°	06:03	06:42	07:17	16:36	17:10	17:49
52°	06:06	06:46	07:23	16:29	17:06	17:46
54°	06:09	06:51	07:30	16:22	17:01	17:43
56°	06:12	06:57	07:38	16:14	16:55	17:40
58°	06:15	07:03	07:47	16:05	16:49	17:37
S 60°	06:19	07:10	07:57	15:55	16:42	17:33

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	05:02	▬	▬	06:55
68°	▬	▬	03:59	▬	▬	07:57
66°	▬	04:16	03:23	▬	06:01	08:32
64°	▬	03:16	02:57	▬	07:00	08:57
62°	02:48	02:42	02:37	05:45	07:33	09:16
60°	02:08	02:17	02:20	06:25	07:58	09:32
N 58°	01:41	01:57	02:06	06:52	08:17	09:45
56°	01:19	01:40	01:54	07:13	08:33	09:56
54°	01:01	01:26	01:44	07:31	08:47	10:06
52°	00:46	01:14	01:34	07:46	08:59	10:15
50°	00:33	01:03	01:26	07:58	09:09	10:23
45°	00:06	00:40	01:08	08:25	09:31	10:40
N 40°	·· ··	00:21	00:53	08:46	09:49	10:53
35°	·· ··	00:06	00:40	09:03	10:03	11:05
30°	23:52	·· ··	00:29	09:18	10:16	11:15
20°	23:29	·· ··	00:10	09:43	10:38	11:32
N 10°	23:09	23:54	·· ··	10:05	10:56	11:47
0°	22:51	23:38	·· ··	10:25	11:14	12:00
S 10°	22:32	23:23	·· ··	10:45	11:31	12:14
20°	22:11	23:06	·· ··	11:07	11:49	12:29
30°	21:48	22:46	23:45	11:31	12:10	12:45
35°	21:34	22:35	23:37	11:46	12:23	12:55
40°	21:18	22:22	23:27	12:02	12:37	13:06
45°	20:59	22:06	23:16	12:22	12:53	13:18
S 50°	20:35	21:47	23:02	12:47	13:14	13:34
52°	20:23	21:38	22:55	12:59	13:23	13:41
54°	20:10	21:28	22:48	13:13	13:34	13:49
56°	19:55	21:16	22:40	13:29	13:46	13:58
58°	19:36	21:03	22:31	13:48	14:00	14:08
S 60°	19:14	20:47	22:20	14:11	14:17	14:19

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 20-22 77-59%
07	03:26	03:28	11:57	04:13	16:38	
08	03:30	03:32	11:56	05:02	17:26	
09	03:33	03:35	11:56	05:49	18:12	

May 10, 11, 12 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	227°48.7	149°43.4	N24°15.9	205°59.9	N08°16.1	115°50.7	N22°18.2	217°38.3	N01°59.7
1	242°51.1	164°42.6	16.3	221°00.6	16.8	130°52.8	18.2	232°40.5	59.8
2	257°53.6	179°41.8	16.6	236°01.3	17.5	145°54.8	18.1	247°42.7	01°59.9
3	272°56.0	194°40.9	·· 16.9	251°02.0	·· 18.3	160°56.9	·· 18.1	262°44.9	02°00.0
4	287°58.5	209°40.1	17.3	266°02.7	19.0	175°58.9	18.0	277°47.1	00.1
5	303°01.0	224°39.3	17.6	281°03.4	19.7	191°01.0	17.9	292°49.3	00.2
6	318°03.4	239°38.5	N24°18.0	296°04.0	N08°20.4	206°03.0	N22°17.9	307°51.6	N02°00.3
7	333°05.9	254°37.7	18.3	311°04.7	21.1	221°05.1	17.8	322°53.8	00.4
8	348°08.4	269°36.9	18.6	326°05.4	21.9	236°07.1	17.8	337°56.0	00.5
9	3°10.8	284°36.0	·· 19.0	341°06.1	·· 22.6	251°09.2	·· 17.7	352°58.2	·· 00.6
10	18°13.3	299°35.2	19.3	356°06.8	23.3	266°11.2	17.7	8°00.4	00.7
11	33°15.8	314°34.4	19.6	11°07.5	24.0	281°13.2	17.6	23°02.6	00.8
12	48°18.2	329°33.6	N24°20.0	26°08.2	N08°24.7	296°15.3	N22°17.6	38°04.9	N02°00.9
13	63°20.7	344°32.8	20.3	41°08.9	25.4	311°17.3	17.5	53°07.1	01.0
14	78°23.2	359°32.0	20.6	56°09.5	26.2	326°19.4	17.4	68°09.3	01.1
15	93°25.6	14°31.1	·· 21.0	71°10.2	·· 26.9	341°21.4	·· 17.4	83°11.5	·· 01.2
16	108°28.1	29°30.3	21.3	86°10.9	27.6	356°23.5	17.3	98°13.7	01.3
17	123°30.5	44°29.5	21.6	101°11.6	28.3	11°25.5	17.3	113°16.0	01.4
18	138°33.0	59°28.7	N24°21.9	116°12.3	N08°29.0	26°27.5	N22°17.2	128°18.2	N02°01.5
19	153°35.5	74°27.9	22.2	131°13.0	29.7	41°29.6	17.2	143°20.4	01.6
20	168°37.9	89°27.0	22.6	146°13.7	30.5	56°31.6	17.1	158°22.6	01.7
21	183°40.4	104°26.2	·· 22.9	161°14.3	·· 31.2	71°33.7	·· 17.0	173°24.8	·· 01.8
22	198°42.9	119°25.4	23.2	176°15.0	31.9	86°35.7	17.0	188°27.1	01.9
23	213°45.3	134°24.6	23.5	191°15.7	32.6	101°37.8	16.9	203°29.3	02.0
Mer.pass. 08:47		ν -0.8′	d 0.3′	m -3.92	ν 0.7′	d 0.7′	m 1.24	ν 2.0′	d 0.1′ m -1.97	ν 2.2′	d 0.1′ m 0.92

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	228°47.8	149°23.8	N24°23.8	206°16.4	N08°33.3	116°39.8	N22°16.9	218°31.5	N02°02.1
1	243°50.3	164°23.0	24.2	221°17.1	34.0	131°41.8	16.8	233°33.7	02.2
2	258°52.7	179°22.1	24.5	236°17.8	34.8	146°43.9	16.7	248°35.9	02.2
3	273°55.2	194°21.3	·· 24.8	251°18.5	·· 35.5	161°45.9	·· 16.7	263°38.1	·· 02.3
4	288°57.6	209°20.5	25.1	266°19.2	36.2	176°48.0	16.6	278°40.4	02.4
5	304°00.1	224°19.7	25.4	281°19.8	36.9	191°50.0	16.6	293°42.6	02.5
6	319°02.6	239°18.9	N24°25.7	296°20.5	N08°37.6	206°52.0	N22°16.5	308°44.8	N02°02.6
7	334°05.0	254°18.0	26.0	311°21.2	38.3	221°54.1	16.5	323°47.0	02.7
8	349°07.5	269°17.2	26.3	326°21.9	39.0	236°56.1	16.4	338°49.2	02.8
9	4°10.0	284°16.4	·· 26.6	341°22.6	·· 39.8	251°58.2	·· 16.3	353°51.5	·· 02.9
10	19°12.4	299°15.6	26.9	356°23.3	40.5	267°00.2	16.3	8°53.7	03.0
11	34°14.9	314°14.8	27.3	11°24.0	41.2	282°02.2	16.2	23°55.9	03.1
12	49°17.4	329°13.9	N24°27.6	26°24.6	N08°41.9	297°04.3	N22°16.2	38°58.1	N02°03.2
13	64°19.8	344°13.1	27.9	41°25.3	42.6	312°06.3	16.1	54°00.3	03.3
14	79°22.3	359°12.3	28.2	56°26.0	43.3	327°08.4	16.1	69°02.6	03.4
15	94°24.8	14°11.5	·· 28.5	71°26.7	·· 44.0	342°10.4	·· 16.0	84°04.8	·· 03.5
16	109°27.2	29°10.6	28.7	86°27.4	44.8	357°12.4	15.9	99°07.0	03.6
17	124°29.7	44°09.8	29.0	101°28.1	45.5	12°14.5	15.9	114°09.2	03.7
18	139°32.1	59°09.0	N24°29.3	116°28.8	N08°46.2	27°16.5	N22°15.8	129°11.4	N02°03.8
19	154°34.6	74°08.2	29.6	131°29.4	46.9	42°18.6	15.8	144°13.7	03.9
20	169°37.1	89°07.4	29.9	146°30.1	47.6	57°20.6	15.7	159°15.9	04.0
21	184°39.5	104°06.5	·· 30.2	161°30.8	·· 48.3	72°22.6	·· 15.6	174°18.1	·· 04.1
22	199°42.0	119°05.7	30.5	176°31.5	49.0	87°24.7	15.6	189°20.3	04.2
23	214°44.5	134°04.9	30.8	191°32.2	49.7	102°26.7	15.5	204°22.5	04.3
Mer.pass. 08:43		ν -0.8′	d 0.3′	m -3.92	ν 0.7′	d 0.7′	m 1.24	ν 2.0′	d 0.1′ m -1.96	ν 2.2′	d 0.1′ m 0.92

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	229°46.9	149°04.1	N24°31.1	206°32.9	N08°50.5	117°28.7	N22°15.5	219°24.8	N02°04.4
1	244°49.4	164°03.2	31.4	221°33.6	51.2	132°30.8	15.4	234°27.0	04.5
2	259°51.9	179°02.4	31.7	236°34.2	51.9	147°32.8	15.4	249°29.2	04.6
3	274°54.3	194°01.6	·· 31.9	251°34.9	·· 52.6	162°34.8	·· 15.3	264°31.4	·· 04.7
4	289°56.8	209°00.8	32.2	266°35.6	53.3	177°36.9	15.2	279°33.7	04.8
5	304°59.2	223°59.9	32.5	281°36.3	54.0	192°38.9	15.2	294°35.9	04.9
6	320°01.7	238°59.1	N24°32.8	296°37.0	N08°54.7	207°41.0	N22°15.1	309°38.1	N02°04.9
7	335°04.2	253°58.3	33.1	311°37.7	55.4	222°43.0	15.1	324°40.3	05.0
8	350°06.6	268°57.5	33.3	326°38.4	56.1	237°45.0	15.0	339°42.5	05.1
9	5°09.1	283°56.6	·· 33.6	341°39.0	·· 56.9	252°47.1	·· 14.9	354°44.8	·· 05.2
10	20°11.6	298°55.8	33.9	356°39.7	57.6	267°49.1	14.9	9°47.0	05.3
11	35°14.0	313°55.0	34.2	11°40.4	58.3	282°51.1	14.8	24°49.2	05.4
12	50°16.5	328°54.2	N24°34.4	26°41.1	N08°59.0	297°53.2	N22°14.8	39°51.4	N02°05.5
13	65°19.0	343°53.4	34.7	41°41.8	08°59.7	312°55.2	14.7	54°53.6	05.6
14	80°21.4	358°52.5	35.0	56°42.5	09°00.4	327°57.2	14.6	69°55.9	05.7
15	95°23.9	13°51.7	·· 35.3	71°43.2	·· 01.1	342°59.3	·· 14.6	84°58.1	·· 05.8
16	110°26.4	28°50.9	35.5	86°43.8	01.8	358°01.3	14.5	100°00.3	05.9
17	125°28.8	43°50.0	35.8	101°44.5	02.5	13°03.3	14.5	115°02.5	06.0
18	140°31.3	58°49.2	N24°36.1	116°45.2	N09°03.2	28°05.4	N22°14.4	130°04.8	N02°06.1
19	155°33.7	73°48.4	36.3	131°45.9	03.9	43°07.4	14.3	145°07.0	06.2
20	170°36.2	88°47.6	36.6	146°46.6	04.7	58°09.4	14.3	160°09.2	06.3
21	185°38.7	103°46.7	·· 36.9	161°47.3	·· 05.4	73°11.5	·· 14.2	175°11.4	·· 06.4
22	200°41.1	118°45.9	37.1	176°47.9	06.1	88°13.5	14.2	190°13.6	06.5
23	215°43.6	133°45.1	37.4	191°48.6	06.8	103°15.5	14.1	205°15.9	06.6
Mer.pass. 08:39		ν -0.8′	d 0.3′	m -3.92	ν 0.7′	d 0.7′	m 1.24	ν 2.0′	d 0.1′ m -1.96	ν 2.2′	d 0.1′ m 0.92

Stars

	SHA	**Dec**
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.4	-42°09.6
Schedar	349°30.2	56°40.7
Diphda	348°46.5	-17°50.5
Achernar	335°19.9	-57°06.0
Hamal	327°50.3	23°35.1
Polaris	313°58.2	89°22.5
Acamar	315°11.4	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.4
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.2	-29°00.7
Procyon	244°49.9	5°09.4
Pollux	243°16.1	27°57.8
Avior	234°14.5	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.1	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.3
Dubhe	193°39.4	61°36.7
Denebola	182°23.6	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.5	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.6	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.4
Antares	112°14.1	-26°29.5
Atria	107°06.9	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.3	51°28.9
Kaus Aust.	83°30.8	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°46.2	-26°15.8
Altair	61°58.8	8°56.1
Peacock	53°03.9	-56°38.8
Deneb	49°25.0	45°22.2
Enif	33°37.8	9°59.6
Al Na'ir	27°31.6	-46°49.8
Fomalhaut	15°13.5	-29°28.8
Scheat	13°44.3	28°13.4
Markab	13°29.0	15°20.7

May 10 Sun	**SHA**	**Mer.pass**
Venus	281°54.7	14:02
Mars	338°11.3	10:16
Jupiter	248°02.1	16:14
Saturn	349°49.6	09:28

May 11 Mon	**SHA**	**Mer.pass**
Venus	280°36.0	14:03
Mars	337°28.6	10:14
Jupiter	247°52.0	16:11
Saturn	349°43.7	09:25

May 12 Tue	**SHA**	**Mer.pass**
Venus	279°17.1	14:05
Mars	336°45.9	10:13
Jupiter	247°41.8	16:08
Saturn	349°37.8	09:21

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°54.0	N17°34.1	264°15.7	13.6′	S15°50.4	12.5′	55.8′
1	195°54.0	34.7	278°48.3	13.6′	15°37.9	12.7′	55.8′
2	210°54.0	35.4	293°21.0	13.7′	15°25.2	12.7′	55.8′
3	225°54.1	·· 36.0	307°53.6	13.7′	15°12.5	12.8′	55.9′
4	240°54.1	36.7	322°26.3	13.7′	14°59.7	12.9′	55.9′
5	255°54.1	37.4	336°59.0	13.7′	14°46.8	12.9′	55.9′
6	270°54.1	N17°38.0	351°31.8	13.8′	S14°33.9	13.1′	55.9′
7	285°54.2	38.7	6°04.6	13.8′	14°20.8	13.1′	56.0′
8	300°54.2	39.3	20°37.4	13.8′	14°07.7	13.2′	56.0′
9	315°54.2	·· 40.0	35°10.2	13.8′	13°54.5	13.2′	56.0′
10	330°54.2	40.6	49°43.0	13.9′	13°41.3	13.4′	56.1′
11	345°54.2	41.3	64°15.9	13.9′	13°27.9	13.4′	56.1′
12	0°54.3	N17°41.9	78°48.8	13.9′	S13°14.5	13.5′	56.1′
13	15°54.3	42.6	93°21.7	13.9′	13°01.0	13.5′	56.2′
14	30°54.3	43.2	107°54.6	13.9′	12°47.5	13.6′	56.2′
15	45°54.3	·· 43.9	122°27.5	14.0′	12°33.9	13.7′	56.2′
16	60°54.3	44.5	137°00.5	14.0′	12°20.2	13.8′	56.3′
17	75°54.4	45.2	151°33.4	14.0′	12°06.4	13.8′	56.3′
18	90°54.4	N17°45.8	166°06.4	14.0′	S11°52.6	13.9′	56.3′
19	105°54.4	46.5	180°39.4	14.0′	11°38.7	14.0′	56.4′
20	120°54.4	47.1	195°12.4	14.0′	11°24.7	14.1′	56.4′
21	135°54.4	·· 47.8	209°45.4	14.0′	11°10.6	14.1′	56.5′
22	150°54.5	48.4	224°18.4	14.0′	10°56.5	14.1′	56.5′
23	165°54.5	49.0	238°51.5	14.0′	10°42.4	14.3′	56.5′
	SD = 15.8′	*d* = 0.7′	SD = 15.2′				

Mon	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°54.5	N17°49.7	253°24.5	14.0′	S10°28.1	14.3′	56.6′
1	195°54.5	50.3	267°57.6	14.1′	10°13.8	14.3′	56.6′
2	210°54.5	51.0	282°30.6	14.1′	09°59.5	14.4′	56.6′
3	225°54.6	·· 51.6	297°03.7	14.1′	09°45.1	14.5′	56.7′
4	240°54.6	52.3	311°36.8	14.1′	09°30.6	14.6′	56.7′
5	255°54.6	52.9	326°09.8	14.1′	09°16.0	14.6′	56.7′
6	270°54.6	N17°53.6	340°42.9	14.1′	S09°01.4	14.6′	56.8′
7	285°54.6	54.2	355°16.0	14.1′	08°46.8	14.7′	56.8′
8	300°54.6	54.8	9°49.0	14.1′	08°32.1	14.8′	56.8′
9	315°54.7	·· 55.5	24°22.1	14.1′	08°17.3	14.8′	56.9′
10	330°54.7	56.1	38°55.2	14.1′	08°02.5	14.9′	56.9′
11	345°54.7	56.8	53°28.2	14.1′	07°47.6	15.0′	57.0′
12	0°54.7	N17°57.4	68°01.3	14.0′	S07°32.6	15.0′	57.0′
13	15°54.7	58.0	82°34.3	14.0′	07°17.6	15.0′	57.0′
14	30°54.7	58.7	97°07.4	14.0′	07°02.6	15.1′	57.1′
15	45°54.7	·· 59.3	111°40.4	14.0′	06°47.5	15.1′	57.1′
16	60°54.8	17°59.9	126°13.4	14.0′	06°32.4	15.2′	57.1′
17	75°54.8	18°00.6	140°46.4	14.0′	06°17.2	15.3′	57.2′
18	90°54.8	N18°01.2	155°19.4	14.0′	S06°01.9	15.3′	57.2′
19	105°54.8	01.8	169°52.4	14.0′	05°46.6	15.3′	57.3′
20	120°54.8	02.5	184°25.4	14.0′	05°31.3	15.4′	57.3′
21	135°54.8	·· 03.1	198°58.3	13.9′	05°15.9	15.4′	57.3′
22	150°54.8	03.7	213°31.3	13.9′	05°00.5	15.5′	57.4′
23	165°54.8	04.4	228°04.2	13.9′	04°45.0	15.5′	57.4′
	SD = 15.8′	*d* = 0.6′	SD = 15.4′				

Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°54.9	N18°05.0	242°37.1	13.9′	S04°29.5	15.6′	57.5′
1	195°54.9	05.6	257°10.0	13.9′	04°13.9	15.6′	57.5′
2	210°54.9	06.3	271°42.8	13.8′	03°58.3	15.6′	57.5′
3	225°54.9	·· 06.9	286°15.6	13.8′	03°42.7	15.7′	57.6′
4	240°54.9	07.5	300°48.4	13.8′	03°27.0	15.7′	57.6′
5	255°54.9	08.2	315°21.2	13.8′	03°11.3	15.7′	57.7′
6	270°54.9	N18°08.8	329°54.0	13.7′	S02°55.6	15.8′	57.7′
7	285°54.9	09.4	344°26.7	13.7′	02°39.8	15.8′	57.7′
8	300°54.9	10.1	358°59.4	13.7′	02°24.0	15.9′	57.8′
9	315°55.0	·· 10.7	13°32.1	13.6′	02°08.1	15.9′	57.8′
10	330°55.0	11.3	28°04.7	13.6′	01°52.2	15.9′	57.9′
11	345°55.0	11.9	42°37.3	13.6′	01°36.3	15.9′	57.9′
12	0°55.0	N18°12.6	57°09.8	13.5′	S01°20.4	16.0′	57.9′
13	15°55.0	13.2	71°42.4	13.5′	01°04.4	16.0′	58.0′
14	30°55.0	13.8	86°14.9	13.4′	00°48.4	16.0′	58.0′
15	45°55.0	·· 14.4	100°47.3	13.4′	00°32.4	16.1′	58.1′
16	60°55.0	15.1	115°19.7	13.4′	00°16.3	16.1′	58.1′
17	75°55.0	15.7	129°52.1	13.3′	S00°00.2	16.1′	58.1′
18	90°55.0	N18°16.3	144°24.4	13.3′	N00°15.9	16.1′	58.2′
19	105°55.0	16.9	158°56.7	13.2′	00°32.0	16.1′	58.2′
20	120°55.0	17.5	173°28.9	13.2′	00°48.1	16.2′	58.2′
21	135°55.0	·· 18.2	188°01.1	13.1′	01°04.3	16.2′	58.3′
22	150°55.1	18.8	202°33.2	13.1′	01°20.5	16.2′	58.3′
23	165°55.1	19.4	217°05.3	13.0′	01°36.7	16.2′	58.4′
	SD = 15.8′	*d* = 0.6′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	01:23	22:37	////	////
68°	////	////	02:09	21:48	////	////
66°	////	00:25	02:38	21:18	////	////
64°	////	01:34	03:00	20:55	22:24	////
62°	////	02:08	03:18	20:37	21:48	////
60°	00:22	02:32	03:32	20:22	21:23	////
N 58°	01:24	02:51	03:44	20:10	21:04	22:33
56°	01:55	03:07	03:55	19:59	20:48	22:00
54°	02:18	03:20	04:04	19:50	20:34	21:37
52°	02:36	03:31	04:13	19:41	20:23	21:19
50°	02:51	03:42	04:20	19:34	20:12	21:03
45°	03:20	04:02	04:36	19:18	19:51	20:34
N 40°	03:41	04:19	04:49	19:05	19:35	20:12
35°	03:58	04:32	05:00	18:53	19:21	19:55
30°	04:12	04:43	05:09	18:44	19:10	19:41
20°	04:34	05:02	05:26	18:27	18:51	19:19
N 10°	04:52	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:06	17:47	18:09	18:34
20°	05:30	05:57	06:20	17:33	17:56	18:23
30°	05:41	06:10	06:35	17:17	17:42	18:11
35°	05:47	06:17	06:44	17:08	17:35	18:05
40°	05:53	06:26	06:55	16:58	17:27	17:59
45°	06:00	06:35	07:07	16:46	17:17	17:53
S 50°	06:07	06:46	07:21	16:31	17:06	17:45
52°	06:10	06:51	07:28	16:24	17:01	17:42
54°	06:13	06:56	07:35	16:17	16:56	17:39
56°	06:17	07:02	07:44	16:08	16:50	17:35
58°	06:20	07:09	07:53	15:59	16:43	17:32
S 60°	06:24	07:16	08:04	15:48	16:36	17:27

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	04:14	03:21	02:43	09:21	11:49	14:04
N 70°	03:42	03:06	02:38	09:50	12:01	14:05
68°	03:19	02:54	02:34	10:12	12:11	14:06
66°	03:00	02:44	02:30	10:29	12:19	14:07
64°	02:45	02:36	02:27	10:43	12:25	14:08
62°	02:33	02:28	02:24	10:54	12:31	14:08
60°	02:22	02:22	02:22	11:04	12:36	14:09
N 58°	02:12	02:16	02:20	11:13	12:40	14:09
56°	02:04	02:11	02:18	11:20	12:44	14:10
54°	01:57	02:07	02:16	11:27	12:48	14:10
52°	01:50	02:03	02:14	11:32	12:51	14:11
50°	01:44	01:59	02:13	11:38	12:54	14:11
45°	01:31	01:51	02:10	11:49	13:00	14:12
N 40°	01:20	01:44	02:07	11:59	13:05	14:12
35°	01:11	01:38	02:05	12:07	13:09	14:13
30°	01:03	01:33	02:03	12:13	13:13	14:13
20°	00:48	01:24	01:59	12:26	13:19	14:14
N 10°	00:36	01:16	01:56	12:36	13:25	14:14
0°	00:24	01:09	01:53	12:46	13:30	14:15
S 10°	00:12	01:01	01:51	12:55	13:35	14:15
20°	00:00	00:53	01:47	13:05	13:41	14:16
30°	·· ··	00:44	01:44	13:17	13:47	14:17
35°	·· ··	00:39	01:42	13:24	13:51	14:17
40°	·· ··	00:33	01:40	13:31	13:55	14:17
45°	·· ··	00:26	01:37	13:40	13:59	14:18
S 50°	·· ··	00:17	01:34	13:50	14:05	14:18
52°	·· ··	00:13	01:32	13:55	14:07	14:18
54°	·· ··	00:09	01:30	14:00	14:10	14:19
56°	·· ··	00:04	01:29	14:06	14:13	14:19
58°	23:58	·· ··	01:27	14:13	14:16	14:19
S 60°	23:52	·· ··	01:24	14:20	14:20	14:20

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 23-25 49-29%
10	03:36	03:37	11:56	06:35	18:57	
11	03:38	03:39	11:56	07:20	19:42	
12	03:39	03:40	11:56	08:04	20:27	

May 13, 14, 15 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230°46.1	148°44.3	N24°37.6	206°49.3	N09°07.5	118°17.6	N22°14.0	220°18.1	N02°06.7
1	245°48.5	163°43.4	37.9	221°50.0	08.2	133°19.6	14.0	235°20.3	06.8
2	260°51.0	178°42.6	38.1	236°50.7	08.9	148°21.6	13.9	250°22.5	06.9
3	275°53.5	193°41.8	·· 38.4	251°51.4	·· 09.6	163°23.7	·· 13.9	265°24.8	·· 07.0
4	290°55.9	208°41.0	38.7	266°52.1	10.3	178°25.7	13.8	280°27.0	07.0
5	305°58.4	223°40.1	38.9	281°52.7	11.0	193°27.7	13.7	295°29.2	07.1
6	321°00.9	238°39.3	N24°39.2	296°53.4	N09°11.7	208°29.8	N22°13.7	310°31.4	N02°07.2
7	336°03.3	253°38.5	39.4	311°54.1	12.4	223°31.8	13.6	325°33.7	07.3
8	351°05.8	268°37.7	39.7	326°54.8	13.1	238°33.8	13.6	340°35.9	07.4
9	6°08.2	283°36.8	·· 39.9	341°55.5	·· 13.8	253°35.9	·· 13.5	355°38.1	·· 07.5
10	21°10.7	298°36.0	40.2	356°56.2	14.6	268°37.9	13.4	10°40.3	07.6
11	36°13.2	313°35.2	40.4	11°56.8	15.3	283°39.9	13.4	25°42.5	07.7
12	51°15.6	328°34.3	N24°40.6	26°57.5	N09°16.0	298°41.9	N22°13.3	40°44.8	N02°07.8
13	66°18.1	343°33.5	40.9	41°58.2	16.7	313°44.0	13.3	55°47.0	07.9
14	81°20.6	358°32.7	41.1	56°58.9	17.4	328°46.0	13.2	70°49.2	08.0
15	96°23.0	13°31.9	·· 41.4	71°59.6	·· 18.1	343°48.0	·· 13.1	85°51.4	·· 08.1
16	111°25.5	28°31.0	41.6	87°00.3	18.8	358°50.1	13.1	100°53.7	08.2
17	126°28.0	43°30.2	41.8	102°01.0	19.5	13°52.1	13.0	115°55.9	08.3
18	141°30.4	58°29.4	N24°42.1	117°01.6	N09°20.2	28°54.1	N22°13.0	130°58.1	N02°08.4
19	156°32.9	73°28.5	42.3	132°02.3	20.9	43°56.2	12.9	146°00.3	08.5
20	171°35.3	88°27.7	42.6	147°03.0	21.6	58°58.2	12.8	161°02.6	08.6
21	186°37.8	103°26.9	·· 42.8	162°03.7	·· 22.3	74°00.2	·· 12.8	176°04.8	·· 08.7
22	201°40.3	118°26.1	43.0	177°04.4	23.0	89°02.2	12.7	191°07.0	08.8
23	216°42.7	133°25.2	43.3	192°05.1	23.7	104°04.3	12.7	206°09.2	08.8
Mer.pass. 08:36		ν -0.8′	d 0.3′	m -3.92	ν 0.7′	d 0.7′	m 1.24	ν 2.0′	d 0.1′ m -1.95	ν 2.2′	d 0.1′ m 0.91

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231°45.2	148°24.4	N24°43.5	207°05.7	N09°24.4	119°06.3	N22°12.6	221°11.5	N02°08.9
1	246°47.7	163°23.6	43.7	222°06.4	25.1	134°08.3	12.5	236°13.7	09.0
2	261°50.1	178°22.7	43.9	237°07.1	25.8	149°10.4	12.5	251°15.9	09.1
3	276°52.6	193°21.9	·· 44.2	252°07.8	·· 26.5	164°12.4	·· 12.4	266°18.1	·· 09.2
4	291°55.1	208°21.1	44.4	267°08.5	27.2	179°14.4	12.4	281°20.4	09.3
5	306°57.5	223°20.2	44.6	282°09.2	27.9	194°16.4	12.3	296°22.6	09.4
6	322°00.0	238°19.4	N24°44.8	297°09.8	N09°28.6	209°18.5	N22°12.2	311°24.8	N02°09.5
7	337°02.5	253°18.6	45.1	312°10.5	29.3	224°20.5	12.2	326°27.0	09.6
8	352°04.9	268°17.8	45.3	327°11.2	30.0	239°22.5	12.1	341°29.3	09.7
9	7°07.4	283°16.9	·· 45.5	342°11.9	·· 30.7	254°24.5	·· 12.1	356°31.5	·· 09.8
10	22°09.8	298°16.1	45.7	357°12.6	31.4	269°26.6	12.0	11°33.7	09.9
11	37°12.3	313°15.3	45.9	12°13.3	32.1	284°28.6	11.9	26°35.9	10.0
12	52°14.8	328°14.4	N24°46.1	27°13.9	N09°32.8	299°30.6	N22°11.9	41°38.2	N02°10.1
13	67°17.2	343°13.6	46.4	42°14.6	33.5	314°32.7	11.8	56°40.4	10.2
14	82°19.7	358°12.8	46.6	57°15.3	34.2	329°34.7	11.7	71°42.6	10.3
15	97°22.2	13°11.9	·· 46.8	72°16.0	·· 34.9	344°36.7	·· 11.7	86°44.8	·· 10.3
16	112°24.6	28°11.1	47.0	87°16.7	35.6	359°38.7	11.6	101°47.1	10.4
17	127°27.1	43°10.3	47.2	102°17.3	36.3	14°40.8	11.6	116°49.3	10.5
18	142°29.6	58°09.5	N24°47.4	117°18.0	N09°37.0	29°42.8	N22°11.5	131°51.5	N02°10.6
19	157°32.0	73°08.6	47.6	132°18.7	37.7	44°44.8	11.4	146°53.7	10.7
20	172°34.5	88°07.8	47.8	147°19.4	38.4	59°46.8	11.4	161°56.0	10.8
21	187°36.9	103°07.0	·· 48.0	162°20.1	·· 39.1	74°48.9	·· 11.3	176°58.2	·· 10.9
22	202°39.4	118°06.1	48.2	177°20.8	39.8	89°50.9	11.3	192°00.4	11.0
23	217°41.9	133°05.3	48.4	192°21.4	40.5	104°52.9	11.2	207°02.7	11.1
Mer.pass. 08:32		ν -0.8′	d 0.2′	m -3.93	ν 0.7′	d 0.7′	m 1.25	ν 2.0′	d 0.1′ m -1.95	ν 2.2′	d 0.1′ m 0.91

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	232°44.3	148°04.5	N24°48.6	207°22.1	N09°41.2	119°54.9	N22°11.1	222°04.9	N02°11.2
1	247°46.8	163°03.6	48.8	222°22.8	41.9	134°57.0	11.1	237°07.1	11.3
2	262°49.3	178°02.8	49.0	237°23.5	42.6	149°59.0	11.0	252°09.3	11.4
3	277°51.7	193°02.0	·· 49.2	252°24.2	·· 43.3	165°01.0	·· 10.9	267°11.6	·· 11.5
4	292°54.2	208°01.1	49.4	267°24.9	44.0	180°03.0	10.9	282°13.8	11.6
5	307°56.7	223°00.3	49.6	282°25.5	44.7	195°05.0	10.8	297°16.0	11.7
6	322°59.1	237°59.5	N24°49.8	297°26.2	N09°45.4	210°07.1	N22°10.8	312°18.2	N02°11.7
7	338°01.6	252°58.6	50.0	312°26.9	46.1	225°09.1	10.7	327°20.5	11.8
8	353°04.1	267°57.8	50.2	327°27.6	46.8	240°11.1	10.6	342°22.7	11.9
9	8°06.5	282°57.0	·· 50.4	342°28.3	·· 47.5	255°13.1	·· 10.6	357°24.9	·· 12.0
10	23°09.0	297°56.2	50.6	357°28.9	48.2	270°15.2	10.5	12°27.2	12.1
11	38°11.4	312°55.3	50.7	12°29.6	48.9	285°17.2	10.4	27°29.4	12.2
12	53°13.9	327°54.5	N24°50.9	27°30.3	N09°49.6	300°19.2	N22°10.4	42°31.6	N02°12.3
13	68°16.4	342°53.7	51.1	42°31.0	50.3	315°21.2	10.3	57°33.8	12.4
14	83°18.8	357°52.8	51.3	57°31.7	51.0	330°23.2	10.3	72°36.1	12.5
15	98°21.3	12°52.0	·· 51.5	72°32.4	·· 51.7	345°25.3	·· 10.2	87°38.3	·· 12.6
16	113°23.8	27°51.2	51.7	87°33.0	52.4	0°27.3	10.1	102°40.5	12.7
17	128°26.2	42°50.3	51.8	102°33.7	53.1	15°29.3	10.1	117°42.7	12.8
18	143°28.7	57°49.5	N24°52.0	117°34.4	N09°53.8	30°31.3	N22°10.0	132°45.0	N02°12.9
19	158°31.2	72°48.7	52.2	132°35.1	54.5	45°33.3	09.9	147°47.2	13.0
20	173°33.6	87°47.8	52.4	147°35.8	55.2	60°35.4	09.9	162°49.4	13.0
21	188°36.1	102°47.0	·· 52.5	162°36.4	·· 55.9	75°37.4	·· 09.8	177°51.7	·· 13.1
22	203°38.6	117°46.2	52.7	177°37.1	56.6	90°39.4	09.8	192°53.9	13.2
23	218°41.0	132°45.3	52.9	192°37.8	57.3	105°41.4	09.7	207°56.1	13.3
Mer.pass. 08:28		ν -0.8′	d 0.2′	m -3.93	ν 0.7′	d 0.7′	m 1.25	ν 2.0′	d 0.1′ m -1.95	ν 2.2′	d 0.1′ m 0.91

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.4	-42°09.6
Schedar	349°30.2	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.9	-57°06.0
Hamal	327°50.3	23°35.1
Polaris	313°58.0	89°22.4
Acamar	315°11.4	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.7
Sirius	258°25.5	-16°45.3
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.5	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.2	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.3
Dubhe	193°39.4	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.6	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.4
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.8	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.8	-56°38.8
Deneb	49°24.9	45°22.2
Enif	33°37.7	9°59.6
Al Na'ir	27°31.6	-46°49.8
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.3	28°13.4
Markab	13°28.9	15°20.7

May 13 Wed	SHA	Mer.pass
Venus	277°58.2	14:06
Mars	336°03.3	10:12
Jupiter	247°31.5	16:05
Saturn	349°32.0	09:17

May 14 Thu	SHA	Mer.pass
Venus	276°39.2	14:07
Mars	335°20.5	10:11
Jupiter	247°21.1	16:01
Saturn	349°26.3	09:14

May 15 Fri	SHA	Mer.pass
Venus	275°20.1	14:08
Mars	334°37.8	10:10
Jupiter	247°10.6	15:58
Saturn	349°20.5	09:10

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°55.1	N18°20.0	231°37.3	13.0′	N01°52.9	16.2′	58.4′
1	195°55.1	20.6	246°09.3	12.9′	02°09.1	16.3′	58.4′
2	210°55.1	21.3	260°41.2	12.9′	02°25.4	16.2′	58.5′
3	225°55.1	·· 21.9	275°13.1	12.8′	02°41.6	16.3′	58.5′
4	240°55.1	22.5	289°44.9	12.7′	02°57.9	16.2′	58.6′
5	255°55.1	23.1	304°16.6	12.7′	03°14.1	16.3′	58.6′
6	270°55.1	N18°23.7	318°48.3	12.6′	N03°30.4	16.3′	58.6′
7	285°55.1	24.4	333°20.0	12.6′	03°46.7	16.3′	58.7′
8	300°55.1	25.0	347°51.5	12.5′	04°03.0	16.3′	58.7′
9	315°55.1	·· 25.6	2°23.0	12.4′	04°19.3	16.3′	58.8′
10	330°55.1	26.2	16°54.5	12.4′	04°35.6	16.3′	58.8′
11	345°55.1	26.8	31°25.8	12.3′	04°51.9	16.3′	58.8′
12	0°55.1	N18°27.4	45°57.1	12.2′	N05°08.2	16.2′	58.9′
13	15°55.1	28.0	60°28.4	12.2′	05°24.4	16.3′	58.9′
14	30°55.1	28.6	74°59.5	12.1′	05°40.7	16.3′	59.0′
15	45°55.1	·· 29.3	89°30.6	12.0′	05°57.0	16.3′	59.0′
16	60°55.1	29.9	104°01.6	11.9′	06°13.3	16.2′	59.0′
17	75°55.1	30.5	118°32.5	11.9′	06°29.5	16.3′	59.1′
18	90°55.1	N18°31.1	133°03.4	11.8′	N06°45.8	16.2′	59.1′
19	105°55.1	31.7	147°34.2	11.7′	07°02.0	16.3′	59.1′
20	120°55.1	32.3	162°04.9	11.6′	07°18.3	16.2′	59.2′
21	135°55.1	·· 32.9	176°35.5	11.5′	07°34.5	16.2′	59.2′
22	150°55.1	33.5	191°06.0	11.4′	07°50.7	16.1′	59.3′
23	165°55.1	34.1	205°36.5	11.4′	08°06.8	16.2′	59.3′
	SD = 15.8′	d = 0.6′	SD = 15.9′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°55.1	N18°34.7	220°06.8	11.3′	N08°23.0	16.1′	59.3′
1	195°55.1	35.3	234°37.1	11.2′	08°39.1	16.1′	59.4′
2	210°55.1	35.9	249°07.3	11.1′	08°55.2	16.1′	59.4′
3	225°55.1	·· 36.6	263°37.4	11.0′	09°11.3	16.1′	59.4′
4	240°55.1	37.2	278°07.4	10.9′	09°27.4	16.0′	59.5′
5	255°55.1	37.8	292°37.3	10.8′	09°43.4	16.0′	59.5′
6	270°55.1	N18°38.4	307°07.1	10.7′	N09°59.4	15.9′	59.6′
7	285°55.1	39.0	321°36.9	10.6′	10°15.3	16.0′	59.6′
8	300°55.1	39.6	336°06.5	10.5′	10°31.3	15.8′	59.6′
9	315°55.1	·· 40.2	350°36.0	10.4′	10°47.1	15.9′	59.7′
10	330°55.1	40.8	5°05.5	10.3′	11°03.0	15.8′	59.7′
11	345°55.1	41.4	19°34.8	10.2′	11°18.8	15.8′	59.7′
12	0°55.1	N18°42.0	34°04.0	10.1′	N11°34.6	15.7′	59.8′
13	15°55.1	42.6	48°33.1	10.0′	11°50.3	15.7′	59.8′
14	30°55.1	43.2	63°02.2	9.9′	12°06.0	15.6′	59.8′
15	45°55.1	·· 43.8	77°31.1	9.8′	12°21.6	15.6′	59.9′
16	60°55.1	44.4	91°59.9	9.7′	12°37.2	15.5′	59.9′
17	75°55.1	45.0	106°28.6	9.6′	12°52.7	15.4′	59.9′
18	90°55.1	N18°45.6	120°57.2	9.5′	N13°08.1	15.4′	60.0′
19	105°55.1	46.2	135°25.7	9.4′	13°23.5	15.4′	60.0′
20	120°55.1	46.8	149°54.1	9.3′	13°38.9	15.3′	60.0′
21	135°55.1	·· 47.3	164°22.3	9.1′	13°54.2	15.2′	60.1′
22	150°55.1	47.9	178°50.5	9.0′	14°09.4	15.2′	60.1′
23	165°55.0	48.5	193°18.5	8.9′	14°24.6	15.1′	60.1′
	SD = 15.8′	d = 0.6′	SD = 16.2′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°55.0	N18°49.1	207°46.4	8.8′	N14°39.7	15.0′	60.2′
1	195°55.0	49.7	222°14.2	8.7′	14°54.7	15.0′	60.2′
2	210°55.0	50.3	236°41.9	8.6′	15°09.7	14.8′	60.2′
3	225°55.0	·· 50.9	251°09.5	8.4′	15°24.5	14.8′	60.2′
4	240°55.0	51.5	265°36.9	8.3′	15°39.3	14.8′	60.3′
5	255°55.0	52.1	280°04.2	8.2′	15°54.1	14.6′	60.3′
6	270°55.0	N18°52.7	294°31.4	8.1′	N16°08.7	14.6′	60.3′
7	285°55.0	53.3	308°58.5	8.0′	16°23.3	14.4′	60.4′
8	300°55.0	53.9	323°25.5	7.8′	16°37.7	14.4′	60.4′
9	315°55.0	·· 54.4	337°52.3	7.7′	16°52.1	14.3′	60.4′
10	330°55.0	55.0	352°19.0	7.6′	17°06.4	14.2′	60.4′
11	345°55.0	55.6	6°45.6	7.5′	17°20.6	14.1′	60.5′
12	0°54.9	N18°56.2	21°12.1	7.3′	N17°34.7	14.1′	60.5′
13	15°54.9	56.8	35°38.4	7.2′	17°48.8	13.9′	60.5′
14	30°54.9	57.4	50°04.6	7.1′	18°02.7	13.8′	60.5′
15	45°54.9	·· 58.0	64°30.7	7.0′	18°16.5	13.7′	60.6′
16	60°54.9	58.6	78°56.7	6.8′	18°30.2	13.6′	60.6′
17	75°54.9	59.1	93°22.5	6.7′	18°43.8	13.5′	60.6′
18	90°54.9	N18°59.7	107°48.2	6.6′	N18°57.3	13.4′	60.6′
19	105°54.9	19°00.3	122°13.8	6.4′	19°10.7	13.3′	60.7′
20	120°54.9	00.9	136°39.2	6.3′	19°24.0	13.1′	60.7′
21	135°54.9	·· 01.5	151°04.5	6.2′	19°37.1	13.1′	60.7′
22	150°54.8	02.0	165°29.7	6.1′	19°50.2	12.9′	60.7′
23	165°54.8	02.6	179°54.8	5.9′	20°03.1	12.8′	60.7′
	SD = 15.8′	d = 0.6′	SD = 16.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	00:54	23:11	////	////
68°	////	////	01:53	22:05	////	////
66°	////	////	02:26	21:30	////	////
64°	////	01:15	02:50	21:05	22:44	////
62°	////	01:56	03:09	20:45	22:01	////
60°	////	02:22	03:25	20:30	21:33	////
N 58°	01:08	02:43	03:38	20:16	21:12	22:51
56°	01:44	03:00	03:49	20:05	20:55	22:12
54°	02:09	03:14	03:59	19:55	20:40	21:46
52°	02:29	03:26	04:08	19:46	20:28	21:26
50°	02:45	03:36	04:16	19:38	20:17	21:10
45°	03:15	03:58	04:32	19:21	19:55	20:39
N 40°	03:38	04:15	04:46	19:07	19:38	20:16
35°	03:55	04:29	04:57	18:56	19:24	19:58
30°	04:10	04:41	05:07	18:46	19:12	19:43
20°	04:33	05:01	05:24	18:29	18:52	19:20
N 10°	04:51	05:17	05:39	18:14	18:36	19:02
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:58	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:15	17:41	18:09
35°	05:49	06:20	06:47	17:06	17:33	18:03
40°	05:56	06:28	06:57	16:55	17:24	17:57
45°	06:03	06:38	07:10	16:42	17:14	17:50
S 50°	06:10	06:50	07:25	16:27	17:02	17:42
52°	06:14	06:55	07:32	16:20	16:57	17:38
54°	06:17	07:01	07:40	16:12	16:51	17:35
56°	06:21	07:07	07:49	16:03	16:45	17:31
58°	06:25	07:14	07:59	15:53	16:38	17:27
S 60°	06:30	07:22	08:11	15:41	16:30	17:22

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	02:09	01:31	00:36	16:22	19:04	▭
N 70°	02:12	01:44	01:06 23:18	16:13	18:37	22:20
68°	02:15	01:54	01:28	16:05	18:17	20:59
66°	02:17	02:03	01:46	15:59	18:01	20:22
64°	02:19	02:10	02:00	15:54	17:48	19:56
62°	02:20	02:16	02:12	15:49	17:37	19:35
60°	02:22	02:22	02:23	15:45	17:28	19:19
N 58°	02:23	02:27	02:32	15:42	17:20	19:05
56°	02:24	02:31	02:40	15:39	17:13	18:53
54°	02:25	02:35	02:47	15:36	17:07	18:43
52°	02:26	02:39	02:54	15:34	17:01	18:34
50°	02:27	02:42	03:00	15:31	16:56	18:26
45°	02:29	02:49	03:13	15:26	16:45	18:09
N 40°	02:30	02:55	03:23	15:22	16:36	17:55
35°	02:32	03:00	03:32	15:19	16:29	17:43
30°	02:33	03:05	03:41	15:16	16:22	17:32
20°	02:35	03:13	03:55	15:10	16:10	17:15
N 10°	02:37	03:20	04:07	15:06	16:00	16:59
0°	02:39	03:27	04:19	15:01	15:51	16:45
S 10°	02:41	03:34	04:31	14:57	15:42	16:31
20°	02:43	03:41	04:44	14:52	15:32	16:16
30°	02:45	03:50	04:58	14:47	15:21	15:59
35°	02:47	03:55	05:07	14:44	15:14	15:49
40°	02:48	04:00	05:17	14:41	15:07	15:38
45°	02:50	04:07	05:28	14:37	14:58	15:24
S 50°	02:52	04:15	05:43	14:32	14:48	15:08
52°	02:53	04:19	05:49	14:30	14:44	15:01
54°	02:55	04:23	05:57	14:28	14:38	14:52
56°	02:56	04:28	06:05	14:25	14:33	14:43
58°	02:57	04:33	06:15	14:22	14:26	14:33
S 60°	02:59	04:38	06:26	14:19	14:19	14:21

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 20-5%
13	03:40	03:40	11:56	08:50	21:14	
14	03:41	03:40	11:56	09:39	22:05	
15	03:40	03:40	11:56	10:32	23:00	

May 16, 17, 18 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	233°43.5	147°44.5	N24°53.1	207°38.5	N09°57.9	120°43.5	N22°09.6	222°58.3	N02°13.4
1	248°45.9	162°43.7	53.2	222°39.2	58.6	135°45.5	09.6	238°00.6	13.5
2	263°48.4	177°42.8	53.4	237°39.9	09°59.3	150°47.5	09.5	253°02.8	13.6
3	278°50.9	192°42.0	·· 53.6	252°40.5	10°00.0	165°49.5	·· 09.4	268°05.0	·· 13.7
4	293°53.3	207°41.2	53.7	267°41.2	00.7	180°51.5	09.4	283°07.3	13.8
5	308°55.8	222°40.3	53.9	282°41.9	01.4	195°53.5	09.3	298°09.5	13.9
6	323°58.3	237°39.5	N24°54.1	297°42.6	N10°02.1	210°55.6	N22°09.2	313°11.7	N02°14.0
7	339°00.7	252°38.7	54.2	312°43.3	02.8	225°57.6	09.2	328°13.9	14.1
8	354°03.2	267°37.8	54.4	327°43.9	03.5	240°59.6	09.1	343°16.2	14.1
9	9°05.7	282°37.0	·· 54.5	342°44.6	·· 04.2	256°01.6	·· 09.1	358°18.4	·· 14.2
10	24°08.1	297°36.2	54.7	357°45.3	04.9	271°03.6	09.0	13°20.6	14.3
11	39°10.6	312°35.3	54.9	12°46.0	05.6	286°05.7	08.9	28°22.9	14.4
12	54°13.1	327°34.5	N24°55.0	27°46.7	N10°06.3	301°07.7	N22°08.9	43°25.1	N02°14.5
13	69°15.5	342°33.7	55.2	42°47.3	07.0	316°09.7	08.8	58°27.3	14.6
14	84°18.0	357°32.8	55.3	57°48.0	07.6	331°11.7	08.7	73°29.6	14.7
15	99°20.4	12°32.0	·· 55.5	72°48.7	·· 08.3	346°13.7	·· 08.7	88°31.8	·· 14.8
16	114°22.9	27°31.2	55.6	87°49.4	09.0	1°15.7	08.6	103°34.0	14.9
17	129°25.4	42°30.3	55.8	102°50.1	09.7	16°17.8	08.5	118°36.2	15.0
18	144°27.8	57°29.5	N24°55.9	117°50.7	N10°10.4	31°19.8	N22°08.5	133°38.5	N02°15.1
19	159°30.3	72°28.7	56.1	132°51.4	11.1	46°21.8	08.4	148°40.7	15.2
20	174°32.8	87°27.8	56.2	147°52.1	11.8	61°23.8	08.4	163°42.9	15.2
21	189°35.2	102°27.0	·· 56.4	162°52.8	·· 12.5	76°25.8	·· 08.3	178°45.2	·· 15.3
22	204°37.7	117°26.2	56.5	177°53.5	13.2	91°27.8	08.2	193°47.4	15.4
23	219°40.2	132°25.3	56.7	192°54.1	13.9	106°29.9	08.2	208°49.6	15.5
Mer.pass. 08:24		ν -0.8′	d 0.2′	ν 0.7′	d 0.7′	ν 2.0′	d 0.1′	ν 2.2′	d 0.1′
		m -3.93		m 1.25		m -1.94		m 0.91	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	234°42.6	147°24.5	N24°56.8	207°54.8	N10°14.6	121°31.9	N22°08.1	223°51.9	N02°15.6
1	249°45.1	162°23.7	56.9	222°55.5	15.2	136°33.9	08.0	238°54.1	15.7
2	264°47.5	177°22.8	57.1	237°56.2	15.9	151°35.9	08.0	253°56.3	15.8
3	279°50.0	192°22.0	·· 57.2	252°56.9	·· 16.6	166°37.9	·· 07.9	268°58.6	·· 15.9
4	294°52.5	207°21.2	57.3	267°57.5	17.3	181°39.9	07.8	284°00.8	16.0
5	309°54.9	222°20.3	57.5	282°58.2	18.0	196°42.0	07.8	299°03.0	16.1
6	324°57.4	237°19.5	N24°57.6	297°58.9	N10°18.7	211°44.0	N22°07.7	314°05.2	N02°16.2
7	339°59.9	252°18.7	57.7	312°59.6	19.4	226°46.0	07.6	329°07.5	16.3
8	355°02.3	267°17.8	57.9	328°00.3	20.1	241°48.0	07.6	344°09.7	16.3
9	10°04.8	282°17.0	·· 58.0	343°00.9	·· 20.8	256°50.0	·· 07.5	359°11.9	·· 16.4
10	25°07.3	297°16.2	58.1	358°01.6	21.4	271°52.0	07.5	14°14.2	16.5
11	40°09.7	312°15.3	58.3	13°02.3	22.1	286°54.0	07.4	29°16.4	16.6
12	55°12.2	327°14.5	N24°58.4	28°03.0	N10°22.8	301°56.0	N22°07.3	44°18.6	N02°16.7
13	70°14.7	342°13.7	58.5	43°03.7	23.5	316°58.1	07.3	59°20.9	16.8
14	85°17.1	357°12.8	58.6	58°04.3	24.2	332°00.1	07.2	74°23.1	16.9
15	100°19.6	12°12.0	·· 58.8	73°05.0	·· 24.9	347°02.1	·· 07.1	89°25.3	·· 17.0
16	115°22.0	27°11.2	58.9	88°05.7	25.6	2°04.1	07.1	104°27.6	17.1
17	130°24.5	42°10.3	59.0	103°06.4	26.2	17°06.1	07.0	119°29.8	17.2
18	145°27.0	57°09.5	N24°59.1	118°07.1	N10°26.9	32°08.1	N22°06.9	134°32.0	N02°17.2
19	160°29.4	72°08.7	59.2	133°07.7	27.6	47°10.1	06.9	149°34.3	17.3
20	175°31.9	87°07.8	59.4	148°08.4	28.3	62°12.2	06.8	164°36.5	17.4
21	190°34.4	102°07.0	·· 59.5	163°09.1	·· 29.0	77°14.2	·· 06.7	179°38.7	·· 17.5
22	205°36.8	117°06.2	59.6	178°09.8	29.7	92°16.2	06.7	194°41.0	17.6
23	220°39.3	132°05.3	59.7	193°10.5	30.4	107°18.2	06.6	209°43.2	17.7
Mer.pass. 08:20		ν -0.8′	d 0.1′	ν 0.7′	d 0.7′	ν 2.0′	d 0.1′	ν 2.2′	d 0.1′
		m -3.93		m 1.25		m -1.94		m 0.91	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	235°41.8	147°04.5	N24°59.8	208°11.1	N10°31.0	122°20.2	N22°06.5	224°45.4	N02°17.8
1	250°44.2	162°03.7	24°59.9	223°11.8	31.7	137°22.2	06.5	239°47.7	17.9
2	265°46.7	177°02.8	25°00.0	238°12.5	32.4	152°24.2	06.4	254°49.9	18.0
3	280°49.2	192°02.0	·· 00.1	253°13.2	·· 33.1	167°26.2	·· 06.3	269°52.1	·· 18.1
4	295°51.6	207°01.2	00.2	268°13.9	33.8	182°28.2	06.3	284°54.4	18.1
5	310°54.1	222°00.3	00.4	283°14.5	34.5	197°30.3	06.2	299°56.6	18.2
6	325°56.5	236°59.5	N25°00.5	298°15.2	N10°35.1	212°32.3	N22°06.2	314°58.8	N02°18.3
7	340°59.0	251°58.7	00.6	313°15.9	35.8	227°34.3	06.1	330°01.1	18.4
8	356°01.5	266°57.8	00.7	328°16.6	36.5	242°36.3	06.0	345°03.3	18.5
9	11°03.9	281°57.0	·· 00.8	343°17.2	·· 37.2	257°38.3	·· 06.0	0°05.5	·· 18.6
10	26°06.4	296°56.2	00.9	358°17.9	37.9	272°40.3	05.9	15°07.8	18.7
11	41°08.9	311°55.3	01.0	13°18.6	38.6	287°42.3	05.8	30°10.0	18.8
12	56°11.3	326°54.5	N25°01.1	28°19.3	N10°39.2	302°44.3	N22°05.8	45°12.2	N02°18.9
13	71°13.8	341°53.7	01.2	43°20.0	39.9	317°46.3	05.7	60°14.5	19.0
14	86°16.3	356°52.8	01.2	58°20.6	40.6	332°48.3	05.6	75°16.7	19.0
15	101°18.7	11°52.0	·· 01.3	73°21.3	·· 41.3	347°50.4	·· 05.6	90°18.9	·· 19.1
16	116°21.2	26°51.2	01.4	88°22.0	42.0	2°52.4	05.5	105°21.2	19.2
17	131°23.7	41°50.3	01.5	103°22.7	42.7	17°54.4	05.4	120°23.4	19.3
18	146°26.1	56°49.5	N25°01.6	118°23.4	N10°43.3	32°56.4	N22°05.4	135°25.6	N02°19.4
19	161°28.6	71°48.7	01.7	133°24.0	44.0	47°58.4	05.3	150°27.9	19.5
20	176°31.0	86°47.8	01.8	148°24.7	44.7	63°00.4	05.2	165°30.1	19.6
21	191°33.5	101°47.0	·· 01.9	163°25.4	·· 45.4	78°02.4	·· 05.2	180°32.3	·· 19.7
22	206°36.0	116°46.2	02.0	178°26.1	46.1	93°04.4	05.1	195°34.6	19.8
23	221°38.4	131°45.3	02.0	193°26.7	46.7	108°06.4	05.0	210°36.8	19.9
Mer.pass. 08:16		ν -0.8′	d 0.1′	ν 0.7′	d 0.7′	ν 2.0′	d 0.1′	ν 2.2′	d 0.1′
		m -3.93		m 1.25		m -1.93		m 0.91	

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.2	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.9	-57°06.0
Hamal	327°50.3	23°35.1
Polaris	313°57.4	89°22.4
Acamar	315°11.4	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.7
Sirius	258°25.5	-16°45.3
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.5	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.2	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.2	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.8	-56°38.8
Deneb	49°24.9	45°22.2
Enif	33°37.7	9°59.6
Al Na'ir	27°31.6	-46°49.8
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.3	28°13.4
Markab	13°28.9	15°20.7

May 16 Sat	SHA	Mer.pass
Venus	274°01.0	14:10
Mars	333°55.0	10:09
Jupiter	247°00.0	15:55
Saturn	349°14.9	09:07

May 17 Sun	SHA	Mer.pass
Venus	272°41.9	14:11
Mars	333°12.2	10:08
Jupiter	246°49.3	15:52
Saturn	349°09.2	09:03

May 18 Mon	SHA	Mer.pass
Venus	271°22.7	14:12
Mars	332°29.4	10:07
Jupiter	246°38.4	15:49
Saturn	349°03.7	09:00

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°54.8	N19°03.2	194°19.7	5.8′	N20°15.9	12.6′	60.8′
1	195°54.8	03.8	208°44.5	5.7′	20°28.5	12.6′	60.8′
2	210°54.8	04.4	223°09.2	5.5′	20°41.1	12.4′	60.8′
3	225°54.8	·· 04.9	237°33.7	5.4′	20°53.5	12.3′	60.8′
4	240°54.8	05.5	251°58.1	5.3′	21°05.8	12.1′	60.8′
5	255°54.7	06.1	266°22.4	5.2′	21°17.9	12.0′	60.9′
6	270°54.7	N19°06.7	280°46.6	5.0′	N21°29.9	11.9′	60.9′
7	285°54.7	07.3	295°10.6	4.9′	21°41.8	11.7′	60.9′
8	300°54.7	07.8	309°34.5	4.8′	21°53.5	11.6′	60.9′
9	315°54.7	·· 08.4	323°58.3	4.6′	22°05.1	11.4′	60.9′
10	330°54.7	09.0	338°21.9	4.5′	22°16.5	11.3′	60.9′
11	345°54.7	09.6	352°45.4	4.4′	22°27.8	11.2′	61.0′
12	0°54.6	N19°10.1	7°08.8	4.3′	N22°39.0	11.0′	61.0′
13	15°54.6	10.7	21°32.1	4.1′	22°50.0	10.8′	61.0′
14	30°54.6	11.3	35°55.3	4.0′	23°00.8	10.7′	61.0′
15	45°54.6	·· 11.8	50°18.3	3.9′	23°11.5	10.5′	61.0′
16	60°54.6	12.4	64°41.2	3.8′	23°22.0	10.3′	61.0′
17	75°54.6	13.0	79°04.0	3.7′	23°32.3	10.2′	61.0′
18	90°54.5	N19°13.6	93°26.6	3.6′	N23°42.5	10.0′	61.1′
19	105°54.5	14.1	107°49.2	3.4′	23°52.5	9.9′	61.1′
20	120°54.5	14.7	122°11.6	3.3′	24°02.4	9.6′	61.1′
21	135°54.5	·· 15.3	136°34.0	3.2′	24°12.0	9.5′	61.1′
22	150°54.5	15.8	150°56.2	3.1′	24°21.5	9.4′	61.1′
23	165°54.5	16.4	165°18.3	3.0′	24°30.9	9.1′	61.1′
	SD = 15.8′	d = 0.6′	SD = 16.6′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°54.4	N19°17.0	179°40.2	2.9′	N24°40.0	9.0′	61.1′
1	195°54.4	17.5	194°02.1	2.8′	24°49.0	8.8′	61.1′
2	210°54.4	18.1	208°23.9	2.7′	24°57.8	8.6′	61.1′
3	225°54.4	·· 18.7	222°45.6	2.6′	25°06.4	8.4′	61.1′
4	240°54.4	19.2	237°07.1	2.5′	25°14.8	8.2′	61.1′
5	255°54.3	19.8	251°28.6	2.4′	25°23.0	8.1′	61.1′
6	270°54.3	N19°20.3	265°49.9	2.3′	N25°31.1	7.8′	61.1′
7	285°54.3	20.9	280°11.2	2.2′	25°38.9	7.7′	61.1′
8	300°54.3	21.5	294°32.4	2.1′	25°46.6	7.4′	61.1′
9	315°54.3	·· 22.0	308°53.5	2.0′	25°54.0	7.3′	61.2′
10	330°54.2	22.6	323°14.5	1.9′	26°01.3	7.1′	61.2′
11	345°54.2	23.2	337°35.4	1.8′	26°08.4	6.9′	61.2′
12	0°54.2	N19°23.7	351°56.2	1.7′	N26°15.3	6.6′	61.2′
13	15°54.2	24.3	6°16.9	1.7′	26°21.9	6.5′	61.2′
14	30°54.2	24.8	20°37.6	1.6′	26°28.4	6.3′	61.2′
15	45°54.1	·· 25.4	34°58.2	1.5′	26°34.7	6.0′	61.2′
16	60°54.1	25.9	49°18.7	1.4′	26°40.7	5.9′	61.2′
17	75°54.1	26.5	63°39.1	1.4′	26°46.6	5.6′	61.2′
18	90°54.1	N19°27.1	77°59.5	1.3′	N26°52.2	5.5′	61.2′
19	105°54.0	27.6	92°19.8	1.3′	26°57.7	5.2′	61.1′
20	120°54.0	28.2	106°40.1	1.2′	27°02.9	5.0′	61.1′
21	135°54.0	·· 28.7	121°00.3	1.1′	27°07.9	4.8′	61.1′
22	150°54.0	29.3	135°20.4	1.1′	27°12.7	4.6′	61.1′
23	165°54.0	29.8	149°40.5	1.0′	27°17.3	4.4′	61.1′
	SD = 15.8′	d = 0.6′	SD = 16.7′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°53.9	N19°30.4	164°00.5	1.0′	N27°21.7	4.1′	61.1′
1	195°53.9	30.9	178°20.5	1.0′	27°25.8	4.0′	61.1′
2	210°53.9	31.5	192°40.5	0.9′	27°29.8	3.7′	61.1′
3	225°53.9	·· 32.0	207°00.4	0.9′	27°33.5	3.5′	61.1′
4	240°53.8	32.6	221°20.3	0.8′	27°37.0	3.3′	61.1′
5	255°53.8	33.1	235°40.1	0.8′	27°40.3	3.1′	61.1′
6	270°53.8	N19°33.7	249°59.9	0.8′	N27°43.4	2.8′	61.1′
7	285°53.8	34.2	264°19.7	0.8′	27°46.2	2.7′	61.1′
8	300°53.7	34.8	278°39.5	0.8′	27°48.9	2.4′	61.1′
9	315°53.7	·· 35.3	292°59.3	0.7′	27°51.3	2.2′	61.1′
10	330°53.7	35.9	307°19.0	0.7′	27°53.5	1.9′	61.0′
11	345°53.6	36.4	321°38.7	0.7′	27°55.4	1.8′	61.0′
12	0°53.6	N19°37.0	335°58.5	0.7′	N27°57.2	1.5′	61.0′
13	15°53.6	37.5	350°18.2	0.7′	27°58.7	1.3′	61.0′
14	30°53.6	38.1	4°37.9	0.7′	28°00.0	1.1′	61.0′
15	45°53.5	·· 38.6	18°57.6	0.7′	28°01.1	0.9′	61.0′
16	60°53.5	39.2	33°17.4	0.7′	28°02.0	0.6′	61.0′
17	75°53.5	39.7	47°37.1	0.8′	28°02.6	0.4′	61.0′
18	90°53.5	N19°40.2	61°56.9	0.8′	N28°03.0	0.2′	60.9′
19	105°53.4	40.8	76°16.7	0.8′	28°03.2	0.0′	60.9′
20	120°53.4	41.3	90°36.5	0.8′	28°03.2	0.2′	60.9′
21	135°53.4	·· 41.9	104°56.3	0.9′	28°03.0	0.5′	60.9′
22	150°53.3	42.4	119°16.2	0.9′	28°02.5	0.7′	60.9′
23	165°53.3	42.9	133°36.1	0.9′	28°01.8	0.9′	60.9′
	SD = 15.8′	d = 0.6′	SD = 16.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	01:36	22:22	////	////
66°	////	////	02:14	21:42	////	////
64°	////	00:52	02:41	21:14	23:09	////
62°	////	01:43	03:01	20:53	22:14	////
60°	////	02:13	03:18	20:37	21:43	////
N 58°	00:47	02:35	03:32	20:22	21:20	23:14
56°	01:33	02:53	03:44	20:10	21:01	22:24
54°	02:01	03:08	03:54	20:00	20:46	21:55
52°	02:22	03:21	04:03	19:50	20:33	21:33
50°	02:38	03:32	04:12	19:42	20:22	21:16
45°	03:11	03:54	04:29	19:25	19:59	20:43
N 40°	03:34	04:12	04:43	19:10	19:41	20:19
35°	03:53	04:27	04:55	18:58	19:26	20:01
30°	04:08	04:39	05:05	18:48	19:14	19:46
20°	04:31	05:00	05:23	18:30	18:53	19:22
N 10°	04:50	05:16	05:39	18:14	18:37	19:03
0°	05:05	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:45	06:07	17:46	18:08	18:34
20°	05:32	05:59	06:22	17:31	17:54	18:21
30°	05:45	06:14	06:39	17:14	17:39	18:08
35°	05:51	06:22	06:49	17:04	17:31	18:01
40°	05:58	06:31	07:00	16:52	17:22	17:54
45°	06:05	06:41	07:13	16:39	17:11	17:47
S 50°	06:14	06:53	07:29	16:23	16:59	17:39
52°	06:17	06:59	07:37	16:15	16:53	17:35
54°	06:21	07:05	07:45	16:07	16:47	17:31
56°	06:25	07:12	07:55	15:58	16:41	17:27
58°	06:30	07:19	08:05	15:47	16:33	17:22
S 60°	06:35	07:27	08:18	15:35	16:25	17:17

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	00:41	▭	▭	▭	▭	▭
66°	01:20	▭	▭	▭	▭	▭
64°	01:47	01:23	▭	22:27	▭	▭
62°	02:09	02:05	02:04	21:45	·· ··	00:04
60°	02:26	02:34	02:57	21:17	23:12	·· ··
N 58°	02:41	02:57	03:29	20:55	22:40	23:59
56°	02:53	03:15	03:53	20:38	22:16	23:33
54°	03:04	03:31	04:13	20:23	21:57	23:13
52°	03:14	03:44	04:29	20:10	21:41	22:56
50°	03:23	03:56	04:44	19:58	21:26	22:41
45°	03:42	04:21	05:13	19:35	20:58	22:11
N 40°	03:58	04:41	05:35	19:16	20:35	21:47
35°	04:11	04:57	05:54	19:00	20:17	21:28
30°	04:22	05:12	06:11	18:46	20:01	21:11
20°	04:42	05:37	06:38	18:23	19:34	20:43
N 10°	04:59	05:58	07:02	18:03	19:11	20:19
0°	05:16	06:18	07:25	17:45	18:49	19:57
S 10°	05:32	06:39	07:47	17:26	18:28	19:34
20°	05:50	07:00	08:11	17:07	18:05	19:10
30°	06:11	07:26	08:39	16:44	17:38	18:41
35°	06:23	07:41	08:56	16:31	17:22	18:25
40°	06:37	07:58	09:15	16:16	17:04	18:05
45°	06:54	08:20	09:39	15:58	16:42	17:41
S 50°	07:15	08:47	10:09	15:35	16:15	17:11
52°	07:25	09:00	10:24	15:25	16:01	16:56
54°	07:36	09:15	10:42	15:13	15:45	16:38
56°	07:49	09:33	11:03	14:59	15:27	16:17
58°	08:04	09:55	11:30	14:44	15:05	15:50
S 60°	08:22	10:23	12:08	14:25	14:36	15:12

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 1-2%
16	03:39	03:39	11:56	11:30	–:–	
17	03:38	03:37	11:56	12:34	00:01	
18	03:36	03:34	11:56	13:41	01:07	

May 19, 20, 21 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°40.9	146°44.5	N25°02.1	208°27.4	N10°47.4	123°08.4	N22°05.0	225°39.0	N02°19.9
1	251°43.4	161°43.7	02.2	223°28.1	48.1	138°10.4	04.9	240°41.3	20.0
2	266°45.8	176°42.8	02.3	238°28.8	48.8	153°12.4	04.8	255°43.5	20.1
3	281°48.3	191°42.0	·· 02.4	253°29.5	·· 49.5	168°14.5	·· 04.8	270°45.7	·· 20.2
4	296°50.8	206°41.2	02.4	268°30.1	50.1	183°16.5	04.7	285°48.0	20.3
5	311°53.2	221°40.3	02.5	283°30.8	50.8	198°18.5	04.6	300°50.2	20.4
6	326°55.7	236°39.5	N25°02.6	298°31.5	N10°51.5	213°20.5	N22°04.6	315°52.4	N02°20.5
7	341°58.2	251°38.7	02.7	313°32.2	52.2	228°22.5	04.5	330°54.7	20.6
8	357°00.6	266°37.8	02.7	328°32.8	52.9	243°24.5	04.4	345°56.9	20.7
9	12°03.1	281°37.0	·· 02.8	343°33.5	·· 53.5	258°26.5	·· 04.4	0°59.2	·· 20.7
10	27°05.5	296°36.2	02.9	358°34.2	54.2	273°28.5	04.3	16°01.4	20.8
11	42°08.0	311°35.3	02.9	13°34.9	54.9	288°30.5	04.2	31°03.6	20.9
12	57°10.5	326°34.5	N25°03.0	28°35.5	N10°55.6	303°32.5	N22°04.2	46°05.9	N02°21.0
13	72°12.9	341°33.7	03.1	43°36.2	56.2	318°34.5	04.1	61°08.1	21.1
14	87°15.4	356°32.8	03.1	58°36.9	56.9	333°36.5	04.0	76°10.3	21.2
15	102°17.9	11°32.0	·· 03.2	73°37.6	·· 57.6	348°38.5	·· 04.0	91°12.6	·· 21.3
16	117°20.3	26°31.2	03.3	88°38.3	58.3	3°40.5	03.9	106°14.8	21.4
17	132°22.8	41°30.3	03.3	103°38.9	58.9	18°42.5	03.8	121°17.0	21.4
18	147°25.3	56°29.5	N25°03.4	118°39.6	N10°59.6	33°44.5	N22°03.8	136°19.3	N02°21.5
19	162°27.7	71°28.7	03.4	133°40.3	11°00.3	48°46.5	03.7	151°21.5	21.6
20	177°30.2	86°27.8	03.5	148°41.0	01.0	63°48.6	03.6	166°23.8	21.7
21	192°32.7	101°27.0	·· 03.6	163°41.6	·· 01.6	78°50.6	·· 03.6	181°26.0	·· 21.8
22	207°35.1	116°26.2	03.6	178°42.3	02.3	93°52.6	03.5	196°28.2	21.9
23	222°37.6	131°25.3	03.7	193°43.0	03.0	108°54.6	03.4	211°30.5	22.0
Mer.pass. 08:12		ν -0.8′	d 0.1′	ν 0.7′	d 0.7′	ν 2.0′	d 0.1′	ν 2.2′	d 0.1′
		m -3.93		m 1.25		m -1.93		m 0.90	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°40.0	146°24.5	N25°03.7	208°43.7	N11°03.7	123°56.6	N22°03.4	226°32.7	N02°22.1
1	252°42.5	161°23.7	03.8	223°44.3	04.3	138°58.6	03.3	241°34.9	22.2
2	267°45.0	176°22.9	03.8	238°45.0	05.0	154°00.6	03.2	256°37.2	22.2
3	282°47.4	191°22.0	·· 03.9	253°45.7	·· 05.7	169°02.6	·· 03.2	271°39.4	·· 22.3
4	297°49.9	206°21.2	03.9	268°46.4	06.4	184°04.6	03.1	286°41.7	22.4
5	312°52.4	221°20.4	04.0	283°47.1	07.0	199°06.6	03.0	301°43.9	22.5
6	327°54.8	236°19.5	N25°04.0	298°47.7	N11°07.7	214°08.6	N22°03.0	316°46.1	N02°22.6
7	342°57.3	251°18.7	04.0	313°48.4	08.4	229°10.6	02.9	331°48.4	22.7
8	357°59.8	266°17.9	04.1	328°49.1	09.1	244°12.6	02.8	346°50.6	22.8
9	13°02.2	281°17.0	·· 04.1	343°49.8	·· 09.7	259°14.6	·· 02.8	1°52.8	·· 22.9
10	28°04.7	296°16.2	04.2	358°50.4	10.4	274°16.6	02.7	16°55.1	22.9
11	43°07.2	311°15.4	04.2	13°51.1	11.1	289°18.6	02.6	31°57.3	23.0
12	58°09.6	326°14.5	N25°04.2	28°51.8	N11°11.8	304°20.6	N22°02.5	46°59.6	N02°23.1
13	73°12.1	341°13.7	04.3	43°52.5	12.4	319°22.6	02.5	62°01.8	23.2
14	88°14.5	356°12.9	04.3	58°53.1	13.1	334°24.6	02.4	77°04.0	23.3
15	103°17.0	11°12.1	·· 04.4	73°53.8	·· 13.8	349°26.6	·· 02.3	92°06.3	·· 23.4
16	118°19.5	26°11.2	04.4	88°54.5	14.4	4°28.6	02.3	107°08.5	23.5
17	133°21.9	41°10.4	04.4	103°55.2	15.1	19°30.6	02.2	122°10.7	23.6
18	148°24.4	56°09.6	N25°04.4	118°55.8	N11°15.8	34°32.6	N22°02.1	137°13.0	N02°23.6
19	163°26.9	71°08.7	04.5	133°56.5	16.5	49°34.6	02.1	152°15.2	23.7
20	178°29.3	86°07.9	04.5	148°57.2	17.1	64°36.6	02.0	167°17.5	23.8
21	193°31.8	101°07.1	·· 04.5	163°57.9	·· 17.8	79°38.6	·· 01.9	182°19.7	·· 23.9
22	208°34.3	116°06.2	04.6	178°58.5	18.5	94°40.6	01.9	197°21.9	24.0
23	223°36.7	131°05.4	04.6	193°59.2	19.1	109°42.6	01.8	212°24.2	24.1
Mer.pass. 08:08		ν -0.8′	d 0.1′	ν 0.7′	d 0.7′	ν 2.0′	d 0.1′	ν 2.2′	d 0.1′
		m -3.93		m 1.25		m -1.92		m 0.90	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	238°39.2	146°04.6	N25°04.6	208°59.9	N11°19.8	124°44.6	N22°01.7	227°26.4	N02°24.2
1	253°41.7	161°03.8	04.6	224°00.6	20.5	139°46.6	01.7	242°28.7	24.2
2	268°44.1	176°02.9	04.6	239°01.2	21.1	154°48.6	01.6	257°30.9	24.3
3	283°46.6	191°02.1	·· 04.7	254°01.9	·· 21.8	169°50.6	·· 01.5	272°33.1	·· 24.4
4	298°49.0	206°01.3	04.7	269°02.6	22.5	184°52.6	01.5	287°35.4	24.5
5	313°51.5	221°00.4	04.7	284°03.3	23.2	199°54.6	01.4	302°37.6	24.6
6	328°54.0	235°59.6	N25°04.7	299°03.9	N11°23.8	214°56.6	N22°01.3	317°39.9	N02°24.7
7	343°56.4	250°58.8	04.7	314°04.6	24.5	229°58.6	01.3	332°42.1	24.8
8	358°58.9	265°58.0	04.7	329°05.3	25.2	245°00.6	01.2	347°44.3	24.9
9	14°01.4	280°57.1	·· 04.7	344°06.0	·· 25.8	260°02.6	·· 01.1	2°46.6	·· 24.9
10	29°03.8	295°56.3	04.8	359°06.6	26.5	275°04.6	01.0	17°48.8	25.0
11	44°06.3	310°55.5	04.8	14°07.3	27.2	290°06.6	01.0	32°51.1	25.1
12	59°08.8	325°54.6	N25°04.8	29°08.0	N11°27.8	305°08.6	N22°00.9	47°53.3	N02°25.2
13	74°11.2	340°53.8	04.8	44°08.7	28.5	320°10.6	00.8	62°55.5	25.3
14	89°13.7	355°53.0	04.8	59°09.3	29.2	335°12.6	00.8	77°57.8	25.4
15	104°16.2	10°52.2	·· 04.8	74°10.0	·· 29.8	350°14.6	·· 00.7	93°00.0	·· 25.5
16	119°18.6	25°51.3	04.8	89°10.7	30.5	5°16.6	00.6	108°02.3	25.5
17	134°21.1	40°50.5	04.8	104°11.4	31.2	20°18.6	00.6	123°04.5	25.6
18	149°23.5	55°49.7	N25°04.8	119°12.0	N11°31.8	35°20.6	N22°00.5	138°06.7	N02°25.7
19	164°26.0	70°48.8	04.8	134°12.7	32.5	50°22.6	00.4	153°09.0	25.8
20	179°28.5	85°48.0	04.8	149°13.4	33.2	65°24.6	00.4	168°11.2	25.9
21	194°30.9	100°47.2	·· 04.8	164°14.1	·· 33.8	80°26.6	·· 00.3	183°13.5	·· 26.0
22	209°33.4	115°46.4	04.8	179°14.7	34.5	95°28.6	00.2	198°15.7	26.1
23	224°35.9	130°45.5	04.8	194°15.4	35.2	110°30.6	00.1	213°18.0	26.1
Mer.pass. 08:04		ν -0.8′	d 0.0′	ν 0.7′	d 0.7′	ν 2.0′	d 0.1′	ν 2.2′	d 0.1′
		m -3.93		m 1.26		m -1.92		m 0.90	

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.1	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.8	-57°06.0
Hamal	327°50.3	23°35.1
Polaris	313°56.6	89°22.4
Acamar	315°11.3	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.3
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.3	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.7	-56°38.7
Deneb	49°24.9	45°22.2
Enif	33°37.7	9°59.7
Al Na'ir	27°31.5	-46°49.8
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.9	15°20.7

May 19 Tue	SHA	Mer.pass
Venus	270°03.6	14:14
Mars	331°46.5	10:06
Jupiter	246°27.5	15:45
Saturn	348°58.1	08:56

May 20 Wed	SHA	Mer.pass
Venus	268°44.5	14:15
Mars	331°03.6	10:05
Jupiter	246°16.5	15:42
Saturn	348°52.7	08:52

May 21 Thu	SHA	Mer.pass
Venus	267°25.4	14:16
Mars	330°20.7	10:04
Jupiter	246°05.4	15:39
Saturn	348°47.2	08:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°53.3	N19°43.5	147°56.0	1.0′	N28°00.9	1.1′	60.8′
1	195°53.3	44.0	162°16.0	1.0′	27°59.8	1.3′	60.8′
2	210°53.2	44.6	176°36.0	1.1′	27°58.5	1.5′	60.8′
3	225°53.2	·· 45.1	190°56.1	1.1′	27°57.0	1.8′	60.8′
4	240°53.2	45.6	205°16.2	1.2′	27°55.2	2.0′	60.8′
5	255°53.1	46.2	219°36.3	1.2′	27°53.2	2.2′	60.7′
6	270°53.1	N19°46.7	233°56.6	1.3′	N27°51.0	2.4′	60.7′
7	285°53.1	47.2	248°16.9	1.4′	27°48.6	2.6′	60.7′
8	300°53.0	47.8	262°37.2	1.4′	27°46.0	2.8′	60.7′
9	315°53.0	·· 48.3	276°57.6	1.5′	27°43.2	3.0′	60.7′
10	330°53.0	48.8	291°18.1	1.6′	27°40.2	3.3′	60.6′
11	345°52.9	49.4	305°38.7	1.6′	27°36.9	3.4′	60.6′
12	0°52.9	N19°49.9	319°59.3	1.7′	N27°33.5	3.7′	60.6′
13	15°52.9	50.4	334°20.1	1.8′	27°29.8	3.8′	60.6′
14	30°52.8	51.0	348°40.9	1.9′	27°26.0	4.1′	60.5′
15	45°52.8	·· 51.5	3°01.8	2.0′	27°21.9	4.3′	60.5′
16	60°52.8	52.0	17°22.7	2.1′	27°17.6	4.4′	60.5′
17	75°52.7	52.6	31°43.8	2.2′	27°13.2	4.7′	60.5′
18	90°52.7	N19°53.1	46°05.0	2.3′	N27°08.5	4.9′	60.4′
19	105°52.7	53.6	60°26.2	2.4′	27°03.6	5.0′	60.4′
20	120°52.6	54.1	74°47.6	2.5′	26°58.6	5.3′	60.4′
21	135°52.6	·· 54.7	89°09.0	2.6′	26°53.3	5.4′	60.4′
22	150°52.6	55.2	103°30.6	2.7′	26°47.9	5.6′	60.3′
23	165°52.5	55.7	117°52.3	2.8′	26°42.3	5.8′	60.3′
	SD = 15.8′	d = 0.5′	SD = 16.6′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°52.5	N19°56.2	132°14.0	2.9′	N26°36.5	6.0′	60.3′
1	195°52.5	56.8	146°35.9	3.0′	26°30.5	6.2′	60.3′
2	210°52.4	57.3	160°57.9	3.1′	26°24.3	6.4′	60.2′
3	225°52.4	·· 57.8	175°20.0	3.2′	26°17.9	6.6′	60.2′
4	240°52.4	58.3	189°42.3	3.3′	26°11.3	6.7′	60.2′
5	255°52.3	58.9	204°04.6	3.5′	26°04.6	6.9′	60.1′
6	270°52.3	N19°59.4	218°27.1	3.6′	N25°57.7	7.1′	60.1′
7	285°52.2	19°59.9	232°49.6	3.7′	25°50.6	7.3′	60.1′
8	300°52.2	20°00.4	247°12.3	3.8′	25°43.3	7.4′	60.1′
9	315°52.2	·· 00.9	261°35.2	4.0′	25°35.9	7.6′	60.0′
10	330°52.1	01.5	275°58.1	4.1′	25°28.3	7.8′	60.0′
11	345°52.1	02.0	290°21.2	4.2′	25°20.5	7.9′	60.0′
12	0°52.1	N20°02.5	304°44.4	4.3′	N25°12.6	8.1′	59.9′
13	15°52.0	03.0	319°07.7	4.5′	25°04.5	8.3′	59.9′
14	30°52.0	03.5	333°31.2	4.6′	24°56.2	8.4′	59.9′
15	45°51.9	·· 04.0	347°54.8	4.7′	24°47.8	8.6′	59.8′
16	60°51.9	04.6	2°18.5	4.9′	24°39.2	8.7′	59.8′
17	75°51.9	05.1	16°42.4	5.0′	24°30.5	8.9′	59.8′
18	90°51.8	N20°05.6	31°06.4	5.1′	N24°21.6	9.0′	59.8′
19	105°51.8	06.1	45°30.5	5.3′	24°12.6	9.2′	59.7′
20	120°51.7	06.6	59°54.8	5.4′	24°03.4	9.4′	59.7′
21	135°51.7	·· 07.1	74°19.2	5.5′	23°54.0	9.5′	59.7′
22	150°51.7	07.6	88°43.7	5.7′	23°44.5	9.6′	59.6′
23	165°51.6	08.1	103°08.4	5.8′	23°34.9	9.7′	59.6′
	SD = 15.8′	d = 0.5′	SD = 16.4′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°51.6	N20°08.7	117°33.2	5.9′	N23°25.2	9.9′	59.6′
1	195°51.5	09.2	131°58.2	6.1′	23°15.3	10.1′	59.5′
2	210°51.5	09.7	146°23.3	6.2′	23°05.2	10.2′	59.5′
3	225°51.5	·· 10.2	160°48.5	6.4′	22°55.0	10.3′	59.5′
4	240°51.4	10.7	175°13.8	6.5′	22°44.7	10.4′	59.4′
5	255°51.4	11.2	189°39.4	6.6′	22°34.3	10.6′	59.4′
6	270°51.3	N20°11.7	204°05.0	6.8′	N22°23.7	10.6′	59.4′
7	285°51.3	12.2	218°30.8	6.9′	22°13.1	10.9′	59.3′
8	300°51.2	12.7	232°56.7	7.1′	22°02.2	10.9′	59.3′
9	315°51.2	·· 13.2	247°22.7	7.2′	21°51.3	11.0′	59.3′
10	330°51.2	13.7	261°48.9	7.3′	21°40.3	11.2′	59.2′
11	345°51.1	14.2	276°15.3	7.5′	21°29.1	11.3′	59.2′
12	0°51.1	N20°14.7	290°41.7	7.6′	N21°17.8	11.4′	59.1′
13	15°51.0	15.2	305°08.3	7.7′	21°06.4	11.5′	59.1′
14	30°51.0	15.7	319°35.1	7.9′	20°54.9	11.6′	59.1′
15	45°50.9	·· 16.2	334°02.0	8.0′	20°43.3	11.8′	59.0′
16	60°50.9	16.7	348°29.0	8.1′	20°31.5	11.8′	59.0′
17	75°50.9	17.2	2°56.1	8.3′	20°19.7	11.9′	59.0′
18	90°50.8	N20°17.7	17°23.4	8.4′	N20°07.8	12.1′	58.9′
19	105°50.8	18.2	31°50.8	8.5′	19°55.7	12.1′	58.9′
20	120°50.7	18.7	46°18.4	8.7′	19°43.6	12.2′	58.9′
21	135°50.7	·· 19.2	60°46.0	8.8′	19°31.4	12.4′	58.8′
22	150°50.6	19.7	75°13.8	8.9′	19°19.0	12.4′	58.8′
23	165°50.6	20.2	89°41.8	9.1′	19°06.6	12.5′	58.8′
	SD = 15.8′	d = 0.5′	SD = 16.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°	////	////	01:17	22:43	////	////
66°	////	////	02:02	21:54	////	////
64°	////	00:13	02:32	21:24	////	////
62°	////	01:29	02:54	21:01	22:28	////
60°	////	02:03	03:11	20:43	21:53	////
N 58°	00:12	02:27	03:26	20:28	21:28	////
56°	01:21	02:47	03:39	20:16	21:08	22:36
54°	01:52	03:02	03:49	20:05	20:52	22:04
52°	02:15	03:16	03:59	19:55	20:39	21:40
50°	02:33	03:27	04:08	19:46	20:27	21:22
45°	03:06	03:51	04:26	19:28	20:03	20:48
N 40°	03:31	04:10	04:41	19:13	19:44	20:23
35°	03:50	04:25	04:53	19:00	19:29	20:04
30°	04:06	04:37	05:04	18:50	19:16	19:48
20°	04:30	04:58	05:22	18:31	18:55	19:23
N 10°	04:49	05:16	05:38	18:15	18:37	19:04
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:45	06:08	17:45	18:08	18:33
20°	05:33	06:00	06:23	17:30	17:53	18:20
30°	05:46	06:15	06:41	17:12	17:38	18:07
35°	05:53	06:24	06:51	17:02	17:29	18:00
40°	06:00	06:33	07:03	16:50	17:19	17:52
45°	06:08	06:44	07:17	16:36	17:08	17:44
S 50°	06:17	06:57	07:33	16:19	16:56	17:36
52°	06:21	07:03	07:41	16:11	16:50	17:32
54°	06:25	07:09	07:50	16:03	16:43	17:27
56°	06:30	07:16	08:00	15:53	16:36	17:23
58°	06:34	07:24	08:11	15:42	16:28	17:18
S 60°	06:40	07:33	08:24	15:28	16:20	17:13

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°						
N 70°						
68°						
66°			05:56			02:59
64°			06:39			02:15
62°	02:46	05:00	07:08	01:44	01:48	01:45
60°	03:56	05:37	07:30	00:34	01:10	01:23
N 58°	04:31	06:04	07:47	·· ··	00:43	01:04
56°	04:57	06:25	08:02	·· ··	00:21	00:49
54°	05:17	06:42	08:15	·· ··	00:04	00:35
52°	05:34	06:57	08:26	23:49	·· ··	00:24
50°	05:49	07:10	08:36	23:36	·· ··	00:13
45°	06:19	07:36	08:57	23:08	23:51	·· ··
N 40°	06:42	07:57	09:13	22:47	23:33	·· ··
35°	07:01	08:14	09:27	22:29	23:18	23:58
30°	07:18	08:29	09:40	22:13	23:05	23:48
20°	07:46	08:54	10:00	21:47	22:43	23:30
N 10°	08:09	09:16	10:18	21:24	22:23	23:15
0°	08:32	09:36	10:35	21:03	22:05	23:01
S 10°	08:54	09:56	10:51	20:41	21:46	22:46
20°	09:18	10:17	11:09	20:18	21:26	22:30
30°	09:46	10:42	11:29	19:51	21:03	22:12
35°	10:02	10:57	11:41	19:35	20:49	22:02
40°	10:21	11:14	11:54	19:16	20:33	21:49
45°	10:44	11:34	12:10	18:54	20:14	21:35
S 50°	11:14	11:59	12:30	18:25	19:50	21:17
52°	11:28	12:11	12:39	18:11	19:38	21:08
54°	11:45	12:25	12:49	17:54	19:25	20:59
56°	12:05	12:41	13:00	17:34	19:10	20:48
58°	12:30	12:59	13:14	17:10	18:51	20:36
S 60°	13:04	13:23	13:29	16:36	18:29	20:21

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 7-24%
19	03:33	03:32	11:56	14:47	02:14	
20	03:30	03:28	11:57	15:50	03:19	
21	03:26	03:24	11:57	16:48	04:20	

May 22, 23, 24 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	239°38.3	145°44.7	N25°04.8	209°16.1	N11°35.8	125°32.6	N22°00.1	228°20.2	N02°26.2
1	254°40.8	160°43.9	04.8	224°16.8	36.5	140°34.6	22°00.0	243°22.4	26.3
2	269°43.3	175°43.1	04.8	239°17.4	37.1	155°36.6	21°59.9	258°24.7	26.4
3	284°45.7	190°42.2	·· 04.7	254°18.1	·· 37.8	170°38.6	·· 59.9	273°26.9	·· 26.5
4	299°48.2	205°41.4	04.7	269°18.8	38.5	185°40.6	59.8	288°29.2	26.6
5	314°50.6	220°40.6	04.7	284°19.5	39.1	200°42.5	59.7	303°31.4	26.7
6	329°53.1	235°39.8	N25°04.7	299°20.1	N11°39.8	215°44.5	N21°59.7	318°33.6	N02°26.7
7	344°55.6	250°38.9	04.7	314°20.8	40.5	230°46.5	59.6	333°35.9	26.8
8	359°58.0	265°38.1	04.7	329°21.5	41.1	245°48.5	59.5	348°38.1	26.9
9	15°00.5	280°37.3	·· 04.7	344°22.2	·· 41.8	260°50.5	·· 59.4	3°40.4	·· 27.0
10	30°03.0	295°36.5	04.6	359°22.8	42.5	275°52.5	59.4	18°42.6	27.1
11	45°05.4	310°35.6	04.6	14°23.5	43.1	290°54.5	59.3	33°44.9	27.2
12	60°07.9	325°34.8	N25°04.6	29°24.2	N11°43.8	305°56.5	N21°59.2	48°47.1	N02°27.3
13	75°10.4	340°34.0	04.6	44°24.8	44.4	320°58.5	59.2	63°49.3	27.3
14	90°12.8	355°33.2	04.5	59°25.5	45.1	336°00.5	59.1	78°51.6	27.4
15	105°15.3	10°32.3	·· 04.5	74°26.2	·· 45.8	351°02.5	·· 59.0	93°53.8	·· 27.5
16	120°17.8	25°31.5	04.5	89°26.9	46.4	6°04.5	59.0	108°56.1	27.6
17	135°20.2	40°30.7	04.5	104°27.5	47.1	21°06.5	58.9	123°58.3	27.7
18	150°22.7	55°29.9	N25°04.4	119°28.2	N11°47.7	36°08.5	N21°58.8	139°00.6	N02°27.8
19	165°25.1	70°29.0	04.4	134°28.9	48.4	51°10.5	58.7	154°02.8	27.9
20	180°27.6	85°28.2	04.4	149°29.6	49.1	66°12.5	58.7	169°05.0	27.9
21	195°30.1	100°27.4	·· 04.3	164°30.2	·· 49.7	81°14.5	·· 58.6	184°07.3	·· 28.0
22	210°32.5	115°26.6	04.3	179°30.9	50.4	96°16.5	58.5	199°09.5	28.1
23	225°35.0	130°25.7	04.3	194°31.6	51.0	111°18.4	58.5	214°11.8	28.2
Mer.pass. 08:00		ν -0.8′ d 0.0′		m -3.93	ν 0.7′ d 0.7′		m 1.26	ν 2.0′ d 0.1′	m -1.92	ν 2.2′ d 0.1′	m 0.90

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	240°37.5	145°24.9	N25°04.2	209°32.2	N11°51.7	126°20.4	N21°58.4	229°14.0	N02°28.3
1	255°39.9	160°24.1	04.2	224°32.9	52.4	141°22.4	58.3	244°16.3	28.4
2	270°42.4	175°23.3	04.2	239°33.6	53.0	156°24.4	58.3	259°18.5	28.4
3	285°44.9	190°22.4	·· 04.1	254°34.3	·· 53.7	171°26.4	·· 58.2	274°20.8	·· 28.5
4	300°47.3	205°21.6	04.1	269°34.9	54.3	186°28.4	58.1	289°23.0	28.6
5	315°49.8	220°20.8	04.0	284°35.6	55.0	201°30.4	58.0	304°25.2	28.7
6	330°52.3	235°20.0	N25°04.0	299°36.3	N11°55.7	216°32.4	N21°58.0	319°27.5	N02°28.8
7	345°54.7	250°19.2	03.9	314°37.0	56.3	231°34.4	57.9	334°29.7	28.9
8	0°57.2	265°18.3	03.9	329°37.6	57.0	246°36.4	57.8	349°32.0	29.0
9	15°59.6	280°17.5	·· 03.8	344°38.3	·· 57.6	261°38.4	·· 57.8	4°34.2	·· 29.0
10	31°02.1	295°16.7	03.8	359°39.0	58.3	276°40.4	57.7	19°36.5	29.1
11	46°04.6	310°15.9	03.7	14°39.6	58.9	291°42.4	57.6	34°38.7	29.2
12	61°07.0	325°15.0	N25°03.7	29°40.3	N11°59.6	306°44.3	N21°57.5	49°41.0	N02°29.3
13	76°09.5	340°14.2	03.6	44°41.0	12°00.3	321°46.3	57.5	64°43.2	29.4
14	91°12.0	355°13.4	03.6	59°41.7	00.9	336°48.3	57.4	79°45.5	29.5
15	106°14.4	10°12.6	·· 03.5	74°42.3	·· 01.6	351°50.3	·· 57.3	94°47.7	·· 29.5
16	121°16.9	25°11.8	03.5	89°43.0	02.2	6°52.3	57.3	109°49.9	29.6
17	136°19.4	40°10.9	03.4	104°43.7	02.9	21°54.3	57.2	124°52.2	29.7
18	151°21.8	55°10.1	N25°03.4	119°44.3	N12°03.5	36°56.3	N21°57.1	139°54.4	N02°29.8
19	166°24.3	70°09.3	03.3	134°45.0	04.2	51°58.3	57.0	154°56.7	29.9
20	181°26.7	85°08.5	03.2	149°45.7	04.8	67°00.3	57.0	169°58.9	30.0
21	196°29.2	100°07.7	·· 03.2	164°46.4	·· 05.5	82°02.3	·· 56.9	185°01.2	·· 30.0
22	211°31.7	115°06.8	03.1	179°47.0	06.2	97°04.2	56.8	200°03.4	30.1
23	226°34.1	130°06.0	03.0	194°47.7	06.8	112°06.2	56.8	215°05.7	30.2
Mer.pass. 07:56		ν -0.8′ d 0.0′		m -3.93	ν 0.7′ d 0.7′		m 1.26	ν 2.0′ d 0.1′	m -1.91	ν 2.2′ d 0.1′	m 0.90

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	241°36.6	145°05.2	N25°03.0	209°48.4	N12°07.5	127°08.2	N21°56.7	230°07.9	N02°30.3
1	256°39.1	160°04.4	02.9	224°49.0	08.1	142°10.2	56.6	245°10.2	30.4
2	271°41.5	175°03.6	02.8	239°49.7	08.8	157°12.2	56.5	260°12.4	30.5
3	286°44.0	190°02.8	·· 02.8	254°50.4	·· 09.4	172°14.2	·· 56.5	275°14.6	·· 30.5
4	301°46.5	205°01.9	02.7	269°51.1	10.1	187°16.2	56.4	290°16.9	30.6
5	316°48.9	220°01.1	02.6	284°51.7	10.7	202°18.2	56.3	305°19.1	30.7
6	331°51.4	235°00.3	N25°02.6	299°52.4	N12°11.4	217°20.2	N21°56.3	320°21.4	N02°30.8
7	346°53.9	249°59.5	02.5	314°53.1	12.0	232°22.1	56.2	335°23.6	30.9
8	1°56.3	264°58.7	02.4	329°53.7	12.7	247°24.1	56.1	350°25.9	31.0
9	16°58.8	279°57.8	·· 02.3	344°54.4	·· 13.3	262°26.1	·· 56.0	5°28.1	·· 31.0
10	32°01.2	294°57.0	02.2	359°55.1	14.0	277°28.1	56.0	20°30.4	31.1
11	47°03.7	309°56.2	02.2	14°55.8	14.6	292°30.1	55.9	35°32.6	31.2
12	62°06.2	324°55.4	N25°02.1	29°56.4	N12°15.3	307°32.1	N21°55.8	50°34.9	N02°31.3
13	77°08.6	339°54.6	02.0	44°57.1	15.9	322°34.1	55.7	65°37.1	31.4
14	92°11.1	354°53.8	01.9	59°57.8	16.6	337°36.1	55.7	80°39.4	31.5
15	107°13.6	9°52.9	·· 01.8	74°58.4	·· 17.2	352°38.0	·· 55.6	95°41.6	·· 31.5
16	122°16.0	24°52.1	01.7	89°59.1	17.9	7°40.0	55.5	110°43.9	31.6
17	137°18.5	39°51.3	01.7	104°59.8	18.5	22°42.0	55.5	125°46.1	31.7
18	152°21.0	54°50.5	N25°01.6	120°00.5	N12°19.2	37°44.0	N21°55.4	140°48.4	N02°31.8
19	167°23.4	69°49.7	01.5	135°01.1	19.8	52°46.0	55.3	155°50.6	31.9
20	182°25.9	84°48.9	01.4	150°01.8	20.5	67°48.0	55.2	170°52.9	32.0
21	197°28.4	99°48.1	·· 01.3	165°02.5	·· 21.1	82°50.0	·· 55.2	185°55.1	·· 32.0
22	212°30.8	114°47.2	01.2	180°03.1	21.8	97°52.0	55.1	200°57.4	32.1
23	227°33.3	129°46.4	01.1	195°03.8	22.4	112°53.9	55.0	215°59.6	32.2
Mer.pass. 07:52		ν -0.8′ d 0.1′		m -3.94	ν 0.7′ d 0.7′		m 1.26	ν 2.2′ d 0.1′	m -1.91	ν 2.2′ d 0.1′	m 0.90

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.1	56°40.7
Diphda	348°46.4	-17°50.4
Achernar	335°19.8	-57°06.0
Hamal	327°50.2	23°35.1
Polaris	313°56.1	89°22.4
Acamar	315°11.3	-40°11.9
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.3	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.6
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.7	-56°38.7
Deneb	49°24.9	45°22.2
Enif	33°37.7	9°59.7
Al Na'ir	27°31.5	-46°49.7
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.9	15°20.7

May 22 Fri	SHA	Mer.pass
Venus	266°06.4	14:18
Mars	329°37.8	10:02
Jupiter	245°54.2	15:36
Saturn	348°41.9	08:45

May 23 Sat	SHA	Mer.pass
Venus	264°47.4	14:19
Mars	328°54.8	10:01
Jupiter	245°43.0	15:33
Saturn	348°36.6	08:42

May 24 Sun	SHA	Mer.pass
Venus	263°28.6	14:20
Mars	328°11.8	10:00
Jupiter	245°31.6	15:29
Saturn	348°31.3	08:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°50.5	N20°20.7	104°09.9	9.2′	N18°54.1	12.6′	58.7′
1	195°50.5	21.2	118°38.1	9.3′	18°41.5	12.7′	58.7′
2	210°50.4	21.7	133°06.4	9.5′	18°28.8	12.8′	58.6′
3	225°50.4	·· 22.2	147°34.9	9.6′	18°16.0	12.8′	58.6′
4	240°50.4	22.7	162°03.4	9.7′	18°03.2	12.9′	58.6′
5	255°50.3	23.2	176°32.1	9.8′	17°50.3	13.1′	58.5′
6	270°50.3	N20°23.7	191°01.0	10.0′	N17°37.2	13.1′	58.5′
7	285°50.2	24.2	205°29.9	10.1′	17°24.1	13.1′	58.5′
8	300°50.2	24.7	219°59.0	10.2′	17°11.0	13.3′	58.4′
9	315°50.1	·· 25.2	234°28.2	10.3′	16°57.7	13.3′	58.4′
10	330°50.1	25.6	248°57.5	10.4′	16°44.4	13.4′	58.4′
11	345°50.0	26.1	263°27.0	10.6′	16°31.0	13.5′	58.3′
12	0°50.0	N20°26.6	277°56.5	10.7′	N16°17.5	13.5′	58.3′
13	15°49.9	27.1	292°26.2	10.8′	16°04.0	13.6′	58.3′
14	30°49.9	27.6	306°56.0	10.9′	15°50.4	13.6′	58.2′
15	45°49.8	·· 28.1	321°25.9	11.0′	15°36.8	13.8′	58.2′
16	60°49.8	28.6	335°55.9	11.1′	15°23.0	13.8′	58.1′
17	75°49.7	29.1	350°26.1	11.2′	15°09.2	13.8′	58.1′
18	90°49.7	N20°29.5	4°56.3	11.4′	N14°55.4	13.9′	58.1′
19	105°49.6	30.0	19°26.7	11.5′	14°41.5	14.0′	58.0′
20	120°49.6	30.5	33°57.1	11.6′	14°27.5	14.0′	58.0′
21	135°49.5	·· 31.0	48°27.7	11.7′	14°13.5	14.0′	58.0′
22	150°49.5	31.5	62°58.4	11.8′	13°59.5	14.1′	57.9′
23	165°49.4	32.0	77°29.1	11.9′	13°45.4	14.2′	57.9′
	SD = 15.8′	d = 0.5′	SD = 16.0′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°49.4	N20°32.4	92°00.0	12.0′	N13°31.2	14.2′	57.9′
1	195°49.3	32.9	106°31.0	12.1′	13°17.0	14.3′	57.8′
2	210°49.3	33.4	121°02.1	12.2′	13°02.7	14.3′	57.8′
3	225°49.2	·· 33.9	135°33.2	12.3′	12°48.4	14.3′	57.8′
4	240°49.2	34.4	150°04.5	12.4′	12°34.1	14.4′	57.7′
5	255°49.1	34.8	164°35.9	12.5′	12°19.7	14.5′	57.7′
6	270°49.1	N20°35.3	179°07.4	12.6′	N12°05.2	14.4′	57.7′
7	285°49.0	35.8	193°38.9	12.7′	11°50.8	14.5′	57.6′
8	300°49.0	36.3	208°10.6	12.7′	11°36.3	14.6′	57.6′
9	315°48.9	·· 36.7	222°42.3	12.8′	11°21.7	14.6′	57.5′
10	330°48.8	37.2	237°14.2	12.9′	11°07.1	14.6′	57.5′
11	345°48.8	37.7	251°46.1	13.0′	10°52.5	14.6′	57.5′
12	0°48.7	N20°38.2	266°18.1	13.1′	N10°37.9	14.7′	57.4′
13	15°48.7	38.6	280°50.2	13.2′	10°23.2	14.7′	57.4′
14	30°48.6	39.1	295°22.4	13.3′	10°08.5	14.7′	57.4′
15	45°48.6	·· 39.6	309°54.6	13.3′	09°53.8	14.8′	57.3′
16	60°48.5	40.1	324°27.0	13.4′	09°39.0	14.8′	57.3′
17	75°48.5	40.5	338°59.4	13.5′	09°24.2	14.8′	57.3′
18	90°48.4	N20°41.0	353°31.9	13.6′	N09°09.4	14.9′	57.2′
19	105°48.4	41.5	8°04.4	13.6′	08°54.5	14.8′	57.2′
20	120°48.3	41.9	22°37.1	13.7′	08°39.7	14.9′	57.2′
21	135°48.2	·· 42.4	37°09.8	13.8′	08°24.8	14.9′	57.1′
22	150°48.2	42.9	51°42.6	13.9′	08°09.9	14.9′	57.1′
23	165°48.1	43.3	66°15.5	13.9′	07°55.0	15.0′	57.1′
	SD = 15.8′	d = 0.5′	SD = 15.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°48.1	N20°43.8	80°48.4	14.0′	N07°40.0	14.9′	57.0′
1	195°48.0	44.3	95°21.4	14.1′	07°25.1	15.0′	57.0′
2	210°48.0	44.7	109°54.5	14.1′	07°10.1	15.0′	57.0′
3	225°47.9	·· 45.2	124°27.6	14.2′	06°55.1	15.0′	56.9′
4	240°47.8	45.7	139°00.8	14.3′	06°40.1	15.0′	56.9′
5	255°47.8	46.1	153°34.1	14.3′	06°25.1	15.0′	56.9′
6	270°47.7	N20°46.6	168°07.4	14.4′	N06°10.1	15.0′	56.8′
7	285°47.7	47.1	182°40.8	14.4′	05°55.1	15.1′	56.8′
8	300°47.6	47.5	197°14.2	14.5′	05°40.0	15.0′	56.8′
9	315°47.6	·· 48.0	211°47.7	14.5′	05°25.0	15.1′	56.8′
10	330°47.5	48.4	226°21.2	14.6′	05°09.9	15.0′	56.7′
11	345°47.4	48.9	240°54.8	14.7′	04°54.9	15.1′	56.7′
12	0°47.4	N20°49.4	255°28.5	14.7′	N04°39.8	15.1′	56.7′
13	15°47.3	49.8	270°02.2	14.8′	04°24.7	15.0′	56.6′
14	30°47.3	50.3	284°36.0	14.8′	04°09.7	15.1′	56.6′
15	45°47.2	·· 50.7	299°09.8	14.9′	03°54.6	15.1′	56.6′
16	60°47.1	51.2	313°43.6	14.9′	03°39.5	15.1′	56.5′
17	75°47.1	51.6	328°17.5	14.9′	03°24.4	15.0′	56.5′
18	90°47.0	N20°52.1	342°51.5	15.0′	N03°09.4	15.1′	56.5′
19	105°47.0	52.5	357°25.5	15.0′	02°54.3	15.1′	56.4′
20	120°46.9	53.0	11°59.5	15.1′	02°39.2	15.0′	56.4′
21	135°46.8	·· 53.5	26°33.5	15.1′	02°24.2	15.1′	56.4′
22	150°46.8	53.9	41°07.7	15.1′	02°09.1	15.0′	56.4′
23	165°46.7	54.4	55°41.8	15.2′	01°54.1	15.1′	56.3′
	SD = 15.8′	d = 0.5′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	00:54	23:08	////	////
66°	////	////	01:50	22:07	////	////
64°	////	////	02:23	21:33	////	////
62°	////	01:15	02:46	21:09	22:44	////
60°	////	01:54	03:05	20:50	22:03	////
N 58°	////	02:20	03:21	20:34	21:35	////
56°	01:07	02:40	03:34	20:21	21:15	22:50
54°	01:43	02:57	03:45	20:09	20:58	22:13
52°	02:08	03:11	03:55	19:59	20:44	21:47
50°	02:27	03:23	04:04	19:50	20:31	21:28
45°	03:02	03:48	04:23	19:31	20:06	20:52
N 40°	03:28	04:07	04:38	19:16	19:47	20:26
35°	03:48	04:23	04:51	19:03	19:31	20:06
30°	04:04	04:36	05:02	18:51	19:18	19:50
20°	04:29	04:58	05:21	18:32	18:56	19:25
N 10°	04:49	05:15	05:38	18:16	18:38	19:05
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:46	06:08	17:45	18:08	18:33
20°	05:34	06:01	06:24	17:29	17:53	18:20
30°	05:48	06:17	06:43	17:11	17:36	18:06
35°	05:55	06:26	06:53	17:00	17:27	17:58
40°	06:03	06:36	07:05	16:48	17:17	17:51
45°	06:11	06:47	07:20	16:33	17:06	17:42
S 50°	06:20	07:00	07:37	16:16	16:53	17:33
52°	06:24	07:06	07:45	16:08	16:47	17:29
54°	06:29	07:13	07:54	15:59	16:40	17:24
56°	06:34	07:21	08:05	15:48	16:32	17:19
58°	06:39	07:29	08:16	15:37	16:24	17:14
S 60°	06:44	07:38	08:30	15:23	16:15	17:08

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	06:17	09:43	12:02	04:36	02:53	02:09
N 70°	07:27	10:02	12:08	03:24	02:31	02:00
68°	08:03	10:18	12:14	02:46	02:14	01:52
66°	08:29	10:30	12:18	02:20	02:00	01:45
64°	08:48	10:40	12:22	01:59	01:48	01:39
62°	09:04	10:49	12:25	01:42	01:38	01:34
60°	09:17	10:56	12:28	01:28	01:29	01:30
N 58°	09:28	11:02	12:31	01:15	01:22	01:26
56°	09:38	11:08	12:33	01:05	01:15	01:22
54°	09:47	11:13	12:35	00:55	01:09	01:19
52°	09:54	11:18	12:37	00:47	01:03	01:16
50°	10:01	11:22	12:38	00:39	00:58	01:14
45°	10:16	11:31	12:42	00:23	00:48	01:08
N 40°	10:28	11:38	12:45	00:09	00:39	01:03
35°	10:38	11:45	12:48	·· ··	00:31	00:59
30°	10:47	11:50	12:50	·· ··	00:24	00:55
20°	11:02	12:00	12:54	·· ··	00:12	00:49
N 10°	11:15	12:08	12:57	·· ··	00:01	00:43
0°	11:28	12:16	13:00	23:51	·· ··	00:37
S 10°	11:40	12:24	13:04	23:41	·· ··	00:32
20°	11:53	12:32	13:07	23:30	·· ··	00:26
30°	12:08	12:41	13:11	23:18	·· ··	00:19
35°	12:17	12:47	13:13	23:10	·· ··	00:15
40°	12:26	12:53	13:16	23:02	·· ··	00:11
45°	12:38	13:00	13:18	22:52	·· ··	00:05
S 50°	12:51	13:08	13:22	22:40	23:59	·· ··
52°	12:58	13:12	13:23	22:35	23:56	·· ··
54°	13:05	13:16	13:25	22:29	23:53	·· ··
56°	13:13	13:21	13:27	22:22	23:49	·· ··
58°	13:21	13:26	13:29	22:14	23:45	·· ··
S 60°	13:31	13:32	13:32	22:05	23:41	·· ··

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 34-56%
22	03:22	03:20	11:57	17:40	05:14	
23	03:17	03:15	11:57	18:27	06:04	
24	03:12	03:10	11:57	19:11	06:49	

May 25, 26, 27 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	242°35.7	144°45.6	N25°01.0	210°04.5	N12°23.1	127°55.9	N21°54.9	231°01.8	N02°32.3
1	257°38.2	159°44.8	00.9	225°05.1	23.7	142°57.9	54.9	246°04.1	32.4
2	272°40.7	174°44.0	00.8	240°05.8	24.4	157°59.9	54.8	261°06.3	32.4
3	287°43.1	189°43.2	·· 00.7	255°06.5	·· 25.0	173°01.9	·· 54.7	276°08.6	·· 32.5
4	302°45.6	204°42.4	00.6	270°07.2	25.7	188°03.9	54.7	291°10.8	32.6
5	317°48.1	219°41.5	00.5	285°07.8	26.3	203°05.9	54.6	306°13.1	32.7
6	332°50.5	234°40.7	N25°00.4	300°08.5	N12°27.0	218°07.8	N21°54.5	321°15.3	N02°32.8
7	347°53.0	249°39.9	00.3	315°09.2	27.6	233°09.8	54.4	336°17.6	32.9
8	2°55.5	264°39.1	00.2	330°09.8	28.3	248°11.8	54.4	351°19.8	32.9
9	17°57.9	279°38.3	·· 00.1	345°10.5	·· 28.9	263°13.8	·· 54.3	6°22.1	·· 33.0
10	33°00.4	294°37.5	25°00.0	0°11.2	29.6	278°15.8	54.2	21°24.3	33.1
11	48°02.8	309°36.7	24°59.9	15°11.8	30.2	293°17.8	54.1	36°26.6	33.2
12	63°05.3	324°35.9	N24°59.8	30°12.5	N12°30.8	308°19.7	N21°54.1	51°28.8	N02°33.3
13	78°07.8	339°35.1	59.7	45°13.2	31.5	323°21.7	54.0	66°31.1	33.3
14	93°10.2	354°34.2	59.5	60°13.8	32.1	338°23.7	53.9	81°33.3	33.4
15	108°12.7	9°33.4	·· 59.4	75°14.5	·· 32.8	353°25.7	·· 53.8	96°35.6	·· 33.5
16	123°15.2	24°32.6	59.3	90°15.2	33.4	8°27.7	53.8	111°37.8	33.6
17	138°17.6	39°31.8	59.2	105°15.9	34.1	23°29.7	53.7	126°40.1	33.7
18	153°20.1	54°31.0	N24°59.1	120°16.5	N12°34.7	38°31.6	N21°53.6	141°42.3	N02°33.8
19	168°22.6	69°30.2	59.0	135°17.2	35.4	53°33.6	53.6	156°44.6	33.8
20	183°25.0	84°29.4	58.8	150°17.9	36.0	68°35.6	53.5	171°46.8	33.9
21	198°27.5	99°28.6	·· 58.7	165°18.5	·· 36.6	83°37.6	·· 53.4	186°49.1	·· 34.0
22	213°30.0	114°27.8	58.6	180°19.2	37.3	98°39.6	53.3	201°51.3	34.1
23	228°32.4	129°27.0	58.5	195°19.9	37.9	113°41.6	53.3	216°53.6	34.2
Mer.pass. 07:48		ν -0.8′	d 0.1′	m -3.94	ν 0.7′	d 0.6′	m 1.26	ν 2.0′	d 0.1′ m -1.91	ν 2.2′	d 0.1′ m 0.89

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	243°34.9	144°26.1	N24°58.3	210°20.5	N12°38.6	128°43.5	N21°53.2	231°55.8	N02°34.2
1	258°37.3	159°25.3	58.2	225°21.2	39.2	143°45.5	53.1	246°58.1	34.3
2	273°39.8	174°24.5	58.1	240°21.9	39.9	158°47.5	53.0	262°00.3	34.4
3	288°42.3	189°23.7	·· 58.0	255°22.5	·· 40.5	173°49.5	·· 53.0	277°02.6	·· 34.5
4	303°44.7	204°22.9	57.8	270°23.2	41.1	188°51.5	52.9	292°04.9	34.6
5	318°47.2	219°22.1	57.7	285°23.9	41.8	203°53.5	52.8	307°07.1	34.6
6	333°49.7	234°21.3	N24°57.6	300°24.5	N12°42.4	218°55.4	N21°52.7	322°09.4	N02°34.7
7	348°52.1	249°20.5	57.4	315°25.2	43.1	233°57.4	52.7	337°11.6	34.8
8	3°54.6	264°19.7	57.3	330°25.9	43.7	248°59.4	52.6	352°13.9	34.9
9	18°57.1	279°18.9	·· 57.2	345°26.5	·· 44.3	264°01.4	·· 52.5	7°16.1	·· 35.0
10	33°59.5	294°18.1	57.0	0°27.2	45.0	279°03.4	52.4	22°18.4	35.1
11	49°02.0	309°17.3	56.9	15°27.9	45.6	294°05.3	52.4	37°20.6	35.1
12	64°04.4	324°16.5	N24°56.8	30°28.6	N12°46.3	309°07.3	N21°52.3	52°22.9	N02°35.2
13	79°06.9	339°15.7	56.6	45°29.2	46.9	324°09.3	52.2	67°25.1	35.3
14	94°09.4	354°14.9	56.5	60°29.9	47.5	339°11.3	52.1	82°27.4	35.4
15	109°11.8	9°14.1	·· 56.3	75°30.6	·· 48.2	354°13.3	·· 52.1	97°29.6	·· 35.5
16	124°14.3	24°13.3	56.2	90°31.2	48.8	9°15.2	52.0	112°31.9	35.5
17	139°16.8	39°12.4	56.0	105°31.9	49.5	24°17.2	51.9	127°34.1	35.6
18	154°19.2	54°11.6	N24°55.9	120°32.6	N12°50.1	39°19.2	N21°51.8	142°36.4	N02°35.7
19	169°21.7	69°10.8	55.7	135°33.2	50.7	54°21.2	51.8	157°38.6	35.8
20	184°24.2	84°10.0	55.6	150°33.9	51.4	69°23.2	51.7	172°40.9	35.9
21	199°26.6	99°09.2	·· 55.4	165°34.6	·· 52.0	84°25.1	·· 51.6	187°43.1	·· 35.9
22	214°29.1	114°08.4	55.3	180°35.2	52.7	99°27.1	51.5	202°45.4	36.0
23	229°31.6	129°07.6	55.1	195°35.9	53.3	114°29.1	51.5	217°47.6	36.1
Mer.pass. 07:44		ν -0.8′	d 0.1′	m -3.94	ν 0.7′	d 0.6′	m 1.26	ν 2.0′	d 0.1′ m -1.90	ν 2.3′	d 0.1′ m 0.89

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	244°34.0	144°06.8	N24°55.0	210°36.6	N12°53.9	129°31.1	N21°51.4	232°49.9	N02°36.2
1	259°36.5	159°06.0	54.8	225°37.2	54.6	144°33.1	51.3	247°52.2	36.3
2	274°38.9	174°05.2	54.7	240°37.9	55.2	159°35.0	51.2	262°54.4	36.3
3	289°41.4	189°04.4	·· 54.5	255°38.6	·· 55.8	174°37.0	·· 51.2	277°56.7	·· 36.4
4	304°43.9	204°03.6	54.3	270°39.2	56.5	189°39.0	51.1	292°58.9	36.5
5	319°46.3	219°02.8	54.2	285°39.9	57.1	204°41.0	51.0	308°01.2	36.6
6	334°48.8	234°02.0	N24°54.0	300°40.6	N12°57.7	219°43.0	N21°50.9	323°03.4	N02°36.7
7	349°51.3	249°01.2	53.9	315°41.2	58.4	234°44.9	50.9	338°05.7	36.7
8	4°53.7	264°00.4	53.7	330°41.9	59.0	249°46.9	50.8	353°07.9	36.8
9	19°56.2	278°59.6	·· 53.5	345°42.6	12°59.7	264°48.9	·· 50.7	8°10.2	·· 36.9
10	34°58.7	293°58.8	53.4	0°43.2	13°00.3	279°50.9	50.6	23°12.4	37.0
11	50°01.1	308°58.0	53.2	15°43.9	00.9	294°52.8	50.6	38°14.7	37.1
12	65°03.6	323°57.2	N24°53.0	30°44.6	N13°01.6	309°54.8	N21°50.5	53°17.0	N02°37.1
13	80°06.1	338°56.4	52.9	45°45.2	02.2	324°56.8	50.4	68°19.2	37.2
14	95°08.5	353°55.6	52.7	60°45.9	02.8	339°58.8	50.3	83°21.5	37.3
15	110°11.0	8°54.8	·· 52.5	75°46.6	·· 03.5	355°00.8	·· 50.3	98°23.7	·· 37.4
16	125°13.4	23°54.0	52.3	90°47.2	04.1	10°02.7	50.2	113°26.0	37.4
17	140°15.9	38°53.2	52.2	105°47.9	04.7	25°04.7	50.1	128°28.2	37.5
18	155°18.4	53°52.4	N24°52.0	120°48.6	N13°05.4	40°06.7	N21°50.0	143°30.5	N02°37.6
19	170°20.8	68°51.6	51.8	135°49.2	06.0	55°08.7	50.0	158°32.7	37.7
20	185°23.3	83°50.8	51.6	150°49.9	06.6	70°10.6	49.9	173°35.0	37.8
21	200°25.8	98°50.0	·· 51.5	165°50.6	·· 07.3	85°12.6	·· 49.8	188°37.2	·· 37.8
22	215°28.2	113°49.3	51.3	180°51.2	07.9	100°14.6	49.7	203°39.5	37.9
23	230°30.7	128°48.5	51.1	195°51.9	08.5	115°16.6	49.7	218°41.8	38.0
Mer.pass. 07:40		ν -0.8′	d 0.2′	m -3.94	ν 0.7′	d 0.6′	m 1.26	ν 2.0′	d 0.1′ m -1.90	ν 2.3′	d 0.1′ m 0.89

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.1	56°40.7
Diphda	348°46.4	-17°50.4
Achernar	335°19.8	-57°06.0
Hamal	327°50.2	23°35.1
Polaris	313°55.6	89°22.4
Acamar	315°11.3	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.4	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.0
Gacrux	171°50.1	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°11.0
Hadar	148°33.8	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.4
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.7	-56°38.7
Deneb	49°24.8	45°22.2
Enif	33°37.6	9°59.7
Al Na'ir	27°31.5	-46°49.7
Fomalhaut	15°13.3	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.8	15°20.7

May 25 Mon	SHA	Mer.pass
Venus	262°09.9	14:22
Mars	327°28.7	09:59
Jupiter	245°20.2	15:26
Saturn	348°26.1	08:35

May 26 Tue	SHA	Mer.pass
Venus	260°51.3	14:23
Mars	326°45.7	09:58
Jupiter	245°08.7	15:23
Saturn	348°21.0	08:31

May 27 Wed	SHA	Mer.pass
Venus	259°32.8	14:24
Mars	326°02.5	09:57
Jupiter	244°57.1	15:20
Saturn	348°15.9	08:27

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°46.7	N20°54.8	70°16.0	15.2′	N01°39.0	15.0′	56.3′
1	195°46.6	55.3	84°50.2	15.2′	01°24.0	15.0′	56.3′
2	210°46.5	55.7	99°24.4	15.3′	01°09.0	15.0′	56.2′
3	225°46.5	·· 56.2	113°58.7	15.3′	00°54.0	15.0′	56.2′
4	240°46.4	56.6	128°33.0	15.3′	00°39.0	15.0′	56.2′
5	255°46.4	57.1	143°07.4	15.4′	00°24.0	15.0′	56.2′
6	270°46.3	N20°57.5	157°41.8	15.4′	N00°09.0	14.9′	56.1′
7	285°46.2	58.0	172°16.1	15.4′	S00°05.9	15.0′	56.1′
8	300°46.2	58.4	186°50.6	15.4′	00°20.9	14.9′	56.1′
9	315°46.1	·· 58.8	201°25.0	15.5′	00°35.8	14.9′	56.0′
10	330°46.0	59.3	215°59.5	15.5′	00°50.7	14.9′	56.0′
11	345°46.0	20°59.7	230°34.0	15.5′	01°05.6	14.9′	56.0′
12	0°45.9	N21°00.2	245°08.5	15.5′	S01°20.5	14.9′	56.0′
13	15°45.8	00.6	259°43.0	15.6′	01°35.4	14.8′	55.9′
14	30°45.8	01.1	274°17.6	15.6′	01°50.2	14.8′	55.9′
15	45°45.7	·· 01.5	288°52.2	15.6′	02°05.0	14.8′	55.9′
16	60°45.7	01.9	303°26.7	15.6′	02°19.8	14.8′	55.9′
17	75°45.6	02.4	318°01.3	15.6′	02°34.6	14.8′	55.8′
18	90°45.5	N21°02.8	332°36.0	15.6′	S02°49.4	14.7′	55.8′
19	105°45.5	03.3	347°10.6	15.6′	03°04.1	14.7′	55.8′
20	120°45.4	03.7	1°45.2	15.6′	03°18.8	14.7′	55.8′
21	135°45.3	·· 04.1	16°19.9	15.7′	03°33.5	14.6′	55.7′
22	150°45.3	04.6	30°54.5	15.7′	03°48.1	14.7′	55.7′
23	165°45.2	05.0	45°29.2	15.7′	04°02.8	14.6′	55.7′
	SD = 15.8′	d = 0.5′	SD = 15.4′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°45.1	N21°05.5	60°03.8	15.7′	S04°17.4	14.5′	55.7′
1	195°45.1	05.9	74°38.5	15.7′	04°31.9	14.6′	55.6′
2	210°45.0	06.3	89°13.2	15.7′	04°46.5	14.5′	55.6′
3	225°44.9	·· 06.8	103°47.9	15.7′	05°01.0	14.5′	55.6′
4	240°44.9	07.2	118°22.5	15.7′	05°15.5	14.4′	55.6′
5	255°44.8	07.6	132°57.2	15.7′	05°29.9	14.4′	55.5′
6	270°44.7	N21°08.1	147°31.9	15.7′	S05°44.3	14.4′	55.5′
7	285°44.7	08.5	162°06.6	15.7′	05°58.7	14.3′	55.5′
8	300°44.6	08.9	176°41.3	15.7′	06°13.0	14.4′	55.5′
9	315°44.5	·· 09.4	191°15.9	15.7′	06°27.4	14.2′	55.4′
10	330°44.5	09.8	205°50.6	15.7′	06°41.6	14.3′	55.4′
11	345°44.4	10.2	220°25.3	15.7′	06°55.9	14.2′	55.4′
12	0°44.3	N21°10.6	234°59.9	15.6′	S07°10.1	14.1′	55.4′
13	15°44.2	11.1	249°34.6	15.6′	07°24.2	14.1′	55.3′
14	30°44.2	11.5	264°09.2	15.6′	07°38.3	14.1′	55.3′
15	45°44.1	·· 11.9	278°43.8	15.6′	07°52.4	14.1′	55.3′
16	60°44.0	12.4	293°18.4	15.6′	08°06.5	14.0′	55.3′
17	75°44.0	12.8	307°53.0	15.6′	08°20.5	13.9′	55.3′
18	90°43.9	N21°13.2	322°27.6	15.6′	S08°34.4	13.9′	55.2′
19	105°43.8	13.6	337°02.2	15.6′	08°48.3	13.9′	55.2′
20	120°43.8	14.0	351°36.7	15.5′	09°02.2	13.8′	55.2′
21	135°43.7	·· 14.5	6°11.3	15.5′	09°16.0	13.8′	55.2′
22	150°43.6	14.9	20°45.8	15.5′	09°29.8	13.7′	55.2′
23	165°43.5	15.3	35°20.3	15.5′	09°43.5	13.7′	55.1′
	SD = 15.8′	d = 0.4′	SD = 15.2′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°43.5	N21°15.7	49°54.8	15.5′	S09°57.2	13.6′	55.1′
1	195°43.4	16.2	64°29.2	15.4′	10°10.8	13.6′	55.1′
2	210°43.3	16.6	79°03.7	15.4′	10°24.4	13.6′	55.1′
3	225°43.3	·· 17.0	93°38.1	15.4′	10°38.0	13.4′	55.1′
4	240°43.2	17.4	108°12.5	15.4′	10°51.4	13.5′	55.0′
5	255°43.1	17.8	122°46.9	15.3′	11°04.9	13.4′	55.0′
6	270°43.0	N21°18.2	137°21.2	15.3′	S11°18.3	13.3′	55.0′
7	285°43.0	18.7	151°55.5	15.3′	11°31.6	13.3′	55.0′
8	300°42.9	19.1	166°29.8	15.3′	11°44.9	13.2′	55.0′
9	315°42.8	·· 19.5	181°04.1	15.2′	11°58.1	13.2′	54.9′
10	330°42.8	19.9	195°38.3	15.2′	12°11.3	13.1′	54.9′
11	345°42.7	20.3	210°12.5	15.2′	12°24.4	13.0′	54.9′
12	0°42.6	N21°20.7	224°46.7	15.1′	S12°37.4	13.0′	54.9′
13	15°42.5	21.2	239°20.8	15.1′	12°50.4	13.0′	54.9′
14	30°42.5	21.6	253°54.9	15.1′	13°03.4	12.8′	54.8′
15	45°42.4	·· 22.0	268°29.0	15.0′	13°16.2	12.9′	54.8′
16	60°42.3	22.4	283°03.0	15.0′	13°29.1	12.7′	54.8′
17	75°42.2	22.8	297°37.0	15.0′	13°41.8	12.7′	54.8′
18	90°42.2	N21°23.2	312°11.0	14.9′	S13°54.5	12.7′	54.8′
19	105°42.1	23.6	326°44.9	14.9′	14°07.2	12.5′	54.8′
20	120°42.0	24.0	341°18.8	14.9′	14°19.7	12.5′	54.7′
21	135°41.9	·· 24.4	355°52.7	14.8′	14°32.2	12.5′	54.7′
22	150°41.9	24.8	10°26.5	14.8′	14°44.7	12.4′	54.7′
23	165°41.8	25.2	25°00.2	14.7′	14°57.1	12.3′	54.7′
	SD = 15.8′	d = 0.4′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	00:17	////	////	////
66°	////	////	01:38	22:20	////	////
64°	////	////	02:14	21:43	////	////
62°	////	00:59	02:39	21:16	23:01	////
60°	////	01:44	02:59	20:56	22:13	////
N 58°	////	02:13	03:16	20:40	21:43	////
56°	00:53	02:35	03:29	20:26	21:21	23:06
54°	01:35	02:52	03:41	20:14	21:03	22:22
52°	02:02	03:07	03:52	20:03	20:48	21:54
50°	02:22	03:19	04:01	19:54	20:36	21:34
45°	02:59	03:45	04:21	19:34	20:10	20:56
N 40°	03:25	04:05	04:36	19:18	19:50	20:30
35°	03:46	04:21	04:50	19:05	19:34	20:09
30°	04:02	04:34	05:01	18:53	19:20	19:52
20°	04:28	04:57	05:21	18:33	18:58	19:26
N 10°	04:49	05:15	05:38	18:16	18:39	19:06
0°	05:06	05:31	05:53	18:01	18:23	18:49
S 10°	05:21	05:47	06:09	17:45	18:07	18:33
20°	05:35	06:02	06:26	17:28	17:52	18:19
30°	05:49	06:19	06:44	17:09	17:35	18:05
35°	05:57	06:28	06:55	16:58	17:26	17:57
40°	06:05	06:38	07:08	16:46	17:16	17:49
45°	06:13	06:50	07:23	16:31	17:04	17:40
S 50°	06:23	07:04	07:41	16:13	16:50	17:30
52°	06:28	07:10	07:49	16:05	16:44	17:26
54°	06:32	07:17	07:59	15:55	16:37	17:21
56°	06:37	07:25	08:09	15:44	16:29	17:16
58°	06:43	07:33	08:22	15:32	16:20	17:11
S 60°	06:49	07:43	08:36	15:18	16:11	17:05

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	14:08	16:13	18:35	01:36	01:03	00:27 23:35
N 70°	14:05	16:00	18:05	01:34	01:10	00:43
68°	14:02	15:50	17:42	01:33	01:15	00:55
66°	14:00	15:41	17:25	01:32	01:19	01:06
64°	13:59	15:34	17:11	01:31	01:23	01:15
62°	13:57	15:28	17:00	01:30	01:26	01:22
60°	13:56	15:23	16:50	01:29	01:29	01:29
N 58°	13:55	15:18	16:41	01:29	01:32	01:35
56°	13:54	15:14	16:34	01:28	01:34	01:40
54°	13:53	15:10	16:27	01:28	01:36	01:44
52°	13:53	15:07	16:21	01:27	01:38	01:49
50°	13:52	15:04	16:16	01:27	01:39	01:52
45°	13:50	14:57	16:04	01:26	01:43	02:01
N 40°	13:49	14:52	15:55	01:25	01:46	02:08
35°	13:48	14:47	15:46	01:24	01:49	02:14
30°	13:47	14:43	15:39	01:24	01:51	02:19
20°	13:45	14:36	15:27	01:23	01:56	02:29
N 10°	13:44	14:30	15:17	01:22	01:59	02:37
0°	13:43	14:25	15:07	01:21	02:03	02:45
S 10°	13:42	14:19	14:57	01:20	02:06	02:52
20°	13:40	14:13	14:46	01:19	02:10	03:01
30°	13:39	14:06	14:35	01:18	02:14	03:10
35°	13:38	14:02	14:28	01:17	02:17	03:16
40°	13:37	13:58	14:20	01:16	02:19	03:22
45°	13:36	13:53	14:11	01:15	02:23	03:29
S 50°	13:35	13:47	14:01	01:14	02:27	03:38
52°	13:34	13:44	13:56	01:13	02:28	03:42
54°	13:33	13:41	13:51	01:13	02:30	03:47
56°	13:33	13:38	13:45	01:12	02:33	03:52
58°	13:32	13:35	13:38	01:11	02:35	03:58
S 60°	13:31	13:31	13:30	01:11	02:38	04:04

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 9-11 66-83%
25	03:07	03:04	11:57	19:53	07:32	
26	03:01	02:57	11:57	20:35	08:14	
27	02:54	02:50	11:57	21:17	08:56	

May 28, 29, 30 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	245°33.2	143°47.7	N24°50.9	210°52.5	N13°09.2	130°18.5	N21°49.6	233°44.0	N02°38.1
1	260°35.6	158°46.9	50.7	225°53.2	09.8	145°20.5	49.5	248°46.3	38.2
2	275°38.1	173°46.1	50.5	240°53.9	10.4	160°22.5	49.4	263°48.5	38.2
3	290°40.5	188°45.3	·· 50.3	255°54.5	·· 11.0	175°24.5	·· 49.4	278°50.8	·· 38.3
4	305°43.0	203°44.5	50.2	270°55.2	11.7	190°26.4	49.3	293°53.0	38.4
5	320°45.5	218°43.7	50.0	285°55.9	12.3	205°28.4	49.2	308°55.3	38.5
6	335°47.9	233°42.9	N24°49.8	300°56.5	N13°12.9	220°30.4	N21°49.1	323°57.6	N02°38.6
7	350°50.4	248°42.1	49.6	315°57.2	13.6	235°32.4	49.1	338°59.8	38.6
8	5°52.9	263°41.3	49.4	330°57.9	14.2	250°34.4	49.0	354°02.1	38.7
9	20°55.3	278°40.5	·· 49.2	345°58.5	·· 14.8	265°36.3	·· 48.9	9°04.3	·· 38.8
10	35°57.8	293°39.7	49.0	0°59.2	15.5	280°38.3	48.8	24°06.6	38.9
11	51°00.3	308°38.9	48.8	15°59.9	16.1	295°40.3	48.7	39°08.8	38.9
12	66°02.7	323°38.1	N24°48.6	31°00.5	N13°16.7	310°42.2	N21°48.7	54°11.1	N02°39.0
13	81°05.2	338°37.4	48.4	46°01.2	17.3	325°44.2	48.6	69°13.4	39.1
14	96°07.7	353°36.6	48.2	61°01.9	18.0	340°46.2	48.5	84°15.6	39.2
15	111°10.1	8°35.8	·· 48.0	76°02.5	·· 18.6	355°48.2	·· 48.4	99°17.9	·· 39.3
16	126°12.6	23°35.0	47.8	91°03.2	19.2	10°50.1	48.4	114°20.1	39.3
17	141°15.0	38°34.2	47.6	106°03.9	19.8	25°52.1	48.3	129°22.4	39.4
18	156°17.5	53°33.4	N24°47.4	121°04.5	N13°20.5	40°54.1	N21°48.2	144°24.6	N02°39.5
19	171°20.0	68°32.6	47.2	136°05.2	21.1	55°56.1	48.1	159°26.9	39.6
20	186°22.4	83°31.8	47.0	151°05.8	21.7	70°58.0	48.1	174°29.2	39.6
21	201°24.9	98°31.0	·· 46.8	166°06.5	·· 22.4	86°00.0	·· 48.0	189°31.4	·· 39.7
22	216°27.4	113°30.2	46.6	181°07.2	23.0	101°02.0	47.9	204°33.7	39.8
23	231°29.8	128°29.5	46.3	196°07.8	23.6	116°04.0	47.8	219°35.9	39.9
Mer.pass. 07:37		ν -0.8′	d 0.2′	m -3.94	ν 0.7′	d 0.6′	m 1.26	ν 2.0′	d 0.1′ m -1.89	ν 2.3′	d 0.1′ m 0.89

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	246°32.3	143°28.7	N24°46.1	211°08.5	N13°24.2	131°05.9	N21°47.7	234°38.2	N02°40.0
1	261°34.8	158°27.9	45.9	226°09.2	24.9	146°07.9	47.7	249°40.4	40.0
2	276°37.2	173°27.1	45.7	241°09.8	25.5	161°09.9	47.6	264°42.7	40.1
3	291°39.7	188°26.3	·· 45.5	256°10.5	·· 26.1	176°11.9	·· 47.5	279°45.0	·· 40.2
4	306°42.2	203°25.5	45.3	271°11.2	26.7	191°13.8	47.4	294°47.2	40.3
5	321°44.6	218°24.7	45.1	286°11.8	27.4	206°15.8	47.4	309°49.5	40.3
6	336°47.1	233°23.9	N24°44.8	301°12.5	N13°28.0	221°17.8	N21°47.3	324°51.7	N02°40.4
7	351°49.5	248°23.2	44.6	316°13.1	28.6	236°19.7	47.2	339°54.0	40.5
8	6°52.0	263°22.4	44.4	331°13.8	29.2	251°21.7	47.1	354°56.3	40.6
9	21°54.5	278°21.6	·· 44.2	346°14.5	·· 29.8	266°23.7	·· 47.0	9°58.5	·· 40.7
10	36°56.9	293°20.8	43.9	1°15.1	30.5	281°25.7	47.0	25°00.8	40.7
11	51°59.4	308°20.0	43.7	16°15.8	31.1	296°27.6	46.9	40°03.0	40.8
12	67°01.9	323°19.2	N24°43.5	31°16.5	N13°31.7	311°29.6	N21°46.8	55°05.3	N02°40.9
13	82°04.3	338°18.5	43.3	46°17.1	32.3	326°31.6	46.7	70°07.6	41.0
14	97°06.8	353°17.7	43.0	61°17.8	33.0	341°33.5	46.7	85°09.8	41.0
15	112°09.3	8°16.9	·· 42.8	76°18.5	·· 33.6	356°35.5	·· 46.6	100°12.1	·· 41.1
16	127°11.7	23°16.1	42.6	91°19.1	34.2	11°37.5	46.5	115°14.3	41.2
17	142°14.2	38°15.3	42.3	106°19.8	34.8	26°39.5	46.4	130°16.6	41.3
18	157°16.6	53°14.5	N24°42.1	121°20.4	N13°35.4	41°41.4	N21°46.3	145°18.9	N02°41.3
19	172°19.1	68°13.8	41.9	136°21.1	36.1	56°43.4	46.3	160°21.1	41.4
20	187°21.6	83°13.0	41.6	151°21.8	36.7	71°45.4	46.2	175°23.4	41.5
21	202°24.0	98°12.2	·· 41.4	166°22.4	·· 37.3	86°47.3	·· 46.1	190°25.6	·· 41.6
22	217°26.5	113°11.4	41.2	181°23.1	37.9	101°49.3	46.0	205°27.9	41.7
23	232°29.0	128°10.6	40.9	196°23.8	38.6	116°51.3	46.0	220°30.2	41.7
Mer.pass. 07:33		ν -0.8′	d 0.2′	m -3.94	ν 0.7′	d 0.6′	m 1.27	ν 2.0′	d 0.1′ m -1.89	ν 2.3′	d 0.1′ m 0.88

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	247°31.4	143°09.9	N24°40.7	211°24.4	N13°39.2	131°53.2	N21°45.9	235°32.4	N02°41.8
1	262°33.9	158°09.1	40.4	226°25.1	39.8	146°55.2	45.8	250°34.7	41.9
2	277°36.4	173°08.3	40.2	241°25.7	40.4	161°57.2	45.7	265°36.9	42.0
3	292°38.8	188°07.5	·· 39.9	256°26.4	·· 41.0	176°59.2	·· 45.6	280°39.2	·· 42.0
4	307°41.3	203°06.8	39.7	271°27.1	41.6	192°01.1	45.6	295°41.5	42.1
5	322°43.8	218°06.0	39.5	286°27.7	42.3	207°03.1	45.5	310°43.7	42.2
6	337°46.2	233°05.2	N24°39.2	301°28.4	N13°42.9	222°05.1	N21°45.4	325°46.0	N02°42.3
7	352°48.7	248°04.4	39.0	316°29.1	43.5	237°07.0	45.3	340°48.3	42.3
8	7°51.1	263°03.6	38.7	331°29.7	44.1	252°09.0	45.2	355°50.5	42.4
9	22°53.6	278°02.9	·· 38.5	346°30.4	·· 44.7	267°11.0	·· 45.2	10°52.8	·· 42.5
10	37°56.1	293°02.1	38.2	1°31.0	45.4	282°12.9	45.1	25°55.0	42.6
11	52°58.5	308°01.3	37.9	16°31.7	46.0	297°14.9	45.0	40°57.3	42.6
12	68°01.0	323°00.5	N24°37.7	31°32.4	N13°46.6	312°16.9	N21°44.9	55°59.6	N02°42.7
13	83°03.5	337°59.8	37.4	46°33.0	47.2	327°18.8	44.9	71°01.8	42.8
14	98°05.9	352°59.0	37.2	61°33.7	47.8	342°20.8	44.8	86°04.1	42.9
15	113°08.4	7°58.2	·· 36.9	76°34.3	·· 48.4	357°22.8	·· 44.7	101°06.4	·· 42.9
16	128°10.9	22°57.4	36.7	91°35.0	49.1	12°24.7	44.6	116°08.6	43.0
17	143°13.3	37°56.7	36.4	106°35.7	49.7	27°26.7	44.5	131°10.9	43.1
18	158°15.8	52°55.9	N24°36.1	121°36.3	N13°50.3	42°28.7	N21°44.5	146°13.1	N02°43.2
19	173°18.3	67°55.1	35.9	136°37.0	50.9	57°30.6	44.4	161°15.4	43.2
20	188°20.7	82°54.3	35.6	151°37.6	51.5	72°32.6	44.3	176°17.7	43.3
21	203°23.2	97°53.6	·· 35.3	166°38.3	·· 52.1	87°34.6	·· 44.2	191°19.9	·· 43.4
22	218°25.6	112°52.8	35.1	181°39.0	52.7	102°36.5	44.1	206°22.2	43.5
23	233°28.1	127°52.0	34.8	196°39.6	53.4	117°38.5	44.1	221°24.5	43.5
Mer.pass. 07:29		ν -0.8′	d 0.2′	m -3.94	ν 0.7′	d 0.6′	m 1.27	ν 2.0′	d 0.1′ m -1.89	ν 2.3′	d 0.1′ m 0.88

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.2	-42°09.5
Schedar	349°30.1	56°40.7
Diphda	348°46.3	-17°50.4
Achernar	335°19.8	-57°05.9
Hamal	327°50.2	23°35.1
Polaris	313°54.9	89°22.4
Acamar	315°11.3	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.4	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.1
Gacrux	171°50.1	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°11.0
Hadar	148°33.9	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.1	-60°56.9
Kochab	137°18.7	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.4
Eltanin	90°41.1	51°29.0
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.6	-56°38.7
Deneb	49°24.8	45°22.2
Enif	33°37.6	9°59.7
Al Na'ir	27°31.4	-46°49.7
Fomalhaut	15°13.3	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.8	15°20.7

May 28 Thu	SHA	Mer.pass
Venus	258°14.5	14:26
Mars	325°19.4	09:56
Jupiter	244°45.4	15:17
Saturn	348°10.9	08:24

May 29 Fri	SHA	Mer.pass
Venus	256°56.4	14:27
Mars	324°36.2	09:55
Jupiter	244°33.6	15:14
Saturn	348°05.9	08:20

May 30 Sat	SHA	Mer.pass
Venus	255°38.4	14:28
Mars	323°53.0	09:54
Jupiter	244°21.8	15:10
Saturn	348°01.0	08:17

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°41.7	N21°25.6	39°34.0	14.7′	S15°09.4	12.2′	54.7′
1	195°41.6	26.1	54°07.7	14.7′	15°21.6	12.2′	54.7′
2	210°41.6	26.5	68°41.3	14.6′	15°33.8	12.1′	54.6′
3	225°41.5	·· 26.9	83°14.9	14.6′	15°45.9	12.0′	54.6′
4	240°41.4	27.3	97°48.5	14.5′	15°57.9	12.0′	54.6′
5	255°41.3	27.7	112°22.0	14.5′	16°09.9	11.9′	54.6′
6	270°41.2	N21°28.1	126°55.5	14.4′	S16°21.8	11.8′	54.6′
7	285°41.2	28.5	141°28.9	14.4′	16°33.6	11.8′	54.6′
8	300°41.1	28.9	156°02.3	14.3′	16°45.4	11.7′	54.6′
9	315°41.0	·· 29.3	170°35.6	14.3′	16°57.1	11.6′	54.5′
10	330°40.9	29.7	185°08.9	14.2′	17°08.7	11.5′	54.5′
11	345°40.9	30.1	199°42.2	14.2′	17°20.2	11.4′	54.5′
12	0°40.8	N21°30.5	214°15.4	14.1′	S17°31.6	11.4′	54.5′
13	15°40.7	30.9	228°48.5	14.1′	17°43.0	11.3′	54.5′
14	30°40.6	31.3	243°21.6	14.0′	17°54.3	11.2′	54.5′
15	45°40.5	·· 31.7	257°54.7	14.0′	18°05.5	11.2′	54.5′
16	60°40.5	32.1	272°27.7	13.9′	18°16.7	11.0′	54.4′
17	75°40.4	32.4	287°00.6	13.9′	18°27.7	11.0′	54.4′
18	90°40.3	N21°32.8	301°33.5	13.8′	S18°38.7	10.9′	54.4′
19	105°40.2	33.2	316°06.3	13.8′	18°49.6	10.8′	54.4′
20	120°40.1	33.6	330°39.1	13.7′	19°00.4	10.7′	54.4′
21	135°40.1	·· 34.0	345°11.9	13.7′	19°11.1	10.7′	54.4′
22	150°40.0	34.4	359°44.6	13.6′	19°21.8	10.5′	54.4′
23	165°39.9	34.8	14°17.2	13.6′	19°32.3	10.5′	54.4′
	SD = 15.8′	d = 0.4′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°39.8	N21°35.2	28°49.8	13.5′	S19°42.8	10.4′	54.3′
1	195°39.7	35.6	43°22.3	13.5′	19°53.2	10.3′	54.3′
2	210°39.7	36.0	57°54.8	13.4′	20°03.5	10.2′	54.3′
3	225°39.6	·· 36.4	72°27.2	13.4′	20°13.7	10.1′	54.3′
4	240°39.5	36.7	86°59.5	13.3′	20°23.8	10.0′	54.3′
5	255°39.4	37.1	101°31.8	13.2′	20°33.8	10.0′	54.3′
6	270°39.3	N21°37.5	116°04.1	13.2′	S20°43.8	9.8′	54.3′
7	285°39.3	37.9	130°36.3	13.1′	20°53.6	9.8′	54.3′
8	300°39.2	38.3	145°08.4	13.1′	21°03.4	9.6′	54.3′
9	315°39.1	·· 38.7	159°40.5	13.0′	21°13.0	9.6′	54.2′
10	330°39.0	39.1	174°12.5	13.0′	21°22.6	9.5′	54.2′
11	345°38.9	39.4	188°44.5	12.9′	21°32.1	9.4′	54.2′
12	0°38.8	N21°39.8	203°16.4	12.9′	S21°41.5	9.2′	54.2′
13	15°38.8	40.2	217°48.3	12.8′	21°50.7	9.2′	54.2′
14	30°38.7	40.6	232°20.1	12.7′	21°59.9	9.1′	54.2′
15	45°38.6	·· 41.0	246°51.8	12.7′	22°09.0	9.0′	54.2′
16	60°38.5	41.3	261°23.5	12.6′	22°18.0	8.9′	54.2′
17	75°38.4	41.7	275°55.1	12.6′	22°26.9	8.8′	54.2′
18	90°38.3	N21°42.1	290°26.7	12.5′	S22°35.7	8.6′	54.2′
19	105°38.3	42.5	304°58.2	12.5′	22°44.3	8.6′	54.1′
20	120°38.2	42.9	319°29.7	12.4′	22°52.9	8.5′	54.1′
21	135°38.1	·· 43.2	334°01.1	12.3′	23°01.4	8.4′	54.1′
22	150°38.0	43.6	348°32.4	12.3′	23°09.8	8.2′	54.1′
23	165°37.9	44.0	3°03.7	12.2′	23°18.0	8.2′	54.1′
	SD = 15.8′	d = 0.4′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°37.8	N21°44.4	17°35.0	12.2′	S23°26.2	8.1′	54.1′
1	195°37.8	44.7	32°06.1	12.1′	23°34.3	7.9′	54.1′
2	210°37.7	45.1	46°37.3	12.1′	23°42.2	7.8′	54.1′
3	225°37.6	·· 45.5	61°08.3	12.0′	23°50.0	7.8′	54.1′
4	240°37.5	45.9	75°39.3	12.0′	23°57.8	7.6′	54.1′
5	255°37.4	46.2	90°10.3	11.9′	24°05.4	7.5′	54.1′
6	270°37.3	N21°46.6	104°41.2	11.8′	S24°12.9	7.4′	54.1′
7	285°37.2	47.0	119°12.0	11.8′	24°20.3	7.3′	54.1′
8	300°37.2	47.3	133°42.8	11.7′	24°27.6	7.2′	54.0′
9	315°37.1	·· 47.7	148°13.6	11.7′	24°34.8	7.1′	54.0′
10	330°37.0	48.1	162°44.3	11.6′	24°41.9	6.9′	54.0′
11	345°36.9	48.4	177°14.9	11.6′	24°48.8	6.8′	54.0′
12	0°36.8	N21°48.8	191°45.5	11.5′	S24°55.6	6.8′	54.0′
13	15°36.7	49.2	206°16.0	11.5′	25°02.4	6.6′	54.0′
14	30°36.6	49.5	220°46.5	11.4′	25°09.0	6.5′	54.0′
15	45°36.5	·· 49.9	235°16.9	11.4′	25°15.5	6.3′	54.0′
16	60°36.5	50.3	249°47.3	11.3′	25°21.8	6.3′	54.0′
17	75°36.4	50.6	264°17.6	11.3′	25°28.1	6.1′	54.0′
18	90°36.3	N21°51.0	278°47.9	11.2′	S25°34.2	6.1′	54.0′
19	105°36.2	51.4	293°18.1	11.2′	25°40.3	5.9′	54.0′
20	120°36.1	51.7	307°48.3	11.1′	25°46.2	5.7′	54.0′
21	135°36.0	·· 52.1	322°18.4	11.1′	25°51.9	5.7′	54.0′
22	150°35.9	52.4	336°48.5	11.0′	25°57.6	5.5′	54.0′
23	165°35.8	52.8	351°18.5	11.0′	26°03.1	5.4′	54.0′
	SD = 15.8′	d = 0.4′	SD = 14.8′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°						
N 70°						
68°						
66°	////	////	01:25	22:33	////	////
64°	////	////	02:06	21:51	////	////
62°	////	00:39	02:33	21:23	23:24	////
60°	////	01:35	02:54	21:02	22:22	////
N 58°	////	02:06	03:11	20:45	21:50	////
56°	00:35	02:29	03:26	20:30	21:27	23:27
54°	01:27	02:48	03:38	20:18	21:08	22:31
52°	01:56	03:03	03:49	20:07	20:53	22:01
50°	02:17	03:16	03:58	19:57	20:40	21:39
45°	02:56	03:42	04:18	19:37	20:13	21:00
N 40°	03:23	04:03	04:35	19:20	19:52	20:33
35°	03:44	04:19	04:48	19:07	19:36	20:11
30°	04:01	04:33	05:00	18:55	19:22	19:54
20°	04:27	04:56	05:20	18:35	18:59	19:28
N 10°	04:48	05:15	05:38	18:17	18:40	19:07
0°	05:06	05:32	05:54	18:01	18:23	18:49
S 10°	05:21	05:47	06:10	17:45	18:08	18:34
20°	05:36	06:03	06:27	17:28	17:52	18:19
30°	05:51	06:20	06:46	17:09	17:35	18:04
35°	05:58	06:30	06:57	16:57	17:25	17:56
40°	06:07	06:40	07:10	16:44	17:14	17:48
45°	06:16	06:52	07:25	16:29	17:02	17:39
S 50°	06:26	07:07	07:44	16:11	16:48	17:28
52°	06:31	07:13	07:53	16:02	16:41	17:24
54°	06:35	07:20	08:03	15:52	16:34	17:19
56°	06:41	07:28	08:14	15:41	16:26	17:14
58°	06:46	07:37	08:26	15:28	16:17	17:08
S 60°	06:53	07:48	08:41	15:13	16:07	17:01

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°						
N 70°	20:54			00:07 22:50		
68°	19:53			00:31 23:53		
66°	19:18	21:43		00:50	00:28 23:40	
64°	18:54	20:47		01:05	00:54	00:36
62°	18:35	20:14	22:00	01:18	01:14	01:10
60°	18:19	19:50	21:22	01:29	01:30	01:34
N 58°	18:06	19:31	20:55	01:38	01:44	01:54
56°	17:54	19:15	20:34	01:47	01:56	02:10
54°	17:44	19:02	20:17	01:54	02:07	02:24
52°	17:36	18:50	20:02	02:01	02:16	02:37
50°	17:28	18:40	19:50	02:07	02:25	02:47
45°	17:11	18:18	19:23	02:20	02:43	03:10
N 40°	16:57	18:01	19:03	02:31	02:58	03:29
35°	16:46	17:46	18:45	02:41	03:10	03:44
30°	16:36	17:33	18:31	02:49	03:21	03:57
20°	16:19	17:12	18:06	03:03	03:40	04:20
N 10°	16:04	16:53	17:44	03:16	03:56	04:40
0°	15:50	16:36	17:24	03:27	04:12	04:59
S 10°	15:37	16:19	17:04	03:39	04:28	05:18
20°	15:22	16:01	16:43	03:52	04:44	05:38
30°	15:05	15:40	16:18	04:07	05:04	06:01
35°	14:56	15:27	16:04	04:15	05:15	06:15
40°	14:45	15:13	15:47	04:25	05:28	06:31
45°	14:32	14:57	15:28	04:36	05:43	06:50
S 50°	14:17	14:37	15:03	04:50	06:02	07:14
52°	14:10	14:27	14:51	04:57	06:11	07:25
54°	14:02	14:17	14:37	05:04	06:22	07:38
56°	13:53	14:04	14:22	05:12	06:33	07:54
58°	13:43	13:50	14:03	05:21	06:47	08:12
S 60°	13:31	13:34	13:40	05:32	07:02	08:34

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Mer.Pass. Lower hh:mm	Age 12-14 90-98%
28	02:47	02:43	11:57	22:01	09:39	
29	02:39	02:35	11:57	22:47	10:24	
30	02:31	02:27	11:58	23:36	11:11	

May 31, 01, 02 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	248°30.6	142°51.3	N24°34.5	211°40.3	N13°54.0	132°40.5	N21°44.0	236°26.7	N02°43.6
1	263°33.0	157°50.5	34.3	226°41.0	54.6	147°42.4	43.9	251°29.0	43.7
2	278°35.5	172°49.7	34.0	241°41.6	55.2	162°44.4	43.8	266°31.2	43.8
3	293°38.0	187°49.0	·· 33.7	256°42.3	·· 55.8	177°46.4	·· 43.7	281°33.5	·· 43.8
4	308°40.4	202°48.2	33.4	271°42.9	56.4	192°48.3	43.7	296°35.8	43.9
5	323°42.9	217°47.4	33.2	286°43.6	57.0	207°50.3	43.6	311°38.0	44.0
6	338°45.4	232°46.6	N24°32.9	301°44.3	N13°57.6	222°52.3	N21°43.5	326°40.3	N02°44.1
7	353°47.8	247°45.9	32.6	316°44.9	58.3	237°54.2	43.4	341°42.6	44.1
8	8°50.3	262°45.1	32.3	331°45.6	58.9	252°56.2	43.3	356°44.8	44.2
9	23°52.8	277°44.3	·· 32.0	346°46.2	13°59.5	267°58.2	·· 43.3	11°47.1	·· 44.3
10	38°55.2	292°43.6	31.8	1°46.9	14°00.1	283°00.1	43.2	26°49.4	44.4
11	53°57.7	307°42.8	31.5	16°47.6	00.7	298°02.1	43.1	41°51.6	44.4
12	69°00.1	322°42.0	N24°31.2	31°48.2	N14°01.3	313°04.1	N21°43.0	56°53.9	N02°44.5
13	84°02.6	337°41.3	30.9	46°48.9	01.9	328°06.0	42.9	71°56.2	44.6
14	99°05.1	352°40.5	30.6	61°49.5	02.5	343°08.0	42.9	86°58.4	44.7
15	114°07.5	7°39.7	·· 30.3	76°50.2	·· 03.1	358°10.0	·· 42.8	102°00.7	·· 44.7
16	129°10.0	22°39.0	30.1	91°50.9	03.7	13°11.9	42.7	117°03.0	44.8
17	144°12.5	37°38.2	29.8	106°51.5	04.4	28°13.9	42.6	132°05.2	44.9
18	159°14.9	52°37.5	N24°29.5	121°52.2	N14°05.0	43°15.9	N21°42.5	147°07.5	N02°45.0
19	174°17.4	67°36.7	29.2	136°52.8	05.6	58°17.8	42.5	162°09.7	45.0
20	189°19.9	82°35.9	28.9	151°53.5	06.2	73°19.8	42.4	177°12.0	45.1
21	204°22.3	97°35.2	·· 28.6	166°54.1	·· 06.8	88°21.8	·· 42.3	192°14.3	·· 45.2
22	219°24.8	112°34.4	28.3	181°54.8	07.4	103°23.7	42.2	207°16.5	45.3
23	234°27.3	127°33.6	28.0	196°55.5	08.0	118°25.7	42.1	222°18.8	45.3
Mer.pass. 07:25		ν -0.8′	d 0.3′	m -3.95	ν 0.7′	d 0.6′	m 1.27	ν 2.0′	d 0.1′ m -1.88	ν 2.3′	d 0.1′ m 0.88

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	249°29.7	142°32.9	N24°27.7	211°56.1	N14°08.6	133°27.6	N21°42.1	237°21.1	N02°45.4
1	264°32.2	157°32.1	27.4	226°56.8	09.2	148°29.6	42.0	252°23.3	45.5
2	279°34.6	172°31.4	27.1	241°57.4	09.8	163°31.6	41.9	267°25.6	45.6
3	294°37.1	187°30.6	·· 26.8	256°58.1	·· 10.4	178°33.5	·· 41.8	282°27.9	·· 45.6
4	309°39.6	202°29.8	26.5	271°58.8	11.0	193°35.5	41.7	297°30.1	45.7
5	324°42.0	217°29.1	26.2	286°59.4	11.7	208°37.5	41.7	312°32.4	45.8
6	339°44.5	232°28.3	N24°25.9	302°00.1	N14°12.3	223°39.4	N21°41.6	327°34.7	N02°45.9
7	354°47.0	247°27.6	25.6	317°00.7	12.9	238°41.4	41.5	342°36.9	45.9
8	9°49.4	262°26.8	25.3	332°01.4	13.5	253°43.4	41.4	357°39.2	46.0
9	24°51.9	277°26.0	·· 25.0	347°02.1	·· 14.1	268°45.3	·· 41.3	12°41.5	·· 46.1
10	39°54.4	292°25.3	24.7	2°02.7	14.7	283°47.3	41.3	27°43.7	46.1
11	54°56.8	307°24.5	24.3	17°03.4	15.3	298°49.2	41.2	42°46.0	46.2
12	69°59.3	322°23.8	N24°24.0	32°04.0	N14°15.9	313°51.2	N21°41.1	57°48.3	N02°46.3
13	85°01.7	337°23.0	23.7	47°04.7	16.5	328°53.2	41.0	72°50.5	46.4
14	100°04.2	352°22.3	23.4	62°05.3	17.1	343°55.1	40.9	87°52.8	46.4
15	115°06.7	7°21.5	·· 23.1	77°06.0	·· 17.7	358°57.1	·· 40.9	102°55.1	·· 46.5
16	130°09.1	22°20.8	22.8	92°06.7	18.3	13°59.1	40.8	117°57.3	46.6
17	145°11.6	37°20.0	22.5	107°07.3	18.9	29°01.0	40.7	132°59.6	46.7
18	160°14.1	52°19.2	N24°22.1	122°08.0	N14°19.5	44°03.0	N21°40.6	148°01.9	N02°46.7
19	175°16.5	67°18.5	21.8	137°08.6	20.1	59°04.9	40.5	163°04.2	46.8
20	190°19.0	82°17.7	21.5	152°09.3	20.7	74°06.9	40.4	178°06.4	46.9
21	205°21.5	97°17.0	·· 21.2	167°09.9	·· 21.3	89°08.9	·· 40.4	193°08.7	·· 47.0
22	220°23.9	112°16.2	20.8	182°10.6	21.9	104°10.8	40.3	208°11.0	47.0
23	235°26.4	127°15.5	20.5	197°11.3	22.5	119°12.8	40.2	223°13.2	47.1
Mer.pass. 07:21		ν -0.8′	d 0.3′	m -3.95	ν 0.7′	d 0.6′	m 1.27	ν 2.0′	d 0.1′ m -1.88	ν 2.3′	d 0.1′ m 0.88

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	250°28.9	142°14.7	N24°20.2	212°11.9	N14°23.1	134°14.7	N21°40.1	238°15.5	N02°47.2
1	265°31.3	157°14.0	19.9	227°12.6	23.7	149°16.7	40.0	253°17.8	47.2
2	280°33.8	172°13.2	19.5	242°13.2	24.3	164°18.7	40.0	268°20.0	47.3
3	295°36.2	187°12.5	·· 19.2	257°13.9	·· 24.9	179°20.6	·· 39.9	283°22.3	·· 47.4
4	310°38.7	202°11.7	18.9	272°14.6	25.5	194°22.6	39.8	298°24.6	47.5
5	325°41.2	217°11.0	18.5	287°15.2	26.1	209°24.5	39.7	313°26.8	47.5
6	340°43.6	232°10.2	N24°18.2	302°15.9	N14°26.7	224°26.5	N21°39.6	328°29.1	N02°47.6
7	355°46.1	247°09.5	17.9	317°16.5	27.3	239°28.5	39.5	343°31.4	47.7
8	10°48.6	262°08.7	17.5	332°17.2	27.9	254°30.4	39.5	358°33.7	47.8
9	25°51.0	277°08.0	·· 17.2	347°17.8	·· 28.5	269°32.4	·· 39.4	13°35.9	·· 47.8
10	40°53.5	292°07.2	16.9	2°18.5	29.1	284°34.4	39.3	28°38.2	47.9
11	55°56.0	307°06.5	16.5	17°19.1	29.7	299°36.3	39.2	43°40.5	48.0
12	70°58.4	322°05.7	N24°16.2	32°19.8	N14°30.3	314°38.3	N21°39.1	58°42.7	N02°48.0
13	86°00.9	337°05.0	15.8	47°20.5	30.9	329°40.2	39.1	73°45.0	48.1
14	101°03.4	352°04.3	15.5	62°21.1	31.5	344°42.2	39.0	88°47.3	48.2
15	116°05.8	7°03.5	·· 15.2	77°21.8	·· 32.1	359°44.1	·· 38.9	103°49.5	·· 48.3
16	131°08.3	22°02.8	14.8	92°22.4	32.7	14°46.1	38.8	118°51.8	48.3
17	146°10.7	37°02.0	14.5	107°23.1	33.3	29°48.1	38.7	133°54.1	48.4
18	161°13.2	52°01.3	N24°14.1	122°23.7	N14°33.9	44°50.0	N21°38.6	148°56.4	N02°48.5
19	176°15.7	67°00.5	13.8	137°24.4	34.5	59°52.0	38.6	163°58.6	48.5
20	191°18.1	81°59.8	13.4	152°25.1	35.1	74°53.9	38.5	179°00.9	48.6
21	206°20.6	96°59.0	·· 13.1	167°25.7	·· 35.7	89°55.9	·· 38.4	194°03.2	·· 48.7
22	221°23.1	111°58.3	12.7	182°26.4	36.3	104°57.9	38.3	209°05.4	48.8
23	236°25.5	126°57.6	12.4	197°27.0	36.9	119°59.8	38.2	224°07.7	48.8
Mer.pass. 07:17		ν -0.8′	d 0.3′	m -3.95	ν 0.7′	d 0.6′	m 1.27	ν 2.0′	d 0.1′ m -1.88	ν 2.3′	d 0.1′ m 0.87

Stars

	SHA	**Dec**
Alpheratz	357°33.7	29°14.0
Ankaa	353°06.2	-42°09.5
Schedar	349°30.0	56°40.7
Diphda	348°46.3	-17°50.4
Achernar	335°19.8	-57°05.9
Hamal	327°50.2	23°35.1
Polaris	313°53.9	89°22.4
Acamar	315°11.3	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.4
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.7	-59°35.9
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.4	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.6	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.1
Gacrux	171°50.1	-57°16.0
Alioth	166°11.7	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.1	-60°56.9
Kochab	137°18.8	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.4
Eltanin	90°41.1	51°29.0
Kaus Aust.	83°30.6	-34°22.3
Vega	80°32.1	38°48.3
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.6	-56°38.7
Deneb	49°24.8	45°22.2
Enif	33°37.6	9°59.7
Al Na'ir	27°31.4	-46°49.7
Fomalhaut	15°13.3	-29°28.8
Scheat	13°44.1	28°13.4
Markab	13°28.8	15°20.8

May 31 Sun	**SHA**	**Mer.pass**
Venus	254°20.7	14:29
Mars	323°09.7	09:53
Jupiter	244°09.9	15:07
Saturn	347°56.1	08:13

Jun 01 Mon	**SHA**	**Mer.pass**
Venus	253°03.2	14:31
Mars	322°26.4	09:52
Jupiter	243°57.9	15:04
Saturn	347°51.4	08:09

Jun 02 Tue	**SHA**	**Mer.pass**
Venus	251°45.9	14:32
Mars	321°43.1	09:51
Jupiter	243°45.9	15:01
Saturn	347°46.6	08:06

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°35.7	N21°53.2	5°48.5	10.9′	S26°08.5	5.3′	54.0′
1	195°35.7	53.5	20°18.5	10.9′	26°13.8	5.2′	54.0′
2	210°35.6	53.9	34°48.4	10.9′	26°19.0	5.0′	53.9′
3	225°35.5	·· 54.2	49°18.2	10.8′	26°24.0	5.0′	53.9′
4	240°35.4	54.6	63°48.0	10.8′	26°29.0	4.8′	53.9′
5	255°35.3	54.9	78°17.8	10.7′	26°33.8	4.6′	53.9′
6	270°35.2	N21°55.3	92°47.5	10.7′	S26°38.4	4.6′	53.9′
7	285°35.1	55.6	107°17.2	10.7′	26°43.0	4.4′	53.9′
8	300°35.0	56.0	121°46.9	10.6′	26°47.4	4.3′	53.9′
9	315°34.9	·· 56.3	136°16.5	10.6′	26°51.7	4.1′	53.9′
10	330°34.8	56.7	150°46.1	10.5′	26°55.8	4.1′	53.9′
11	345°34.8	57.1	165°15.6	10.5′	26°59.9	3.9′	53.9′
12	0°34.7	N21°57.4	179°45.1	10.5′	S27°03.8	3.8′	53.9′
13	15°34.6	57.8	194°14.6	10.4′	27°07.6	3.6′	53.9′
14	30°34.5	58.1	208°44.1	10.4′	27°11.2	3.5′	53.9′
15	45°34.4	·· 58.5	223°13.5	10.4′	27°14.7	3.4′	53.9′
16	60°34.3	58.8	237°42.8	10.3′	27°18.1	3.3′	53.9′
17	75°34.2	59.1	252°12.2	10.3′	27°21.4	3.1′	53.9′
18	90°34.1	N21°59.5	266°41.5	10.3′	S27°24.5	3.0′	53.9′
19	105°34.0	21°59.8	281°10.8	10.3′	27°27.5	2.9′	53.9′
20	120°33.9	22°00.2	295°40.0	10.2′	27°30.4	2.7′	53.9′
21	135°33.8	·· 00.5	310°09.3	10.2′	27°33.1	2.6′	53.9′
22	150°33.7	00.9	324°38.5	10.2′	27°35.7	2.4′	53.9′
23	165°33.6	01.2	339°07.7	10.2′	27°38.1	2.4′	53.9′
	SD = 15.8′	d = 0.4′	SD = 14.7′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°33.5	N22°01.6	353°36.8	10.1′	S27°40.5	2.2′	53.9′
1	195°33.5	01.9	8°06.0	10.1′	27°42.7	2.0′	53.9′
2	210°33.4	02.2	22°35.1	10.1′	27°44.7	2.0′	53.9′
3	225°33.3	·· 02.6	37°04.2	10.1′	27°46.7	1.8′	53.9′
4	240°33.2	02.9	51°33.3	10.1′	27°48.5	1.6′	53.9′
5	255°33.1	03.3	66°02.4	10.1′	27°50.1	1.6′	53.9′
6	270°33.0	N22°03.6	80°31.4	10.0′	S27°51.7	1.4′	53.9′
7	285°32.9	03.9	95°00.4	10.0′	27°53.1	1.2′	53.9′
8	300°32.8	04.3	109°29.5	10.0′	27°54.3	1.1′	53.9′
9	315°32.7	·· 04.6	123°58.5	10.0′	27°55.4	1.0′	53.9′
10	330°32.6	05.0	138°27.5	10.0′	27°56.4	0.9′	53.9′
11	345°32.5	05.3	152°56.5	10.0′	27°57.3	0.7′	53.9′
12	0°32.4	N22°05.6	167°25.5	10.0′	S27°58.0	0.6′	53.9′
13	15°32.3	06.0	181°54.4	10.0′	27°58.6	0.4′	53.9′
14	30°32.2	06.3	196°23.4	10.0′	27°59.0	0.3′	53.9′
15	45°32.1	·· 06.6	210°52.4	10.0′	27°59.3	0.2′	53.9′
16	60°32.0	07.0	225°21.3	10.0′	27°59.5	0.1′	53.9′
17	75°31.9	07.3	239°50.3	10.0′	27°59.6	0.1′	53.9′
18	90°31.8	N22°07.6	254°19.3	10.0′	S27°59.5	0.3′	53.9′
19	105°31.7	07.9	268°48.2	10.0′	27°59.2	0.3′	53.9′
20	120°31.6	08.3	283°17.2	10.0′	27°58.9	0.5′	53.9′
21	135°31.5	·· 08.6	297°46.2	10.0′	27°58.4	0.7′	53.9′
22	150°31.4	08.9	312°15.1	10.0′	27°57.7	0.7′	53.9′
23	165°31.3	09.3	326°44.1	10.0′	27°57.0	1.0′	53.9′
	SD = 15.8′	d = 0.3′	SD = 14.7′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°31.2	N22°09.6	341°13.1	10.0′	S27°56.0	1.0′	53.9′
1	195°31.2	09.9	355°42.1	10.0′	27°55.0	1.2′	53.9′
2	210°31.1	10.2	10°11.1	10.0′	27°53.8	1.3′	53.9′
3	225°31.0	·· 10.6	24°40.1	10.0′	27°52.5	1.4′	53.9′
4	240°30.9	10.9	39°09.1	10.0′	27°51.1	1.6′	53.9′
5	255°30.8	11.2	53°38.1	10.0′	27°49.5	1.7′	53.9′
6	270°30.7	N22°11.5	68°07.2	10.1′	S27°47.8	1.9′	53.9′
7	285°30.6	11.9	82°36.2	10.1′	27°45.9	2.0′	54.0′
8	300°30.5	12.2	97°05.3	10.1′	27°43.9	2.1′	54.0′
9	315°30.4	·· 12.5	111°34.4	10.1′	27°41.8	2.3′	54.0′
10	330°30.3	12.8	126°03.5	10.1′	27°39.5	2.4′	54.0′
11	345°30.2	13.1	140°32.7	10.2′	27°37.1	2.5′	54.0′
12	0°30.1	N22°13.5	155°01.8	10.2′	S27°34.6	2.6′	54.0′
13	15°30.0	13.8	169°31.0	10.2′	27°32.0	2.8′	54.0′
14	30°29.9	14.1	184°00.2	10.2′	27°29.2	3.0′	54.0′
15	45°29.8	·· 14.4	198°29.4	10.2′	27°26.2	3.0′	54.0′
16	60°29.7	14.7	212°58.6	10.3′	27°23.2	3.2′	54.0′
17	75°29.6	15.0	227°27.9	10.3′	27°20.0	3.3′	54.0′
18	90°29.5	N22°15.4	241°57.2	10.3′	S27°16.7	3.5′	54.0′
19	105°29.4	15.7	256°26.6	10.4′	27°13.2	3.5′	54.0′
20	120°29.3	16.0	270°55.9	10.4′	27°09.7	3.7′	54.0′
21	135°29.2	·· 16.3	285°25.3	10.4′	27°06.0	3.9′	54.0′
22	150°29.1	16.6	299°54.7	10.5′	27°02.1	4.0′	54.0′
23	165°29.0	16.9	314°24.2	10.5′	26°58.1	4.1′	54.0′
	SD = 15.8′	d = 0.3′	SD = 14.7′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:12	22:47	////	////
64°	////	////	01:58	22:00	////	////
62°	////	////	02:27	21:30	////	////
60°	////	01:26	02:49	21:08	22:32	////
N 58°	////	02:00	03:07	20:50	21:57	////
56°	////	02:25	03:22	20:34	21:32	////
54°	01:19	02:44	03:35	20:22	21:13	22:40
52°	01:50	03:00	03:46	20:10	20:57	22:07
50°	02:13	03:13	03:56	20:00	20:43	21:44
45°	02:53	03:40	04:17	19:39	20:16	21:04
N 40°	03:21	04:01	04:33	19:23	19:55	20:35
35°	03:42	04:18	04:47	19:09	19:38	20:14
30°	04:00	04:32	04:59	18:56	19:24	19:56
20°	04:27	04:56	05:20	18:36	19:00	19:29
N 10°	04:48	05:15	05:38	18:18	18:41	19:08
0°	05:06	05:32	05:54	18:01	18:24	18:50
S 10°	05:22	05:48	06:11	17:45	18:08	18:34
20°	05:37	06:04	06:28	17:28	17:51	18:19
30°	05:52	06:22	06:48	17:08	17:34	18:03
35°	06:00	06:31	06:59	16:56	17:24	17:55
40°	06:09	06:42	07:12	16:43	17:13	17:47
45°	06:18	06:55	07:28	16:27	17:01	17:37
S 50°	06:29	07:09	07:47	16:08	16:46	17:27
52°	06:33	07:16	07:56	15:59	16:39	17:22
54°	06:38	07:24	08:06	15:49	16:32	17:17
56°	06:44	07:32	08:18	15:38	16:23	17:11
58°	06:50	07:41	08:31	15:24	16:14	17:05
S 60°	06:57	07:52	08:46	15:09	16:04	16:59

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	23:52	·· ··	01:14	01:05	00:58	01:23
60°	22:45	23:43	·· ··	01:43	02:05	02:54
N 58°	22:10	23:07	23:43	02:10	02:40	03:30
56°	21:45	22:41	23:20	02:32	03:05	03:56
54°	21:25	22:20	23:01	02:49	03:26	04:16
52°	21:08	22:03	22:45	03:04	03:43	04:34
50°	20:54	21:48	22:32	03:17	03:57	04:48
45°	20:24	21:19	22:04	03:44	04:27	05:18
N 40°	20:02	20:55	21:42	04:06	04:50	05:41
35°	19:43	20:36	21:24	04:23	05:09	06:00
30°	19:27	20:19	21:08	04:39	05:25	06:17
20°	18:59	19:52	20:41	05:05	05:53	06:44
N 10°	18:36	19:28	20:18	05:27	06:17	07:08
0°	18:14	19:05	19:57	05:48	06:39	07:30
S 10°	17:52	18:43	19:35	06:09	07:01	07:52
20°	17:29	18:19	19:12	06:32	07:25	08:16
30°	17:02	17:51	18:45	06:58	07:53	08:43
35°	16:46	17:35	18:29	07:13	08:09	08:59
40°	16:28	17:16	18:11	07:31	08:28	09:18
45°	16:06	16:53	17:48	07:53	08:51	09:41
S 50°	15:37	16:23	17:20	08:21	09:21	10:10
52°	15:24	16:08	17:06	08:35	09:35	10:24
54°	15:08	15:51	16:49	08:50	09:52	10:41
56°	14:49	15:31	16:30	09:09	10:13	11:00
58°	14:26	15:05	16:06	09:32	10:39	11:25
S 60°	13:55	14:29	15:33	10:02	11:14	11:57

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Mer.Pass. Lower hh:mm	Age 15-17 100-97%
31	02:23	02:19	11:58	–:–	12:01	◯
01	02:14	02:10	11:58	00:26	12:52	
02	02:05	02:00	11:58	01:18	13:43	

June 03, 04, 05 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	251°28.0	141°56.8	N24°12.0	212°27.7	N14°37.5	135°01.8	N21°38.2	239°10.0	N02°48.9
1	266°30.5	156°56.1	11.7	227°28.3	38.1	150°03.7	38.1	254°12.3	49.0
2	281°32.9	171°55.3	11.3	242°29.0	38.7	165°05.7	38.0	269°14.5	49.0
3	296°35.4	186°54.6	·· 11.0	257°29.6	·· 39.3	180°07.6	·· 37.9	284°16.8	·· 49.1
4	311°37.9	201°53.9	10.6	272°30.3	39.9	195°09.6	37.8	299°19.1	49.2
5	326°40.3	216°53.1	10.2	287°31.0	40.4	210°11.6	37.7	314°21.3	49.3
6	341°42.8	231°52.4	N24°09.9	302°31.6	N14°41.0	225°13.5	N21°37.7	329°23.6	N02°49.3
7	356°45.2	246°51.6	09.5	317°32.3	41.6	240°15.5	37.6	344°25.9	49.4
8	11°47.7	261°50.9	09.1	332°32.9	42.2	255°17.4	37.5	359°28.2	49.5
9	26°50.2	276°50.2	·· 08.8	347°33.6	·· 42.8	270°19.4	·· 37.4	14°30.4	·· 49.5
10	41°52.6	291°49.4	08.4	2°34.2	43.4	285°21.4	37.3	29°32.7	49.6
11	56°55.1	306°48.7	08.1	17°34.9	44.0	300°23.3	37.2	44°35.0	49.7
12	71°57.6	321°48.0	N24°07.7	32°35.5	N14°44.6	315°25.3	N21°37.2	59°37.2	N02°49.8
13	87°00.0	336°47.2	07.3	47°36.2	45.2	330°27.2	37.1	74°39.5	49.8
14	102°02.5	351°46.5	06.9	62°36.8	45.8	345°29.2	37.0	89°41.8	49.9
15	117°05.0	6°45.8	·· 06.6	77°37.5	·· 46.4	0°31.1	·· 36.9	104°44.1	·· 50.0
16	132°07.4	21°45.0	06.2	92°38.2	47.0	15°33.1	36.8	119°46.3	50.0
17	147°09.9	36°44.3	05.8	107°38.8	47.6	30°35.0	36.7	134°48.6	50.1
18	162°12.4	51°43.6	N24°05.5	122°39.5	N14°48.1	45°37.0	N21°36.7	149°50.9	N02°50.2
19	177°14.8	66°42.8	05.1	137°40.1	48.7	60°39.0	36.6	164°53.2	50.2
20	192°17.3	81°42.1	04.7	152°40.8	49.3	75°40.9	36.5	179°55.4	50.3
21	207°19.7	96°41.4	·· 04.3	167°41.4	·· 49.9	90°42.9	·· 36.4	194°57.7	·· 50.4
22	222°22.2	111°40.6	03.9	182°42.1	50.5	105°44.8	36.3	210°00.0	50.5
23	237°24.7	126°39.9	03.6	197°42.7	51.1	120°46.8	36.2	225°02.3	50.5
Mer.pass. 07:13		ν -0.7′	d 0.4′	ν 0.7′	d 0.6′	ν 2.0′	d 0.1′	ν 2.3′	d 0.1′
		m -3.95		m 1.27		m -1.88		m 0.87	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	252°27.1	141°39.2	N24°03.2	212°43.4	N14°51.7	135°48.7	N21°36.2	240°04.5	N02°50.6
1	267°29.6	156°38.4	02.8	227°44.0	52.3	150°50.7	36.1	255°06.8	50.7
2	282°32.1	171°37.7	02.4	242°44.7	52.9	165°52.6	36.0	270°09.1	50.7
3	297°34.5	186°37.0	·· 02.0	257°45.4	·· 53.4	180°54.6	·· 35.9	285°11.4	·· 50.8
4	312°37.0	201°36.3	01.6	272°46.0	54.0	195°56.6	35.8	300°13.6	50.9
5	327°39.5	216°35.5	01.3	287°46.7	54.6	210°58.5	35.7	315°15.9	51.0
6	342°41.9	231°34.8	N24°00.9	302°47.3	N14°55.2	226°00.5	N21°35.7	330°18.2	N02°51.0
7	357°44.4	246°34.1	00.5	317°48.0	55.8	241°02.4	35.6	345°20.5	51.1
8	12°46.9	261°33.3	24°00.1	332°48.6	56.4	256°04.4	35.5	0°22.7	51.2
9	27°49.3	276°32.6	23°59.7	347°49.3	·· 57.0	271°06.3	·· 35.4	15°25.0	·· 51.2
10	42°51.8	291°31.9	59.3	2°49.9	57.6	286°08.3	35.3	30°27.3	51.3
11	57°54.2	306°31.2	58.9	17°50.6	58.1	301°10.2	35.2	45°29.6	51.4
12	72°56.7	321°30.4	N23°58.5	32°51.2	N14°58.7	316°12.2	N21°35.1	60°31.8	N02°51.4
13	87°59.2	336°29.7	58.1	47°51.9	59.3	331°14.1	35.1	75°34.1	51.5
14	103°01.6	351°29.0	57.7	62°52.5	14°59.9	346°16.1	35.0	90°36.4	51.6
15	118°04.1	6°28.3	·· 57.3	77°53.2	15°00.5	1°18.1	·· 34.9	105°38.7	·· 51.6
16	133°06.6	21°27.5	56.9	92°53.8	01.1	16°20.0	34.8	120°40.9	51.7
17	148°09.0	36°26.8	56.5	107°54.5	01.6	31°22.0	34.7	135°43.2	51.8
18	163°11.5	51°26.1	N23°56.1	122°55.1	N15°02.2	46°23.9	N21°34.6	150°45.5	N02°51.9
19	178°14.0	66°25.4	55.7	137°55.8	02.8	61°25.9	34.6	165°47.8	51.9
20	193°16.4	81°24.7	55.3	152°56.5	03.4	76°27.8	34.5	180°50.0	52.0
21	208°18.9	96°23.9	·· 54.9	167°57.1	·· 04.0	91°29.8	·· 34.4	195°52.3	·· 52.1
22	223°21.3	111°23.2	54.5	182°57.8	04.6	106°31.7	34.3	210°54.6	52.1
23	238°23.8	126°22.5	54.1	197°58.4	05.1	121°33.7	34.2	225°56.9	52.2
Mer.pass. 07:09		ν -0.7′	d 0.4′	ν 0.7′	d 0.6′	ν 2.0′	d 0.1′	ν 2.3′	d 0.1′
		m -3.95		m 1.27		m -1.87		m 0.87	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	253°26.3	141°21.8	N23°53.7	212°59.1	N15°05.7	136°35.6	N21°34.1	240°59.1	N02°52.3
1	268°28.7	156°21.1	53.3	227°59.7	06.3	151°37.6	34.0	256°01.4	52.3
2	283°31.2	171°20.4	52.9	243°00.4	06.9	166°39.5	34.0	271°03.7	52.4
3	298°33.7	186°19.6	·· 52.5	258°01.0	·· 07.5	181°41.5	·· 33.9	286°06.0	·· 52.5
4	313°36.1	201°18.9	52.0	273°01.7	08.1	196°43.4	33.8	301°08.3	52.5
5	328°38.6	216°18.2	51.6	288°02.3	08.6	211°45.4	33.7	316°10.5	52.6
6	343°41.1	231°17.5	N23°51.2	303°03.0	N15°09.2	226°47.3	N21°33.6	331°12.8	N02°52.7
7	358°43.5	246°16.8	50.8	318°03.6	09.8	241°49.3	33.5	346°15.1	52.7
8	13°46.0	261°16.1	50.4	333°04.3	10.4	256°51.3	33.5	1°17.4	52.8
9	28°48.5	276°15.3	·· 50.0	348°04.9	·· 11.0	271°53.2	·· 33.4	16°19.6	·· 52.9
10	43°50.9	291°14.6	49.5	3°05.6	11.5	286°55.2	33.3	31°21.9	53.0
11	58°53.4	306°13.9	49.1	18°06.2	12.1	301°57.1	33.2	46°24.2	53.0
12	73°55.8	321°13.2	N23°48.7	33°06.9	N15°12.7	316°59.1	N21°33.1	61°26.5	N02°53.1
13	88°58.3	336°12.5	48.3	48°07.5	13.3	332°01.0	33.0	76°28.8	53.2
14	104°00.8	351°11.8	47.8	63°08.2	13.8	347°03.0	32.9	91°31.0	53.2
15	119°03.2	6°11.1	·· 47.4	78°08.8	·· 14.4	2°04.9	·· 32.9	106°33.3	·· 53.3
16	134°05.7	21°10.4	47.0	93°09.5	15.0	17°06.9	32.8	121°35.6	53.4
17	149°08.2	36°09.6	46.6	108°10.1	15.6	32°08.8	32.7	136°37.9	53.4
18	164°10.6	51°08.9	N23°46.1	123°10.8	N15°16.2	47°10.8	N21°32.6	151°40.1	N02°53.5
19	179°13.1	66°08.2	45.7	138°11.4	16.7	62°12.7	32.5	166°42.4	53.6
20	194°15.6	81°07.5	45.3	153°12.1	17.3	77°14.7	32.4	181°44.7	53.6
21	209°18.0	96°06.8	·· 44.8	168°12.7	·· 17.9	92°16.6	·· 32.3	196°47.0	·· 53.7
22	224°20.5	111°06.1	44.4	183°13.4	18.5	107°18.6	32.3	211°49.3	53.8
23	239°23.0	126°05.4	44.0	198°14.0	19.0	122°20.5	32.2	226°51.5	53.8
Mer.pass. 07:05		ν -0.7′	d 0.4′	ν 0.7′	d 0.6′	ν 2.0′	d 0.1′	ν 2.3′	d 0.1′
		m -3.96		m 1.28		m -1.87		m 0.87	

Stars

	SHA	Dec
Alpheratz	357°33.7	29°14.0
Ankaa	353°06.2	-42°09.5
Schedar	349°30.0	56°40.7
Diphda	348°46.3	-17°50.4
Achernar	335°19.7	-57°05.9
Hamal	327°50.2	23°35.1
Polaris	313°52.9	89°22.4
Acamar	315°11.3	-40°11.8
Menkar	314°05.2	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.4
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.7	-59°35.9
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.5	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.6	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.1
Gacrux	171°50.1	-57°16.0
Alioth	166°11.7	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.1	-60°56.9
Kochab	137°18.8	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.0	-26°29.5
Atria	107°06.7	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.0
Kaus Aust.	83°30.6	-34°22.3
Vega	80°32.0	38°48.3
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.5	-56°38.7
Deneb	49°24.7	45°22.3
Enif	33°37.6	9°59.7
Al Na'ir	27°31.4	-46°49.7
Fomalhaut	15°13.2	-29°28.8
Scheat	13°44.1	28°13.4
Markab	13°28.8	15°20.8

Jun 03 Wed	SHA	Mer.pass
Venus	250°28.8	14:33
Mars	320°59.7	09:50
Jupiter	243°33.8	14:58
Saturn	347°42.0	08:02

Jun 04 Thu	SHA	Mer.pass
Venus	249°12.0	14:34
Mars	320°16.3	09:49
Jupiter	243°21.6	14:55
Saturn	347°37.4	07:58

Jun 05 Fri	SHA	Mer.pass
Venus	247°55.5	14:35
Mars	319°32.8	09:48
Jupiter	243°09.4	14:52
Saturn	347°32.9	07:55

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.9	N22°17.2	328°53.7	10.5′	S26°54.0	4.2′	54.1′
1	195°28.8	17.5	343°23.2	10.6′	26°49.8	4.3′	54.1′
2	210°28.6	17.9	357°52.7	10.6′	26°45.5	4.5′	54.1′
3	225°28.5	·· 18.2	12°22.3	10.6′	26°41.0	4.6′	54.1′
4	240°28.4	18.5	26°51.9	10.7′	26°36.4	4.8′	54.1′
5	255°28.3	18.8	41°21.6	10.7′	26°31.6	4.8′	54.1′
6	270°28.2	N22°19.1	55°51.3	10.7′	S26°26.8	5.0′	54.1′
7	285°28.1	19.4	70°21.0	10.8′	26°21.8	5.1′	54.1′
8	300°28.0	19.7	84°50.8	10.8′	26°16.7	5.3′	54.1′
9	315°27.9	·· 20.0	99°20.6	10.9′	26°11.4	5.4′	54.1′
10	330°27.8	20.3	113°50.5	10.9′	26°06.0	5.4′	54.1′
11	345°27.7	20.6	128°20.4	10.9′	26°00.6	5.7′	54.1′
12	0°27.6	N22°20.9	142°50.3	11.0′	S25°54.9	5.7′	54.2′
13	15°27.5	21.2	157°20.3	11.0′	25°49.2	5.8′	54.2′
14	30°27.4	21.5	171°50.4	11.1′	25°43.4	6.0′	54.2′
15	45°27.3	·· 21.8	186°20.4	11.1′	25°37.4	6.1′	54.2′
16	60°27.2	22.1	200°50.6	11.2′	25°31.3	6.2′	54.2′
17	75°27.1	22.4	215°20.7	11.2′	25°25.1	6.4′	54.2′
18	90°27.0	N22°22.7	229°50.9	11.3′	S25°18.7	6.4′	54.2′
19	105°26.9	23.0	244°21.2	11.3′	25°12.3	6.6′	54.2′
20	120°26.8	23.3	258°51.5	11.4′	25°05.7	6.7′	54.2′
21	135°26.7	·· 23.6	273°21.9	11.4′	24°59.0	6.8′	54.3′
22	150°26.6	23.9	287°52.3	11.4′	24°52.2	7.0′	54.3′
23	165°26.5	24.2	302°22.7	11.5′	24°45.2	7.0′	54.3′
	SD = 15.8′	d = 0.3′		SD = 14.7′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°26.4	N22°24.5	316°53.2	11.5′	S24°38.2	7.2′	54.3′
1	195°26.3	24.8	331°23.7	11.6′	24°31.0	7.2′	54.3′
2	210°26.2	25.1	345°54.3	11.6′	24°23.8	7.4′	54.3′
3	225°26.0	·· 25.4	0°25.0	11.7′	24°16.4	7.5′	54.3′
4	240°25.9	25.7	14°55.7	11.7′	24°08.9	7.6′	54.3′
5	255°25.8	25.9	29°26.4	11.8′	24°01.3	7.8′	54.3′
6	270°25.7	N22°26.2	43°57.2	11.8′	S23°53.5	7.8′	54.4′
7	285°25.6	26.5	58°28.1	11.9′	23°45.7	8.0′	54.4′
8	300°25.5	26.8	72°59.0	11.9′	23°37.7	8.0′	54.4′
9	315°25.4	·· 27.1	87°29.9	12.0′	23°29.7	8.2′	54.4′
10	330°25.3	27.4	102°00.9	12.1′	23°21.5	8.3′	54.4′
11	345°25.2	27.7	116°32.0	12.1′	23°13.2	8.4′	54.4′
12	0°25.1	N22°28.0	131°03.1	12.2′	S23°04.8	8.4′	54.4′
13	15°25.0	28.3	145°34.2	12.2′	22°56.4	8.6′	54.5′
14	30°24.9	28.5	160°05.4	12.3′	22°47.8	8.7′	54.5′
15	45°24.8	·· 28.8	174°36.7	12.3′	22°39.1	8.9′	54.5′
16	60°24.7	29.1	189°08.0	12.4′	22°30.2	8.9′	54.5′
17	75°24.5	29.4	203°39.4	12.4′	22°21.3	9.0′	54.5′
18	90°24.4	N22°29.7	218°10.8	12.5′	S22°12.3	9.1′	54.5′
19	105°24.3	30.0	232°42.2	12.5′	22°03.2	9.2′	54.6′
20	120°24.2	30.2	247°13.8	12.6′	21°54.0	9.4′	54.6′
21	135°24.1	·· 30.5	261°45.3	12.6′	21°44.6	9.4′	54.6′
22	150°24.0	30.8	276°16.9	12.7′	21°35.2	9.5′	54.6′
23	165°23.9	31.1	290°48.6	12.7′	21°25.7	9.6′	54.6′
	SD = 15.8′	d = 0.3′		SD = 14.8′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.8	N22°31.3	305°20.3	12.8′	S21°16.1	9.7′	54.6′
1	195°23.7	31.6	319°52.1	12.8′	21°06.4	9.9′	54.7′
2	210°23.6	31.9	334°23.9	12.9′	20°56.5	9.9′	54.7′
3	225°23.5	·· 32.2	348°55.8	12.9′	20°46.6	10.0′	54.7′
4	240°23.3	32.5	3°27.7	13.0′	20°36.6	10.1′	54.7′
5	255°23.2	32.7	17°59.7	13.0′	20°26.5	10.2′	54.7′
6	270°23.1	N22°33.0	32°31.7	13.1′	S20°16.3	10.3′	54.7′
7	285°23.0	33.3	47°03.8	13.1′	20°06.0	10.4′	54.8′
8	300°22.9	33.5	61°35.9	13.2′	19°55.6	10.5′	54.8′
9	315°22.8	·· 33.8	76°08.0	13.2′	19°45.1	10.5′	54.8′
10	330°22.7	34.1	90°40.3	13.3′	19°34.6	10.7′	54.8′
11	345°22.6	34.4	105°12.5	13.3′	19°23.9	10.7′	54.8′
12	0°22.5	N22°34.6	119°44.8	13.4′	S19°13.2	10.9′	54.9′
13	15°22.4	34.9	134°17.2	13.4′	19°02.3	10.9′	54.9′
14	30°22.2	35.2	148°49.6	13.4′	18°51.4	11.0′	54.9′
15	45°22.1	·· 35.4	163°22.0	13.5′	18°40.4	11.1′	54.9′
16	60°22.0	35.7	177°54.5	13.5′	18°29.3	11.2′	54.9′
17	75°21.9	36.0	192°27.0	13.6′	18°18.1	11.3′	55.0′
18	90°21.8	N22°36.2	206°59.6	13.6′	S18°06.8	11.4′	55.0′
19	105°21.7	36.5	221°32.3	13.7′	17°55.4	11.4′	55.0′
20	120°21.6	36.8	236°04.9	13.7′	17°44.0	11.6′	55.0′
21	135°21.5	·· 37.0	250°37.6	13.7′	17°32.4	11.6′	55.0′
22	150°21.3	37.3	265°10.4	13.8′	17°20.8	11.7′	55.1′
23	165°21.2	37.6	279°43.2	13.8′	17°09.1	11.7′	55.1′
	SD = 15.8′	d = 0.3′		SD = 14.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:59	23:02	////	////
64°	////	////	01:51	22:08	////	////
62°	////	////	02:22	21:36	////	////
60°	////	01:18	02:45	21:12	22:42	////
N 58°	////	01:55	03:04	20:54	22:03	////
56°	////	02:20	03:19	20:38	21:37	////
54°	01:11	02:40	03:32	20:25	21:17	22:48
52°	01:45	02:57	03:44	20:13	21:01	22:13
50°	02:09	03:11	03:54	20:03	20:47	21:49
45°	02:51	03:39	04:15	19:42	20:19	21:07
N 40°	03:19	04:00	04:32	19:25	19:57	20:38
35°	03:41	04:17	04:46	19:10	19:40	20:16
30°	03:59	04:32	04:59	18:58	19:25	19:58
20°	04:27	04:55	05:20	18:37	19:01	19:30
N 10°	04:48	05:15	05:38	18:19	18:42	19:09
0°	05:06	05:32	05:55	18:02	18:24	18:50
S 10°	05:22	05:49	06:11	17:45	18:08	18:34
20°	05:38	06:05	06:29	17:28	17:51	18:19
30°	05:53	06:23	06:49	17:07	17:33	18:03
35°	06:02	06:33	07:01	16:56	17:23	17:55
40°	06:10	06:44	07:14	16:42	17:12	17:46
45°	06:20	06:57	07:30	16:26	16:59	17:36
S 50°	06:31	07:12	07:50	16:07	16:44	17:25
52°	06:36	07:19	07:59	15:57	16:37	17:20
54°	06:41	07:27	08:10	15:47	16:30	17:15
56°	06:47	07:35	08:21	15:35	16:21	17:10
58°	06:53	07:45	08:35	15:21	16:12	17:03
S 60°	07:00	07:56	08:51	15:05	16:01	16:56

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°						
68°			02:29			05:18
66°			01:42			06:04
64°		01:33	01:11		04:34	06:34
62°	00:57	00:52	00:48	03:26	05:14	06:56
60°	00:12	00:24	00:29	04:11	05:41	07:14
N 58°	·· ··	00:02	00:14	04:40	06:03	07:29
56°	23:45	·· ··	00:01	05:03	06:20	07:42
54°	23:29	23:49	·· ··	05:21	06:35	07:53
52°	23:16	23:39	23:56	05:37	06:48	08:02
50°	23:05	23:29	23:49	05:50	06:59	08:11
45°	22:41	23:10	23:34	06:17	07:22	08:29
N 40°	22:21	22:54	23:22	06:39	07:41	08:44
35°	22:05	22:41	23:12	06:57	07:56	08:57
30°	21:51	22:29	23:03	07:12	08:09	09:07
20°	21:27	22:09	22:47	07:38	08:32	09:26
N 10°	21:06	21:51	22:33	08:00	08:52	09:42
0°	20:47	21:34	22:20	08:21	09:10	09:57
S 10°	20:27	21:18	22:07	08:42	09:28	10:12
20°	20:06	21:00	21:53	09:04	09:47	10:27
30°	19:42	20:39	21:37	09:29	10:09	10:45
35°	19:27	20:27	21:28	09:44	10:22	10:56
40°	19:11	20:13	21:17	10:01	10:37	11:07
45°	18:51	19:57	21:05	10:22	10:55	11:21
S 50°	18:25	19:36	20:49	10:48	11:16	11:38
52°	18:13	19:26	20:42	11:00	11:27	11:46
54°	17:59	19:15	20:34	11:15	11:38	11:55
56°	17:43	19:03	20:25	11:31	11:52	12:05
58°	17:23	18:48	20:14	11:52	12:07	12:16
S 60°	16:58	18:30	20:02	12:17	12:25	12:29

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 18-20 94-82%
03	01:55	01:50	11:58	02:09	14:34	
04	01:45	01:40	11:58	02:58	15:22	
05	01:35	01:30	11:59	03:46	16:09	

June 06, 07, 08 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	254°25.4	141°04.7	N23°43.5	213°14.7	N15°19.6	137°22.5	N21°32.1	241°53.8	N02°53.9
1	269°27.9	156°04.0	43.1	228°15.3	20.2	152°24.4	32.0	256°56.1	54.0
2	284°30.3	171°03.3	42.7	243°16.0	20.8	167°26.4	31.9	271°58.4	54.0
3	299°32.8	186°02.6	·· 42.2	258°16.6	·· 21.3	182°28.3	·· 31.8	287°00.7	·· 54.1
4	314°35.3	201°01.9	41.8	273°17.3	21.9	197°30.3	31.7	302°02.9	54.2
5	329°37.7	216°01.2	41.3	288°17.9	22.5	212°32.2	31.7	317°05.2	54.2
6	344°40.2	231°00.5	N23°40.9	303°18.6	N15°23.1	227°34.2	N21°31.6	332°07.5	N02°54.3
7	359°42.7	245°59.8	40.5	318°19.2	23.6	242°36.1	31.5	347°09.8	54.4
8	14°45.1	260°59.0	40.0	333°19.9	24.2	257°38.1	31.4	2°12.1	54.4
9	29°47.6	275°58.3	·· 39.6	348°20.5	·· 24.8	272°40.0	·· 31.3	17°14.3	·· 54.5
10	44°50.1	290°57.6	39.1	3°21.2	25.4	287°42.0	31.2	32°16.6	54.6
11	59°52.5	305°56.9	38.7	18°21.8	25.9	302°43.9	31.1	47°18.9	54.6
12	74°55.0	320°56.2	N23°38.2	33°22.5	N15°26.5	317°45.9	N21°31.1	62°21.2	N02°54.7
13	89°57.5	335°55.5	37.8	48°23.1	27.1	332°47.8	31.0	77°23.5	54.8
14	104°59.9	350°54.8	37.3	63°23.8	27.7	347°49.8	30.9	92°25.8	54.8
15	120°02.4	5°54.1	·· 36.9	78°24.4	·· 28.2	2°51.7	·· 30.8	107°28.0	·· 54.9
16	135°04.8	20°53.4	36.4	93°25.1	28.8	17°53.7	30.7	122°30.3	55.0
17	150°07.3	35°52.7	36.0	108°25.7	29.4	32°55.6	30.6	137°32.6	55.0
18	165°09.8	50°52.0	N23°35.5	123°26.4	N15°29.9	47°57.6	N21°30.5	152°34.9	N02°55.1
19	180°12.2	65°51.4	35.1	138°27.0	30.5	62°59.5	30.4	167°37.2	55.2
20	195°14.7	80°50.7	34.6	153°27.7	31.1	78°01.4	30.4	182°39.4	55.2
21	210°17.2	95°50.0	·· 34.1	168°28.3	·· 31.6	93°03.4	·· 30.3	197°41.7	·· 55.3
22	225°19.6	110°49.3	33.7	183°29.0	32.2	108°05.3	30.2	212°44.0	55.4
23	240°22.1	125°48.6	33.2	198°29.6	32.8	123°07.3	30.1	227°46.3	55.4
Mer.pass. 07:01		ν -0.7′	d 0.4′	m -3.96	ν 0.7′	d 0.6′	m 1.28	ν 1.9′	d 0.1′ m -1.87	ν 2.3′	d 0.1′ m 0.86

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	255°24.6	140°47.9	N23°32.8	213°30.3	N15°33.4	138°09.2	N21°30.0	242°48.6	N02°55.5
1	270°27.0	155°47.2	32.3	228°30.9	33.9	153°11.2	29.9	257°50.9	55.6
2	285°29.5	170°46.5	31.8	243°31.6	34.5	168°13.1	29.8	272°53.1	55.6
3	300°31.9	185°45.8	·· 31.4	258°32.2	·· 35.1	183°15.1	·· 29.8	287°55.4	·· 55.7
4	315°34.4	200°45.1	30.9	273°32.9	35.6	198°17.0	29.7	302°57.7	55.8
5	330°36.9	215°44.4	30.4	288°33.5	36.2	213°19.0	29.6	318°00.0	55.8
6	345°39.3	230°43.7	N23°30.0	303°34.2	N15°36.8	228°20.9	N21°29.5	333°02.3	N02°55.9
7	0°41.8	245°43.0	29.5	318°34.8	37.3	243°22.9	29.4	348°04.6	56.0
8	15°44.3	260°42.3	29.0	333°35.5	37.9	258°24.8	29.3	3°06.8	56.0
9	30°46.7	275°41.6	·· 28.5	348°36.1	·· 38.5	273°26.8	·· 29.2	18°09.1	·· 56.1
10	45°49.2	290°41.0	28.1	3°36.8	39.0	288°28.7	29.1	33°11.4	56.2
11	60°51.7	305°40.3	27.6	18°37.4	39.6	303°30.7	29.1	48°13.7	56.2
12	75°54.1	320°39.6	N23°27.1	33°38.1	N15°40.2	318°32.6	N21°29.0	63°16.0	N02°56.3
13	90°56.6	335°38.9	26.6	48°38.7	40.7	333°34.5	28.9	78°18.3	56.4
14	105°59.1	350°38.2	26.2	63°39.3	41.3	348°36.5	28.8	93°20.5	56.4
15	121°01.5	5°37.5	·· 25.7	78°40.0	·· 41.9	3°38.4	·· 28.7	108°22.8	·· 56.5
16	136°04.0	20°36.8	25.2	93°40.6	42.4	18°40.4	28.6	123°25.1	56.6
17	151°06.4	35°36.2	24.7	108°41.3	43.0	33°42.3	28.5	138°27.4	56.6
18	166°08.9	50°35.5	N23°24.3	123°41.9	N15°43.6	48°44.3	N21°28.4	153°29.7	N02°56.7
19	181°11.4	65°34.8	23.8	138°42.6	44.1	63°46.2	28.4	168°32.0	56.8
20	196°13.8	80°34.1	23.3	153°43.2	44.7	78°48.2	28.3	183°34.2	56.8
21	211°16.3	95°33.4	·· 22.8	168°43.9	·· 45.2	93°50.1	·· 28.2	198°36.5	·· 56.9
22	226°18.8	110°32.7	22.3	183°44.5	45.8	108°52.1	28.1	213°38.8	57.0
23	241°21.2	125°32.0	21.8	198°45.2	46.4	123°54.0	28.0	228°41.1	57.0
Mer.pass. 06:57		ν -0.7′	d 0.5′	m -3.96	ν 0.6′	d 0.6′	m 1.28	ν 1.9′	d 0.1′ m -1.86	ν 2.3′	d 0.1′ m 0.86

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	256°23.7	140°31.4	N23°21.3	213°45.8	N15°46.9	138°55.9	N21°27.9	243°43.4	N02°57.1
1	271°26.2	155°30.7	20.8	228°46.5	47.5	153°57.9	27.8	258°45.7	57.1
2	286°28.6	170°30.0	20.4	243°47.1	48.1	168°59.8	27.7	273°48.0	57.2
3	301°31.1	185°29.3	·· 19.9	258°47.8	·· 48.6	184°01.8	·· 27.7	288°50.2	·· 57.3
4	316°33.6	200°28.6	19.4	273°48.4	49.2	199°03.7	27.6	303°52.5	57.3
5	331°36.0	215°28.0	18.9	288°49.1	49.7	214°05.7	27.5	318°54.8	57.4
6	346°38.5	230°27.3	N23°18.4	303°49.7	N15°50.3	229°07.6	N21°27.4	333°57.1	N02°57.5
7	1°40.9	245°26.6	17.9	318°50.3	50.9	244°09.6	27.3	348°59.4	57.5
8	16°43.4	260°25.9	17.4	333°51.0	51.4	259°11.5	27.2	4°01.7	57.6
9	31°45.9	275°25.3	·· 16.9	348°51.6	·· 52.0	274°13.4	·· 27.1	19°04.0	·· 57.7
10	46°48.3	290°24.6	16.4	3°52.3	52.5	289°15.4	27.0	34°06.2	57.7
11	61°50.8	305°23.9	15.9	18°52.9	53.1	304°17.3	26.9	49°08.5	57.8
12	76°53.3	320°23.2	N23°15.4	33°53.6	N15°53.7	319°19.3	N21°26.9	64°10.8	N02°57.9
13	91°55.7	335°22.6	14.9	48°54.2	54.2	334°21.2	26.8	79°13.1	57.9
14	106°58.2	350°21.9	14.4	63°54.9	54.8	349°23.2	26.7	94°15.4	58.0
15	122°00.7	5°21.2	·· 13.9	78°55.5	·· 55.3	4°25.1	·· 26.6	109°17.7	·· 58.1
16	137°03.1	20°20.5	13.4	93°56.2	55.9	19°27.1	26.5	124°20.0	58.1
17	152°05.6	35°19.9	12.9	108°56.8	56.4	34°29.0	26.4	139°22.3	58.2
18	167°08.0	50°19.2	N23°12.4	123°57.5	N15°57.0	49°30.9	N21°26.3	154°24.5	N02°58.2
19	182°10.5	65°18.5	11.9	138°58.1	57.6	64°32.9	26.2	169°26.8	58.3
20	197°13.0	80°17.9	11.3	153°58.7	58.1	79°34.8	26.1	184°29.1	58.4
21	212°15.4	95°17.2	·· 10.8	168°59.4	·· 58.7	94°36.8	·· 26.1	199°31.4	·· 58.4
22	227°17.9	110°16.5	10.3	184°00.0	59.2	109°38.7	26.0	214°33.7	58.5
23	242°20.4	125°15.8	09.8	199°00.7	59.8	124°40.7	25.9	229°36.0	58.6
Mer.pass. 06:53		ν -0.7′	d 0.5′	m -3.96	ν 0.6′	d 0.6′	m 1.28	ν 1.9′	d 0.1′ m -1.86	ν 2.3′	d 0.1′ m 0.86

Stars

	SHA	Dec
Alpheratz	357°33.7	29°14.0
Ankaa	353°06.2	-42°09.5
Schedar	349°29.9	56°40.7
Diphda	348°46.3	-17°50.4
Achernar	335°19.7	-57°05.9
Hamal	327°50.1	23°35.2
Polaris	313°52.1	89°22.3
Acamar	315°11.3	-40°11.8
Menkar	314°05.2	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.4
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.7	-59°35.9
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.5	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.6	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.1
Gacrux	171°50.1	-57°16.0
Alioth	166°11.7	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.1	-60°56.9
Kochab	137°18.8	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.0
Kaus Aust.	83°30.6	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.5	-56°38.8
Deneb	49°24.7	45°22.3
Enif	33°37.5	9°59.7
Al Na'ir	27°31.3	-46°49.7
Fomalhaut	15°13.2	-29°28.7
Scheat	13°44.1	28°13.4
Markab	13°28.7	15°20.8

Jun 06 Sat	SHA	Mer.pass
Venus	246°39.3	14:36
Mars	318°49.3	09:47
Jupiter	242°57.0	14:49
Saturn	347°28.4	07:51

Jun 07 Sun	SHA	Mer.pass
Venus	245°23.3	14:37
Mars	318°05.7	09:46
Jupiter	242°44.7	14:45
Saturn	347°24.0	07:48

Jun 08 Mon	SHA	Mer.pass
Venus	244°07.7	14:39
Mars	317°22.1	09:45
Jupiter	242°32.3	14:42
Saturn	347°19.7	07:44

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°21.1	N22°37.8	294°16.0	13.9′	S16°57.4	11.9′	55.1′
1	195°21.0	38.1	308°48.9	13.9′	16°45.5	11.9′	55.1′
2	210°20.9	38.3	323°21.8	13.9′	16°33.6	12.0′	55.2′
3	225°20.8	·· 38.6	337°54.7	14.0′	16°21.6	12.1′	55.2′
4	240°20.7	38.9	352°27.7	14.0′	16°09.5	12.2′	55.2′
5	255°20.6	39.1	7°00.7	14.1′	15°57.3	12.2′	55.2′
6	270°20.4	N22°39.4	21°33.8	14.1′	S15°45.1	12.4′	55.3′
7	285°20.3	39.6	36°06.9	14.1′	15°32.7	12.4′	55.3′
8	300°20.2	39.9	50°40.0	14.2′	15°20.3	12.4′	55.3′
9	315°20.1	·· 40.1	65°13.2	14.2′	15°07.9	12.6′	55.3′
10	330°20.0	40.4	79°46.4	14.2′	14°55.3	12.6′	55.4′
11	345°19.9	40.7	94°19.6	14.3′	14°42.7	12.7′	55.4′
12	0°19.8	N22°40.9	108°52.9	14.3′	S14°30.0	12.7′	55.4′
13	15°19.6	41.2	123°26.2	14.3′	14°17.3	12.9′	55.4′
14	30°19.5	41.4	137°59.5	14.4′	14°04.4	12.9′	55.5′
15	45°19.4	·· 41.7	152°32.9	14.4′	13°51.5	12.9′	55.5′
16	60°19.3	41.9	167°06.2	14.4′	13°38.6	13.1′	55.5′
17	75°19.2	42.2	181°39.7	14.4′	13°25.5	13.1′	55.5′
18	90°19.1	N22°42.4	196°13.1	14.5′	S13°12.4	13.1′	55.6′
19	105°19.0	42.7	210°46.6	14.5′	12°59.3	13.3′	55.6′
20	120°18.8	42.9	225°20.0	14.5′	12°46.0	13.3′	55.6′
21	135°18.7	·· 43.2	239°53.6	14.5′	12°32.7	13.3′	55.6′
22	150°18.6	43.4	254°27.1	14.6′	12°19.4	13.5′	55.7′
23	165°18.5	43.6	269°00.6	14.6′	12°05.9	13.4′	55.7′
	SD = 15.8′	d = 0.3′		SD = 15.0′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.4	N22°43.9	283°34.2	14.6′	S11°52.5	13.6′	55.7′
1	195°18.3	44.1	298°07.8	14.6′	11°38.9	13.6′	55.7′
2	210°18.1	44.4	312°41.4	14.6′	11°25.3	13.7′	55.8′
3	225°18.0	·· 44.6	327°15.1	14.7′	11°11.6	13.7′	55.8′
4	240°17.9	44.9	341°48.7	14.7′	10°57.9	13.8′	55.8′
5	255°17.8	45.1	356°22.4	14.7′	10°44.1	13.9′	55.9′
6	270°17.7	N22°45.3	10°56.1	14.7′	S10°30.2	13.9′	55.9′
7	285°17.6	45.6	25°29.8	14.7′	10°16.3	13.9′	55.9′
8	300°17.4	45.8	40°03.5	14.7′	10°02.4	14.1′	56.0′
9	315°17.3	·· 46.1	54°37.2	14.7′	09°48.3	14.0′	56.0′
10	330°17.2	46.3	69°10.9	14.7′	09°34.3	14.2′	56.0′
11	345°17.1	46.5	83°44.7	14.8′	09°20.1	14.1′	56.0′
12	0°17.0	N22°46.8	98°18.4	14.8′	S09°06.0	14.3′	56.1′
13	15°16.9	47.0	112°52.2	14.8′	08°51.7	14.3′	56.1′
14	30°16.7	47.2	127°26.0	14.8′	08°37.4	14.3′	56.1′
15	45°16.6	·· 47.5	141°59.7	14.8′	08°23.1	14.4′	56.2′
16	60°16.5	47.7	156°33.5	14.8′	08°08.7	14.4′	56.2′
17	75°16.4	48.0	171°07.3	14.8′	07°54.3	14.5′	56.2′
18	90°16.3	N22°48.2	185°41.1	14.8′	S07°39.8	14.5′	56.3′
19	105°16.1	48.4	200°14.8	14.8′	07°25.3	14.6′	56.3′
20	120°16.0	48.6	214°48.6	14.8′	07°10.7	14.7′	56.3′
21	135°15.9	·· 48.9	229°22.4	14.8′	06°56.0	14.6′	56.4′
22	150°15.8	49.1	243°56.2	14.8′	06°41.4	14.7′	56.4′
23	165°15.7	49.3	258°29.9	14.8′	06°26.7	14.8′	56.4′
	SD = 15.8′	d = 0.2′		SD = 15.2′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.5	N22°49.6	273°03.7	14.8′	S06°11.9	14.8′	56.5′
1	195°15.4	49.8	287°37.5	14.8′	05°57.1	14.8′	56.5′
2	210°15.3	50.0	302°11.2	14.7′	05°42.3	14.9′	56.5′
3	225°15.2	·· 50.2	316°45.0	14.7′	05°27.4	15.0′	56.6′
4	240°15.1	50.5	331°18.7	14.7′	05°12.4	14.9′	56.6′
5	255°14.9	50.7	345°52.4	14.7′	04°57.5	15.0′	56.6′
6	270°14.8	N22°50.9	0°26.1	14.7′	S04°42.5	15.1′	56.7′
7	285°14.7	51.1	14°59.8	14.7′	04°27.4	15.0′	56.7′
8	300°14.6	51.4	29°33.5	14.7′	04°12.4	15.2′	56.7′
9	315°14.5	·· 51.6	44°07.2	14.6′	03°57.2	15.1′	56.8′
10	330°14.3	51.8	58°40.8	14.6′	03°42.1	15.2′	56.8′
11	345°14.2	52.0	73°14.5	14.6′	03°26.9	15.2′	56.8′
12	0°14.1	N22°52.3	87°48.1	14.6′	S03°11.7	15.3′	56.9′
13	15°14.0	52.5	102°21.7	14.6′	02°56.4	15.2′	56.9′
14	30°13.9	52.7	116°55.2	14.5′	02°41.2	15.3′	56.9′
15	45°13.7	·· 52.9	131°28.8	14.5′	02°25.9	15.4′	57.0′
16	60°13.6	53.1	146°02.3	14.5′	02°10.5	15.4′	57.0′
17	75°13.5	53.3	160°35.8	14.5′	01°55.1	15.4′	57.0′
18	90°13.4	N22°53.6	175°09.3	14.4′	S01°39.7	15.4′	57.1′
19	105°13.3	53.8	189°42.7	14.4′	01°24.3	15.4′	57.1′
20	120°13.1	54.0	204°16.1	14.4′	01°08.9	15.5′	57.1′
21	135°13.0	·· 54.2	218°49.5	14.3′	00°53.4	15.5′	57.2′
22	150°12.9	54.4	233°22.8	14.3′	00°37.9	15.5′	57.2′
23	165°12.8	54.6	247°56.1	14.3′	00°22.4	15.6′	57.3′
	SD = 15.8′	d = 0.2′		SD = 15.4′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	00:45	23:18	////	////
64°	////	////	01:45	22:15	////	////
62°	////	////	02:18	21:41	////	////
60°	////	01:10	02:42	21:17	22:50	////
N 58°	////	01:50	03:01	20:58	22:09	////
56°	////	02:17	03:17	20:42	21:42	////
54°	01:04	02:37	03:30	20:28	21:21	22:56
52°	01:41	02:54	03:42	20:16	21:04	22:18
50°	02:06	03:09	03:52	20:06	20:50	21:53
45°	02:49	03:37	04:14	19:44	20:21	21:10
N 40°	03:18	03:59	04:31	19:27	19:59	20:40
35°	03:40	04:16	04:46	19:12	19:42	20:18
30°	03:58	04:31	04:58	18:59	19:27	20:00
20°	04:26	04:55	05:20	18:38	19:02	19:32
N 10°	04:48	05:15	05:38	18:20	18:43	19:10
0°	05:07	05:33	05:55	18:03	18:25	18:51
S 10°	05:23	05:49	06:12	17:46	18:08	18:35
20°	05:39	06:06	06:30	17:28	17:51	18:19
30°	05:55	06:24	06:51	17:07	17:33	18:03
35°	06:03	06:35	07:03	16:55	17:23	17:55
40°	06:12	06:46	07:16	16:41	17:12	17:46
45°	06:22	06:59	07:32	16:25	16:59	17:36
S 50°	06:33	07:14	07:52	16:05	16:43	17:24
52°	06:38	07:22	08:02	15:56	16:36	17:19
54°	06:44	07:29	08:13	15:45	16:28	17:14
56°	06:49	07:38	08:25	15:33	16:19	17:08
58°	06:56	07:48	08:39	15:19	16:10	17:02
S 60°	07:03	07:59	08:55	15:02	15:59	16:55

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	02:51	01:45	01:06	06:34	09:12	11:25
N 70°	02:07	01:26	00:58	07:16	09:29	11:30
68°	01:38	01:11	00:51	07:43	09:42	11:34
66°	01:16	00:59	00:45	08:04	09:53	11:37
64°	00:58	00:49	00:40	08:21	10:01	11:40
62°	00:44	00:40	00:36	08:34	10:09	11:43
60°	00:31	00:32	00:32	08:46	10:15	11:45
N 58°	00:21	00:25	00:29	08:55	10:21	11:47
56°	00:11	00:19	00:26	09:04	10:26	11:48
54°	00:03	00:14	00:23	09:12	10:30	11:50
52°	·· ··	00:09	00:21	09:18	10:34	11:51
50°	·· ··	00:05	00:18	09:24	10:38	11:52
45°	23:55	·· ··	00:14	09:37	10:46	11:55
N 40°	23:47	·· ··	00:09	09:48	10:52	11:57
35°	23:40	·· ··	00:06	09:57	10:58	11:59
30°	23:34	·· ··	00:03	10:05	11:03	12:01
20°	23:23	23:57	·· ··	10:19	11:11	12:04
N 10°	23:13	23:52	·· ··	10:31	11:19	12:06
0°	23:05	23:48	·· ··	10:42	11:25	12:09
S 10°	22:56	23:43	·· ··	10:53	11:32	12:11
20°	22:46	23:38	·· ··	11:04	11:39	12:13
30°	22:35	23:33	·· ··	11:17	11:47	12:16
35°	22:29	23:30	·· ··	11:25	11:52	12:17
40°	22:21	23:26	·· ··	11:34	11:57	12:19
45°	22:13	23:22	·· ··	11:44	12:03	12:21
S 50°	22:03	23:17	·· ··	11:56	12:10	12:24
52°	21:58	23:14	·· ··	12:01	12:13	12:25
54°	21:53	23:12	·· ··	12:07	12:17	12:26
56°	21:47	23:09	·· ··	12:14	12:21	12:27
58°	21:40	23:06	·· ··	12:21	12:25	12:28
S 60°	21:33	23:02	·· ··	12:30	12:30	12:30

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	21-23	74-54%
06	01:24	01:19	11:59	04:31	16:53		
07	01:13	01:08	11:59	05:15	17:37		
08	01:02	00:56	11:59	05:58	18:20		

June 09, 10, 11 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	257°22.8	140°15.2	N23°09.3	214°01.3	N16°00.3	139°42.6	N21°25.8	244°38.3	N02°58.6
1	272°25.3	155°14.5	08.8	229°02.0	00.9	154°44.5	25.7	259°40.6	58.7
2	287°27.8	170°13.8	08.3	244°02.6	01.5	169°46.5	25.6	274°42.8	58.8
3	302°30.2	185°13.2	·· 07.7	259°03.3	·· 02.0	184°48.4	·· 25.5	289°45.1	·· 58.8
4	317°32.7	200°12.5	07.2	274°03.9	02.6	199°50.4	25.4	304°47.4	58.9
5	332°35.2	215°11.8	06.7	289°04.5	03.1	214°52.3	25.3	319°49.7	58.9
6	347°37.6	230°11.2	N23°06.2	304°05.2	N16°03.7	229°54.2	N21°25.3	334°52.0	N02°59.0
7	2°40.1	245°10.5	05.7	319°05.8	04.2	244°56.2	25.2	349°54.3	59.1
8	17°42.5	260°09.8	05.1	334°06.5	04.8	259°58.1	25.1	4°56.6	59.1
9	32°45.0	275°09.2	·· 04.6	349°07.1	·· 05.3	275°00.1	·· 25.0	19°58.9	·· 59.2
10	47°47.5	290°08.5	04.1	4°07.8	05.9	290°02.0	24.9	35°01.2	59.3
11	62°49.9	305°07.9	03.6	19°08.4	06.4	305°04.0	24.8	50°03.5	59.3
12	77°52.4	320°07.2	N23°03.0	34°09.1	N16°07.0	320°05.9	N21°24.7	65°05.7	N02°59.4
13	92°54.9	335°06.5	02.5	49°09.7	07.5	335°07.8	24.6	80°08.0	59.4
14	107°57.3	350°05.9	02.0	64°10.3	08.1	350°09.8	24.5	95°10.3	59.5
15	122°59.8	5°05.2	·· 01.4	79°11.0	·· 08.6	5°11.7	·· 24.4	110°12.6	·· 59.6
16	138°02.3	20°04.6	00.9	94°11.6	09.2	20°13.7	24.4	125°14.9	59.6
17	153°04.7	35°03.9	23°00.4	109°12.3	09.7	35°15.6	24.3	140°17.2	59.7
18	168°07.2	50°03.2	N22°59.9	124°12.9	N16°10.3	50°17.5	N21°24.2	155°19.5	N02°59.8
19	183°09.6	65°02.6	59.3	139°13.6	10.8	65°19.5	24.1	170°21.8	59.8
20	198°12.1	80°01.9	58.8	154°14.2	11.4	80°21.4	24.0	185°24.1	59.9
21	213°14.6	95°01.3	·· 58.2	169°14.9	·· 11.9	95°23.4	·· 23.9	200°26.4	02°59.9
22	228°17.0	110°00.6	57.7	184°15.5	12.5	110°25.3	23.8	215°28.6	03°00.0
23	243°19.5	125°00.0	57.2	199°16.1	13.0	125°27.2	23.7	230°30.9	00.1
Mer.pass. 06:49		ν -0.7′	d 0.5′	ν 0.6′	d 0.6′	ν 1.9′	d 0.1′	ν 2.3′	d 0.1′
		m -3.97		m 1.28		m -1.86		m 0.85	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	258°22.0	139°59.3	N22°56.6	214°16.8	N16°13.6	140°29.2	N21°23.6	245°33.2	N03°00.1
1	273°24.4	154°58.6	56.1	229°17.4	14.1	155°31.1	23.5	260°35.5	00.2
2	288°26.9	169°58.0	55.5	244°18.1	14.7	170°33.1	23.5	275°37.8	00.3
3	303°29.4	184°57.3	·· 55.0	259°18.7	·· 15.2	185°35.0	·· 23.4	290°40.1	·· 00.3
4	318°31.8	199°56.7	54.5	274°19.4	15.8	200°36.9	23.3	305°42.4	00.4
5	333°34.3	214°56.0	53.9	289°20.0	16.3	215°38.9	23.2	320°44.7	00.4
6	348°36.8	229°55.4	N22°53.4	304°20.6	N16°16.9	230°40.8	N21°23.1	335°47.0	N03°00.5
7	3°39.2	244°54.7	52.8	319°21.3	17.4	245°42.8	23.0	350°49.3	00.6
8	18°41.7	259°54.1	52.3	334°21.9	18.0	260°44.7	22.9	5°51.6	00.6
9	33°44.1	274°53.4	·· 51.7	349°22.6	·· 18.5	275°46.6	·· 22.8	20°53.9	·· 00.7
10	48°46.6	289°52.8	51.2	4°23.2	19.1	290°48.6	22.7	35°56.1	00.8
11	63°49.1	304°52.1	50.6	19°23.9	19.6	305°50.5	22.6	50°58.4	00.8
12	78°51.5	319°51.5	N22°50.1	34°24.5	N16°20.2	320°52.5	N21°22.6	66°00.7	N03°00.9
13	93°54.0	334°50.8	49.5	49°25.1	20.7	335°54.4	22.5	81°03.0	00.9
14	108°56.5	349°50.2	49.0	64°25.8	21.2	350°56.3	22.4	96°05.3	01.0
15	123°58.9	4°49.5	·· 48.4	79°26.4	·· 21.8	5°58.3	·· 22.3	111°07.6	·· 01.1
16	139°01.4	19°48.9	47.8	94°27.1	22.3	21°00.2	22.2	126°09.9	01.1
17	154°03.9	34°48.3	47.3	109°27.7	22.9	36°02.2	22.1	141°12.2	01.2
18	169°06.3	49°47.6	N22°46.7	124°28.4	N16°23.4	51°04.1	N21°22.0	156°14.5	N03°01.2
19	184°08.8	64°47.0	46.2	139°29.0	24.0	66°06.0	21.9	171°16.8	01.3
20	199°11.3	79°46.3	45.6	154°29.6	24.5	81°08.0	21.8	186°19.1	01.4
21	214°13.7	94°45.7	·· 45.0	169°30.3	·· 25.0	96°09.9	·· 21.7	201°21.4	·· 01.4
22	229°16.2	109°45.0	44.5	184°30.9	25.6	111°11.8	21.6	216°23.7	01.5
23	244°18.6	124°44.4	43.9	199°31.6	26.1	126°13.8	21.5	231°26.0	01.5
Mer.pass. 06:45		ν -0.7′	d 0.5′	ν 0.6′	d 0.5′	ν 1.9′	d 0.1′	ν 2.3′	d 0.1′
		m -3.97		m 1.28		m -1.85		m 0.85	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	259°21.1	139°43.8	N22°43.4	214°32.2	N16°26.7	141°15.7	N21°21.5	246°28.3	N03°01.6
1	274°23.6	154°43.1	42.8	229°32.8	27.2	156°17.7	21.4	261°30.5	01.7
2	289°26.0	169°42.5	42.2	244°33.5	27.8	171°19.6	21.3	276°32.8	01.7
3	304°28.5	184°41.8	·· 41.7	259°34.1	·· 28.3	186°21.5	·· 21.2	291°35.1	·· 01.8
4	319°31.0	199°41.2	41.1	274°34.8	28.8	201°23.5	21.1	306°37.4	01.9
5	334°33.4	214°40.6	40.5	289°35.4	29.4	216°25.4	21.0	321°39.7	01.9
6	349°35.9	229°39.9	N22°39.9	304°36.1	N16°29.9	231°27.3	N21°20.9	336°42.0	N03°02.0
7	4°38.4	244°39.3	39.4	319°36.7	30.5	246°29.3	20.8	351°44.3	02.0
8	19°40.8	259°38.7	38.8	334°37.3	31.0	261°31.2	20.7	6°46.6	02.1
9	34°43.3	274°38.0	·· 38.2	349°38.0	·· 31.5	276°33.2	·· 20.6	21°48.9	·· 02.2
10	49°45.7	289°37.4	37.6	4°38.6	32.1	291°35.1	20.5	36°51.2	02.2
11	64°48.2	304°36.8	37.1	19°39.3	32.6	306°37.0	20.5	51°53.5	02.3
12	79°50.7	319°36.1	N22°36.5	34°39.9	N16°33.1	321°39.0	N21°20.4	66°55.8	N03°02.3
13	94°53.1	334°35.5	35.9	49°40.5	33.7	336°40.9	20.3	81°58.1	02.4
14	109°55.6	349°34.9	35.3	64°41.2	34.2	351°42.8	20.2	97°00.4	02.5
15	124°58.1	4°34.2	·· 34.8	79°41.8	·· 34.8	6°44.8	·· 20.1	112°02.7	·· 02.5
16	140°00.5	19°33.6	34.2	94°42.5	35.3	21°46.7	20.0	127°05.0	02.6
17	155°03.0	34°33.0	33.6	109°43.1	35.8	36°48.7	19.9	142°07.3	02.6
18	170°05.5	49°32.3	N22°33.0	124°43.7	N16°36.4	51°50.6	N21°19.8	157°09.6	N03°02.7
19	185°07.9	64°31.7	32.4	139°44.4	36.9	66°52.5	19.7	172°11.9	02.8
20	200°10.4	79°31.1	31.8	154°45.0	37.4	81°54.5	19.6	187°14.2	02.8
21	215°12.9	94°30.4	·· 31.2	169°45.7	·· 38.0	96°56.4	·· 19.5	202°16.5	·· 02.9
22	230°15.3	109°29.8	30.7	184°46.3	38.5	111°58.3	19.4	217°18.8	02.9
23	245°17.8	124°29.2	30.1	199°46.9	39.0	127°00.3	19.3	232°21.1	03.0
Mer.pass. 06:41		ν -0.6′	d 0.6′	ν 0.6′	d 0.5′	ν 1.9′	d 0.1′	ν 2.3′	d 0.1′
		m -3.97		m 1.28		m -1.85		m 0.85	

Stars

	SHA	Dec
Alpheratz	357°33.6	29°14.0
Ankaa	353°06.1	-42°09.5
Schedar	349°29.9	56°40.7
Diphda	348°46.3	-17°50.4
Achernar	335°19.7	-57°05.9
Hamal	327°50.1	23°35.2
Polaris	313°51.3	89°22.3
Acamar	315°11.3	-40°11.8
Menkar	314°05.2	4°11.6
Mirfak	308°27.0	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.4
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.7	-59°35.9
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.6	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.6	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.6	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.7	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°18.9	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.0
Kaus Aust.	83°30.6	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.5	-56°38.8
Deneb	49°24.7	45°22.3
Enif	33°37.5	9°59.7
Al Na'ir	27°31.3	-46°49.7
Fomalhaut	15°13.2	-29°28.7
Scheat	13°44.0	28°13.4
Markab	13°28.7	15°20.8

Jun 09 Tue	SHA	Mer.pass
Venus	242°52.3	14:40
Mars	316°38.5	09:43
Jupiter	242°19.8	14:39
Saturn	347°15.4	07:40

Jun 10 Wed	SHA	Mer.pass
Venus	241°37.3	14:41
Mars	315°54.8	09:42
Jupiter	242°07.2	14:36
Saturn	347°11.3	07:37

Jun 11 Thu	SHA	Mer.pass
Venus	240°22.7	14:42
Mars	315°11.1	09:41
Jupiter	241°54.6	14:33
Saturn	347°07.1	07:33

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°12.7	N22°54.8	262°29.4	14.2′	S00°06.8	15.5′	57.3′
1	195°12.5	55.0	277°02.6	14.2′	N00°08.7	15.6′	57.3′
2	210°12.4	55.3	291°35.8	14.1′	00°24.3	15.6′	57.4′
3	225°12.3	·· 55.5	306°08.9	14.1′	00°39.9	15.6′	57.4′
4	240°12.2	55.7	320°42.0	14.1′	00°55.5	15.6′	57.4′
5	255°12.0	55.9	335°15.1	14.0′	01°11.1	15.7′	57.5′
6	270°11.9	N22°56.1	349°48.1	14.0′	N01°26.8	15.7′	57.5′
7	285°11.8	56.3	4°21.1	13.9′	01°42.5	15.6′	57.6′
8	300°11.7	56.5	18°54.0	13.9′	01°58.1	15.7′	57.6′
9	315°11.5	·· 56.7	33°26.9	13.8′	02°13.8	15.7′	57.6′
10	330°11.4	56.9	47°59.7	13.8′	02°29.5	15.7′	57.7′
11	345°11.3	57.1	62°32.5	13.7′	02°45.2	15.8′	57.7′
12	0°11.2	N22°57.3	77°05.2	13.7′	N03°01.0	15.7′	57.7′
13	15°11.1	57.5	91°37.9	13.6′	03°16.7	15.7′	57.8′
14	30°10.9	57.7	106°10.5	13.6′	03°32.4	15.8′	57.8′
15	45°10.8	·· 57.9	120°43.1	13.5′	03°48.2	15.7′	57.9′
16	60°10.7	58.1	135°15.6	13.4′	04°03.9	15.7′	57.9′
17	75°10.6	58.3	149°48.0	13.4′	04°19.6	15.8′	57.9′
18	90°10.4	N22°58.5	164°20.4	13.3′	N04°35.4	15.7′	58.0′
19	105°10.3	58.7	178°52.7	13.2′	04°51.1	15.8′	58.0′
20	120°10.2	58.9	193°24.9	13.2′	05°06.9	15.7′	58.0′
21	135°10.1	·· 59.1	207°57.1	13.1′	05°22.6	15.8′	58.1′
22	150°09.9	59.3	222°29.2	13.0′	05°38.4	15.7′	58.1′
23	165°09.8	59.5	237°01.3	13.0′	05°54.1	15.7′	58.2′
	SD = 15.8′	*d* = 0.2′	SD = 15.6′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°09.7	N22°59.7	251°33.2	12.9′	N06°09.8	15.8′	58.2′
1	195°09.6	22°59.9	266°05.1	12.8′	06°25.6	15.7′	58.2′
2	210°09.4	23°00.1	280°37.0	12.7′	06°41.3	15.7′	58.3′
3	225°09.3	·· 00.3	295°08.7	12.7′	06°57.0	15.7′	58.3′
4	240°09.2	00.5	309°40.4	12.6′	07°12.7	15.7′	58.4′
5	255°09.1	00.7	324°12.0	12.5′	07°28.4	15.6′	58.4′
6	270°08.9	N23°00.9	338°43.5	12.4′	N07°44.0	15.7′	58.4′
7	285°08.8	01.1	353°14.9	12.4′	07°59.7	15.6′	58.5′
8	300°08.7	01.2	7°46.3	12.3′	08°15.3	15.6′	58.5′
9	315°08.6	·· 01.4	22°17.5	12.2′	08°30.9	15.6′	58.6′
10	330°08.4	01.6	36°48.7	12.1′	08°46.5	15.6′	58.6′
11	345°08.3	01.8	51°19.8	12.0′	09°02.1	15.5′	58.6′
12	0°08.2	N23°02.0	65°50.8	11.9′	N09°17.6	15.5′	58.7′
13	15°08.1	02.2	80°21.7	11.8′	09°33.1	15.5′	58.7′
14	30°07.9	02.4	94°52.6	11.7′	09°48.6	15.5′	58.7′
15	45°07.8	·· 02.5	109°23.3	11.6′	10°04.1	15.4′	58.8′
16	60°07.7	02.7	123°53.9	11.5′	10°19.5	15.5′	58.8′
17	75°07.5	02.9	138°24.5	11.4′	10°35.0	15.3′	58.9′
18	90°07.4	N23°03.1	152°54.9	11.3′	N10°50.3	15.4′	58.9′
19	105°07.3	03.3	167°25.3	11.2′	11°05.7	15.3′	58.9′
20	120°07.2	03.5	181°55.5	11.1′	11°21.0	15.2′	59.0′
21	135°07.0	·· 03.6	196°25.7	11.0′	11°36.2	15.3′	59.0′
22	150°06.9	03.8	210°55.7	10.9′	11°51.5	15.2′	59.0′
23	165°06.8	04.0	225°25.6	10.8′	12°06.7	15.1′	59.1′
	SD = 15.7′	*d* = 0.2′	SD = 15.9′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	180°06.7	N23°04.2	239°55.5	10.7′	N12°21.8	15.1′	59.1′
1	195°06.5	04.3	254°25.2	10.6′	12°36.9	15.0′	59.2′
2	210°06.4	04.5	268°54.8	10.5′	12°51.9	15.0′	59.2′
3	225°06.3	·· 04.7	283°24.3	10.4′	13°06.9	15.0′	59.2′
4	240°06.1	04.9	297°53.7	10.3′	13°21.9	14.9′	59.3′
5	255°06.0	05.0	312°23.0	10.2′	13°36.8	14.8′	59.3′
6	270°05.9	N23°05.2	326°52.2	10.1′	N13°51.6	14.8′	59.3′
7	285°05.8	05.4	341°21.2	9.9′	14°06.4	14.8′	59.4′
8	300°05.6	05.6	355°50.2	9.8′	14°21.2	14.6′	59.4′
9	315°05.5	·· 05.7	10°19.0	9.7′	14°35.8	14.6′	59.5′
10	330°05.4	05.9	24°47.7	9.6′	14°50.4	14.6′	59.5′
11	345°05.3	06.1	39°16.3	9.5′	15°05.0	14.5′	59.5′
12	0°05.1	N23°06.3	53°44.7	9.3′	N15°19.5	14.4′	59.6′
13	15°05.0	06.4	68°13.1	9.2′	15°33.9	14.3′	59.6′
14	30°04.9	06.6	82°41.3	9.1′	15°48.2	14.3′	59.6′
15	45°04.7	·· 06.8	97°09.4	9.0′	16°02.5	14.2′	59.7′
16	60°04.6	06.9	111°37.4	8.8′	16°16.7	14.1′	59.7′
17	75°04.5	07.1	126°05.2	8.7′	16°30.8	14.1′	59.7′
18	90°04.3	N23°07.3	140°32.9	8.6′	N16°44.9	13.9′	59.8′
19	105°04.2	07.4	155°00.5	8.5′	16°58.8	13.9′	59.8′
20	120°04.1	07.6	169°27.9	8.3′	17°12.7	13.8′	59.8′
21	135°04.0	·· 07.7	183°55.3	8.2′	17°26.5	13.7′	59.9′
22	150°03.8	07.9	198°22.5	8.1′	17°40.2	13.6′	59.9′
23	165°03.7	08.1	212°49.5	7.9′	17°53.8	13.5′	60.0′
	SD = 15.7′	*d* = 0.2′	SD = 16.1′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	00:28	23:37	////	////
64°	////	////	01:39	22:21	////	////
62°	////	////	02:14	21:46	////	////
60°	////	01:03	02:39	21:21	22:58	////
N 58°	////	01:46	02:59	21:01	22:14	////
56°	////	02:14	03:15	20:45	21:46	////
54°	00:57	02:35	03:29	20:31	21:24	23:04
52°	01:37	02:53	03:41	20:19	21:07	22:23
50°	02:03	03:07	03:51	20:08	20:52	21:56
45°	02:47	03:36	04:13	19:46	20:23	21:12
N 40°	03:17	03:58	04:31	19:28	20:01	20:42
35°	03:40	04:16	04:46	19:14	19:43	20:20
30°	03:58	04:31	04:58	19:01	19:28	20:01
20°	04:26	04:55	05:20	18:39	19:04	19:33
N 10°	04:49	05:16	05:39	18:20	18:43	19:10
0°	05:07	05:33	05:56	18:03	18:26	18:52
S 10°	05:24	05:50	06:13	17:46	18:09	18:35
20°	05:40	06:07	06:31	17:28	17:52	18:19
30°	05:56	06:26	06:52	17:07	17:33	18:03
35°	06:04	06:36	07:04	16:55	17:23	17:54
40°	06:14	06:47	07:18	16:41	17:11	17:45
45°	06:24	07:01	07:34	16:24	16:58	17:35
S 50°	06:35	07:16	07:55	16:04	16:42	17:24
52°	06:40	07:24	08:04	15:54	16:35	17:19
54°	06:46	07:32	08:15	15:44	16:27	17:13
56°	06:52	07:40	08:27	15:31	16:18	17:07
58°	06:58	07:50	08:42	15:17	16:08	17:00
S 60°	07:05	08:02	08:59	15:00	15:57	16:53

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	00:32 23:58	23:15	21:45	13:35	15:58	19:17
N 70°	00:32	00:06 23:35	22:44	13:31	15:41	18:20
68°	00:32	00:13 23:51	23:19	13:27	15:27	17:46
66°	00:32	00:19	00:04 23:44	13:23	15:16	17:22
64°	00:32	00:24	00:15	13:21	15:07	17:04
62°	00:32	00:28	00:24	13:18	14:59	16:49
60°	00:32	00:32	00:32	13:16	14:52	16:36
N 58°	00:32	00:35	00:40	13:14	14:46	16:25
56°	00:32	00:38	00:46	13:13	14:41	16:16
54°	00:32	00:41	00:52	13:11	14:37	16:08
52°	00:32	00:43	00:57	13:10	14:32	16:00
50°	00:32	00:46	01:01	13:09	14:29	15:54
45°	00:32	00:50	01:12	13:06	14:21	15:39
N 40°	00:32	00:55	01:20	13:04	14:14	15:28
35°	00:32	00:58	01:28	13:02	14:08	15:18
30°	00:32	01:01	01:34	13:00	14:03	15:09
20°	00:31	01:07	01:46	12:58	13:54	14:54
N 10°	00:31	01:12	01:56	12:55	13:46	14:42
0°	00:31	01:17	02:05	12:53	13:39	14:30
S 10°	00:32	01:22	02:15	12:50	13:32	14:18
20°	00:32	01:27	02:25	12:48	13:25	14:05
30°	00:32	01:33	02:37	12:45	13:16	13:51
35°	00:32	01:36	02:44	12:43	13:11	13:42
40°	00:32	01:40	02:52	12:41	13:05	13:33
45°	00:32	01:44	03:01	12:39	12:59	13:22
S 50°	00:32	01:50	03:13	12:37	12:51	13:09
52°	00:32	01:53	03:18	12:36	12:48	13:02
54°	00:32	01:55	03:24	12:34	12:44	12:56
56°	00:32	01:58	03:30	12:33	12:40	12:48
58°	00:32	02:02	03:38	12:31	12:35	12:40
S 60°	00:32	02:06	03:46	12:30	12:30	12:30

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Mer.Pass. Lower hh:mm	Age 24-26 44-23%
09	00:51	00:45	11:59	06:42	19:05	
10	00:39	00:33	11:59	07:28	19:52	
11	00:27	00:20	12:00	08:17	20:44	

June 12, 13, 14 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	260°20.2	139°28.6	N22°29.5	214°47.6	N16°39.6	142°02.2	N21°19.3	247°23.3	N03°03.1
1	275°22.7	154°27.9	28.9	229°48.2	40.1	157°04.1	19.2	262°25.6	03.1
2	290°25.2	169°27.3	28.3	244°48.9	40.7	172°06.1	19.1	277°27.9	03.2
3	305°27.6	184°26.7	·· 27.7	259°49.5	·· 41.2	187°08.0	·· 19.0	292°30.2	·· 03.2
4	320°30.1	199°26.1	27.1	274°50.1	41.7	202°09.9	18.9	307°32.5	03.3
5	335°32.6	214°25.4	26.5	289°50.8	42.3	217°11.9	18.8	322°34.8	03.3
6	350°35.0	229°24.8	N22°25.9	304°51.4	N16°42.8	232°13.8	N21°18.7	337°37.1	N03°03.4
7	5°37.5	244°24.2	25.3	319°52.1	43.3	247°15.7	18.6	352°39.4	03.5
8	20°40.0	259°23.6	24.7	334°52.7	43.9	262°17.7	18.5	7°41.7	03.5
9	35°42.4	274°22.9	·· 24.1	349°53.3	·· 44.4	277°19.6	·· 18.4	22°44.0	·· 03.6
10	50°44.9	289°22.3	23.5	4°54.0	44.9	292°21.6	18.3	37°46.3	03.6
11	65°47.4	304°21.7	22.9	19°54.6	45.4	307°23.5	18.2	52°48.6	03.7
12	80°49.8	319°21.1	N22°22.3	34°55.3	N16°46.0	322°25.4	N21°18.1	67°50.9	N03°03.8
13	95°52.3	334°20.5	21.7	49°55.9	46.5	337°27.4	18.0	82°53.2	03.8
14	110°54.7	349°19.9	21.1	64°56.5	47.0	352°29.3	18.0	97°55.5	03.9
15	125°57.2	4°19.2	·· 20.5	79°57.2	·· 47.6	7°31.2	·· 17.9	112°57.8	·· 03.9
16	140°59.7	19°18.6	19.9	94°57.8	48.1	22°33.2	17.8	128°00.1	04.0
17	156°02.1	34°18.0	19.3	109°58.5	48.6	37°35.1	17.7	143°02.4	04.1
18	171°04.6	49°17.4	N22°18.7	124°59.1	N16°49.2	52°37.0	N21°17.6	158°04.7	N03°04.1
19	186°07.1	64°16.8	18.1	139°59.7	49.7	67°39.0	17.5	173°07.0	04.2
20	201°09.5	79°16.2	17.5	155°00.4	50.2	82°40.9	17.4	188°09.3	04.2
21	216°12.0	94°15.5	·· 16.9	170°01.0	·· 50.7	97°42.8	·· 17.3	203°11.6	·· 04.3
22	231°14.5	109°14.9	16.2	185°01.6	51.3	112°44.8	17.2	218°13.9	04.3
23	246°16.9	124°14.3	15.6	200°02.3	51.8	127°46.7	17.1	233°16.2	04.4
Mer.pass. 06:38		ν -0.6′	d 0.6′	m -3.98	ν 0.6′	d 0.5′	m 1.28	ν 1.9′	d 0.1′ m -1.85	ν 2.3′	d 0.1′ m 0.84

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	261°19.4	139°13.7	N22°15.0	215°02.9	N16°52.3	142°48.6	N21°17.0	248°18.5	N03°04.5
1	276°21.9	154°13.1	14.4	230°03.6	52.9	157°50.6	16.9	263°20.8	04.5
2	291°24.3	169°12.5	13.8	245°04.2	53.4	172°52.5	16.8	278°23.1	04.6
3	306°26.8	184°11.9	·· 13.2	260°04.8	·· 53.9	187°54.4	·· 16.7	293°25.4	·· 04.6
4	321°29.2	199°11.3	12.6	275°05.5	54.4	202°56.4	16.6	308°27.7	04.7
5	336°31.7	214°10.7	11.9	290°06.1	55.0	217°58.3	16.6	323°30.0	04.8
6	351°34.2	229°10.0	N22°11.3	305°06.8	N16°55.5	233°00.2	N21°16.5	338°32.3	N03°04.8
7	6°36.6	244°09.4	10.7	320°07.4	56.0	248°02.2	16.4	353°34.6	04.9
8	21°39.1	259°08.8	10.1	335°08.0	56.5	263°04.1	16.3	8°36.9	04.9
9	36°41.6	274°08.2	·· 09.4	350°08.7	·· 57.1	278°06.0	·· 16.2	23°39.2	·· 05.0
10	51°44.0	289°07.6	08.8	5°09.3	57.6	293°08.0	16.1	38°41.5	05.0
11	66°46.5	304°07.0	08.2	20°09.9	58.1	308°09.9	16.0	53°43.8	05.1
12	81°49.0	319°06.4	N22°07.6	35°10.6	N16°58.6	323°11.8	N21°15.9	68°46.1	N03°05.2
13	96°51.4	334°05.8	06.9	50°11.2	59.2	338°13.8	15.8	83°48.4	05.2
14	111°53.9	349°05.2	06.3	65°11.9	16°59.7	353°15.7	15.7	98°50.7	05.3
15	126°56.4	4°04.6	·· 05.7	80°12.5	17°00.2	8°17.6	·· 15.6	113°53.0	·· 05.3
16	141°58.8	19°04.0	05.1	95°13.1	00.7	23°19.6	15.5	128°55.3	05.4
17	157°01.3	34°03.4	04.4	110°13.8	01.2	38°21.5	15.4	143°57.6	05.4
18	172°03.7	49°02.8	N22°03.8	125°14.4	N17°01.8	53°23.4	N21°15.3	158°59.9	N03°05.5
19	187°06.2	64°02.2	03.2	140°15.0	02.3	68°25.3	15.2	174°02.2	05.6
20	202°08.7	79°01.6	02.5	155°15.7	02.8	83°27.3	15.1	189°04.6	05.6
21	217°11.1	94°01.0	·· 01.9	170°16.3	·· 03.3	98°29.2	·· 15.0	204°06.9	·· 05.7
22	232°13.6	109°00.4	01.3	185°16.9	03.9	113°31.1	15.0	219°09.2	05.7
23	247°16.1	123°59.8	00.6	200°17.6	04.4	128°33.1	14.9	234°11.5	05.8
Mer.pass. 06:34		ν -0.6′	d 0.6′	m -3.98	ν 0.6′	d 0.5′	m 1.28	ν 1.9′	d 0.1′ m -1.85	ν 2.3′	d 0.1′ m 0.84

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	262°18.5	138°59.2	N22°00.0	215°18.2	N17°04.9	143°35.0	N21°14.8	249°13.8	N03°05.8
1	277°21.0	153°58.6	21°59.3	230°18.9	05.4	158°36.9	14.7	264°16.1	05.9
2	292°23.5	168°58.0	58.7	245°19.5	05.9	173°38.9	14.6	279°18.4	06.0
3	307°25.9	183°57.4	·· 58.1	260°20.1	·· 06.5	188°40.8	·· 14.5	294°20.7	·· 06.0
4	322°28.4	198°56.8	57.4	275°20.8	07.0	203°42.7	14.4	309°23.0	06.1
5	337°30.8	213°56.2	56.8	290°21.4	07.5	218°44.7	14.3	324°25.3	06.1
6	352°33.3	228°55.6	N21°56.1	305°22.0	N17°08.0	233°46.6	N21°14.2	339°27.6	N03°06.2
7	7°35.8	243°55.0	55.5	320°22.7	08.5	248°48.5	14.1	354°29.9	06.2
8	22°38.2	258°54.5	54.8	335°23.3	09.0	263°50.4	14.0	9°32.2	06.3
9	37°40.7	273°53.9	·· 54.2	350°23.9	·· 09.6	278°52.4	·· 13.9	24°34.5	·· 06.3
10	52°43.2	288°53.3	53.5	5°24.6	10.1	293°54.3	13.8	39°36.8	06.4
11	67°45.6	303°52.7	52.9	20°25.2	10.6	308°56.2	13.7	54°39.1	06.5
12	82°48.1	318°52.1	N21°52.2	35°25.9	N17°11.1	323°58.2	N21°13.6	69°41.4	N03°06.5
13	97°50.6	333°51.5	51.6	50°26.5	11.6	339°00.1	13.5	84°43.7	06.6
14	112°53.0	348°50.9	50.9	65°27.1	12.2	354°02.0	13.4	99°46.0	06.6
15	127°55.5	3°50.3	·· 50.3	80°27.8	·· 12.7	9°04.0	·· 13.3	114°48.3	·· 06.7
16	142°58.0	18°49.7	49.6	95°28.4	13.2	24°05.9	13.2	129°50.6	06.7
17	158°00.4	33°49.2	49.0	110°29.0	13.7	39°07.8	13.2	144°52.9	06.8
18	173°02.9	48°48.6	N21°48.3	125°29.7	N17°14.2	54°09.7	N21°13.1	159°55.2	N03°06.9
19	188°05.3	63°48.0	47.7	140°30.3	14.7	69°11.7	13.0	174°57.6	06.9
20	203°07.8	78°47.4	47.0	155°30.9	15.2	84°13.6	12.9	189°59.9	07.0
21	218°10.3	93°46.8	·· 46.4	170°31.6	·· 15.8	99°15.5	·· 12.8	205°02.2	·· 07.0
22	233°12.7	108°46.2	45.7	185°32.2	16.3	114°17.5	12.7	220°04.5	07.1
23	248°15.2	123°45.7	45.0	200°32.8	16.8	129°19.4	12.6	235°06.8	07.1
Mer.pass. 06:30		ν -0.6′	d 0.6′	m -3.98	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.84	ν 2.3′	d 0.1′ m 0.84

Stars

	SHA	Dec
Alpheratz	357°33.6	29°14.1
Ankaa	353°06.1	-42°09.5
Schedar	349°29.9	56°40.7
Diphda	348°46.2	-17°50.4
Achernar	335°19.7	-57°05.9
Hamal	327°50.1	23°35.2
Polaris	313°50.1	89°22.3
Acamar	315°11.2	-40°11.8
Menkar	314°05.2	4°11.6
Mirfak	308°27.0	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.6	46°01.4
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.7
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.6	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.7	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.6	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.7	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°18.9	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.0
Kaus Aust.	83°30.6	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.5	-56°38.8
Deneb	49°24.7	45°22.3
Enif	33°37.5	9°59.7
Al Na'ir	27°31.3	-46°49.7
Fomalhaut	15°13.2	-29°28.7
Scheat	13°44.0	28°13.4
Markab	13°28.7	15°20.8

Jun 12 Fri	SHA	Mer.pass
Venus	239°08.3	14:43
Mars	314°27.3	09:40
Jupiter	241°42.0	14:30
Saturn	347°03.1	07:29

Jun 13 Sat	SHA	Mer.pass
Venus	237°54.3	14:44
Mars	313°43.5	09:39
Jupiter	241°29.2	14:27
Saturn	346°59.1	07:26

Jun 14 Sun	SHA	Mer.pass
Venus	236°40.7	14:45
Mars	312°59.7	09:38
Jupiter	241°16.5	14:24
Saturn	346°55.2	07:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°03.6	N23°08.2	227°16.5	7.8′	N18°07.3	13.5′	60.0′
1	195°03.4	08.4	241°43.3	7.7′	18°20.8	13.3′	60.0′
2	210°03.3	08.5	256°09.9	7.5′	18°34.1	13.3′	60.1′
3	225°03.2	·· 08.7	270°36.4	7.4′	18°47.4	13.1′	60.1′
4	240°03.1	08.9	285°02.8	7.3′	19°00.5	13.0′	60.1′
5	255°02.9	09.0	299°29.1	7.1′	19°13.5	13.0′	60.1′
6	270°02.8	N23°09.2	313°55.2	7.0′	N19°26.5	12.8′	60.2′
7	285°02.7	09.3	328°21.2	6.8′	19°39.3	12.7′	60.2′
8	300°02.5	09.5	342°47.0	6.7′	19°52.0	12.6′	60.2′
9	315°02.4	·· 09.6	357°12.7	6.6′	20°04.6	12.5′	60.3′
10	330°02.3	09.8	11°38.3	6.4′	20°17.1	12.4′	60.3′
11	345°02.1	10.0	26°03.7	6.3′	20°29.5	12.3′	60.3′
12	0°02.0	N23°10.1	40°29.0	6.2′	N20°41.8	12.1′	60.4′
13	15°01.9	10.3	54°54.2	6.0′	20°53.9	12.0′	60.4′
14	30°01.7	10.4	69°19.2	5.9′	21°05.9	11.9′	60.4′
15	45°01.6	·· 10.6	83°44.1	5.7′	21°17.8	11.8′	60.4′
16	60°01.5	10.7	98°08.8	5.6′	21°29.6	11.6′	60.5′
17	75°01.4	10.9	112°33.4	5.5′	21°41.2	11.5′	60.5′
18	90°01.2	N23°11.0	126°57.9	5.3′	N21°52.7	11.3′	60.5′
19	105°01.1	11.2	141°22.2	5.2′	22°04.0	11.3′	60.6′
20	120°01.0	11.3	155°46.3	5.0′	22°15.3	11.0′	60.6′
21	135°00.8	·· 11.4	170°10.4	4.9′	22°26.3	11.0′	60.6′
22	150°00.7	11.6	184°34.3	4.8′	22°37.3	10.8′	60.6′
23	165°00.6	11.7	198°58.1	4.6′	22°48.1	10.6′	60.7′
	SD = 15.7′	d = 0.2′	SD = 16.4′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°00.4	N23°11.9	213°21.7	4.5′	N22°58.7	10.5′	60.7′
1	195°00.3	12.0	227°45.2	4.4′	23°09.2	10.4′	60.7′
2	210°00.2	12.2	242°08.5	4.2′	23°19.6	10.2′	60.7′
3	225°00.0	·· 12.3	256°31.8	4.1′	23°29.8	10.0′	60.8′
4	239°59.9	12.4	270°54.9	4.0′	23°39.8	9.9′	60.8′
5	254°59.8	12.6	285°17.8	3.8′	23°49.7	9.7′	60.8′
6	269°59.6	N23°12.7	299°40.6	3.7′	N23°59.4	9.6′	60.8′
7	284°59.5	12.9	314°03.3	3.6′	24°09.0	9.4′	60.9′
8	299°59.4	13.0	328°25.9	3.4′	24°18.4	9.2′	60.9′
9	314°59.3	·· 13.1	342°48.3	3.3′	24°27.6	9.1′	60.9′
10	329°59.1	13.3	357°10.7	3.2′	24°36.7	8.8′	60.9′
11	344°59.0	13.4	11°32.8	3.1′	24°45.5	8.7′	60.9′
12	359°58.9	N23°13.5	25°54.9	2.9′	N24°54.2	8.6′	61.0′
13	14°58.7	13.7	40°16.8	2.8′	25°02.8	8.3′	61.0′
14	29°58.6	13.8	54°38.7	2.7′	25°11.1	8.2′	61.0′
15	44°58.5	·· 13.9	69°00.4	2.6′	25°19.3	8.0′	61.0′
16	59°58.3	14.1	83°22.0	2.5′	25°27.3	7.8′	61.0′
17	74°58.2	14.2	97°43.4	2.4′	25°35.1	7.6′	61.0′
18	89°58.1	N23°14.3	112°04.8	2.2′	N25°42.7	7.4′	61.1′
19	104°57.9	14.5	126°26.0	2.1′	25°50.1	7.3′	61.1′
20	119°57.8	14.6	140°47.2	2.0′	25°57.4	7.0′	61.1′
21	134°57.7	·· 14.7	155°08.2	1.9′	26°04.4	6.9′	61.1′
22	149°57.5	14.9	169°29.1	1.8′	26°11.3	6.6′	61.1′
23	164°57.4	15.0	183°50.0	1.7′	26°17.9	6.5′	61.1′
	SD = 15.7′	d = 0.1′	SD = 16.6′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°57.3	N23°15.1	198°10.7	1.6′	N26°24.4	6.3′	61.2′
1	194°57.1	15.2	212°31.3	1.5′	26°30.7	6.0′	61.2′
2	209°57.0	15.4	226°51.8	1.4′	26°36.7	5.9′	61.2′
3	224°56.9	·· 15.5	241°12.3	1.4′	26°42.6	5.6′	61.2′
4	239°56.7	15.6	255°32.7	1.3′	26°48.2	5.5′	61.2′
5	254°56.6	15.7	269°52.9	1.2′	26°53.7	5.2′	61.2′
6	269°56.5	N23°15.9	284°13.1	1.1′	N26°58.9	5.0′	61.2′
7	284°56.3	16.0	298°33.2	1.0′	27°03.9	4.8′	61.2′
8	299°56.2	16.1	312°53.3	1.0′	27°08.7	4.7′	61.2′
9	314°56.1	·· 16.2	327°13.2	0.9′	27°13.4	4.3′	61.3′
10	329°55.9	16.3	341°33.1	0.8′	27°17.7	4.2′	61.3′
11	344°55.8	16.5	355°52.9	0.8′	27°21.9	4.0′	61.3′
12	359°55.7	N23°16.6	10°12.7	0.7′	N27°25.9	3.7′	61.3′
13	14°55.5	16.7	24°32.4	0.6′	27°29.6	3.6′	61.3′
14	29°55.4	16.8	38°52.0	0.6′	27°33.2	3.3′	61.3′
15	44°55.3	·· 16.9	53°11.6	0.5′	27°36.5	3.0′	61.3′
16	59°55.1	17.0	67°31.2	0.5′	27°39.5	2.9′	61.3′
17	74°55.0	17.2	81°50.7	0.5′	27°42.4	2.7′	61.3′
18	89°54.8	N23°17.3	96°10.1	0.4′	N27°45.1	2.4′	61.3′
19	104°54.7	17.4	110°29.5	0.4′	27°47.5	2.2′	61.3′
20	119°54.6	17.5	124°48.9	0.4′	27°49.7	2.0′	61.3′
21	134°54.4	·· 17.6	139°08.3	0.3′	27°51.7	1.7′	61.3′
22	149°54.3	17.7	153°27.6	0.3′	27°53.4	1.6′	61.3′
23	164°54.2	17.8	167°46.9	0.3′	27°55.0	1.3′	61.3′
	SD = 15.7′	d = 0.1′	SD = 16.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:35	22:26	////	////
62°	////	////	02:12	21:49	////	////
60°	////	00:57	02:37	21:24	23:05	////
N 58°	////	01:43	02:57	21:03	22:18	////
56°	////	02:12	03:14	20:47	21:49	////
54°	00:52	02:34	03:28	20:33	21:27	23:10
52°	01:35	02:51	03:40	20:21	21:09	22:26
50°	02:02	03:06	03:50	20:10	20:54	21:59
45°	02:46	03:36	04:13	19:48	20:25	21:14
N 40°	03:16	03:58	04:31	19:30	20:02	20:44
35°	03:39	04:16	04:45	19:15	19:44	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:03
20°	04:27	04:56	05:20	18:40	19:05	19:34
N 10°	04:49	05:16	05:39	18:21	18:44	19:11
0°	05:08	05:34	05:56	18:04	18:26	18:52
S 10°	05:25	05:51	06:14	17:46	18:09	18:36
20°	05:41	06:08	06:32	17:28	17:52	18:20
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:06	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°	06:25	07:02	07:36	16:24	16:58	17:35
S 50°	06:37	07:18	07:57	16:04	16:42	17:23
52°	06:42	07:25	08:06	15:54	16:35	17:18
54°	06:47	07:34	08:17	15:43	16:26	17:13
56°	06:54	07:43	08:30	15:30	16:17	17:06
58°	07:00	07:53	08:44	15:16	16:07	17:00
S 60°	07:08	08:04	09:01	14:59	15:56	16:52

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°						
N 70°						
68°						
66°	23:06			20:00		
64°	00:04 23:49			19:18		
62°	00:21	00:17	00:16	18:50	21:04	23:16
60°	00:34	00:40	00:54	18:29	20:26	22:09
N 58°	00:46	00:58	01:21	18:11	19:59	21:34
56°	00:57	01:13	01:42	17:56	19:38	21:08
54°	01:06	01:27	02:00	17:44	19:21	20:48
52°	01:14	01:38	02:15	17:33	19:06	20:31
50°	01:21	01:49	02:28	17:23	18:53	20:16
45°	01:37	02:11	02:55	17:03	18:27	19:46
N 40°	01:51	02:28	03:17	16:46	18:06	19:23
35°	02:02	02:43	03:35	16:32	17:49	19:04
30°	02:12	02:57	03:51	16:20	17:34	18:47
20°	02:29	03:19	04:17	16:00	17:09	18:20
N 10°	02:44	03:39	04:40	15:42	16:47	17:56
0°	02:58	03:57	05:01	15:25	16:27	17:33
S 10°	03:13	04:16	05:23	15:09	16:07	17:11
20°	03:28	04:35	05:46	14:51	15:45	16:47
30°	03:46	04:59	06:13	14:31	15:20	16:19
35°	03:56	05:12	06:29	14:20	15:06	16:03
40°	04:08	05:28	06:48	14:06	14:49	15:44
45°	04:23	05:47	07:11	13:51	14:29	15:21
S 50°	04:40	06:11	07:40	13:31	14:04	14:51
52°	04:49	06:23	07:54	13:22	13:52	14:37
54°	04:58	06:36	08:10	13:12	13:38	14:20
56°	05:09	06:52	08:30	13:01	13:22	14:00
58°	05:21	07:10	08:55	12:48	13:03	13:35
S 60°	05:35	07:32	09:29	12:33	12:40	13:01

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 27-29 14-2%
12	00:14	00:08	12:00	09:12	21:41	
13	00:02	00:05	12:00	10:12	22:44	
14	00:11	00:17	12:00	11:17	23:51	

June 15, 16, 17 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	263°17.7	138°45.1	N21°44.4	215°33.5	N17°17.3	144°21.3	N21°12.5	250°09.1	N03°07.2
1	278°20.1	153°44.5	43.7	230°34.1	17.8	159°23.3	12.4	265°11.4	07.2
2	293°22.6	168°43.9	43.0	245°34.8	18.3	174°25.2	12.3	280°13.7	07.3
3	308°25.1	183°43.3	·· 42.4	260°35.4	·· 18.8	189°27.1	·· 12.2	295°16.0	·· 07.3
4	323°27.5	198°42.8	41.7	275°36.0	19.3	204°29.0	12.1	310°18.3	07.4
5	338°30.0	213°42.2	41.0	290°36.7	19.9	219°31.0	12.0	325°20.6	07.5
6	353°32.5	228°41.6	N21°40.4	305°37.3	N17°20.4	234°32.9	N21°11.9	340°22.9	N03°07.5
7	8°34.9	243°41.0	39.7	320°37.9	20.9	249°34.8	11.8	355°25.2	07.6
8	23°37.4	258°40.4	39.0	335°38.6	21.4	264°36.8	11.7	10°27.5	07.6
9	38°39.8	273°39.9	·· 38.4	350°39.2	·· 21.9	279°38.7	·· 11.6	25°29.8	·· 07.7
10	53°42.3	288°39.3	37.7	5°39.8	22.4	294°40.6	11.5	40°32.2	07.7
11	68°44.8	303°38.7	37.0	20°40.5	22.9	309°42.5	11.4	55°34.5	07.8
12	83°47.2	318°38.1	N21°36.4	35°41.1	N17°23.4	324°44.5	N21°11.3	70°36.8	N03°07.8
13	98°49.7	333°37.6	35.7	50°41.7	23.9	339°46.4	11.2	85°39.1	07.9
14	113°52.2	348°37.0	35.0	65°42.4	24.4	354°48.3	11.1	100°41.4	08.0
15	128°54.6	3°36.4	·· 34.3	80°43.0	·· 25.0	9°50.3	·· 11.0	115°43.7	·· 08.0
16	143°57.1	18°35.9	33.6	95°43.6	25.5	24°52.2	10.9	130°46.0	08.1
17	158°59.6	33°35.3	33.0	110°44.3	26.0	39°54.1	10.9	145°48.3	08.1
18	174°02.0	48°34.7	N21°32.3	125°44.9	N17°26.5	54°56.0	N21°10.8	160°50.6	N03°08.2
19	189°04.5	63°34.2	31.6	140°45.5	27.0	69°58.0	10.7	175°52.9	08.2
20	204°07.0	78°33.6	30.9	155°46.2	27.5	84°59.9	10.6	190°55.2	08.3
21	219°09.4	93°33.0	·· 30.2	170°46.8	·· 28.0	100°01.8	·· 10.5	205°57.5	·· 08.3
22	234°11.9	108°32.4	29.6	185°47.4	28.5	115°03.7	10.4	220°59.9	08.4
23	249°14.3	123°31.9	28.9	200°48.1	29.0	130°05.7	10.3	236°02.2	08.4
Mer.pass. 06:26		ν -0.6′	d 0.7′	m -3.98	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.84	ν 2.3′	d 0.1′ m 0.83

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	264°16.8	138°31.3	N21°28.2	215°48.7	N17°29.5	145°07.6	N21°10.2	251°04.5	N03°08.5
1	279°19.3	153°30.7	27.5	230°49.3	30.0	160°09.5	10.1	266°06.8	08.5
2	294°21.7	168°30.2	26.8	245°50.0	30.5	175°11.5	10.0	281°09.1	08.6
3	309°24.2	183°29.6	·· 26.1	260°50.6	·· 31.0	190°13.4	·· 09.9	296°11.4	·· 08.7
4	324°26.7	198°29.1	25.4	275°51.2	31.5	205°15.3	09.8	311°13.7	08.7
5	339°29.1	213°28.5	24.8	290°51.9	32.0	220°17.2	09.7	326°16.0	08.8
6	354°31.6	228°27.9	N21°24.1	305°52.5	N17°32.5	235°19.2	N21°09.6	341°18.3	N03°08.8
7	9°34.1	243°27.4	23.4	320°53.1	33.0	250°21.1	09.5	356°20.6	08.9
8	24°36.5	258°26.8	22.7	335°53.8	33.6	265°23.0	09.4	11°23.0	08.9
9	39°39.0	273°26.3	·· 22.0	350°54.4	·· 34.1	280°24.9	·· 09.3	26°25.3	·· 09.0
10	54°41.5	288°25.7	21.3	5°55.0	34.6	295°26.9	09.2	41°27.6	09.0
11	69°43.9	303°25.1	20.6	20°55.7	35.1	310°28.8	09.1	56°29.9	09.1
12	84°46.4	318°24.6	N21°19.9	35°56.3	N17°35.6	325°30.7	N21°09.0	71°32.2	N03°09.1
13	99°48.8	333°24.0	19.2	50°56.9	36.1	340°32.6	08.9	86°34.5	09.2
14	114°51.3	348°23.5	18.5	65°57.6	36.6	355°34.6	08.8	101°36.8	09.2
15	129°53.8	3°22.9	·· 17.8	80°58.2	·· 37.1	10°36.5	·· 08.7	116°39.1	·· 09.3
16	144°56.2	18°22.4	17.1	95°58.8	37.6	25°38.4	08.6	131°41.5	09.3
17	159°58.7	33°21.8	16.4	110°59.5	38.1	40°40.3	08.5	146°43.8	09.4
18	175°01.2	48°21.2	N21°15.7	126°00.1	N17°38.6	55°42.3	N21°08.4	161°46.1	N03°09.5
19	190°03.6	63°20.7	15.0	141°00.7	39.1	70°44.2	08.3	176°48.4	09.5
20	205°06.1	78°20.1	14.3	156°01.4	39.6	85°46.1	08.2	191°50.7	09.6
21	220°08.6	93°19.6	·· 13.6	171°02.0	·· 40.1	100°48.1	·· 08.1	206°53.0	·· 09.6
22	235°11.0	108°19.0	12.9	186°02.6	40.6	115°50.0	08.0	221°55.3	09.7
23	250°13.5	123°18.5	12.2	201°03.3	41.1	130°51.9	07.9	236°57.6	09.7
Mer.pass. 06:22		ν -0.6′	d 0.7′	m -3.99	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.84	ν 2.3′	d 0.1′ m 0.83

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	265°16.0	138°17.9	N21°11.5	216°03.9	N17°41.6	145°53.8	N21°07.8	251°59.9	N03°09.8
1	280°18.4	153°17.4	10.8	231°04.5	42.1	160°55.8	07.7	267°02.3	09.8
2	295°20.9	168°16.8	10.1	246°05.2	42.6	175°57.7	07.6	282°04.6	09.9
3	310°23.3	183°16.3	·· 09.4	261°05.8	·· 43.1	190°59.6	·· 07.6	297°06.9	·· 09.9
4	325°25.8	198°15.7	08.6	276°06.4	43.6	206°01.5	07.5	312°09.2	10.0
5	340°28.3	213°15.2	07.9	291°07.1	44.0	221°03.5	07.4	327°11.5	10.0
6	355°30.7	228°14.6	N21°07.2	306°07.7	N17°44.5	236°05.4	N21°07.3	342°13.8	N03°10.1
7	10°33.2	243°14.1	06.5	321°08.3	45.0	251°07.3	07.2	357°16.1	10.1
8	25°35.7	258°13.6	05.8	336°09.0	45.5	266°09.2	07.1	12°18.5	10.2
9	40°38.1	273°13.0	·· 05.1	351°09.6	·· 46.0	281°11.2	·· 07.0	27°20.8	·· 10.2
10	55°40.6	288°12.5	04.4	6°10.2	46.5	296°13.1	06.9	42°23.1	10.3
11	70°43.1	303°11.9	03.6	21°10.9	47.0	311°15.0	06.8	57°25.4	10.3
12	85°45.5	318°11.4	N21°02.9	36°11.5	N17°47.5	326°16.9	N21°06.7	72°27.7	N03°10.4
13	100°48.0	333°10.8	02.2	51°12.1	48.0	341°18.8	06.6	87°30.0	10.4
14	115°50.5	348°10.3	01.5	66°12.7	48.5	356°20.8	06.5	102°32.3	10.5
15	130°52.9	3°09.8	·· 00.8	81°13.4	·· 49.0	11°22.7	·· 06.4	117°34.7	·· 10.5
16	145°55.4	18°09.2	21°00.0	96°14.0	49.5	26°24.6	06.3	132°37.0	10.6
17	160°57.8	33°08.7	20°59.3	111°14.6	50.0	41°26.5	06.2	147°39.3	10.6
18	176°00.3	48°08.1	N20°58.6	126°15.3	N17°50.5	56°28.5	N21°06.1	162°41.6	N03°10.7
19	191°02.8	63°07.6	57.9	141°15.9	51.0	71°30.4	06.0	177°43.9	10.7
20	206°05.2	78°07.1	57.1	156°16.5	51.5	86°32.3	05.9	192°46.2	10.8
21	221°07.7	93°06.5	·· 56.4	171°17.2	·· 52.0	101°34.2	·· 05.8	207°48.5	·· 10.9
22	236°10.2	108°06.0	55.7	186°17.8	52.4	116°36.2	05.7	222°50.9	10.9
23	251°12.6	123°05.5	55.0	201°18.4	52.9	131°38.1	05.6	237°53.2	11.0
Mer.pass. 06:18		ν -0.5′	d 0.7′	m -3.99	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.84	ν 2.3′	d 0.1′ m 0.83

Stars

	SHA	Dec
Alpheratz	357°33.6	29°14.1
Ankaa	353°06.1	-42°09.5
Schedar	349°29.8	56°40.7
Diphda	348°46.2	-17°50.4
Achernar	335°19.6	-57°05.9
Hamal	327°50.1	23°35.2
Polaris	313°48.7	89°22.3
Acamar	315°11.2	-40°11.7
Menkar	314°05.2	4°11.6
Mirfak	308°27.0	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.8	28°37.7
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.6	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.7	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.6	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.7	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°18.9	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.4	-56°38.8
Deneb	49°24.7	45°22.3
Enif	33°37.5	9°59.8
Al Na'ir	27°31.2	-46°49.7
Fomalhaut	15°13.1	-29°28.7
Scheat	13°44.0	28°13.5
Markab	13°28.7	15°20.8

Jun 15 Mon	SHA	Mer.pass
Venus	235°27.4	14:46
Mars	312°15.8	09:37
Jupiter	241°03.7	14:21
Saturn	346°51.4	07:18

Jun 16 Tue	SHA	Mer.pass
Venus	234°14.5	14:46
Mars	311°31.9	09:36
Jupiter	240°50.8	14:18
Saturn	346°47.7	07:15

Jun 17 Wed	SHA	Mer.pass
Venus	233°02.0	14:47
Mars	310°47.9	09:35
Jupiter	240°37.9	14:15
Saturn	346°44.0	07:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°54.0	N23°17.9	182°06.2	0.3′	N27°56.3	1.0′	61.3′
1	194°53.9	18.1	196°25.4	0.3′	27°57.3	0.9′	61.3′
2	209°53.8	18.2	210°44.7	0.2′	27°58.2	0.6′	61.3′
3	224°53.6	·· 18.3	225°04.0	0.2′	27°58.8	0.4′	61.3′
4	239°53.5	18.4	239°23.2	0.2′	27°59.2	0.2′	61.3′
5	254°53.4	18.5	253°42.4	0.2′	27°59.4	0.0′	61.3′
6	269°53.2	N23°18.6	268°01.7	0.3′	N27°59.4	0.3′	61.3′
7	284°53.1	18.7	282°20.9	0.3′	27°59.1	0.5′	61.3′
8	299°53.0	18.8	296°40.2	0.3′	27°58.6	0.7′	61.3′
9	314°52.8	·· 18.9	310°59.5	0.3′	27°57.9	1.0′	61.3′
10	329°52.7	19.0	325°18.8	0.3′	27°56.9	1.2′	61.3′
11	344°52.6	19.1	339°38.1	0.4′	27°55.7	1.4′	61.3′
12	359°52.4	N23°19.2	353°57.5	0.4′	N27°54.3	1.6′	61.3′
13	14°52.3	19.3	8°16.8	0.4′	27°52.7	1.8′	61.3′
14	29°52.2	19.4	22°36.3	0.5′	27°50.9	2.1′	61.2′
15	44°52.0	·· 19.5	36°55.7	0.5′	27°48.8	2.3′	61.2′
16	59°51.9	19.6	51°15.2	0.5′	27°46.5	2.5′	61.2′
17	74°51.7	19.7	65°34.8	0.6′	27°44.0	2.7′	61.2′
18	89°51.6	N23°19.8	79°54.4	0.6′	N27°41.3	2.9′	61.2′
19	104°51.5	19.9	94°14.0	0.7′	27°38.4	3.2′	61.2′
20	119°51.3	20.0	108°33.7	0.8′	27°35.2	3.4′	61.2′
21	134°51.2	·· 20.1	122°53.5	0.8′	27°31.8	3.6′	61.2′
22	149°51.1	20.2	137°13.3	0.9′	27°28.2	3.8′	61.2′
23	164°50.9	20.3	151°33.2	1.0′	27°24.4	4.0′	61.1′
	SD = 15.7′	d = 0.1′		SD = 16.7′			

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°50.8	N23°20.4	165°53.1	1.0′	N27°20.4	4.3′	61.1′
1	194°50.7	20.5	180°13.2	1.1′	27°16.1	4.4′	61.1′
2	209°50.5	20.5	194°33.3	1.2′	27°11.7	4.7′	61.1′
3	224°50.4	·· 20.6	208°53.5	1.3′	27°07.0	4.8′	61.1′
4	239°50.3	20.7	223°13.8	1.4′	27°02.2	5.1′	61.1′
5	254°50.1	20.8	237°34.1	1.5′	26°57.1	5.3′	61.1′
6	269°50.0	N23°20.9	251°54.6	1.5′	N26°51.8	5.5′	61.0′
7	284°49.8	21.0	266°15.1	1.6′	26°46.3	5.7′	61.0′
8	299°49.7	21.1	280°35.8	1.7′	26°40.6	5.9′	61.0′
9	314°49.6	·· 21.2	294°56.5	1.8′	26°34.7	6.0′	61.0′
10	329°49.4	21.2	309°17.3	1.9′	26°28.7	6.3′	61.0′
11	344°49.3	21.3	323°38.3	2.0′	26°22.4	6.5′	60.9′
12	359°49.2	N23°21.4	337°59.3	2.2′	N26°15.9	6.7′	60.9′
13	14°49.0	21.5	352°20.5	2.3′	26°09.2	6.8′	60.9′
14	29°48.9	21.6	6°41.7	2.4′	26°02.4	7.1′	60.9′
15	44°48.8	·· 21.7	21°03.1	2.5′	25°55.3	7.2′	60.9′
16	59°48.6	21.7	35°24.6	2.6′	25°48.1	7.4′	60.8′
17	74°48.5	21.8	49°46.2	2.7′	25°40.7	7.6′	60.8′
18	89°48.3	N23°21.9	64°07.9	2.8′	N25°33.1	7.8′	60.8′
19	104°48.2	22.0	78°29.8	3.0′	25°25.3	8.0′	60.8′
20	119°48.1	22.1	92°51.7	3.1′	25°17.3	8.1′	60.7′
21	134°47.9	·· 22.1	107°13.8	3.2′	25°09.2	8.4′	60.7′
22	149°47.8	22.2	121°36.0	3.3′	25°00.8	8.4′	60.7′
23	164°47.7	22.3	135°58.4	3.5′	24°52.4	8.7′	60.7′
	SD = 15.7′	d = 0.1′		SD = 16.7′			

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°47.5	N23°22.4	150°20.8	3.6′	N24°43.7	8.8′	60.6′
1	194°47.4	22.4	164°43.4	3.7′	24°34.9	9.0′	60.6′
2	209°47.3	22.5	179°06.2	3.9′	24°25.9	9.2′	60.6′
3	224°47.1	·· 22.6	193°29.0	4.0′	24°16.7	9.3′	60.6′
4	239°47.0	22.7	207°52.0	4.1′	24°07.4	9.5′	60.5′
5	254°46.8	22.7	222°15.2	4.3′	23°57.9	9.7′	60.5′
6	269°46.7	N23°22.8	236°38.4	4.4′	N23°48.2	9.8′	60.5′
7	284°46.6	22.9	251°01.8	4.5′	23°38.4	9.9′	60.5′
8	299°46.4	22.9	265°25.4	4.7′	23°28.5	10.1′	60.4′
9	314°46.3	·· 23.0	279°49.1	4.8′	23°18.4	10.3′	60.4′
10	329°46.2	23.1	294°12.9	5.0′	23°08.1	10.3′	60.4′
11	344°46.0	23.1	308°36.8	5.1′	22°57.8	10.6′	60.3′
12	359°45.9	N23°23.2	323°00.9	5.2′	N22°47.2	10.7′	60.3′
13	14°45.8	23.3	337°25.2	5.4′	22°36.5	10.8′	60.3′
14	29°45.6	23.3	351°49.5	5.5′	22°25.7	10.9′	60.2′
15	44°45.5	·· 23.4	6°14.1	5.7′	22°14.8	11.1′	60.2′
16	59°45.3	23.5	20°38.7	5.8′	22°03.7	11.3′	60.2′
17	74°45.2	23.5	35°03.5	5.9′	21°52.4	11.3′	60.1′
18	89°45.1	N23°23.6	49°28.5	6.1′	N21°41.1	11.5′	60.1′
19	104°44.9	23.7	63°53.6	6.2′	21°29.6	11.6′	60.1′
20	119°44.8	23.7	78°18.8	6.4′	21°18.0	11.7′	60.1′
21	134°44.7	·· 23.8	92°44.2	6.5′	21°06.3	11.9′	60.0′
22	149°44.5	23.8	107°09.7	6.7′	20°54.4	11.9′	60.0′
23	164°44.4	23.9	121°35.3	6.8′	20°42.5	12.1′	60.0′
	SD = 15.7′	d = 0.1′		SD = 16.5′			

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°	////	////	01:32	22:30	////	////
62°	////	////	02:10	21:52	////	////
60°	////	00:52	02:36	21:26	23:11	////
N 58°	////	01:41	02:56	21:05	22:21	////
56°	////	02:11	03:13	20:49	21:51	////
54°	00:48	02:33	03:27	20:35	21:29	23:15
52°	01:33	02:51	03:39	20:22	21:11	22:29
50°	02:00	03:06	03:50	20:11	20:56	22:01
45°	02:46	03:35	04:13	19:49	20:26	21:16
N 40°	03:16	03:58	04:31	19:31	20:04	20:45
35°	03:39	04:16	04:46	19:16	19:46	20:22
30°	03:58	04:31	04:59	19:03	19:30	20:04
20°	04:27	04:56	05:21	18:41	19:05	19:35
N 10°	04:49	05:16	05:40	18:22	18:45	19:12
0°	05:08	05:35	05:57	18:04	18:27	18:53
S 10°	05:25	05:52	06:14	17:47	18:10	18:36
20°	05:41	06:09	06:33	17:28	17:52	18:20
30°	05:58	06:28	06:54	17:07	17:34	18:04
35°	06:07	06:38	07:06	16:55	17:23	17:55
40°	06:16	06:50	07:21	16:41	17:11	17:45
45°	06:26	07:04	07:37	16:24	16:58	17:35
S 50°	06:38	07:20	07:58	16:03	16:42	17:23
52°	06:43	07:27	08:08	15:53	16:34	17:18
54°	06:49	07:35	08:19	15:42	16:26	17:12
56°	06:55	07:44	08:32	15:30	16:17	17:06
58°	07:02	07:54	08:46	15:15	16:07	17:00
S 60°	07:09	08:06	09:04	14:58	15:55	16:52

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°						
N 70°						
68°						
66°						
64°			03:44			00:36
62°	00:25	02:08	04:24	23:56	23:56	23:53
60°	01:32	02:58	04:51	23:06	23:28	23:36
N 58°	02:07	03:29	05:12	22:35	23:06	23:21
56°	02:33	03:52	05:30	22:11	22:48	23:09
54°	02:53	04:11	05:44	21:52	22:33	22:58
52°	03:11	04:27	05:57	21:35	22:19	22:48
50°	03:25	04:41	06:08	21:21	22:08	22:39
45°	03:55	05:09	06:32	20:53	21:43	22:21
N 40°	04:19	05:31	06:50	20:30	21:24	22:05
35°	04:38	05:50	07:06	20:11	21:07	21:52
30°	04:54	06:06	07:19	19:55	20:53	21:41
20°	05:22	06:32	07:42	19:27	20:28	21:21
N 10°	05:47	06:55	08:02	19:04	20:07	21:04
0°	06:09	07:16	08:20	18:41	19:47	20:48
S 10°	06:32	07:38	08:38	18:19	19:27	20:32
20°	06:56	08:01	08:58	17:55	19:06	20:14
30°	07:24	08:27	09:20	17:27	18:40	19:54
35°	07:41	08:43	09:33	17:11	18:26	19:42
40°	08:00	09:01	09:48	16:51	18:08	19:28
45°	08:24	09:22	10:06	16:28	17:47	19:11
S 50°	08:54	09:50	10:27	15:58	17:21	18:51
52°	09:09	10:03	10:38	15:43	17:08	18:41
54°	09:27	10:18	10:50	15:25	16:53	18:30
56°	09:48	10:36	11:03	15:04	16:36	18:17
58°	10:15	10:58	11:18	14:38	16:14	18:03
S 60°	10:52	11:25	11:37	14:01	15:47	17:45

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 0-5%
15	00:24	00:30	12:01	12:25	–:–	
16	00:37	00:43	12:01	13:32	00:59	
17	00:50	00:56	12:01	14:34	02:04	

June 18, 19, 20 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	266°15.1	138°04.9	N20°54.2	216°19.1	N17°53.4	146°40.0	N21°05.5	252°55.5	N03°11.0
1	281°17.6	153°04.4	53.5	231°19.7	53.9	161°41.9	05.4	267°57.8	11.1
2	296°20.0	168°03.9	52.8	246°20.3	54.4	176°43.9	05.3	283°00.1	11.1
3	311°22.5	183°03.3	·· 52.0	261°21.0	·· 54.9	191°45.8	·· 05.2	298°02.4	·· 11.2
4	326°25.0	198°02.8	51.3	276°21.6	55.4	206°47.7	05.1	313°04.8	11.2
5	341°27.4	213°02.3	50.6	291°22.2	55.9	221°49.6	05.0	328°07.1	11.3
6	356°29.9	228°01.7	N20°49.8	306°22.8	N17°56.4	236°51.5	N21°04.9	343°09.4	N03°11.3
7	11°32.3	243°01.2	49.1	321°23.5	56.9	251°53.5	04.8	358°11.7	11.4
8	26°34.8	258°00.7	48.4	336°24.1	57.3	266°55.4	04.7	13°14.0	11.4
9	41°37.3	273°00.2	·· 47.6	351°24.7	·· 57.8	281°57.3	·· 04.6	28°16.3	·· 11.5
10	56°39.7	287°59.6	46.9	6°25.4	58.3	296°59.2	04.5	43°18.7	11.5
11	71°42.2	302°59.1	46.1	21°26.0	58.8	312°01.2	04.4	58°21.0	11.6
12	86°44.7	317°58.6	N20°45.4	36°26.6	N17°59.3	327°03.1	N21°04.3	73°23.3	N03°11.6
13	101°47.1	332°58.1	44.7	51°27.3	17°59.8	342°05.0	04.2	88°25.6	11.7
14	116°49.6	347°57.5	43.9	66°27.9	18°00.3	357°06.9	04.1	103°27.9	11.7
15	131°52.1	2°57.0	·· 43.2	81°28.5	·· 00.8	12°08.9	·· 04.0	118°30.3	·· 11.8
16	146°54.5	17°56.5	42.4	96°29.1	01.2	27°10.8	03.9	133°32.6	11.8
17	161°57.0	32°56.0	41.7	111°29.8	01.7	42°12.7	03.8	148°34.9	11.9
18	176°59.5	47°55.4	N20°40.9	126°30.4	N18°02.2	57°14.6	N21°03.7	163°37.2	N03°11.9
19	192°01.9	62°54.9	40.2	141°31.0	02.7	72°16.5	03.6	178°39.5	12.0
20	207°04.4	77°54.4	39.4	156°31.7	03.2	87°18.5	03.5	193°41.8	12.0
21	222°06.8	92°53.9	·· 38.7	171°32.3	·· 03.7	102°20.4	·· 03.4	208°44.2	·· 12.1
22	237°09.3	107°53.4	37.9	186°32.9	04.1	117°22.3	03.3	223°46.5	12.1
23	252°11.8	122°52.8	37.2	201°33.6	04.6	132°24.2	03.2	238°48.8	12.2
Mer.pass. 06:14		ν -0.5′	d 0.7′	m -3.99	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.83	ν 2.3′	d 0.1′ m 0.82

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	267°14.2	137°52.3	N20°36.4	216°34.2	N18°05.1	147°26.1	N21°03.1	253°51.1	N03°12.2
1	282°16.7	152°51.8	35.7	231°34.8	05.6	162°28.1	03.0	268°53.4	12.3
2	297°19.2	167°51.3	34.9	246°35.4	06.1	177°30.0	02.9	283°55.8	12.3
3	312°21.6	182°50.8	·· 34.2	261°36.1	·· 06.6	192°31.9	·· 02.8	298°58.1	·· 12.4
4	327°24.1	197°50.3	33.4	276°36.7	07.0	207°33.8	02.7	314°00.4	12.4
5	342°26.6	212°49.8	32.7	291°37.3	07.5	222°35.8	02.6	329°02.7	12.5
6	357°29.0	227°49.2	N20°31.9	306°38.0	N18°08.0	237°37.7	N21°02.5	344°05.0	N03°12.5
7	12°31.5	242°48.7	31.2	321°38.6	08.5	252°39.6	02.4	359°07.4	12.6
8	27°33.9	257°48.2	30.4	336°39.2	09.0	267°41.5	02.3	14°09.7	12.6
9	42°36.4	272°47.7	·· 29.6	351°39.8	·· 09.4	282°43.4	·· 02.2	29°12.0	·· 12.6
10	57°38.9	287°47.2	28.9	6°40.5	09.9	297°45.4	02.1	44°14.3	12.7
11	72°41.3	302°46.7	28.1	21°41.1	10.4	312°47.3	02.0	59°16.6	12.7
12	87°43.8	317°46.2	N20°27.4	36°41.7	N18°10.9	327°49.2	N21°01.9	74°19.0	N03°12.8
13	102°46.3	332°45.7	26.6	51°42.4	11.4	342°51.1	01.8	89°21.3	12.8
14	117°48.7	347°45.2	25.8	66°43.0	11.8	357°53.0	01.7	104°23.6	12.9
15	132°51.2	2°44.7	·· 25.1	81°43.6	·· 12.3	12°55.0	·· 01.6	119°25.9	·· 12.9
16	147°53.7	17°44.1	24.3	96°44.2	12.8	27°56.9	01.5	134°28.3	13.0
17	162°56.1	32°43.6	23.5	111°44.9	13.3	42°58.8	01.4	149°30.6	13.0
18	177°58.6	47°43.1	N20°22.8	126°45.5	N18°13.8	58°00.7	N21°01.3	164°32.9	N03°13.1
19	193°01.1	62°42.6	22.0	141°46.1	14.2	73°02.6	01.2	179°35.2	13.1
20	208°03.5	77°42.1	21.2	156°46.8	14.7	88°04.6	01.1	194°37.5	13.2
21	223°06.0	92°41.6	·· 20.5	171°47.4	·· 15.2	103°06.5	·· 01.0	209°39.9	·· 13.2
22	238°08.4	107°41.1	19.7	186°48.0	15.7	118°08.4	00.9	224°42.2	13.3
23	253°10.9	122°40.6	18.9	201°48.6	16.1	133°10.3	00.8	239°44.5	13.3
Mer.pass. 06:10		ν -0.5′	d 0.8′	m -4.00	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.83	ν 2.3′	d 0.0′ m 0.82

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	268°13.4	137°40.1	N20°18.2	216°49.3	N18°16.6	148°12.2	N21°00.7	254°46.8	N03°13.4
1	283°15.8	152°39.6	17.4	231°49.9	17.1	163°14.2	00.6	269°49.2	13.4
2	298°18.3	167°39.1	16.6	246°50.5	17.6	178°16.1	00.5	284°51.5	13.5
3	313°20.8	182°38.6	·· 15.8	261°51.2	·· 18.0	193°18.0	·· 00.4	299°53.8	·· 13.5
4	328°23.2	197°38.1	15.1	276°51.8	18.5	208°19.9	00.3	314°56.1	13.6
5	343°25.7	212°37.6	14.3	291°52.4	19.0	223°21.8	00.2	329°58.4	13.6
6	358°28.2	227°37.1	N20°13.5	306°53.0	N18°19.5	238°23.8	N21°00.1	345°00.8	N03°13.7
7	13°30.6	242°36.6	12.7	321°53.7	19.9	253°25.7	21°00.0	0°03.1	13.7
8	28°33.1	257°36.1	11.9	336°54.3	20.4	268°27.6	20°59.9	15°05.4	13.8
9	43°35.6	272°35.6	·· 11.2	351°54.9	·· 20.9	283°29.5	·· 59.8	30°07.7	·· 13.8
10	58°38.0	287°35.2	10.4	6°55.6	21.3	298°31.4	59.7	45°10.1	13.9
11	73°40.5	302°34.7	09.6	21°56.2	21.8	313°33.4	59.6	60°12.4	13.9
12	88°42.9	317°34.2	N20°08.8	36°56.8	N18°22.3	328°35.3	N20°59.5	75°14.7	N03°13.9
13	103°45.4	332°33.7	08.0	51°57.4	22.8	343°37.2	59.4	90°17.0	14.0
14	118°47.9	347°33.2	07.2	66°58.1	23.2	358°39.1	59.3	105°19.4	14.0
15	133°50.3	2°32.7	·· 06.5	81°58.7	·· 23.7	13°41.0	·· 59.2	120°21.7	·· 14.1
16	148°52.8	17°32.2	05.7	96°59.3	24.2	28°43.0	59.1	135°24.0	14.1
17	163°55.3	32°31.7	04.9	111°59.9	24.6	43°44.9	59.0	150°26.3	14.2
18	178°57.7	47°31.2	N20°04.1	127°00.6	N18°25.1	58°46.8	N20°58.9	165°28.7	N03°14.2
19	194°00.2	62°30.7	03.3	142°01.2	25.6	73°48.7	58.8	180°31.0	14.3
20	209°02.7	77°30.3	02.5	157°01.8	26.1	88°50.6	58.7	195°33.3	14.3
21	224°05.1	92°29.8	·· 01.7	172°02.5	·· 26.5	103°52.5	·· 58.6	210°35.6	·· 14.4
22	239°07.6	107°29.3	00.9	187°03.1	27.0	118°54.5	58.5	225°38.0	14.4
23	254°10.0	122°28.8	00.2	202°03.7	27.5	133°56.4	58.4	240°40.3	14.5
Mer.pass. 06:06		ν -0.5′	d 0.8′	m -4.00	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.83	ν 2.3′	d 0.0′ m 0.82

Stars

	SHA	Dec
Alpheratz	357°33.6	29°14.1
Ankaa	353°06.0	-42°09.5
Schedar	349°29.8	56°40.7
Diphda	348°46.2	-17°50.3
Achernar	335°19.6	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°47.5	89°22.3
Acamar	315°11.2	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.1	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.7	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.6	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°19.0	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.4	-56°38.8
Deneb	49°24.6	45°22.3
Enif	33°37.4	9°59.8
Al Na'ir	27°31.2	-46°49.7
Fomalhaut	15°13.1	-29°28.7
Scheat	13°44.0	28°13.5
Markab	13°28.6	15°20.8

Jun 18 Thu	SHA	Mer.pass
Venus	231°49.8	14:48
Mars	310°04.0	09:34
Jupiter	240°24.9	14:12
Saturn	346°40.4	07:07

Jun 19 Fri	SHA	Mer.pass
Venus	230°38.1	14:49
Mars	309°19.9	09:33
Jupiter	240°11.9	14:08
Saturn	346°36.9	07:04

Jun 20 Sat	SHA	Mer.pass
Venus	229°26.7	14:50
Mars	308°35.9	09:32
Jupiter	239°58.9	14:05
Saturn	346°33.5	07:00

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.0670 sec ΔT = TT-UT1 = +69.1170 sec

2026 June 18 to Jun. 20 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°44.2	N23°24.0	136°01.1	6.9′	N20°30.4	12.2′	59.9′
1	194°44.1	24.0	150°27.1	7.1′	20°18.2	12.3′	59.9′
2	209°44.0	24.1	164°53.1	7.2′	20°05.9	12.4′	59.8′
3	224°43.8	·· 24.1	179°19.4	7.4′	19°53.5	12.5′	59.8′
4	239°43.7	24.2	193°45.7	7.5′	19°41.0	12.7′	59.8′
5	254°43.6	24.2	208°12.2	7.6′	19°28.3	12.7′	59.7′
6	269°43.4	N23°24.3	222°38.9	7.8′	N19°15.6	12.8′	59.7′
7	284°43.3	24.3	237°05.6	7.9′	19°02.8	12.9′	59.7′
8	299°43.2	24.4	251°32.5	8.0′	18°49.9	13.0′	59.6′
9	314°43.0	·· 24.4	265°59.6	8.2′	18°36.9	13.2′	59.6′
10	329°42.9	24.5	280°26.8	8.3′	18°23.7	13.2′	59.6′
11	344°42.7	24.6	294°54.1	8.5′	18°10.5	13.3′	59.5′
12	359°42.6	N23°24.6	309°21.6	8.6′	N17°57.2	13.3′	59.5′
13	14°42.5	24.6	323°49.1	8.7′	17°43.9	13.5′	59.5′
14	29°42.3	24.7	338°16.9	8.9′	17°30.4	13.6′	59.4′
15	44°42.2	·· 24.7	352°44.7	9.0′	17°16.8	13.6′	59.4′
16	59°42.1	24.8	7°12.7	9.1′	17°03.2	13.7′	59.3′
17	74°41.9	24.8	21°40.8	9.2′	16°49.5	13.8′	59.3′
18	89°41.8	N23°24.9	36°09.1	9.4′	N16°35.7	13.8′	59.3′
19	104°41.6	24.9	50°37.4	9.5′	16°21.9	14.0′	59.2′
20	119°41.5	25.0	65°05.9	9.6′	16°07.9	14.0′	59.2′
21	134°41.4	·· 25.0	79°34.6	9.8′	15°53.9	14.0′	59.1′
22	149°41.2	25.1	94°03.3	9.9′	15°39.9	14.2′	59.1′
23	164°41.1	25.1	108°32.2	10.0′	15°25.7	14.2′	59.1′
	SD = 15.7′	d = 0.1′	SD = 16.3′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°41.0	N23°25.1	123°01.2	10.1′	N15°11.5	14.2′	59.0′
1	194°40.8	25.2	137°30.3	10.2′	14°57.3	14.3′	59.0′
2	209°40.7	25.2	151°59.5	10.4′	14°43.0	14.4′	59.0′
3	224°40.5	·· 25.3	166°28.9	10.5′	14°28.6	14.5′	58.9′
4	239°40.4	25.3	180°58.4	10.6′	14°14.1	14.5′	58.9′
5	254°40.3	25.3	195°28.0	10.7′	13°59.6	14.5′	58.8′
6	269°40.1	N23°25.4	209°57.7	10.8′	N13°45.1	14.6′	58.8′
7	284°40.0	25.4	224°27.5	10.9′	13°30.5	14.7′	58.8′
8	299°39.9	25.4	238°57.4	11.0′	13°15.8	14.7′	58.7′
9	314°39.7	·· 25.5	253°27.5	11.2′	13°01.1	14.7′	58.7′
10	329°39.6	25.5	267°57.6	11.3′	12°46.4	14.8′	58.6′
11	344°39.4	25.5	282°27.9	11.4′	12°31.6	14.8′	58.6′
12	359°39.3	N23°25.6	296°58.2	11.5′	N12°16.8	14.9′	58.6′
13	14°39.2	25.6	311°28.7	11.6′	12°01.9	14.9′	58.5′
14	29°39.0	25.6	325°59.3	11.7′	11°47.0	15.0′	58.5′
15	44°38.9	·· 25.7	340°30.0	11.8′	11°32.0	14.9′	58.4′
16	59°38.8	25.7	355°00.8	11.9′	11°17.1	15.1′	58.4′
17	74°38.6	25.7	9°31.6	12.0′	11°02.0	15.0′	58.4′
18	89°38.5	N23°25.7	24°02.6	12.1′	N10°47.0	15.1′	58.3′
19	104°38.4	25.8	38°33.7	12.2′	10°31.9	15.1′	58.3′
20	119°38.2	25.8	53°04.9	12.3′	10°16.8	15.2′	58.2′
21	134°38.1	·· 25.8	67°36.1	12.4′	10°01.6	15.1′	58.2′
22	149°37.9	25.9	82°07.5	12.5′	09°46.5	15.2′	58.2′
23	164°37.8	25.9	96°38.9	12.5′	09°31.3	15.3′	58.1′
	SD = 15.7′	d = 0.0′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°37.7	N23°25.9	111°10.5	12.6′	N09°16.0	15.2′	58.1′
1	194°37.5	25.9	125°42.1	12.7′	09°00.8	15.3′	58.0′
2	209°37.4	25.9	140°13.8	12.8′	08°45.5	15.3′	58.0′
3	224°37.3	·· 26.0	154°45.6	12.9′	08°30.2	15.3′	58.0′
4	239°37.1	26.0	169°17.5	13.0′	08°14.9	15.3′	57.9′
5	254°37.0	26.0	183°49.5	13.0′	07°59.6	15.3′	57.9′
6	269°36.8	N23°26.0	198°21.5	13.1′	N07°44.3	15.4′	57.9′
7	284°36.7	26.0	212°53.7	13.2′	07°28.9	15.3′	57.8′
8	299°36.6	26.1	227°25.9	13.3′	07°13.6	15.4′	57.8′
9	314°36.4	·· 26.1	241°58.2	13.4′	06°58.2	15.4′	57.7′
10	329°36.3	26.1	256°30.5	13.4′	06°42.8	15.4′	57.7′
11	344°36.2	26.1	271°03.0	13.5′	06°27.4	15.4′	57.7′
12	359°36.0	N23°26.1	285°35.5	13.6′	N06°12.0	15.4′	57.6′
13	14°35.9	26.1	300°08.0	13.6′	05°56.6	15.4′	57.6′
14	29°35.7	26.2	314°40.7	13.7′	05°41.2	15.4′	57.5′
15	44°35.6	·· 26.2	329°13.4	13.8′	05°25.8	15.5′	57.5′
16	59°35.5	26.2	343°46.2	13.8′	05°10.3	15.4′	57.5′
17	74°35.3	26.2	358°19.0	13.9′	04°54.9	15.4′	57.4′
18	89°35.2	N23°26.2	12°51.9	14.0′	N04°39.5	15.4′	57.4′
19	104°35.1	26.2	27°24.9	14.0′	04°24.1	15.5′	57.3′
20	119°34.9	26.2	41°57.9	14.1′	04°08.6	15.4′	57.3′
21	134°34.8	·· 26.2	56°31.0	14.1′	03°53.2	15.4′	57.3′
22	149°34.7	26.2	71°04.2	14.2′	03°37.8	15.4′	57.2′
23	164°34.5	26.2	85°37.4	14.3′	03°22.4	15.4′	57.2′
	SD = 15.7′	d = 0.0′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	////	////	01:31	22:32	////	////
62°	////	////	02:09	21:54	////	////
60°	////	00:49	02:36	21:27	23:14	////
N 58°	////	01:40	02:56	21:07	22:23	////
56°	////	02:10	03:13	20:50	21:53	////
54°	00:45	02:33	03:27	20:36	21:30	23:18
52°	01:32	02:51	03:39	20:23	21:12	22:31
50°	02:00	03:06	03:50	20:12	20:57	22:03
45°	02:46	03:35	04:13	19:50	20:27	21:17
N 40°	03:16	03:58	04:31	19:32	20:05	20:46
35°	03:40	04:16	04:46	19:17	19:46	20:23
30°	03:58	04:32	04:59	19:04	19:31	20:05
20°	04:27	04:57	05:21	18:42	19:06	19:35
N 10°	04:50	05:17	05:40	18:23	18:46	19:13
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	05:26	05:52	06:15	17:48	18:10	18:37
20°	05:42	06:10	06:34	17:29	17:53	18:21
30°	05:59	06:29	06:55	17:08	17:34	18:04
35°	06:07	06:39	07:07	16:55	17:24	17:55
40°	06:17	06:51	07:22	16:41	17:12	17:46
45°	06:27	07:05	07:38	16:24	16:58	17:35
S 50°	06:39	07:21	07:59	16:04	16:42	17:24
52°	06:44	07:28	08:09	15:54	16:35	17:18
54°	06:50	07:36	08:20	15:43	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:07
58°	07:03	07:56	08:48	15:15	16:07	17:00
S 60°	07:11	08:07	09:05	14:58	15:55	16:52

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	06:54	09:28	▭	01:26	00:33 23:56
N 70°	03:56	07:21	09:38	02:31	00:56	00:20 23:52
68°	05:07	07:42	09:47	01:18	00:34	00:09 23:49
66°	05:44	07:58	09:54	00:40	00:16	00:00 23:46
64°	06:09	08:11	09:59	00:14	00:02 23:52	23:44
62°	06:29	08:22	10:04	23:49	23:46	23:42
60°	06:45	08:31	10:09	23:39	23:40	23:40
N 58°	06:59	08:39	10:12	23:30	23:35	23:38
56°	07:11	08:46	10:16	23:21	23:30	23:37
54°	07:21	08:53	10:19	23:14	23:26	23:35
52°	07:30	08:58	10:21	23:08	23:22	23:34
50°	07:38	09:03	10:24	23:02	23:19	23:33
45°	07:55	09:14	10:29	22:49	23:11	23:31
N 40°	08:09	09:23	10:34	22:38	23:05	23:29
35°	08:20	09:31	10:37	22:29	23:00	23:27
30°	08:31	09:38	10:41	22:21	22:55	23:25
20°	08:48	09:49	10:46	22:07	22:46	23:22
N 10°	09:03	10:00	10:51	21:54	22:39	23:20
0°	09:17	10:09	10:56	21:43	22:32	23:18
S 10°	09:31	10:18	11:01	21:31	22:25	23:15
20°	09:46	10:28	11:06	21:18	22:17	23:13
30°	10:03	10:40	11:12	21:03	22:08	23:10
35°	10:13	10:46	11:15	20:55	22:03	23:08
40°	10:24	10:54	11:19	20:45	21:57	23:06
45°	10:38	11:02	11:23	20:33	21:51	23:03
S 50°	10:54	11:13	11:28	20:19	21:42	23:01
52°	11:01	11:17	11:30	20:12	21:38	22:59
54°	11:09	11:23	11:33	20:05	21:34	22:58
56°	11:18	11:28	11:36	19:57	21:30	22:56
58°	11:29	11:35	11:39	19:47	21:24	22:55
S 60°	11:41	11:42	11:42	19:36	21:18	22:53

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 12-30%
18	01:03	01:10	12:01	15:30	03:03	
19	01:16	01:23	12:01	16:21	03:56	
20	01:29	01:36	12:02	17:07	04:44	

June 21, 22, 23 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	269°12.5	137°28.3	N19°59.4	217°04.3	N18°27.9	148°58.3	N20°58.3	255°42.6	N03°14.5
1	284°15.0	152°27.8	58.6	232°05.0	28.4	164°00.2	58.2	270°44.9	14.6
2	299°17.4	167°27.3	57.8	247°05.6	28.9	179°02.1	58.1	285°47.3	14.6
3	314°19.9	182°26.9	·· 57.0	262°06.2	·· 29.3	194°04.1	·· 58.0	300°49.6	·· 14.6
4	329°22.4	197°26.4	56.2	277°06.8	29.8	209°06.0	57.9	315°51.9	14.7
5	344°24.8	212°25.9	55.4	292°07.5	30.3	224°07.9	57.8	330°54.2	14.7
6	359°27.3	227°25.4	N19°54.6	307°08.1	N18°30.7	239°09.8	N20°57.7	345°56.6	N03°14.8
7	14°29.8	242°24.9	53.8	322°08.7	31.2	254°11.7	57.6	0°58.9	14.8
8	29°32.2	257°24.5	53.0	337°09.3	31.7	269°13.6	57.5	16°01.2	14.9
9	44°34.7	272°24.0	·· 52.2	352°10.0	·· 32.1	284°15.6	·· 57.4	31°03.6	·· 14.9
10	59°37.2	287°23.5	51.4	7°10.6	32.6	299°17.5	57.2	46°05.9	15.0
11	74°39.6	302°23.0	50.6	22°11.2	33.1	314°19.4	57.1	61°08.2	15.0
12	89°42.1	317°22.6	N19°49.8	37°11.9	N18°33.5	329°21.3	N20°57.0	76°10.5	N03°15.1
13	104°44.5	332°22.1	49.0	52°12.5	34.0	344°23.2	56.9	91°12.9	15.1
14	119°47.0	347°21.6	48.2	67°13.1	34.4	359°25.1	56.8	106°15.2	15.1
15	134°49.5	2°21.1	·· 47.4	82°13.7	·· 34.9	14°27.1	·· 56.7	121°17.5	·· 15.2
16	149°51.9	17°20.7	46.6	97°14.4	35.4	29°29.0	56.6	136°19.8	15.2
17	164°54.4	32°20.2	45.7	112°15.0	35.8	44°30.9	56.5	151°22.2	15.3
18	179°56.9	47°19.7	N19°44.9	127°15.6	N18°36.3	59°32.8	N20°56.4	166°24.5	N03°15.3
19	194°59.3	62°19.3	44.1	142°16.2	36.8	74°34.7	56.3	181°26.8	15.4
20	210°01.8	77°18.8	43.3	157°16.9	37.2	89°36.7	56.2	196°29.2	15.4
21	225°04.3	92°18.3	·· 42.5	172°17.5	·· 37.7	104°38.6	·· 56.1	211°31.5	·· 15.5
22	240°06.7	107°17.8	41.7	187°18.1	38.1	119°40.5	56.0	226°33.8	15.5
23	255°09.2	122°17.4	40.9	202°18.7	38.6	134°42.4	55.9	241°36.1	15.6
Mer.pass. 06:02		ν -0.5′	d 0.8′	m -4.01	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.83	ν 2.3′	d 0.0′ m 0.81

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	270°11.7	137°16.9	N19°40.1	217°19.4	N18°39.1	149°44.3	N20°55.8	256°38.5	N03°15.6
1	285°14.1	152°16.4	39.3	232°20.0	39.5	164°46.2	55.7	271°40.8	15.6
2	300°16.6	167°16.0	38.4	247°20.6	40.0	179°48.2	55.6	286°43.1	15.7
3	315°19.0	182°15.5	·· 37.6	262°21.2	·· 40.4	194°50.1	·· 55.5	301°45.5	·· 15.7
4	330°21.5	197°15.1	36.8	277°21.9	40.9	209°52.0	55.4	316°47.8	15.8
5	345°24.0	212°14.6	36.0	292°22.5	41.4	224°53.9	55.3	331°50.1	15.8
6	0°26.4	227°14.1	N19°35.2	307°23.1	N18°41.8	239°55.8	N20°55.2	346°52.5	N03°15.9
7	15°28.9	242°13.7	34.4	322°23.7	42.3	254°57.7	55.1	1°54.8	15.9
8	30°31.4	257°13.2	33.5	337°24.4	42.7	269°59.6	55.0	16°57.1	16.0
9	45°33.8	272°12.7	·· 32.7	352°25.0	·· 43.2	285°01.6	·· 54.9	31°59.4	·· 16.0
10	60°36.3	287°12.3	31.9	7°25.6	43.6	300°03.5	54.8	47°01.8	16.0
11	75°38.8	302°11.8	31.1	22°26.2	44.1	315°05.4	54.7	62°04.1	16.1
12	90°41.2	317°11.4	N19°30.2	37°26.9	N18°44.6	330°07.3	N20°54.6	77°06.4	N03°16.1
13	105°43.7	332°10.9	29.4	52°27.5	45.0	345°09.2	54.5	92°08.8	16.2
14	120°46.1	347°10.4	28.6	67°28.1	45.5	0°11.1	54.4	107°11.1	16.2
15	135°48.6	2°10.0	·· 27.8	82°28.7	·· 45.9	15°13.1	·· 54.3	122°13.4	·· 16.3
16	150°51.1	17°09.5	26.9	97°29.4	46.4	30°15.0	54.2	137°15.8	16.3
17	165°53.5	32°09.1	26.1	112°30.0	46.8	45°16.9	54.1	152°18.1	16.4
18	180°56.0	47°08.6	N19°25.3	127°30.6	N18°47.3	60°18.8	N20°54.0	167°20.4	N03°16.4
19	195°58.5	62°08.2	24.5	142°31.2	47.7	75°20.7	53.9	182°22.8	16.4
20	211°00.9	77°07.7	23.6	157°31.9	48.2	90°22.6	53.7	197°25.1	16.5
21	226°03.4	92°07.3	·· 22.8	172°32.5	·· 48.6	105°24.6	·· 53.6	212°27.4	·· 16.5
22	241°05.9	107°06.8	22.0	187°33.1	49.1	120°26.5	53.5	227°29.8	16.6
23	256°08.3	122°06.4	21.1	202°33.7	49.5	135°28.4	53.4	242°32.1	16.6
Mer.pass. 05:58		ν -0.5′	d 0.8′	m -4.01	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.83	ν 2.3′	d 0.0′ m 0.81

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	271°10.8	137°05.9	N19°20.3	217°34.4	N18°50.0	150°30.3	N20°53.3	257°34.4	N03°16.7
1	286°13.3	152°05.5	19.5	232°35.0	50.5	165°32.2	53.2	272°36.8	16.7
2	301°15.7	167°05.0	18.6	247°35.6	50.9	180°34.1	53.1	287°39.1	16.7
3	316°18.2	182°04.6	·· 17.8	262°36.2	·· 51.4	195°36.0	·· 53.0	302°41.4	·· 16.8
4	331°20.6	197°04.1	17.0	277°36.9	51.8	210°38.0	52.9	317°43.8	16.8
5	346°23.1	212°03.7	16.1	292°37.5	52.3	225°39.9	52.8	332°46.1	16.9
6	1°25.6	227°03.2	N19°15.3	307°38.1	N18°52.7	240°41.8	N20°52.7	347°48.4	N03°16.9
7	16°28.0	242°02.8	14.4	322°38.7	53.2	255°43.7	52.6	2°50.8	17.0
8	31°30.5	257°02.3	13.6	337°39.4	53.6	270°45.6	52.5	17°53.1	17.0
9	46°33.0	272°01.9	·· 12.8	352°40.0	·· 54.1	285°47.5	·· 52.4	32°55.4	·· 17.0
10	61°35.4	287°01.5	11.9	7°40.6	54.5	300°49.4	52.3	47°57.8	17.1
11	76°37.9	302°01.0	11.1	22°41.2	55.0	315°51.4	52.2	63°00.1	17.1
12	91°40.4	317°00.6	N19°10.2	37°41.8	N18°55.4	330°53.3	N20°52.1	78°02.4	N03°17.2
13	106°42.8	332°00.1	09.4	52°42.5	55.8	345°55.2	52.0	93°04.8	17.2
14	121°45.3	346°59.7	08.6	67°43.1	56.3	0°57.1	51.9	108°07.1	17.3
15	136°47.7	1°59.3	·· 07.7	82°43.7	·· 56.7	15°59.0	·· 51.8	123°09.4	·· 17.3
16	151°50.2	16°58.8	06.9	97°44.3	57.2	31°00.9	51.7	138°11.8	17.3
17	166°52.7	31°58.4	06.0	112°45.0	57.6	46°02.8	51.6	153°14.1	17.4
18	181°55.1	46°57.9	N19°05.2	127°45.6	N18°58.1	61°04.8	N20°51.5	168°16.4	N03°17.4
19	196°57.6	61°57.5	04.3	142°46.2	58.5	76°06.7	51.4	183°18.8	17.5
20	212°00.1	76°57.1	03.5	157°46.8	59.0	91°08.6	51.2	198°21.1	17.5
21	227°02.5	91°56.6	·· 02.6	172°47.5	·· 59.4	106°10.5	·· 51.1	213°23.4	·· 17.6
22	242°05.0	106°56.2	01.8	187°48.1	18°59.9	121°12.4	51.0	228°25.8	17.6
23	257°07.5	121°55.8	00.9	202°48.7	19°00.3	136°14.3	50.9	243°28.1	17.6
Mer.pass. 05:54		ν -0.4′	d 0.8′	m -4.01	ν 0.6′	d 0.5′	m 1.29	ν 1.9′	d 0.1′ m -1.82	ν 2.3′	d 0.0′ m 0.81

Stars

	SHA	**Dec**
Alpheratz	357°33.5	29°14.1
Ankaa	353°06.0	-42°09.4
Schedar	349°29.8	56°40.7
Diphda	348°46.2	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°46.5	89°22.3
Acamar	315°11.2	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.7	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°19.0	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.3
Enif	33°37.4	9°59.8
Al Na'ir	27°31.2	-46°49.7
Fomalhaut	15°13.1	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.6	15°20.8

Jun 21 Sun	**SHA**	**Mer.pass**
Venus	228°15.8	14:51
Mars	307°51.8	09:31
Jupiter	239°45.8	14:02
Saturn	346°30.1	06:56

Jun 22 Mon	**SHA**	**Mer.pass**
Venus	227°05.3	14:51
Mars	307°07.7	09:30
Jupiter	239°32.7	13:59
Saturn	346°26.8	06:52

Jun 23 Tue	**SHA**	**Mer.pass**
Venus	225°55.1	14:52
Mars	306°23.6	09:29
Jupiter	239°19.5	13:56
Saturn	346°23.6	06:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sun	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°34.4	N23°26.3	100°10.6	14.3′	N03°07.0	15.4′	57.2′
1	194°34.2	26.3	114°43.9	14.4′	02°51.6	15.4′	57.1′
2	209°34.1	26.3	129°17.3	14.4′	02°36.2	15.4′	57.1′
3	224°34.0	·· 26.3	143°50.7	14.5′	02°20.8	15.4′	57.0′
4	239°33.8	26.3	158°24.2	14.5′	02°05.4	15.3′	57.0′
5	254°33.7	26.3	172°57.7	14.6′	01°50.1	15.4′	57.0′
6	269°33.6	N23°26.3	187°31.2	14.6′	N01°34.7	15.3′	56.9′
7	284°33.4	26.3	202°04.8	14.6′	01°19.4	15.3′	56.9′
8	299°33.3	26.3	216°38.5	14.7′	01°04.1	15.3′	56.9′
9	314°33.2	·· 26.3	231°12.2	14.7′	00°48.8	15.3′	56.8′
10	329°33.0	26.3	245°45.9	14.8′	00°33.5	15.3′	56.8′
11	344°32.9	26.3	260°19.7	14.8′	00°18.2	15.3′	56.8′
12	359°32.7	N23°26.3	274°53.5	14.8′	N00°02.9	15.2′	56.7′
13	14°32.6	26.3	289°27.3	14.9′	S00°12.3	15.2′	56.7′
14	29°32.5	26.3	304°01.2	14.9′	00°27.5	15.2′	56.6′
15	44°32.3	·· 26.3	318°35.1	14.9′	00°42.7	15.2′	56.6′
16	59°32.2	26.3	333°09.0	15.0′	00°57.9	15.1′	56.6′
17	74°32.1	26.2	347°43.0	15.0′	01°13.0	15.1′	56.5′
18	89°31.9	N23°26.2	2°17.0	15.0′	S01°28.1	15.1′	56.5′
19	104°31.8	26.2	16°51.0	15.1′	01°43.2	15.1′	56.5′
20	119°31.7	26.2	31°25.1	15.1′	01°58.3	15.1′	56.4′
21	134°31.5	·· 26.2	45°59.2	15.1′	02°13.4	15.0′	56.4′
22	149°31.4	26.2	60°33.3	15.1′	02°28.4	15.0′	56.4′
23	164°31.2	26.2	75°07.4	15.2′	02°43.4	15.0′	56.3′
	SD = 15.7′	d = 0.0′		SD = 15.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.1	N23°26.2	89°41.6	15.2′	S02°58.4	14.9′	56.3′
1	194°31.0	26.2	104°15.7	15.2′	03°13.3	14.9′	56.3′
2	209°30.8	26.2	118°49.9	15.2′	03°28.2	14.9′	56.2′
3	224°30.7	·· 26.2	133°24.1	15.2′	03°43.1	14.8′	56.2′
4	239°30.6	26.1	147°58.4	15.2′	03°57.9	14.8′	56.2′
5	254°30.4	26.1	162°32.6	15.3′	04°12.7	14.8′	56.1′
6	269°30.3	N23°26.1	177°06.9	15.3′	S04°27.5	14.7′	56.1′
7	284°30.2	26.1	191°41.1	15.3′	04°42.2	14.7′	56.1′
8	299°30.0	26.1	206°15.4	15.3′	04°56.9	14.7′	56.0′
9	314°29.9	·· 26.1	220°49.7	15.3′	05°11.6	14.6′	56.0′
10	329°29.7	26.0	235°24.0	15.3′	05°26.2	14.6′	56.0′
11	344°29.6	26.0	249°58.3	15.3′	05°40.8	14.6′	56.0′
12	359°29.5	N23°26.0	264°32.6	15.3′	S05°55.4	14.5′	55.9′
13	14°29.3	26.0	279°07.0	15.3′	06°09.9	14.5′	55.9′
14	29°29.2	26.0	293°41.3	15.3′	06°24.4	14.4′	55.9′
15	44°29.1	·· 25.9	308°15.6	15.3′	06°38.8	14.4′	55.8′
16	59°28.9	25.9	322°50.0	15.3′	06°53.2	14.4′	55.8′
17	74°28.8	25.9	337°24.3	15.3′	07°07.6	14.3′	55.8′
18	89°28.7	N23°25.9	351°58.6	15.3′	S07°21.9	14.2′	55.7′
19	104°28.5	25.8	6°33.0	15.3′	07°36.1	14.2′	55.7′
20	119°28.4	25.8	21°07.3	15.3′	07°50.3	14.2′	55.7′
21	134°28.3	·· 25.8	35°41.6	15.3′	08°04.5	14.1′	55.7′
22	149°28.1	25.8	50°15.9	15.3′	08°18.6	14.1′	55.6′
23	164°28.0	25.7	64°50.2	15.3′	08°32.7	14.1′	55.6′
	SD = 15.7′	d = 0.0′		SD = 15.4′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.8	N23°25.7	79°24.6	15.3′	S08°46.8	13.9′	55.6′
1	194°27.7	25.7	93°58.9	15.3′	09°00.7	14.0′	55.5′
2	209°27.6	25.7	108°33.1	15.3′	09°14.7	13.9′	55.5′
3	224°27.4	·· 25.6	123°07.4	15.3′	09°28.6	13.8′	55.5′
4	239°27.3	25.6	137°41.7	15.3′	09°42.4	13.8′	55.5′
5	254°27.2	25.6	152°15.9	15.2′	09°56.2	13.7′	55.4′
6	269°27.0	N23°25.5	166°50.2	15.2′	S10°09.9	13.7′	55.4′
7	284°26.9	25.5	181°24.4	15.2′	10°23.6	13.6′	55.4′
8	299°26.8	25.5	195°58.6	15.2′	10°37.2	13.6′	55.4′
9	314°26.6	·· 25.4	210°32.8	15.2′	10°50.8	13.5′	55.3′
10	329°26.5	25.4	225°07.0	15.2′	11°04.3	13.4′	55.3′
11	344°26.4	25.4	239°41.2	15.1′	11°17.7	13.4′	55.3′
12	359°26.2	N23°25.3	254°15.3	15.1′	S11°31.1	13.4′	55.3′
13	14°26.1	25.3	268°49.4	15.1′	11°44.5	13.3′	55.2′
14	29°26.0	25.2	283°23.5	15.1′	11°57.8	13.2′	55.2′
15	44°25.8	·· 25.2	297°57.6	15.1′	12°11.0	13.2′	55.2′
16	59°25.7	25.2	312°31.6	15.0′	12°24.2	13.1′	55.2′
17	74°25.6	25.1	327°05.7	15.0′	12°37.3	13.0′	55.1′
18	89°25.4	N23°25.1	341°39.7	15.0′	S12°50.3	13.0′	55.1′
19	104°25.3	25.0	356°13.6	14.9′	13°03.3	12.9′	55.1′
20	119°25.2	25.0	10°47.6	14.9′	13°16.2	12.9′	55.1′
21	134°25.0	·· 25.0	25°21.5	14.9′	13°29.1	12.8′	55.0′
22	149°24.9	24.9	39°55.4	14.9′	13°41.9	12.7′	55.0′
23	164°24.7	24.9	54°29.3	14.8′	13°54.6	12.7′	55.0′
	SD = 15.7′	d = 0.0′		SD = 15.2′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	////	////	01:31	22:33	////	////
62°	////	////	02:10	21:54	////	////
60°	////	00:49	02:36	21:28	23:14	////
N 58°	////	01:41	02:57	21:07	22:23	////
56°	////	02:11	03:13	20:51	21:53	////
54°	00:45	02:33	03:28	20:36	21:31	23:18
52°	01:33	02:51	03:40	20:24	21:13	22:31
50°	02:01	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:13	19:51	20:28	21:18
N 40°	03:17	03:59	04:32	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:51	05:18	05:41	18:23	18:46	19:13
0°	05:10	05:36	05:58	18:06	18:28	18:54
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:18	06:52	07:22	16:42	17:12	17:47
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:30	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	11:40	13:47	16:02	23:24	22:49	22:04
N 70°	11:40	13:37	15:38	23:28	23:02	22:30
68°	11:40	13:29	15:20	23:31	23:12	22:50
66°	11:40	13:22	15:06	23:34	23:20	23:06
64°	11:40	13:17	14:54	23:36	23:28	23:19
62°	11:40	13:12	14:44	23:38	23:34	23:30
60°	11:40	13:08	14:35	23:40	23:39	23:40
N 58°	11:40	13:04	14:28	23:41	23:44	23:48
56°	11:40	13:01	14:22	23:43	23:49	23:55
54°	11:40	12:58	14:16	23:44	23:52	·· ··
52°	11:40	12:56	14:11	23:45	23:56	·· ··
50°	11:40	12:54	14:06	23:46	23:59	·· ··
45°	11:40	12:48	13:56	23:49	·· ··	00:06
N 40°	11:40	12:44	13:47	23:51	·· ··	00:12
35°	11:40	12:41	13:40	23:52	·· ··	00:17
30°	11:40	12:38	13:34	23:54	·· ··	00:22
20°	11:40	12:32	13:23	23:56	·· ··	00:30
N 10°	11:40	12:27	13:14	23:59	·· ··	00:37
0°	11:40	12:23	13:05	·· ··	00:01	00:43
S 10°	11:40	12:19	12:57	·· ··	00:03	00:50
20°	11:41	12:14	12:48	·· ··	00:05	00:57
30°	11:41	12:09	12:37	·· ··	00:08	01:05
35°	11:41	12:06	12:31	·· ··	00:09	01:09
40°	11:41	12:02	12:25	·· ··	00:11	01:15
45°	11:41	11:59	12:17	·· ··	00:13	01:21
S 50°	11:41	11:54	12:07	·· ··	00:15	01:28
52°	11:41	11:52	12:03	·· ··	00:17	01:32
54°	11:41	11:50	11:59	·· ··	00:18	01:36
56°	11:42	11:47	11:53	·· ··	00:19	01:40
58°	11:42	11:44	11:48	·· ··	00:21	01:44
S 60°	11:42	11:41	11:41	·· ··	00:22	01:50

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 6-8 41-61%
21	01:42	01:49	12:02	17:51	05:29	
22	01:56	02:02	12:02	18:33	06:12	
23	02:09	02:15	12:02	19:16	06:54	

June 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	272°09.9	136°55.3	N19°00.1	217°49.3	N19°00.8	151°16.2	N20°50.8	258°30.4	N03°17.7
1	287°12.4	151°54.9	18°59.2	232°50.0	01.2	166°18.2	50.7	273°32.8	17.7
2	302°14.9	166°54.5	58.4	247°50.6	01.6	181°20.1	50.6	288°35.1	17.8
3	317°17.3	181°54.0	·· 57.5	262°51.2	·· 02.1	196°22.0	·· 50.5	303°37.5	·· 17.8
4	332°19.8	196°53.6	56.7	277°51.8	02.5	211°23.9	50.4	318°39.8	17.9
5	347°22.2	211°53.2	55.8	292°52.4	03.0	226°25.8	50.3	333°42.1	17.9
6	2°24.7	226°52.8	N18°54.9	307°53.1	N19°03.4	241°27.7	N20°50.2	348°44.5	N03°17.9
7	17°27.2	241°52.3	54.1	322°53.7	03.9	256°29.6	50.1	3°46.8	18.0
8	32°29.6	256°51.9	53.2	337°54.3	04.3	271°31.6	50.0	18°49.1	18.0
9	47°32.1	271°51.5	·· 52.4	352°54.9	·· 04.7	286°33.5	·· 49.9	33°51.5	·· 18.1
10	62°34.6	286°51.0	51.5	7°55.6	05.2	301°35.4	49.8	48°53.8	18.1
11	77°37.0	301°50.6	50.6	22°56.2	05.6	316°37.3	49.7	63°56.2	18.1
12	92°39.5	316°50.2	N18°49.8	37°56.8	N19°06.1	331°39.2	N20°49.6	78°58.5	N03°18.2
13	107°42.0	331°49.8	48.9	52°57.4	06.5	346°41.1	49.5	94°00.8	18.2
14	122°44.4	346°49.4	48.1	67°58.0	06.9	1°43.0	49.4	109°03.2	18.3
15	137°46.9	1°48.9	·· 47.2	82°58.7	·· 07.4	16°44.9	·· 49.2	124°05.5	·· 18.3
16	152°49.4	16°48.5	46.3	97°59.3	07.8	31°46.9	49.1	139°07.8	18.3
17	167°51.8	31°48.1	45.5	112°59.9	08.3	46°48.8	49.0	154°10.2	18.4
18	182°54.3	46°47.7	N18°44.6	128°00.5	N19°08.7	61°50.7	N20°48.9	169°12.5	N03°18.4
19	197°56.7	61°47.3	43.7	143°01.2	09.1	76°52.6	48.8	184°14.9	18.5
20	212°59.2	76°46.8	42.9	158°01.8	09.6	91°54.5	48.7	199°17.2	18.5
21	228°01.7	91°46.4	·· 42.0	173°02.4	·· 10.0	106°56.4	·· 48.6	214°19.5	·· 18.6
22	243°04.1	106°46.0	41.1	188°03.0	10.4	121°58.3	48.5	229°21.9	18.6
23	258°06.6	121°45.6	40.3	203°03.6	10.9	137°00.2	48.4	244°24.2	18.6
Mer.pass. 05:50		ν -0.4′	d 0.9′	m -4.02	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.82	ν 2.3′	d 0.0′ m 0.80

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°09.1	136°45.2	N18°39.4	218°04.3	N19°11.3	152°02.2	N20°48.3	259°26.6	N03°18.7
1	288°11.5	151°44.8	38.5	233°04.9	11.8	167°04.1	48.2	274°28.9	18.7
2	303°14.0	166°44.3	37.6	248°05.5	12.2	182°06.0	48.1	289°31.2	18.8
3	318°16.5	181°43.9	·· 36.8	263°06.1	·· 12.6	197°07.9	·· 48.0	304°33.6	·· 18.8
4	333°18.9	196°43.5	35.9	278°06.8	13.1	212°09.8	47.9	319°35.9	18.8
5	348°21.4	211°43.1	35.0	293°07.4	13.5	227°11.7	47.8	334°38.3	18.9
6	3°23.9	226°42.7	N18°34.1	308°08.0	N19°13.9	242°13.6	N20°47.7	349°40.6	N03°18.9
7	18°26.3	241°42.3	33.3	323°08.6	14.4	257°15.5	47.6	4°42.9	19.0
8	33°28.8	256°41.9	32.4	338°09.2	14.8	272°17.5	47.4	19°45.3	19.0
9	48°31.2	271°41.5	·· 31.5	353°09.9	·· 15.2	287°19.4	·· 47.3	34°47.6	·· 19.0
10	63°33.7	286°41.1	30.6	8°10.5	15.7	302°21.3	47.2	49°50.0	19.1
11	78°36.2	301°40.6	29.7	23°11.1	16.1	317°23.2	47.1	64°52.3	19.1
12	93°38.6	316°40.2	N18°28.9	38°11.7	N19°16.5	332°25.1	N20°47.0	79°54.6	N03°19.2
13	108°41.1	331°39.8	28.0	53°12.3	17.0	347°27.0	46.9	94°57.0	19.2
14	123°43.6	346°39.4	27.1	68°13.0	17.4	2°28.9	46.8	109°59.3	19.2
15	138°46.0	1°39.0	·· 26.2	83°13.6	·· 17.8	17°30.8	·· 46.7	125°01.7	·· 19.3
16	153°48.5	16°38.6	25.3	98°14.2	18.3	32°32.7	46.6	140°04.0	19.3
17	168°51.0	31°38.2	24.5	113°14.8	18.7	47°34.7	46.5	155°06.3	19.4
18	183°53.4	46°37.8	N18°23.6	128°15.5	N19°19.1	62°36.6	N20°46.4	170°08.7	N03°19.4
19	198°55.9	61°37.4	22.7	143°16.1	19.5	77°38.5	46.3	185°11.0	19.4
20	213°58.3	76°37.0	21.8	158°16.7	20.0	92°40.4	46.2	200°13.4	19.5
21	229°00.8	91°36.6	·· 20.9	173°17.3	·· 20.4	107°42.3	·· 46.1	215°15.7	·· 19.5
22	244°03.3	106°36.2	20.0	188°17.9	20.8	122°44.2	46.0	230°18.1	19.5
23	259°05.7	121°35.8	19.1	203°18.6	21.3	137°46.1	45.9	245°20.4	19.6
Mer.pass. 05:46		ν -0.4′	d 0.9′	m -4.02	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.82	ν 2.3′	d 0.0′ m 0.80

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	274°08.2	136°35.4	N18°18.2	218°19.2	N19°21.7	152°48.0	N20°45.7	260°22.7	N03°19.6
1	289°10.7	151°35.0	17.4	233°19.8	22.1	167°49.9	45.6	275°25.1	19.7
2	304°13.1	166°34.6	16.5	248°20.4	22.6	182°51.9	45.5	290°27.4	19.7
3	319°15.6	181°34.2	·· 15.6	263°21.0	·· 23.0	197°53.8	·· 45.4	305°29.8	·· 19.7
4	334°18.1	196°33.8	14.7	278°21.7	23.4	212°55.7	45.3	320°32.1	19.8
5	349°20.5	211°33.4	13.8	293°22.3	23.8	227°57.6	45.2	335°34.5	19.8
6	4°23.0	226°33.0	N18°12.9	308°22.9	N19°24.3	242°59.5	N20°45.1	350°36.8	N03°19.9
7	19°25.5	241°32.6	12.0	323°23.5	24.7	258°01.4	45.0	5°39.2	19.9
8	34°27.9	256°32.3	11.1	338°24.1	25.1	273°03.3	44.9	20°41.5	19.9
9	49°30.4	271°31.9	·· 10.2	353°24.8	·· 25.5	288°05.2	·· 44.8	35°43.8	·· 20.0
10	64°32.8	286°31.5	09.3	8°25.4	26.0	303°07.1	44.7	50°46.2	20.0
11	79°35.3	301°31.1	08.4	23°26.0	26.4	318°09.0	44.6	65°48.5	20.0
12	94°37.8	316°30.7	N18°07.5	38°26.6	N19°26.8	333°11.0	N20°44.5	80°50.9	N03°20.1
13	109°40.2	331°30.3	06.6	53°27.2	27.2	348°12.9	44.4	95°53.2	20.1
14	124°42.7	346°29.9	05.7	68°27.9	27.7	3°14.8	44.2	110°55.6	20.2
15	139°45.2	1°29.5	·· 04.8	83°28.5	·· 28.1	18°16.7	·· 44.1	125°57.9	·· 20.2
16	154°47.6	16°29.1	03.9	98°29.1	28.5	33°18.6	44.0	141°00.3	20.2
17	169°50.1	31°28.8	03.0	113°29.7	28.9	48°20.5	43.9	156°02.6	20.3
18	184°52.6	46°28.4	N18°02.1	128°30.3	N19°29.4	63°22.4	N20°43.8	171°04.9	N03°20.3
19	199°55.0	61°28.0	01.2	143°31.0	29.8	78°24.3	43.7	186°07.3	20.4
20	214°57.5	76°27.6	18°00.3	158°31.6	30.2	93°26.2	43.6	201°09.6	20.4
21	230°00.0	91°27.2	17°59.4	173°32.2	·· 30.6	108°28.1	·· 43.5	216°12.0	·· 20.4
22	245°02.4	106°26.8	58.5	188°32.8	31.0	123°30.1	43.4	231°14.3	20.5
23	260°04.9	121°26.5	57.6	203°33.4	31.5	138°32.0	43.3	246°16.7	20.5
Mer.pass. 05:43		ν -0.4′	d 0.9′	m -4.03	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.82	ν 2.3′	d 0.0′ m 0.80

Stars

	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°06.0	-42°09.4
Schedar	349°29.7	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°45.2	89°22.3
Acamar	315°11.2	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°19.1	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.4
Enif	33°37.4	9°59.8
Al Na'ir	27°31.2	-46°49.7
Fomalhaut	15°13.1	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.6	15°20.8

Jun 24 Wed	SHA	Mer.pass
Venus	224°45.4	14:53
Mars	305°39.4	09:28
Jupiter	239°06.3	13:53
Saturn	346°20.5	06:45

Jun 25 Thu	SHA	Mer.pass
Venus	223°36.1	14:53
Mars	304°55.2	09:27
Jupiter	238°53.1	13:50
Saturn	346°17.5	06:41

Jun 26 Fri	SHA	Mer.pass
Venus	222°27.2	14:54
Mars	304°11.0	09:26
Jupiter	238°39.8	13:47
Saturn	346°14.5	06:37

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°24.6	N23°24.8	69°03.1	14.8′	S14°07.3	12.6′	55.0′
1	194°24.5	24.8	83°36.9	14.8′	14°19.9	12.5′	54.9′
2	209°24.3	24.7	98°10.7	14.7′	14°32.4	12.5′	54.9′
3	224°24.2	·· 24.7	112°44.4	14.7′	14°44.9	12.4′	54.9′
4	239°24.1	24.6	127°18.1	14.7′	14°57.3	12.3′	54.9′
5	254°23.9	24.6	141°51.8	14.6′	15°09.6	12.3′	54.9′
6	269°23.8	N23°24.5	156°25.4	14.6′	S15°21.9	12.2′	54.8′
7	284°23.7	24.5	170°59.0	14.6′	15°34.1	12.1′	54.8′
8	299°23.5	24.4	185°32.5	14.5′	15°46.2	12.0′	54.8′
9	314°23.4	·· 24.4	200°06.0	14.5′	15°58.2	12.0′	54.8′
10	329°23.3	24.3	214°39.5	14.4′	16°10.2	11.9′	54.8′
11	344°23.1	24.3	229°12.9	14.4′	16°22.1	11.8′	54.7′
12	359°23.0	N23°24.2	243°46.3	14.4′	S16°33.9	11.8′	54.7′
13	14°22.9	24.2	258°19.7	14.3′	16°45.7	11.7′	54.7′
14	29°22.7	24.1	272°53.0	14.3′	16°57.4	11.6′	54.7′
15	44°22.6	·· 24.1	287°26.3	14.2′	17°09.0	11.5′	54.7′
16	59°22.5	24.0	301°59.5	14.2′	17°20.5	11.4′	54.6′
17	74°22.3	23.9	316°32.7	14.1′	17°31.9	11.4′	54.6′
18	89°22.2	N23°23.9	331°05.8	14.1′	S17°43.3	11.3′	54.6′
19	104°22.1	23.8	345°38.9	14.0′	17°54.6	11.2′	54.6′
20	119°21.9	23.8	0°12.0	14.0′	18°05.8	11.1′	54.6′
21	134°21.8	·· 23.7	14°45.0	14.0′	18°16.9	11.0′	54.6′
22	149°21.7	23.6	29°17.9	13.9′	18°27.9	11.0′	54.5′
23	164°21.5	23.6	43°50.8	13.9′	18°38.9	10.9′	54.5′
	SD = 15.7′	*d* = 0.0′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°21.4	N23°23.5	58°23.7	13.8′	S18°49.8	10.8′	54.5′
1	194°21.3	23.5	72°56.5	13.8′	19°00.6	10.7′	54.5′
2	209°21.1	23.4	87°29.3	13.7′	19°11.3	10.6′	54.5′
3	224°21.0	·· 23.3	102°02.0	13.7′	19°21.9	10.5′	54.5′
4	239°20.9	23.3	116°34.6	13.6′	19°32.4	10.5′	54.4′
5	254°20.7	23.2	131°07.3	13.6′	19°42.9	10.4′	54.4′
6	269°20.6	N23°23.1	145°39.8	13.5′	S19°53.3	10.2′	54.4′
7	284°20.5	23.1	160°12.3	13.5′	20°03.5	10.2′	54.4′
8	299°20.3	23.0	174°44.8	13.4′	20°13.7	10.1′	54.4′
9	314°20.2	·· 22.9	189°17.2	13.4′	20°23.8	10.0′	54.4′
10	329°20.1	22.9	203°49.6	13.3′	20°33.8	9.9′	54.4′
11	344°19.9	22.8	218°21.9	13.2′	20°43.7	9.9′	54.3′
12	359°19.8	N23°22.7	232°54.1	13.2′	S20°53.6	9.7′	54.3′
13	14°19.7	22.6	247°26.3	13.1′	21°03.3	9.6′	54.3′
14	29°19.6	22.6	261°58.4	13.1′	21°12.9	9.6′	54.3′
15	44°19.4	·· 22.5	276°30.5	13.0′	21°22.5	9.4′	54.3′
16	59°19.3	22.4	291°02.6	13.0′	21°31.9	9.4′	54.3′
17	74°19.2	22.3	305°34.6	12.9′	21°41.3	9.2′	54.3′
18	89°19.0	N23°22.3	320°06.5	12.9′	S21°50.5	9.2′	54.3′
19	104°18.9	22.2	334°38.4	12.8′	21°59.7	9.0′	54.2′
20	119°18.8	22.1	349°10.2	12.8′	22°08.7	9.0′	54.2′
21	134°18.6	·· 22.0	3°41.9	12.7′	22°17.7	8.8′	54.2′
22	149°18.5	22.0	18°13.6	12.7′	22°26.5	8.8′	54.2′
23	164°18.4	21.9	32°45.3	12.6′	22°35.3	8.7′	54.2′
	SD = 15.7′	*d* = 0.1′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	179°18.2	N23°21.8	47°16.9	12.5′	S22°44.0	8.5′	54.2′
1	194°18.1	21.7	61°48.4	12.5′	22°52.5	8.5′	54.2′
2	209°18.0	21.6	76°19.9	12.4′	23°01.0	8.3′	54.2′
3	224°17.8	·· 21.6	90°51.4	12.4′	23°09.3	8.3′	54.2′
4	239°17.7	21.5	105°22.7	12.3′	23°17.6	8.1′	54.1′
5	254°17.6	21.4	119°54.0	12.3′	23°25.7	8.0′	54.1′
6	269°17.4	N23°21.3	134°25.3	12.2′	S23°33.7	8.0′	54.1′
7	284°17.3	21.2	148°56.5	12.2′	23°41.7	7.8′	54.1′
8	299°17.2	21.1	163°27.7	12.1′	23°49.5	7.7′	54.1′
9	314°17.1	·· 21.1	177°58.8	12.0′	23°57.2	7.6′	54.1′
10	329°16.9	21.0	192°29.8	12.0′	24°04.8	7.5′	54.1′
11	344°16.8	20.9	207°00.8	11.9′	24°12.3	7.4′	54.1′
12	359°16.7	N23°20.8	221°31.8	11.9′	S24°19.7	7.3′	54.1′
13	14°16.5	20.7	236°02.6	11.8′	24°27.0	7.1′	54.1′
14	29°16.4	20.6	250°33.5	11.8′	24°34.1	7.1′	54.1′
15	44°16.3	·· 20.5	265°04.3	11.7′	24°41.2	6.9′	54.1′
16	59°16.1	20.4	279°35.0	11.7′	24°48.1	6.8′	54.0′
17	74°16.0	20.3	294°05.7	11.6′	24°54.9	6.8′	54.0′
18	89°15.9	N23°20.3	308°36.3	11.6′	S25°01.7	6.6′	54.0′
19	104°15.7	20.2	323°06.8	11.5′	25°08.3	6.4′	54.0′
20	119°15.6	20.1	337°37.4	11.5′	25°14.7	6.4′	54.0′
21	134°15.5	·· 20.0	352°07.8	11.4′	25°21.1	6.3′	54.0′
22	149°15.4	19.9	6°38.2	11.4′	25°27.4	6.1′	54.0′
23	164°15.2	19.8	21°08.6	11.3′	25°33.5	6.0′	54.0′
	SD = 15.7′	*d* = 0.1′	SD = 14.8′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	////	////	01:33	22:32	////	////
62°	////	////	02:11	21:54	////	////
60°	////	00:52	02:37	21:28	23:12	////
N 58°	////	01:42	02:58	21:07	22:23	////
56°	////	02:12	03:14	20:51	21:53	////
54°	00:48	02:34	03:29	20:36	21:31	23:17
52°	01:34	02:52	03:41	20:24	21:13	22:31
50°	02:02	03:07	03:52	20:13	20:58	22:03
45°	02:47	03:37	04:14	19:51	20:28	21:18
N 40°	03:18	04:00	04:32	19:33	20:06	20:47
35°	03:41	04:18	04:47	19:18	19:48	20:24
30°	04:00	04:33	05:00	19:05	19:32	20:06
20°	04:29	04:58	05:22	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:36	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	06:16	17:49	18:12	18:38
20°	05:43	06:11	06:35	17:30	17:54	18:22
30°	06:00	06:30	06:56	17:09	17:36	18:05
35°	06:09	06:40	07:09	16:57	17:25	17:57
40°	06:18	06:52	07:23	16:43	17:13	17:47
45°	06:28	07:06	07:39	16:26	17:00	17:37
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:29	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:32	16:19	17:08
58°	07:04	07:57	08:48	15:17	16:09	17:01
S 60°	07:12	08:08	09:06	14:59	15:57	16:54

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	18:04	▬	▬	21:35	▬	▬
68°	17:23	▬	▬	22:17	▬	▬
66°	16:56	19:05	▬	22:46	22:12	▬
64°	16:35	18:24	20:38	23:08	22:53	22:19
62°	16:18	17:56	19:40	23:26	23:22	23:17
60°	16:04	17:35	19:07	23:41	23:44	23:51
N 58°	15:52	17:18	18:42	23:53	·· ··	00:01
56°	15:42	17:03	18:23	·· ··	00:04	00:17
54°	15:33	16:51	18:07	00:02	00:14	00:30
52°	15:25	16:40	17:53	00:08	00:22	00:41
50°	15:18	16:30	17:41	00:13	00:30	00:51
45°	15:03	16:10	17:16	00:25	00:47	01:13
N 40°	14:50	15:53	16:56	00:35	01:00	01:30
35°	14:40	15:40	16:39	00:43	01:12	01:45
30°	14:31	15:28	16:25	00:51	01:22	01:57
20°	14:15	15:07	16:01	01:04	01:40	02:19
N 10°	14:01	14:50	15:40	01:15	01:55	02:38
0°	13:49	14:34	15:21	01:26	02:10	02:56
S 10°	13:36	14:17	15:02	01:37	02:25	03:14
20°	13:22	14:00	14:41	01:48	02:40	03:33
30°	13:07	13:40	14:17	02:01	02:58	03:55
35°	12:58	13:29	14:04	02:09	03:09	04:09
40°	12:48	13:16	13:48	02:18	03:21	04:24
45°	12:37	13:00	13:29	02:28	03:35	04:42
S 50°	12:23	12:41	13:05	02:41	03:53	05:04
52°	12:16	12:33	12:54	02:46	04:01	05:15
54°	12:09	12:23	12:41	02:53	04:10	05:27
56°	12:01	12:11	12:27	03:00	04:21	05:42
58°	11:52	11:59	12:10	03:08	04:33	05:58
S 60°	11:42	11:44	11:49	03:18	04:47	06:18

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 9-11 70-86%
24	02:22	02:28	12:02	19:59	07:37	
25	02:34	02:41	12:03	20:45	08:22	
26	02:47	02:53	12:03	21:33	09:08	

June 27, 28, 29 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	275°07.3	136°26.1	N17°56.7	218°34.1	N19°31.9	153°33.9	N20°43.2	261°19.0	N03°20.5
1	290°09.8	151°25.7	55.8	233°34.7	32.3	168°35.8	43.1	276°21.4	20.6
2	305°12.3	166°25.3	54.9	248°35.3	32.7	183°37.7	43.0	291°23.7	20.6
3	320°14.7	181°24.9	·· 54.0	263°35.9	·· 33.1	198°39.6	·· 42.8	306°26.1	·· 20.7
4	335°17.2	196°24.6	53.0	278°36.5	33.6	213°41.5	42.7	321°28.4	20.7
5	350°19.7	211°24.2	52.1	293°37.2	34.0	228°43.4	42.6	336°30.8	20.7
6	5°22.1	226°23.8	N17°51.2	308°37.8	N19°34.4	243°45.3	N20°42.5	351°33.1	N03°20.8
7	20°24.6	241°23.4	50.3	323°38.4	34.8	258°47.2	42.4	6°35.4	20.8
8	35°27.1	256°23.1	49.4	338°39.0	35.2	273°49.2	42.3	21°37.8	20.8
9	50°29.5	271°22.7	·· 48.5	353°39.6	·· 35.6	288°51.1	·· 42.2	36°40.1	·· 20.9
10	65°32.0	286°22.3	47.6	8°40.3	36.1	303°53.0	42.1	51°42.5	20.9
11	80°34.5	301°21.9	46.7	23°40.9	36.5	318°54.9	42.0	66°44.8	20.9
12	95°36.9	316°21.6	N17°45.7	38°41.5	N19°36.9	333°56.8	N20°41.9	81°47.2	N03°21.0
13	110°39.4	331°21.2	44.8	53°42.1	37.3	348°58.7	41.8	96°49.5	21.0
14	125°41.8	346°20.8	43.9	68°42.7	37.7	4°00.6	41.7	111°51.9	21.1
15	140°44.3	1°20.5	·· 43.0	83°43.3	·· 38.1	19°02.5	·· 41.5	126°54.2	·· 21.1
16	155°46.8	16°20.1	42.1	98°44.0	38.6	34°04.4	41.4	141°56.6	21.1
17	170°49.2	31°19.7	41.2	113°44.6	39.0	49°06.3	41.3	156°58.9	21.2
18	185°51.7	46°19.3	N17°40.2	128°45.2	N19°39.4	64°08.2	N20°41.2	172°01.3	N03°21.2
19	200°54.2	61°19.0	39.3	143°45.8	39.8	79°10.2	41.1	187°03.6	21.2
20	215°56.6	76°18.6	38.4	158°46.4	40.2	94°12.1	41.0	202°06.0	21.3
21	230°59.1	91°18.2	·· 37.5	173°47.1	·· 40.6	109°14.0	·· 40.9	217°08.3	·· 21.3
22	246°01.6	106°17.9	36.5	188°47.7	41.0	124°15.9	40.8	232°10.7	21.3
23	261°04.0	121°17.5	35.6	203°48.3	41.5	139°17.8	40.7	247°13.0	21.4
Mer.pass. 05:39		ν -0.4′	d 0.9′	m -4.03	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.82	ν 2.3′	d 0.0′ m 0.79

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	276°06.5	136°17.2	N17°34.7	218°48.9	N19°41.9	154°19.7	N20°40.6	262°15.4	N03°21.4
1	291°08.9	151°16.8	33.8	233°49.5	42.3	169°21.6	40.5	277°17.7	21.5
2	306°11.4	166°16.4	32.8	248°50.2	42.7	184°23.5	40.3	292°20.1	21.5
3	321°13.9	181°16.1	·· 31.9	263°50.8	·· 43.1	199°25.4	·· 40.2	307°22.4	·· 21.5
4	336°16.3	196°15.7	31.0	278°51.4	43.5	214°27.3	40.1	322°24.8	21.6
5	351°18.8	211°15.3	30.1	293°52.0	43.9	229°29.2	40.0	337°27.1	21.6
6	6°21.3	226°15.0	N17°29.1	308°52.6	N19°44.3	244°31.1	N20°39.9	352°29.5	N03°21.6
7	21°23.7	241°14.6	28.2	323°53.2	44.7	259°33.1	39.8	7°31.8	21.7
8	36°26.2	256°14.3	27.3	338°53.9	45.2	274°35.0	39.7	22°34.2	21.7
9	51°28.7	271°13.9	·· 26.3	353°54.5	·· 45.6	289°36.9	·· 39.6	37°36.5	·· 21.7
10	66°31.1	286°13.6	25.4	8°55.1	46.0	304°38.8	39.5	52°38.9	21.8
11	81°33.6	301°13.2	24.5	23°55.7	46.4	319°40.7	39.4	67°41.2	21.8
12	96°36.1	316°12.9	N17°23.6	38°56.3	N19°46.8	334°42.6	N20°39.3	82°43.6	N03°21.8
13	111°38.5	331°12.5	22.6	53°57.0	47.2	349°44.5	39.1	97°45.9	21.9
14	126°41.0	346°12.1	21.7	68°57.6	47.6	4°46.4	39.0	112°48.3	21.9
15	141°43.4	1°11.8	·· 20.7	83°58.2	·· 48.0	19°48.3	·· 38.9	127°50.6	·· 21.9
16	156°45.9	16°11.4	19.8	98°58.8	48.4	34°50.2	38.8	142°53.0	22.0
17	171°48.4	31°11.1	18.9	113°59.4	48.8	49°52.1	38.7	157°55.3	22.0
18	186°50.8	46°10.7	N17°17.9	129°00.0	N19°49.2	64°54.0	N20°38.6	172°57.7	N03°22.1
19	201°53.3	61°10.4	17.0	144°00.7	49.6	79°55.9	38.5	188°00.1	22.1
20	216°55.8	76°10.0	16.1	159°01.3	50.0	94°57.9	38.4	203°02.4	22.1
21	231°58.2	91°09.7	·· 15.1	174°01.9	·· 50.5	109°59.8	·· 38.3	218°04.8	·· 22.2
22	247°00.7	106°09.3	14.2	189°02.5	50.9	125°01.7	38.2	233°07.1	22.2
23	262°03.2	121°09.0	13.2	204°03.1	51.3	140°03.6	38.1	248°09.5	22.2
Mer.pass. 05:35		ν -0.4′	d 0.9′	m -4.04	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.79

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	277°05.6	136°08.6	N17°12.3	219°03.7	N19°51.7	155°05.5	N20°37.9	263°11.8	N03°22.3
1	292°08.1	151°08.3	11.4	234°04.4	52.1	170°07.4	37.8	278°14.2	22.3
2	307°10.6	166°08.0	10.4	249°05.0	52.5	185°09.3	37.7	293°16.5	22.3
3	322°13.0	181°07.6	·· 09.5	264°05.6	·· 52.9	200°11.2	·· 37.6	308°18.9	·· 22.4
4	337°15.5	196°07.3	08.5	279°06.2	53.3	215°13.1	37.5	323°21.2	22.4
5	352°17.9	211°06.9	07.6	294°06.8	53.7	230°15.0	37.4	338°23.6	22.4
6	7°20.4	226°06.6	N17°06.6	309°07.5	N19°54.1	245°16.9	N20°37.3	353°25.9	N03°22.5
7	22°22.9	241°06.2	05.7	324°08.1	54.5	260°18.8	37.2	8°28.3	22.5
8	37°25.3	256°05.9	04.8	339°08.7	54.9	275°20.7	37.1	23°30.6	22.5
9	52°27.8	271°05.6	·· 03.8	354°09.3	·· 55.3	290°22.6	·· 37.0	38°33.0	·· 22.6
10	67°30.3	286°05.2	02.9	9°09.9	55.7	305°24.5	36.8	53°35.4	22.6
11	82°32.7	301°04.9	01.9	24°10.5	56.1	320°26.5	36.7	68°37.7	22.6
12	97°35.2	316°04.6	N17°01.0	39°11.2	N19°56.5	335°28.4	N20°36.6	83°40.1	N03°22.7
13	112°37.7	331°04.2	17°00.0	54°11.8	56.9	350°30.3	36.5	98°42.4	22.7
14	127°40.1	346°03.9	16°59.1	69°12.4	57.3	5°32.2	36.4	113°44.8	22.7
15	142°42.6	1°03.5	·· 58.1	84°13.0	·· 57.7	20°34.1	·· 36.3	128°47.1	·· 22.8
16	157°45.1	16°03.2	57.2	99°13.6	58.1	35°36.0	36.2	143°49.5	22.8
17	172°47.5	31°02.9	56.2	114°14.2	58.5	50°37.9	36.1	158°51.8	22.8
18	187°50.0	46°02.5	N16°55.2	129°14.9	N19°58.9	65°39.8	N20°36.0	173°54.2	N03°22.9
19	202°52.4	61°02.2	54.3	144°15.5	59.3	80°41.7	35.8	188°56.6	22.9
20	217°54.9	76°01.9	53.3	159°16.1	19°59.7	95°43.6	35.7	203°58.9	22.9
21	232°57.4	91°01.5	·· 52.4	174°16.7	20°00.1	110°45.5	·· 35.6	219°01.3	·· 23.0
22	247°59.8	106°01.2	51.4	189°17.3	00.5	125°47.4	35.5	234°03.6	23.0
23	263°02.3	121°00.9	50.5	204°17.9	00.9	140°49.3	35.4	249°06.0	23.0
Mer.pass. 05:31		ν -0.3′	d 0.9′	m -4.04	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.78

Stars	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°06.0	-42°09.4
Schedar	349°29.7	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°43.7	89°22.3
Acamar	315°11.1	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°19.1	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.4
Enif	33°37.4	9°59.8
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°13.0	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.6	15°20.8

Jun 27 Sat	SHA	Mer.pass
Venus	221°18.7	14:55
Mars	303°26.7	09:25
Jupiter	238°26.5	13:44
Saturn	346°11.7	06:34

Jun 28 Sun	SHA	Mer.pass
Venus	220°10.7	14:55
Mars	302°42.4	09:24
Jupiter	238°13.2	13:41
Saturn	346°08.9	06:30

Jun 29 Mon	SHA	Mer.pass
Venus	219°03.0	14:56
Mars	301°58.1	09:23
Jupiter	237°59.9	13:38
Saturn	346°06.2	06:26

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°15.1	N23°19.7	35°38.9	11.3′	S25°39.5	5.9′	54.0′
1	194°15.0	19.6	50°09.2	11.2′	25°45.4	5.8′	54.0′
2	209°14.8	19.5	64°39.4	11.2′	25°51.2	5.6′	54.0′
3	224°14.7	·· 19.4	79°09.6	11.1′	25°56.8	5.6′	54.0′
4	239°14.6	19.3	93°39.7	11.1′	26°02.4	5.4′	54.0′
5	254°14.5	19.2	108°09.8	11.0′	26°07.8	5.3′	54.0′
6	269°14.3	N23°19.1	122°39.8	11.0′	S26°13.1	5.1′	54.0′
7	284°14.2	19.0	137°09.8	10.9′	26°18.2	5.1′	54.0′
8	299°14.1	18.9	151°39.7	10.9′	26°23.3	4.9′	54.0′
9	314°13.9	·· 18.8	166°09.6	10.8′	26°28.2	4.8′	53.9′
10	329°13.8	18.7	180°39.4	10.8′	26°33.0	4.7′	53.9′
11	344°13.7	18.6	195°09.2	10.8′	26°37.7	4.5′	53.9′
12	359°13.5	N23°18.5	209°39.0	10.7′	S26°42.2	4.5′	53.9′
13	14°13.4	18.4	224°08.7	10.7′	26°46.7	4.3′	53.9′
14	29°13.3	18.3	238°38.4	10.6′	26°51.0	4.1′	53.9′
15	44°13.2	·· 18.1	253°08.1	10.6′	26°55.1	4.1′	53.9′
16	59°13.0	18.0	267°37.7	10.6′	26°59.2	3.9′	53.9′
17	74°12.9	17.9	282°07.2	10.5′	27°03.1	3.8′	53.9′
18	89°12.8	N23°17.8	296°36.8	10.5′	S27°06.9	3.6′	53.9′
19	104°12.6	17.7	311°06.3	10.5′	27°10.5	3.6′	53.9′
20	119°12.5	17.6	325°35.7	10.4′	27°14.1	3.4′	53.9′
21	134°12.4	·· 17.5	340°05.1	10.4′	27°17.5	3.3′	53.9′
22	149°12.3	17.4	354°34.5	10.4′	27°20.8	3.1′	53.9′
23	164°12.1	17.3	9°03.9	10.3′	27°23.9	3.0′	53.9′
	SD = 15.7′	d = 0.1′		SD = 14.7′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.0	N23°17.1	23°33.2	10.3′	S27°26.9	2.9′	53.9′
1	194°11.9	17.0	38°02.5	10.3′	27°29.8	2.7′	53.9′
2	209°11.8	16.9	52°31.8	10.2′	27°32.5	2.7′	53.9′
3	224°11.6	·· 16.8	67°01.0	10.2′	27°35.2	2.4′	53.9′
4	239°11.5	16.7	81°30.3	10.2′	27°37.6	2.4′	53.9′
5	254°11.4	16.6	95°59.5	10.2′	27°40.0	2.2′	53.9′
6	269°11.2	N23°16.5	110°28.6	10.1′	S27°42.2	2.1′	53.9′
7	284°11.1	16.3	124°57.8	10.1′	27°44.3	1.9′	53.9′
8	299°11.0	16.2	139°26.9	10.1′	27°46.2	1.9′	53.9′
9	314°10.9	·· 16.1	153°56.0	10.1′	27°48.1	1.7′	53.9′
10	329°10.7	16.0	168°25.1	10.1′	27°49.8	1.5′	53.9′
11	344°10.6	15.9	182°54.1	10.0′	27°51.3	1.4′	53.9′
12	359°10.5	N23°15.7	197°23.2	10.0′	S27°52.7	1.3′	53.9′
13	14°10.4	15.6	211°52.2	10.0′	27°54.0	1.2′	53.9′
14	29°10.2	15.5	226°21.2	10.0′	27°55.2	1.0′	53.9′
15	44°10.1	·· 15.4	240°50.2	10.0′	27°56.2	0.8′	53.9′
16	59°10.0	15.2	255°19.2	10.0′	27°57.0	0.8′	53.9′
17	74°09.8	15.1	269°48.2	10.0′	27°57.8	0.6′	53.9′
18	89°09.7	N23°15.0	284°17.1	10.0′	S27°58.4	0.5′	53.9′
19	104°09.6	14.9	298°46.1	9.9′	27°58.9	0.3′	53.9′
20	119°09.5	14.7	313°15.0	9.9′	27°59.2	0.2′	53.9′
21	134°09.3	·· 14.6	327°44.0	9.9′	27°59.4	0.1′	53.9′
22	149°09.2	14.5	342°12.9	9.9′	27°59.5	0.1′	53.9′
23	164°09.1	14.3	356°41.8	9.9′	27°59.4	0.2′	53.9′
	SD = 15.7′	d = 0.1′		SD = 14.7′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.0	N23°14.2	11°10.7	9.9′	S27°59.2	0.4′	53.9′
1	194°08.8	14.1	25°39.7	9.9′	27°58.8	0.4′	53.9′
2	209°08.7	13.9	40°08.6	9.9′	27°58.4	0.7′	53.9′
3	224°08.6	·· 13.8	54°37.5	9.9′	27°57.7	0.7′	53.9′
4	239°08.5	13.7	69°06.4	9.9′	27°57.0	0.9′	53.9′
5	254°08.3	13.5	83°35.4	9.9′	27°56.1	1.0′	53.9′
6	269°08.2	N23°13.4	98°04.3	9.9′	S27°55.1	1.2′	53.9′
7	284°08.1	13.3	112°33.2	9.9′	27°53.9	1.3′	54.0′
8	299°08.0	13.1	127°02.2	10.0′	27°52.6	1.4′	54.0′
9	314°07.8	·· 13.0	141°31.1	10.0′	27°51.2	1.6′	54.0′
10	329°07.7	12.9	156°00.1	10.0′	27°49.6	1.7′	54.0′
11	344°07.6	12.7	170°29.1	10.0′	27°47.9	1.8′	54.0′
12	359°07.5	N23°12.6	184°58.1	10.0′	S27°46.1	2.0′	54.0′
13	14°07.3	12.4	199°27.1	10.0′	27°44.1	2.1′	54.0′
14	29°07.2	12.3	213°56.1	10.0′	27°42.0	2.2′	54.0′
15	44°07.1	·· 12.2	228°25.1	10.0′	27°39.8	2.4′	54.0′
16	59°07.0	12.0	242°54.2	10.1′	27°37.4	2.5′	54.0′
17	74°06.8	11.9	257°23.2	10.1′	27°34.9	2.7′	54.0′
18	89°06.7	N23°11.7	271°52.3	10.1′	S27°32.2	2.7′	54.0′
19	104°06.6	11.6	286°21.4	10.1′	27°29.5	2.9′	54.0′
20	119°06.5	11.4	300°50.6	10.2′	27°26.6	3.1′	54.0′
21	134°06.3	·· 11.3	315°19.7	10.2′	27°23.5	3.2′	54.0′
22	149°06.2	11.2	329°48.9	10.2′	27°20.3	3.3′	54.0′
23	164°06.1	11.0	344°18.1	10.2′	27°17.0	3.4′	54.0′
	SD = 15.7′	d = 0.1′		SD = 14.7′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	////	////	01:37	22:29	////	////
62°	////	////	02:13	21:52	////	////
60°	////	00:57	02:39	21:27	23:08	////
N 58°	////	01:45	03:00	21:07	22:21	////
56°	////	02:14	03:16	20:50	21:52	////
54°	00:52	02:36	03:30	20:36	21:30	23:13
52°	01:36	02:54	03:42	20:24	21:12	22:29
50°	02:04	03:09	03:53	20:13	20:58	22:02
45°	02:49	03:38	04:16	19:51	20:28	21:18
N 40°	03:19	04:01	04:34	19:33	20:06	20:47
35°	03:42	04:19	04:48	19:18	19:48	20:24
30°	04:01	04:34	05:01	19:05	19:33	20:06
20°	04:30	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:15
0°	05:11	05:37	06:00	18:07	18:29	18:56
S 10°	05:28	05:54	06:17	17:50	18:12	18:39
20°	05:44	06:11	06:35	17:31	17:55	18:23
30°	06:00	06:30	06:56	17:10	17:37	18:06
35°	06:09	06:41	07:09	16:58	17:26	17:58
40°	06:18	06:52	07:23	16:44	17:14	17:48
45°	06:29	07:06	07:40	16:27	17:01	17:38
S 50°	06:40	07:22	08:00	16:07	16:45	17:27
52°	06:45	07:29	08:10	15:57	16:38	17:21
54°	06:51	07:37	08:21	15:46	16:30	17:16
56°	06:57	07:46	08:33	15:33	16:21	17:10
58°	07:04	07:56	08:48	15:19	16:10	17:03
S 60°	07:11	08:08	09:05	15:01	15:59	16:55

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	21:29	▬	23:10	23:11	▬	▬
60°	20:33	21:41	22:17	·· ··	00:08	00:47
N 58°	20:01	21:04	21:45	00:15	00:40	01:24
56°	19:37	20:37	21:21	00:35	01:05	01:50
54°	19:17	20:17	21:02	00:52	01:25	02:11
52°	19:01	19:59	20:45	01:06	01:41	02:28
50°	18:47	19:44	20:31	01:19	01:55	02:43
45°	18:18	19:14	20:02	01:44	02:24	03:13
N 40°	17:56	18:51	19:40	02:05	02:47	03:36
35°	17:37	18:32	19:21	02:22	03:06	03:56
30°	17:21	18:15	19:05	02:37	03:22	04:12
20°	16:55	17:47	18:38	03:02	03:49	04:40
N 10°	16:32	17:23	18:15	03:24	04:13	05:04
0°	16:10	17:01	17:53	03:44	04:35	05:26
S 10°	15:49	16:39	17:31	04:05	04:57	05:48
20°	15:26	16:15	17:07	04:27	05:20	06:12
30°	15:00	15:47	16:40	04:52	05:48	06:40
35°	14:44	15:31	16:24	05:07	06:04	06:56
40°	14:26	15:12	16:05	05:25	06:23	07:15
45°	14:05	14:49	15:42	05:46	06:46	07:38
S 50°	13:37	14:19	15:13	06:13	07:15	08:08
52°	13:24	14:05	14:59	06:26	07:30	08:22
54°	13:09	13:48	14:42	06:41	07:47	08:39
56°	12:51	13:28	14:22	06:59	08:07	08:59
58°	12:29	13:02	13:57	07:20	08:32	09:24
S 60°	12:01	12:28	13:23	07:48	09:07	09:58

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 12-14 92-99%
27	03:00	03:06	12:03	22:22	09:57	
28	03:12	03:18	12:03	23:14	10:48	
29	03:24	03:30	12:04	–:–	11:39	

June 30, 01, 02 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°04.8	136°00.6	N16°49.5	219°18.6	N20°01.3	155°51.2	N20°35.3	264°08.3	N03°23.1
1	293°07.2	151°00.2	48.6	234°19.2	01.7	170°53.1	35.2	279°10.7	23.1
2	308°09.7	165°59.9	47.6	249°19.8	02.1	185°55.0	35.1	294°13.1	23.1
3	323°12.2	180°59.6	·· 46.6	264°20.4	·· 02.5	200°57.0	·· 35.0	309°15.4	·· 23.2
4	338°14.6	195°59.2	45.7	279°21.0	02.9	215°58.9	34.9	324°17.8	23.2
5	353°17.1	210°58.9	44.7	294°21.6	03.2	231°00.8	34.7	339°20.1	23.2
6	8°19.6	225°58.6	N16°43.8	309°22.3	N20°03.6	246°02.7	N20°34.6	354°22.5	N03°23.3
7	23°22.0	240°58.3	42.8	324°22.9	04.0	261°04.6	34.5	9°24.8	23.3
8	38°24.5	255°58.0	41.8	339°23.5	04.4	276°06.5	34.4	24°27.2	23.3
9	53°26.9	270°57.6	·· 40.9	354°24.1	·· 04.8	291°08.4	·· 34.3	39°29.6	·· 23.4
10	68°29.4	285°57.3	39.9	9°24.7	05.2	306°10.3	34.2	54°31.9	23.4
11	83°31.9	300°57.0	38.9	24°25.3	05.6	321°12.2	34.1	69°34.3	23.4
12	98°34.3	315°56.7	N16°38.0	39°25.9	N20°06.0	336°14.1	N20°34.0	84°36.6	N03°23.5
13	113°36.8	330°56.3	37.0	54°26.6	06.4	351°16.0	33.9	99°39.0	23.5
14	128°39.3	345°56.0	36.0	69°27.2	06.8	6°17.9	33.7	114°41.4	23.5
15	143°41.7	0°55.7	·· 35.1	84°27.8	·· 07.2	21°19.8	·· 33.6	129°43.7	·· 23.5
16	158°44.2	15°55.4	34.1	99°28.4	07.6	36°21.7	33.5	144°46.1	23.6
17	173°46.7	30°55.1	33.1	114°29.0	08.0	51°23.6	33.4	159°48.4	23.6
18	188°49.1	45°54.8	N16°32.2	129°29.6	N20°08.3	66°25.5	N20°33.3	174°50.8	N03°23.6
19	203°51.6	60°54.4	31.2	144°30.3	08.7	81°27.4	33.2	189°53.2	23.7
20	218°54.1	75°54.1	30.2	159°30.9	09.1	96°29.3	33.1	204°55.5	23.7
21	233°56.5	90°53.8	·· 29.3	174°31.5	·· 09.5	111°31.3	·· 33.0	219°57.9	·· 23.7
22	248°59.0	105°53.5	28.3	189°32.1	09.9	126°33.2	32.8	235°00.2	23.8
23	264°01.4	120°53.2	27.3	204°32.7	10.3	141°35.1	32.7	250°02.6	23.8
Mer.pass. 05:27		ν -0.3′	d 1.0′	m -4.05	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.78

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°03.9	135°52.9	N16°26.3	219°33.3	N20°10.7	156°37.0	N20°32.6	265°05.0	N03°23.8
1	294°06.4	150°52.6	25.4	234°34.0	11.1	171°38.9	32.5	280°07.3	23.9
2	309°08.8	165°52.3	24.4	249°34.6	11.5	186°40.8	32.4	295°09.7	23.9
3	324°11.3	180°52.0	·· 23.4	264°35.2	·· 11.8	201°42.7	·· 32.3	310°12.0	·· 23.9
4	339°13.8	195°51.6	22.4	279°35.8	12.2	216°44.6	32.2	325°14.4	24.0
5	354°16.2	210°51.3	21.5	294°36.4	12.6	231°46.5	32.1	340°16.8	24.0
6	9°18.7	225°51.0	N16°20.5	309°37.0	N20°13.0	246°48.4	N20°32.0	355°19.1	N03°24.0
7	24°21.2	240°50.7	19.5	324°37.6	13.4	261°50.3	31.8	10°21.5	24.0
8	39°23.6	255°50.4	18.5	339°38.3	13.8	276°52.2	31.7	25°23.8	24.1
9	54°26.1	270°50.1	·· 17.6	354°38.9	·· 14.2	291°54.1	·· 31.6	40°26.2	·· 24.1
10	69°28.5	285°49.8	16.6	9°39.5	14.5	306°56.0	31.5	55°28.6	24.1
11	84°31.0	300°49.5	15.6	24°40.1	14.9	321°57.9	31.4	70°30.9	24.2
12	99°33.5	315°49.2	N16°14.6	39°40.7	N20°15.3	336°59.8	N20°31.3	85°33.3	N03°24.2
13	114°35.9	330°48.9	13.6	54°41.3	15.7	352°01.7	31.2	100°35.7	24.2
14	129°38.4	345°48.6	12.7	69°41.9	16.1	7°03.6	31.1	115°38.0	24.3
15	144°40.9	0°48.3	·· 11.7	84°42.6	·· 16.5	22°05.5	·· 30.9	130°40.4	·· 24.3
16	159°43.3	15°48.0	10.7	99°43.2	16.8	37°07.4	30.8	145°42.7	24.3
17	174°45.8	30°47.7	09.7	114°43.8	17.2	52°09.3	30.7	160°45.1	24.4
18	189°48.3	45°47.4	N16°08.7	129°44.4	N20°17.6	67°11.3	N20°30.6	175°47.5	N03°24.4
19	204°50.7	60°47.1	07.7	144°45.0	18.0	82°13.2	30.5	190°49.8	24.4
20	219°53.2	75°46.8	06.7	159°45.6	18.4	97°15.1	30.4	205°52.2	24.4
21	234°55.7	90°46.5	·· 05.8	174°46.3	·· 18.7	112°17.0	·· 30.3	220°54.6	·· 24.5
22	249°58.1	105°46.2	04.8	189°46.9	19.1	127°18.9	30.2	235°56.9	24.5
23	265°00.6	120°45.9	03.8	204°47.5	19.5	142°20.8	30.0	250°59.3	24.5
Mer.pass. 05:23		ν -0.3′	d 1.0′	m -4.05	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.78

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°03.0	135°45.6	N16°02.8	219°48.1	N20°19.9	157°22.7	N20°29.9	266°01.6	N03°24.6
1	295°05.5	150°45.3	01.8	234°48.7	20.3	172°24.6	29.8	281°04.0	24.6
2	310°08.0	165°45.0	16°00.8	249°49.3	20.6	187°26.5	29.7	296°06.4	24.6
3	325°10.4	180°44.7	15°59.8	264°49.9	·· 21.0	202°28.4	·· 29.6	311°08.7	·· 24.7
4	340°12.9	195°44.4	58.8	279°50.6	21.4	217°30.3	29.5	326°11.1	24.7
5	355°15.4	210°44.2	57.8	294°51.2	21.8	232°32.2	29.4	341°13.5	24.7
6	10°17.8	225°43.9	N15°56.9	309°51.8	N20°22.2	247°34.1	N20°29.3	356°15.8	N03°24.7
7	25°20.3	240°43.6	55.9	324°52.4	22.5	262°36.0	29.1	11°18.2	24.8
8	40°22.8	255°43.3	54.9	339°53.0	22.9	277°37.9	29.0	26°20.6	24.8
9	55°25.2	270°43.0	·· 53.9	354°53.6	·· 23.3	292°39.8	·· 28.9	41°22.9	·· 24.8
10	70°27.7	285°42.7	52.9	9°54.2	23.7	307°41.7	28.8	56°25.3	24.9
11	85°30.2	300°42.4	51.9	24°54.9	24.0	322°43.6	28.7	71°27.7	24.9
12	100°32.6	315°42.1	N15°50.9	39°55.5	N20°24.4	337°45.5	N20°28.6	86°30.0	N03°24.9
13	115°35.1	330°41.9	49.9	54°56.1	24.8	352°47.4	28.5	101°32.4	24.9
14	130°37.5	345°41.6	48.9	69°56.7	25.2	7°49.3	28.4	116°34.8	25.0
15	145°40.0	0°41.3	·· 47.9	84°57.3	·· 25.5	22°51.2	·· 28.2	131°37.1	·· 25.0
16	160°42.5	15°41.0	46.9	99°57.9	25.9	37°53.1	28.1	146°39.5	25.0
17	175°44.9	30°40.7	45.9	114°58.5	26.3	52°55.0	28.0	161°41.9	25.1
18	190°47.4	45°40.4	N15°44.9	129°59.2	N20°26.7	67°56.9	N20°27.9	176°44.2	N03°25.1
19	205°49.9	60°40.2	43.9	144°59.8	27.0	82°58.8	27.8	191°46.6	25.1
20	220°52.3	75°39.9	42.9	160°00.4	27.4	98°00.7	27.7	206°49.0	25.1
21	235°54.8	90°39.6	·· 41.9	175°01.0	·· 27.8	113°02.6	·· 27.6	221°51.3	·· 25.2
22	250°57.3	105°39.3	40.9	190°01.6	28.2	128°04.6	27.4	236°53.7	25.2
23	265°59.7	120°39.0	39.9	205°02.2	28.5	143°06.5	27.3	251°56.1	25.2
Mer.pass. 05:19		ν -0.3′	d 1.0′	m -4.06	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.77

Stars

	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°05.9	-42°09.4
Schedar	349°29.6	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°42.2	89°22.3
Acamar	315°11.1	-40°11.7
Menkar	314°05.1	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.8	-69°49.7
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°57.0
Kochab	137°19.2	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.4
Enif	33°37.4	9°59.8
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°13.0	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.5	15°20.9

Jun 30 Tue	SHA	Mer.pass
Venus	217°55.8	14:56
Mars	301°13.8	09:22
Jupiter	237°46.5	13:35
Saturn	346°03.6	06:22

Jul 01 Wed	SHA	Mer.pass
Venus	216°49.0	14:57
Mars	300°29.4	09:21
Jupiter	237°33.1	13:32
Saturn	346°01.0	06:19

Jul 02 Thu	SHA	Mer.pass
Venus	215°42.6	14:57
Mars	299°45.0	09:20
Jupiter	237°19.6	13:29
Saturn	345°58.6	06:15

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°06.0	N23°10.9	358°47.3	10.3′	S27°13.6	3.6′	54.0′
1	194°05.9	10.7	13°16.6	10.3′	27°10.0	3.7′	54.0′
2	209°05.7	10.6	27°45.8	10.3′	27°06.3	3.8′	54.1′
3	224°05.6	·· 10.4	42°15.2	10.3′	27°02.5	4.0′	54.1′
4	239°05.5	10.3	56°44.5	10.4′	26°58.5	4.1′	54.1′
5	254°05.4	10.1	71°13.9	10.4′	26°54.4	4.2′	54.1′
6	269°05.2	N23°10.0	85°43.3	10.4′	S26°50.2	4.4′	54.1′
7	284°05.1	09.8	100°12.7	10.5′	26°45.8	4.5′	54.1′
8	299°05.0	09.7	114°42.2	10.5′	26°41.3	4.6′	54.1′
9	314°04.9	·· 09.5	129°11.7	10.5′	26°36.7	4.7′	54.1′
10	329°04.7	09.3	143°41.2	10.6′	26°32.0	4.9′	54.1′
11	344°04.6	09.2	158°10.8	10.6′	26°27.1	5.0′	54.1′
12	359°04.5	N23°09.0	172°40.4	10.7′	S26°22.1	5.1′	54.1′
13	14°04.4	08.9	187°10.1	10.7′	26°17.0	5.3′	54.1′
14	29°04.3	08.7	201°39.7	10.7′	26°11.7	5.3′	54.1′
15	44°04.1	·· 08.6	216°09.5	10.8′	26°06.4	5.5′	54.2′
16	59°04.0	08.4	230°39.3	10.8′	26°00.9	5.7′	54.2′
17	74°03.9	08.2	245°09.1	10.9′	25°55.2	5.7′	54.2′
18	89°03.8	N23°08.1	259°38.9	10.9′	S25°49.5	5.9′	54.2′
19	104°03.7	07.9	274°08.8	10.9′	25°43.6	6.0′	54.2′
20	119°03.5	07.8	288°38.8	11.0′	25°37.6	6.1′	54.2′
21	134°03.4	·· 07.6	303°08.8	11.0′	25°31.5	6.2′	54.2′
22	149°03.3	07.4	317°38.8	11.1′	25°25.3	6.4′	54.2′
23	164°03.2	07.3	332°08.9	11.1′	25°18.9	6.5′	54.2′
	SD = 15.7′	d = 0.1′		SD = 14.7′			

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°03.0	N23°07.1	346°39.0	11.2′	S25°12.4	6.6′	54.2′
1	194°02.9	06.9	1°09.2	11.2′	25°05.8	6.7′	54.2′
2	209°02.8	06.8	15°39.4	11.3′	24°59.1	6.8′	54.3′
3	224°02.7	·· 06.6	30°09.7	11.3′	24°52.3	7.0′	54.3′
4	239°02.6	06.4	44°40.0	11.4′	24°45.3	7.0′	54.3′
5	254°02.4	06.3	59°10.4	11.4′	24°38.3	7.2′	54.3′
6	269°02.3	N23°06.1	73°40.8	11.5′	S24°31.1	7.3′	54.3′
7	284°02.2	05.9	88°11.2	11.5′	24°23.8	7.4′	54.3′
8	299°02.1	05.8	102°41.8	11.6′	24°16.4	7.6′	54.3′
9	314°02.0	·· 05.6	117°12.3	11.6′	24°08.8	7.6′	54.3′
10	329°01.8	05.4	131°43.0	11.7′	24°01.2	7.8′	54.3′
11	344°01.7	05.3	146°13.6	11.7′	23°53.4	7.8′	54.4′
12	359°01.6	N23°05.1	160°44.4	11.8′	S23°45.6	8.0′	54.4′
13	14°01.5	04.9	175°15.1	11.8′	23°37.6	8.1′	54.4′
14	29°01.4	04.7	189°46.0	11.9′	23°29.5	8.2′	54.4′
15	44°01.2	·· 04.6	204°16.8	11.9′	23°21.3	8.3′	54.4′
16	59°01.1	04.4	218°47.8	12.0′	23°13.0	8.4′	54.4′
17	74°01.0	04.2	233°18.8	12.0′	23°04.6	8.6′	54.4′
18	89°00.9	N23°04.0	247°49.8	12.1′	S22°56.0	8.6′	54.4′
19	104°00.8	03.9	262°20.9	12.1′	22°47.4	8.7′	54.5′
20	119°00.7	03.7	276°52.1	12.2′	22°38.7	8.9′	54.5′
21	134°00.5	·· 03.5	291°23.3	12.3′	22°29.8	8.9′	54.5′
22	149°00.4	03.3	305°54.5	12.3′	22°20.9	9.1′	54.5′
23	164°00.3	03.1	320°25.8	12.4′	22°11.8	9.1′	54.5′
	SD = 15.7′	d = 0.2′		SD = 14.8′			

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°00.2	N23°03.0	334°57.2	12.4′	S22°02.7	9.3′	54.5′
1	194°00.1	02.8	349°28.6	12.5′	21°53.4	9.3′	54.5′
2	208°59.9	02.6	4°00.1	12.5′	21°44.1	9.5′	54.5′
3	223°59.8	·· 02.4	18°31.6	12.6′	21°34.6	9.6′	54.6′
4	238°59.7	02.2	33°03.2	12.6′	21°25.0	9.6′	54.6′
5	253°59.6	02.0	47°34.8	12.7′	21°15.4	9.8′	54.6′
6	268°59.5	N23°01.9	62°06.5	12.7′	S21°05.6	9.8′	54.6′
7	283°59.4	01.7	76°38.3	12.8′	20°55.8	10.0′	54.6′
8	298°59.2	01.5	91°10.1	12.8′	20°45.8	10.0′	54.6′
9	313°59.1	·· 01.3	105°41.9	12.9′	20°35.8	10.1′	54.6′
10	328°59.0	01.1	120°13.8	13.0′	20°25.7	10.3′	54.7′
11	343°58.9	00.9	134°45.8	13.0′	20°15.4	10.3′	54.7′
12	358°58.8	N23°00.7	149°17.8	13.1′	S20°05.1	10.4′	54.7′
13	13°58.7	00.5	163°49.8	13.1′	19°54.7	10.5′	54.7′
14	28°58.5	00.3	178°21.9	13.2′	19°44.2	10.6′	54.7′
15	43°58.4	·· 00.2	192°54.1	13.2′	19°33.6	10.7′	54.7′
16	58°58.3	23°00.0	207°26.3	13.3′	19°22.9	10.8′	54.8′
17	73°58.2	22°59.8	221°58.6	13.3′	19°12.1	10.8′	54.8′
18	88°58.1	N22°59.6	236°30.9	13.4′	S19°01.3	11.0′	54.8′
19	103°58.0	59.4	251°03.3	13.4′	18°50.3	11.0′	54.8′
20	118°57.8	59.2	265°35.7	13.5′	18°39.3	11.2′	54.8′
21	133°57.7	·· 59.0	280°08.2	13.5′	18°28.1	11.2′	54.8′
22	148°57.6	58.8	294°40.7	13.6′	18°16.9	11.3′	54.8′
23	163°57.5	58.6	309°13.2	13.6′	18°05.6	11.3′	54.9′
	SD = 15.7′	d = 0.2′		SD = 14.9′			

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°						
N 70°						
68°						
66°	////	////	00:20	23:40	////	////
64°	////	////	01:41	22:25	////	////
62°	////	////	02:17	21:50	////	////
60°	////	01:03	02:42	21:25	23:02	////
N 58°	////	01:49	03:02	21:05	22:18	////
56°	////	02:17	03:18	20:49	21:50	////
54°	00:58	02:39	03:32	20:35	21:29	23:08
52°	01:40	02:56	03:44	20:23	21:11	22:27
50°	02:06	03:11	03:55	20:12	20:57	22:01
45°	02:51	03:40	04:17	19:50	20:28	21:17
N 40°	03:21	04:02	04:35	19:33	20:05	20:47
35°	03:44	04:20	04:50	19:18	19:48	20:24
30°	04:02	04:35	05:02	19:05	19:33	20:06
20°	04:31	05:00	05:24	18:44	19:08	19:37
N 10°	04:53	05:20	05:43	18:25	18:48	19:15
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	05:28	05:55	06:17	17:50	18:13	18:39
20°	05:44	06:12	06:36	17:32	17:56	18:24
30°	06:00	06:30	06:57	17:11	17:38	18:07
35°	06:09	06:41	07:09	16:59	17:27	17:59
40°	06:18	06:52	07:23	16:45	17:16	17:50
45°	06:28	07:06	07:39	16:29	17:02	17:40
S 50°	06:40	07:21	08:00	16:08	16:47	17:28
52°	06:45	07:29	08:09	15:59	16:39	17:23
54°	06:51	07:37	08:20	15:48	16:31	17:17
56°	06:57	07:46	08:32	15:35	16:22	17:11
58°	07:03	07:56	08:47	15:21	16:12	17:05
S 60°	07:11	08:07	09:04	15:04	16:01	16:57

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°						
N 70°						
68°			01:23 23:59			02:19
66°			00:04 23:33			03:37
64°	23:56	23:27	23:13		02:03	04:13
62°	23:05	23:00	22:56	01:05	02:55	04:39
60°	22:33	22:39	22:42	01:57	03:26	04:59
N 58°	22:09	22:22	22:30	02:29	03:49	05:16
56°	21:49	22:08	22:20	02:53	04:08	05:30
54°	21:33	21:55	22:10	03:12	04:24	05:42
52°	21:19	21:44	22:02	03:28	04:38	05:52
50°	21:07	21:34	21:55	03:42	04:50	06:01
45°	20:42	21:13	21:39	04:10	05:14	06:21
N 40°	20:21	20:56	21:26	04:33	05:34	06:37
35°	20:05	20:42	21:14	04:51	05:50	06:50
30°	19:50	20:30	21:05	05:07	06:04	07:02
20°	19:25	20:08	20:48	05:33	06:28	07:22
N 10°	19:03	19:50	20:33	05:56	06:48	07:39
0°	18:43	19:32	20:19	06:17	07:07	07:55
S 10°	18:23	19:15	20:05	06:38	07:26	08:11
20°	18:01	18:56	19:49	07:01	07:46	08:27
30°	17:36	18:34	19:32	07:27	08:09	08:47
35°	17:21	18:21	19:22	07:43	08:23	08:58
40°	17:04	18:06	19:10	08:00	08:38	09:10
45°	16:43	17:49	18:56	08:22	08:57	09:25
S 50°	16:17	17:27	18:40	08:49	09:20	09:44
52°	16:04	17:16	18:32	09:02	09:31	09:52
54°	15:49	17:04	18:23	09:17	09:43	10:02
56°	15:32	16:50	18:13	09:35	09:58	10:12
58°	15:11	16:34	18:01	09:56	10:14	10:25
S 60°	14:44	16:15	17:48	10:23	10:34	10:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 15-17 100-96%
30	03:36	03:42	12:04	00:05	12:30	
01	03:48	03:54	12:04	00:55	13:20	
02	03:59	04:05	12:04	01:43	14:07	

July 03, 04, 05 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281°02.2	135°38.8	N15°38.9	220°02.8	N20°28.9	158°08.4	N20°27.2	266°58.4	N03°25.3
1	296°04.7	150°38.5	37.9	235°03.4	29.3	173°10.3	27.1	282°00.8	25.3
2	311°07.1	165°38.2	36.9	250°04.1	29.6	188°12.2	27.0	297°03.2	25.3
3	326°09.6	180°37.9	·· 35.9	265°04.7	·· 30.0	203°14.1	·· 26.9	312°05.5	·· 25.3
4	341°12.0	195°37.7	34.9	280°05.3	30.4	218°16.0	26.8	327°07.9	25.4
5	356°14.5	210°37.4	33.9	295°05.9	30.8	233°17.9	26.7	342°10.3	25.4
6	11°17.0	225°37.1	N15°32.9	310°06.5	N20°31.1	248°19.8	N20°26.5	357°12.6	N03°25.4
7	26°19.4	240°36.8	31.9	325°07.1	31.5	263°21.7	26.4	12°15.0	25.4
8	41°21.9	255°36.6	30.8	340°07.7	31.9	278°23.6	26.3	27°17.4	25.5
9	56°24.4	270°36.3	·· 29.8	355°08.4	·· 32.2	293°25.5	·· 26.2	42°19.7	·· 25.5
10	71°26.8	285°36.0	28.8	10°09.0	32.6	308°27.4	26.1	57°22.1	25.5
11	86°29.3	300°35.8	27.8	25°09.6	33.0	323°29.3	26.0	72°24.5	25.6
12	101°31.8	315°35.5	N15°26.8	40°10.2	N20°33.3	338°31.2	N20°25.9	87°26.9	N03°25.6
13	116°34.2	330°35.2	25.8	55°10.8	33.7	353°33.1	25.7	102°29.2	25.6
14	131°36.7	345°35.0	24.8	70°11.4	34.1	8°35.0	25.6	117°31.6	25.6
15	146°39.1	0°34.7	·· 23.8	85°12.0	·· 34.4	23°36.9	·· 25.5	132°34.0	·· 25.7
16	161°41.6	15°34.4	22.8	100°12.6	34.8	38°38.8	25.4	147°36.3	25.7
17	176°44.1	30°34.2	21.7	115°13.3	35.2	53°40.7	25.3	162°38.7	25.7
18	191°46.5	45°33.9	N15°20.7	130°13.9	N20°35.5	68°42.6	N20°25.2	177°41.1	N03°25.7
19	206°49.0	60°33.6	19.7	145°14.5	35.9	83°44.5	25.1	192°43.4	25.8
20	221°51.5	75°33.4	18.7	160°15.1	36.3	98°46.4	24.9	207°45.8	25.8
21	236°53.9	90°33.1	·· 17.7	175°15.7	·· 36.6	113°48.3	·· 24.8	222°48.2	·· 25.8
22	251°56.4	105°32.8	16.7	190°16.3	37.0	128°50.2	24.7	237°50.6	25.9
23	266°58.9	120°32.6	15.7	205°16.9	37.3	143°52.1	24.6	252°52.9	25.9
Mer.pass.	05:15	ν -0.3′	d 1.0′	m -4.06	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.77

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°01.3	135°32.3	N15°14.6	220°17.6	N20°37.7	158°54.0	N20°24.5	267°55.3	N03°25.9
1	297°03.8	150°32.1	13.6	235°18.2	38.1	173°55.9	24.4	282°57.7	25.9
2	312°06.3	165°31.8	12.6	250°18.8	38.4	188°57.8	24.3	298°00.0	26.0
3	327°08.7	180°31.5	·· 11.6	265°19.4	·· 38.8	203°59.7	·· 24.1	313°02.4	·· 26.0
4	342°11.2	195°31.3	10.6	280°20.0	39.2	219°01.6	24.0	328°04.8	26.0
5	357°13.6	210°31.0	09.5	295°20.6	39.5	234°03.5	23.9	343°07.2	26.0
6	12°16.1	225°30.8	N15°08.5	310°21.2	N20°39.9	249°05.4	N20°23.8	358°09.5	N03°26.1
7	27°18.6	240°30.5	07.5	325°21.8	40.2	264°07.3	23.7	13°11.9	26.1
8	42°21.0	255°30.3	06.5	340°22.5	40.6	279°09.2	23.6	28°14.3	26.1
9	57°23.5	270°30.0	·· 05.5	355°23.1	·· 41.0	294°11.1	·· 23.4	43°16.7	·· 26.1
10	72°26.0	285°29.7	04.4	10°23.7	41.3	309°13.0	23.3	58°19.0	26.2
11	87°28.4	300°29.5	03.4	25°24.3	41.7	324°14.9	23.2	73°21.4	26.2
12	102°30.9	315°29.2	N15°02.4	40°24.9	N20°42.0	339°16.8	N20°23.1	88°23.8	N03°26.2
13	117°33.4	330°29.0	01.4	55°25.5	42.4	354°18.7	23.0	103°26.1	26.2
14	132°35.8	345°28.7	15°00.3	70°26.1	42.8	9°20.6	22.9	118°28.5	26.3
15	147°38.3	0°28.5	14°59.3	85°26.7	·· 43.1	24°22.5	·· 22.8	133°30.9	·· 26.3
16	162°40.8	15°28.2	58.3	100°27.4	43.5	39°24.4	22.6	148°33.3	26.3
17	177°43.2	30°28.0	57.3	115°28.0	43.8	54°26.3	22.5	163°35.6	26.3
18	192°45.7	45°27.7	N14°56.2	130°28.6	N20°44.2	69°28.2	N20°22.4	178°38.0	N03°26.4
19	207°48.1	60°27.5	55.2	145°29.2	44.5	84°30.1	22.3	193°40.4	26.4
20	222°50.6	75°27.3	54.2	160°29.8	44.9	99°32.0	22.2	208°42.8	26.4
21	237°53.1	90°27.0	·· 53.1	175°30.4	·· 45.3	114°33.9	·· 22.1	223°45.1	·· 26.4
22	252°55.5	105°26.8	52.1	190°31.0	45.6	129°35.8	22.0	238°47.5	26.5
23	267°58.0	120°26.5	51.1	205°31.6	46.0	144°37.7	21.8	253°49.9	26.5
Mer.pass.	05:11	ν -0.3′	d 1.0′	m -4.07	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.81	ν 2.4′	d 0.0′ m 0.76

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°00.5	135°26.3	N14°50.0	220°32.3	N20°46.3	159°39.7	N20°21.7	268°52.3	N03°26.5
1	298°02.9	150°26.0	49.0	235°32.9	46.7	174°41.6	21.6	283°54.6	26.5
2	313°05.4	165°25.8	48.0	250°33.5	47.0	189°43.5	21.5	298°57.0	26.6
3	328°07.9	180°25.5	·· 47.0	265°34.1	·· 47.4	204°45.4	·· 21.4	313°59.4	·· 26.6
4	343°10.3	195°25.3	45.9	280°34.7	47.7	219°47.3	21.3	329°01.8	26.6
5	358°12.8	210°25.1	44.9	295°35.3	48.1	234°49.2	21.1	344°04.1	26.6
6	13°15.2	225°24.8	N14°43.8	310°35.9	N20°48.4	249°51.1	N20°21.0	359°06.5	N03°26.7
7	28°17.7	240°24.6	42.8	325°36.5	48.8	264°53.0	20.9	14°08.9	26.7
8	43°20.2	255°24.3	41.8	340°37.1	49.1	279°54.9	20.8	29°11.3	26.7
9	58°22.6	270°24.1	·· 40.7	355°37.8	·· 49.5	294°56.8	·· 20.7	44°13.6	·· 26.7
10	73°25.1	285°23.9	39.7	10°38.4	49.9	309°58.7	20.6	59°16.0	26.8
11	88°27.6	300°23.6	38.7	25°39.0	50.2	325°00.6	20.4	74°18.4	26.8
12	103°30.0	315°23.4	N14°37.6	40°39.6	N20°50.6	340°02.5	N20°20.3	89°20.8	N03°26.8
13	118°32.5	330°23.2	36.6	55°40.2	50.9	355°04.4	20.2	104°23.2	26.8
14	133°35.0	345°22.9	35.6	70°40.8	51.3	10°06.3	20.1	119°25.5	26.9
15	148°37.4	0°22.7	·· 34.5	85°41.4	·· 51.6	25°08.2	·· 20.0	134°27.9	·· 26.9
16	163°39.9	15°22.5	33.5	100°42.0	52.0	40°10.1	19.9	149°30.3	26.9
17	178°42.4	30°22.2	32.4	115°42.7	52.3	55°12.0	19.8	164°32.7	26.9
18	193°44.8	45°22.0	N14°31.4	130°43.3	N20°52.6	70°13.9	N20°19.6	179°35.0	N03°27.0
19	208°47.3	60°21.8	30.3	145°43.9	53.0	85°15.8	19.5	194°37.4	27.0
20	223°49.7	75°21.5	29.3	160°44.5	53.3	100°17.7	19.4	209°39.8	27.0
21	238°52.2	90°21.3	·· 28.3	175°45.1	·· 53.7	115°19.6	·· 19.3	224°42.2	·· 27.0
22	253°54.7	105°21.1	27.2	190°45.7	54.0	130°21.5	19.2	239°44.6	27.1
23	268°57.1	120°20.9	26.2	205°46.3	54.4	145°23.4	19.1	254°46.9	27.1
Mer.pass.	05:07	ν -0.2′	d 1.0′	m -4.07	ν 0.6′	d 0.4′	m 1.30	ν 1.9′	d 0.1′ m -1.80	ν 2.4′	d 0.0′ m 0.76

Stars

	SHA	Dec
Alpheratz	357°33.4	29°14.1
Ankaa	353°05.9	-42°09.4
Schedar	349°29.6	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.4	-57°05.8
Hamal	327°49.9	23°35.2
Polaris	313°40.9	89°22.3
Acamar	315°11.1	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.8	-69°49.7
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.3	-60°57.0
Kochab	137°19.2	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.3
Peacock	53°03.2	-56°38.8
Deneb	49°24.5	45°22.4
Enif	33°37.3	9°59.8
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°13.0	-29°28.7
Scheat	13°43.8	28°13.5
Markab	13°28.5	15°20.9

Jul 03 Fri	SHA	Mer.pass
Venus	214°36.6	14:58
Mars	299°00.6	09:19
Jupiter	237°06.2	13:26
Saturn	345°56.2	06:11

Jul 04 Sat	SHA	Mer.pass
Venus	213°31.0	14:58
Mars	298°16.2	09:18
Jupiter	236°52.7	13:23
Saturn	345°54.0	06:07

Jul 05 Sun	SHA	Mer.pass
Venus	212°25.8	14:58
Mars	297°31.8	09:17
Jupiter	236°39.2	13:20
Saturn	345°51.8	06:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°57.4	N22°58.4	323°45.9	13.7′	S17°54.3	11.5′	54.9′
1	193°57.3	58.2	338°18.5	13.7′	17°42.8	11.5′	54.9′
2	208°57.1	58.0	352°51.2	13.8′	17°31.3	11.7′	54.9′
3	223°57.0	·· 57.8	7°24.0	13.8′	17°19.6	11.6′	54.9′
4	238°56.9	57.6	21°56.8	13.8′	17°08.0	11.8′	55.0′
5	253°56.8	57.4	36°29.6	13.9′	16°56.2	11.9′	55.0′
6	268°56.7	N22°57.2	51°02.5	13.9′	S16°44.3	11.9′	55.0′
7	283°56.6	57.0	65°35.5	14.0′	16°32.4	12.0′	55.0′
8	298°56.5	56.8	80°08.5	14.0′	16°20.4	12.1′	55.0′
9	313°56.3	·· 56.6	94°41.5	14.1′	16°08.3	12.2′	55.0′
10	328°56.2	56.4	109°14.5	14.1′	15°56.1	12.2′	55.1′
11	343°56.1	56.2	123°47.7	14.2′	15°43.9	12.3′	55.1′
12	358°56.0	N22°56.0	138°20.8	14.2′	S15°31.6	12.4′	55.1′
13	13°55.9	55.8	152°54.0	14.2′	15°19.2	12.4′	55.1′
14	28°55.8	55.6	167°27.2	14.3′	15°06.8	12.6′	55.1′
15	43°55.7	·· 55.3	182°00.5	14.3′	14°54.2	12.5′	55.2′
16	58°55.5	55.1	196°33.8	14.4′	14°41.7	12.7′	55.2′
17	73°55.4	54.9	211°07.2	14.4′	14°29.0	12.7′	55.2′
18	88°55.3	N22°54.7	225°40.6	14.4′	S14°16.3	12.8′	55.2′
19	103°55.2	54.5	240°14.0	14.5′	14°03.5	12.9′	55.2′
20	118°55.1	54.3	254°47.5	14.5′	13°50.6	12.9′	55.3′
21	133°55.0	·· 54.1	269°21.0	14.5′	13°37.7	13.0′	55.3′
22	148°54.9	53.9	283°54.5	14.6′	13°24.7	13.0′	55.3′
23	163°54.8	53.7	298°28.0	14.6′	13°11.7	13.2′	55.3′
	SD = 15.7′	d = 0.2′	SD = 15.0′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°54.6	N22°53.4	313°01.6	14.6′	S12°58.5	13.1′	55.3′
1	193°54.5	53.2	327°35.3	14.7′	12°45.4	13.3′	55.4′
2	208°54.4	53.0	342°08.9	14.7′	12°32.1	13.3′	55.4′
3	223°54.3	·· 52.8	356°42.6	14.7′	12°18.8	13.3′	55.4′
4	238°54.2	52.6	11°16.3	14.7′	12°05.5	13.4′	55.4′
5	253°54.1	52.4	25°50.1	14.8′	11°52.1	13.5′	55.4′
6	268°54.0	N22°52.1	40°23.8	14.8′	S11°38.6	13.5′	55.5′
7	283°53.9	51.9	54°57.6	14.8′	11°25.1	13.6′	55.5′
8	298°53.8	51.7	69°31.5	14.8′	11°11.5	13.7′	55.5′
9	313°53.6	·· 51.5	84°05.3	14.9′	10°57.8	13.7′	55.5′
10	328°53.5	51.3	98°39.2	14.9′	10°44.1	13.7′	55.5′
11	343°53.4	51.0	113°13.1	14.9′	10°30.4	13.8′	55.6′
12	358°53.3	N22°50.8	127°47.0	14.9′	S10°16.6	13.9′	55.6′
13	13°53.2	50.6	142°21.0	15.0′	10°02.7	13.9′	55.6′
14	28°53.1	50.4	156°54.9	15.0′	09°48.8	13.9′	55.6′
15	43°53.0	·· 50.1	171°28.9	15.0′	09°34.9	14.0′	55.7′
16	58°52.9	49.9	186°02.9	15.0′	09°20.9	14.1′	55.7′
17	73°52.8	49.7	200°36.9	15.0′	09°06.8	14.1′	55.7′
18	88°52.6	N22°49.5	215°10.9	15.0′	S08°52.7	14.1′	55.7′
19	103°52.5	49.2	229°45.0	15.1′	08°38.6	14.2′	55.8′
20	118°52.4	49.0	244°19.0	15.1′	08°24.4	14.3′	55.8′
21	133°52.3	·· 48.8	258°53.1	15.1′	08°10.1	14.3′	55.8′
22	148°52.2	48.5	273°27.2	15.1′	07°55.8	14.3′	55.8′
23	163°52.1	48.3	288°01.3	15.1′	07°41.5	14.4′	55.9′
	SD = 15.7′	d = 0.2′	SD = 15.1′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°52.0	N22°48.1	302°35.4	15.1′	S07°27.1	14.4′	55.9′
1	193°51.9	47.8	317°09.5	15.1′	07°12.7	14.4′	55.9′
2	208°51.8	47.6	331°43.6	15.1′	06°58.3	14.5′	55.9′
3	223°51.7	·· 47.4	346°17.7	15.1′	06°43.8	14.5′	56.0′
4	238°51.6	47.2	0°51.8	15.1′	06°29.3	14.6′	56.0′
5	253°51.4	46.9	15°26.0	15.1′	06°14.7	14.6′	56.0′
6	268°51.3	N22°46.7	30°00.1	15.1′	S06°00.1	14.7′	56.0′
7	283°51.2	46.4	44°34.2	15.1′	05°45.4	14.7′	56.1′
8	298°51.1	46.2	59°08.4	15.1′	05°30.7	14.7′	56.1′
9	313°51.0	·· 46.0	73°42.5	15.1′	05°16.0	14.7′	56.1′
10	328°50.9	45.7	88°16.6	15.1′	05°01.3	14.8′	56.1′
11	343°50.8	45.5	102°50.8	15.1′	04°46.5	14.8′	56.2′
12	358°50.7	N22°45.3	117°24.9	15.1′	S04°31.7	14.9′	56.2′
13	13°50.6	45.0	131°59.0	15.1′	04°16.8	14.8′	56.2′
14	28°50.5	44.8	146°33.1	15.1′	04°02.0	14.9′	56.2′
15	43°50.4	·· 44.5	161°07.3	15.1′	03°47.1	15.0′	56.3′
16	58°50.3	44.3	175°41.4	15.1′	03°32.1	14.9′	56.3′
17	73°50.2	44.0	190°15.4	15.1′	03°17.2	15.0′	56.3′
18	88°50.1	N22°43.8	204°49.5	15.1′	S03°02.2	15.1′	56.3′
19	103°49.9	43.6	219°23.6	15.1′	02°47.1	15.0′	56.4′
20	118°49.8	43.3	233°57.6	15.0′	02°32.1	15.1′	56.4′
21	133°49.7	·· 43.1	248°31.7	15.0′	02°17.0	15.1′	56.4′
22	148°49.6	42.8	263°05.7	15.0′	02°01.9	15.1′	56.5′
23	163°49.5	42.6	277°39.7	15.0′	01°46.8	15.1′	56.5′
	SD = 15.7′	d = 0.2′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	00:41	23:22	////	////
64°	////	////	01:47	22:20	////	////
62°	////	////	02:21	21:47	////	////
60°	////	01:11	02:46	21:22	22:55	////
N 58°	////	01:53	03:05	21:03	22:14	////
56°	////	02:21	03:21	20:47	21:47	////
54°	01:05	02:42	03:35	20:34	21:27	23:01
52°	01:44	02:59	03:47	20:22	21:10	22:24
50°	02:10	03:13	03:57	20:11	20:55	21:58
45°	02:53	03:42	04:19	19:50	20:27	21:15
N 40°	03:23	04:04	04:36	19:32	20:05	20:46
35°	03:45	04:22	04:51	19:18	19:47	20:23
30°	04:03	04:36	05:04	19:05	19:32	20:05
20°	04:32	05:01	05:25	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:31	18:57
S 10°	05:29	05:55	06:18	17:51	18:14	18:40
20°	05:45	06:12	06:36	17:33	17:57	18:24
30°	06:01	06:30	06:56	17:13	17:39	18:08
35°	06:09	06:41	07:09	17:01	17:29	18:00
40°	06:18	06:52	07:22	16:47	17:17	17:51
45°	06:28	07:05	07:39	16:30	17:04	17:41
S 50°	06:39	07:21	07:59	16:10	16:49	17:30
52°	06:44	07:28	08:08	16:01	16:41	17:25
54°	06:50	07:36	08:19	15:50	16:34	17:19
56°	06:56	07:44	08:31	15:38	16:25	17:13
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:09	08:05	09:02	15:07	16:04	17:00

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	01:43	00:10 23:27	22:53	03:38	06:43	08:58
N 70°	00:36 23:47	23:16	22:50	04:43	07:04	09:06
68°	23:29	23:07	22:48	05:18	07:20	09:12
66°	23:14	23:00	22:47	05:43	07:33	09:17
64°	23:02	22:53	22:45	06:03	07:44	09:22
62°	22:52	22:48	22:44	06:18	07:53	09:26
60°	22:43	22:43	22:43	06:31	08:01	09:29
N 58°	22:35	22:39	22:42	06:42	08:08	09:32
56°	22:28	22:35	22:41	06:52	08:14	09:35
54°	22:22	22:31	22:40	07:00	08:19	09:37
52°	22:16	22:28	22:39	07:08	08:24	09:39
50°	22:11	22:25	22:38	07:15	08:28	09:41
45°	22:00	22:19	22:37	07:29	08:37	09:45
N 40°	21:51	22:14	22:36	07:41	08:45	09:49
35°	21:43	22:09	22:34	07:51	08:52	09:52
30°	21:36	22:05	22:34	08:00	08:57	09:55
20°	21:24	21:58	22:32	08:15	09:07	09:59
N 10°	21:13	21:52	22:30	08:28	09:16	10:03
0°	21:03	21:46	22:29	08:40	09:24	10:07
S 10°	20:53	21:40	22:28	08:52	09:32	10:10
20°	20:42	21:34	22:26	09:05	09:40	10:14
30°	20:30	21:27	22:24	09:20	09:50	10:18
35°	20:23	21:23	22:23	09:28	09:55	10:21
40°	20:14	21:18	22:22	09:38	10:01	10:24
45°	20:05	21:13	22:21	09:49	10:09	10:27
S 50°	19:53	21:06	22:20	10:02	10:17	10:30
52°	19:47	21:03	22:19	10:08	10:21	10:32
54°	19:41	21:00	22:18	10:15	10:25	10:34
56°	19:35	20:56	22:17	10:23	10:30	10:36
58°	19:27	20:52	22:16	10:31	10:35	10:38
S 60°	19:18	20:47	22:15	10:41	10:41	10:41

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 92-78%
03	04:10	04:16	12:04	02:29	14:52	
04	04:21	04:27	12:04	03:14	15:35	
05	04:32	04:37	12:05	03:56	16:18	

July 06, 07, 08 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°59.6	135°20.6	N14°25.1	220°46.9	N20°54.7	160°25.3	N20°18.9	269°49.3	N03°27.1
1	299°02.1	150°20.4	24.1	235°47.5	55.1	175°27.2	18.8	284°51.7	27.1
2	314°04.5	165°20.2	23.0	250°48.2	55.4	190°29.1	18.7	299°54.1	27.1
3	329°07.0	180°20.0	·· 22.0	265°48.8	·· 55.8	205°31.0	·· 18.6	314°56.4	·· 27.2
4	344°09.5	195°19.7	20.9	280°49.4	56.1	220°32.9	18.5	329°58.8	27.2
5	359°11.9	210°19.5	19.9	295°50.0	56.5	235°34.8	18.4	345°01.2	27.2
6	14°14.4	225°19.3	N14°18.9	310°50.6	N20°56.8	250°36.7	N20°18.2	0°03.6	N03°27.2
7	29°16.9	240°19.1	17.8	325°51.2	57.1	265°38.6	18.1	15°06.0	27.3
8	44°19.3	255°18.8	16.8	340°51.8	57.5	280°40.5	18.0	30°08.3	27.3
9	59°21.8	270°18.6	·· 15.7	355°52.4	·· 57.8	295°42.4	·· 17.9	45°10.7	·· 27.3
10	74°24.2	285°18.4	14.7	10°53.0	58.2	310°44.3	17.8	60°13.1	27.3
11	89°26.7	300°18.2	13.6	25°53.7	58.5	325°46.2	17.7	75°15.5	27.4
12	104°29.2	315°18.0	N14°12.6	40°54.3	N20°58.9	340°48.1	N20°17.5	90°17.9	N03°27.4
13	119°31.6	330°17.7	11.5	55°54.9	59.2	355°50.0	17.4	105°20.2	27.4
14	134°34.1	345°17.5	10.5	70°55.5	59.5	10°51.9	17.3	120°22.6	27.4
15	149°36.6	0°17.3	·· 09.4	85°56.1	20°59.9	25°53.8	·· 17.2	135°25.0	·· 27.4
16	164°39.0	15°17.1	08.3	100°56.7	21°00.2	40°55.7	17.1	150°27.4	27.5
17	179°41.5	30°16.9	07.3	115°57.3	00.6	55°57.6	17.0	165°29.8	27.5
18	194°44.0	45°16.7	N14°06.2	130°57.9	N21°00.9	70°59.5	N20°16.8	180°32.2	N03°27.5
19	209°46.4	60°16.5	05.2	145°58.5	01.2	86°01.4	16.7	195°34.5	27.5
20	224°48.9	75°16.2	04.1	160°59.2	01.6	101°03.3	16.6	210°36.9	27.6
21	239°51.3	90°16.0	·· 03.1	175°59.8	·· 01.9	116°05.2	·· 16.5	225°39.3	·· 27.6
22	254°53.8	105°15.8	02.0	191°00.4	02.3	131°07.1	16.4	240°41.7	27.6
23	269°56.3	120°15.6	01.0	206°01.0	02.6	146°09.0	16.3	255°44.1	27.6
Mer.pass. 05:03		ν -0.2′	d 1.0′	ν 0.6′	d 0.3′	ν 1.9′	d 0.1′	ν 2.4′	d 0.0′
		m -4.08		m 1.30		m -1.80		m 0.75	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	284°58.7	135°15.4	N13°59.9	221°01.6	N21°02.9	161°10.9	N20°16.1	270°46.4	N03°27.6
1	300°01.2	150°15.2	58.8	236°02.2	03.3	176°12.8	16.0	285°48.8	27.7
2	315°03.7	165°15.0	57.8	251°02.8	03.6	191°14.7	15.9	300°51.2	27.7
3	330°06.1	180°14.8	·· 56.7	266°03.4	·· 04.0	206°16.6	·· 15.8	315°53.6	·· 27.7
4	345°08.6	195°14.6	55.7	281°04.0	04.3	221°18.5	15.7	330°56.0	27.7
5	0°11.1	210°14.4	54.6	296°04.7	04.6	236°20.4	15.5	345°58.4	27.7
6	15°13.5	225°14.1	N13°53.5	311°05.3	N21°05.0	251°22.3	N20°15.4	1°00.7	N03°27.8
7	30°16.0	240°13.9	52.5	326°05.9	05.3	266°24.2	15.3	16°03.1	27.8
8	45°18.5	255°13.7	51.4	341°06.5	05.6	281°26.1	15.2	31°05.5	27.8
9	60°20.9	270°13.5	·· 50.4	356°07.1	·· 06.0	296°28.0	·· 15.1	46°07.9	·· 27.8
10	75°23.4	285°13.3	49.3	11°07.7	06.3	311°29.9	15.0	61°10.3	27.9
11	90°25.8	300°13.1	48.2	26°08.3	06.6	326°31.8	14.8	76°12.7	27.9
12	105°28.3	315°12.9	N13°47.2	41°08.9	N21°07.0	341°33.7	N20°14.7	91°15.0	N03°27.9
13	120°30.8	330°12.7	46.1	56°09.5	07.3	356°35.6	14.6	106°17.4	27.9
14	135°33.2	345°12.5	45.0	71°10.2	07.6	11°37.5	14.5	121°19.8	27.9
15	150°35.7	0°12.3	·· 44.0	86°10.8	·· 08.0	26°39.4	·· 14.4	136°22.2	·· 28.0
16	165°38.2	15°12.1	42.9	101°11.4	08.3	41°41.2	14.3	151°24.6	28.0
17	180°40.6	30°11.9	41.8	116°12.0	08.6	56°43.1	14.1	166°27.0	28.0
18	195°43.1	45°11.7	N13°40.8	131°12.6	N21°09.0	71°45.0	N20°14.0	181°29.4	N03°28.0
19	210°45.6	60°11.5	39.7	146°13.2	09.3	86°46.9	13.9	196°31.7	28.0
20	225°48.0	75°11.3	38.6	161°13.8	09.6	101°48.8	13.8	211°34.1	28.1
21	240°50.5	90°11.1	·· 37.6	176°14.4	·· 10.0	116°50.7	·· 13.7	226°36.5	·· 28.1
22	255°53.0	105°10.9	36.5	191°15.0	10.3	131°52.6	13.5	241°38.9	28.1
23	270°55.4	120°10.7	35.4	206°15.6	10.6	146°54.5	13.4	256°41.3	28.1
Mer.pass. 04:59		ν -0.2′	d 1.1′	ν 0.6′	d 0.3′	ν 1.9′	d 0.1′	ν 2.4′	d 0.0′
		m -4.08		m 1.30		m -1.80		m 0.75	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	285°57.9	135°10.5	N13°34.4	221°16.3	N21°10.9	161°56.4	N20°13.3	271°43.7	N03°28.1
1	301°00.3	150°10.4	33.3	236°16.9	11.3	176°58.3	13.2	286°46.1	28.2
2	316°02.8	165°10.2	32.2	251°17.5	11.6	192°00.2	13.1	301°48.4	28.2
3	331°05.3	180°10.0	·· 31.2	266°18.1	·· 11.9	207°02.1	·· 13.0	316°50.8	·· 28.2
4	346°07.7	195°09.8	30.1	281°18.7	12.3	222°04.0	12.8	331°53.2	28.2
5	1°10.2	210°09.6	29.0	296°19.3	12.6	237°05.9	12.7	346°55.6	28.2
6	16°12.7	225°09.4	N13°27.9	311°19.9	N21°12.9	252°07.8	N20°12.6	1°58.0	N03°28.3
7	31°15.1	240°09.2	26.9	326°20.5	13.2	267°09.7	12.5	17°00.4	28.3
8	46°17.6	255°09.0	25.8	341°21.1	13.6	282°11.6	12.4	32°02.8	28.3
9	61°20.1	270°08.8	·· 24.7	356°21.7	·· 13.9	297°13.5	·· 12.2	47°05.2	·· 28.3
10	76°22.5	285°08.6	23.6	11°22.4	14.2	312°15.4	12.1	62°07.5	28.3
11	91°25.0	300°08.5	22.6	26°23.0	14.5	327°17.3	12.0	77°09.9	28.4
12	106°27.4	315°08.3	N13°21.5	41°23.6	N21°14.9	342°19.2	N20°11.9	92°12.3	N03°28.4
13	121°29.9	330°08.1	20.4	56°24.2	15.2	357°21.1	11.8	107°14.7	28.4
14	136°32.4	345°07.9	19.3	71°24.8	15.5	12°23.0	11.6	122°17.1	28.4
15	151°34.8	0°07.7	·· 18.3	86°25.4	·· 15.8	27°24.9	·· 11.5	137°19.5	·· 28.4
16	166°37.3	15°07.5	17.2	101°26.0	16.2	42°26.8	11.4	152°21.9	28.5
17	181°39.8	30°07.4	16.1	116°26.6	16.5	57°28.7	11.3	167°24.3	28.5
18	196°42.2	45°07.2	N13°15.0	131°27.2	N21°16.8	72°30.6	N20°11.2	182°26.6	N03°28.5
19	211°44.7	60°07.0	13.9	146°27.9	17.1	87°32.5	11.1	197°29.0	28.5
20	226°47.2	75°06.8	12.9	161°28.5	17.5	102°34.4	10.9	212°31.4	28.5
21	241°49.6	90°06.6	·· 11.8	176°29.1	·· 17.8	117°36.3	·· 10.8	227°33.8	·· 28.5
22	256°52.1	105°06.5	10.7	191°29.7	18.1	132°38.2	10.7	242°36.2	28.6
23	271°54.6	120°06.3	09.6	206°30.3	18.4	147°40.1	10.6	257°38.6	28.6
Mer.pass. 04:55		ν -0.2′	d 1.1′	ν 0.6′	d 0.3′	ν 1.9′	d 0.1′	ν 2.4′	d 0.0′
		m -4.09		m 1.30		m -1.80		m 0.75	

Stars

	SHA	Dec
Alpheratz	357°33.4	29°14.1
Ankaa	353°05.9	-42°09.4
Schedar	349°29.6	56°40.8
Diphda	348°46.0	-17°50.3
Achernar	335°19.4	-57°05.8
Hamal	327°49.9	23°35.2
Polaris	313°39.7	89°22.3
Acamar	315°11.1	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.4
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.8	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.7	19°02.7
Rigil Kent.	139°38.3	-60°57.0
Kochab	137°19.2	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.3
Peacock	53°03.2	-56°38.8
Deneb	49°24.5	45°22.4
Enif	33°37.3	9°59.8
Al Na'ir	27°31.0	-46°49.7
Fomalhaut	15°13.0	-29°28.7
Scheat	13°43.8	28°13.5
Markab	13°28.5	15°20.9

Jul 06 Mon	SHA	Mer.pass
Venus	211°21.0	14:59
Mars	296°47.3	09:16
Jupiter	236°25.7	13:17
Saturn	345°49.7	06:00

Jul 07 Tue	SHA	Mer.pass
Venus	210°16.7	14:59
Mars	296°02.9	09:16
Jupiter	236°12.1	13:14
Saturn	345°47.7	05:56

Jul 08 Wed	SHA	Mer.pass
Venus	209°12.7	14:59
Mars	295°18.4	09:15
Jupiter	235°58.6	13:11
Saturn	345°45.8	05:52

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.4	N22°42.3	292°13.7	15.0′	S01°31.7	15.2′	56.5′
1	193°49.3	42.1	306°47.6	14.9′	01°16.5	15.1′	56.5′
2	208°49.2	41.8	321°21.6	14.9′	01°01.4	15.2′	56.6′
3	223°49.1	·· 41.6	335°55.5	14.9′	00°46.2	15.2′	56.6′
4	238°49.0	41.3	350°29.4	14.9′	00°31.0	15.3′	56.6′
5	253°48.9	41.1	5°03.3	14.8′	00°15.7	15.2′	56.7′
6	268°48.8	N22°40.8	19°37.1	14.8′	S00°00.5	15.3′	56.7′
7	283°48.7	40.6	34°10.9	14.8′	N00°14.8	15.2′	56.7′
8	298°48.6	40.3	48°44.7	14.8′	00°30.0	15.3′	56.7′
9	313°48.5	·· 40.1	63°18.5	14.7′	00°45.3	15.3′	56.8′
10	328°48.4	39.8	77°52.2	14.7′	01°00.6	15.3′	56.8′
11	343°48.3	39.6	92°25.9	14.7′	01°15.9	15.3′	56.8′
12	358°48.2	N22°39.3	106°59.6	14.6′	N01°31.2	15.4′	56.9′
13	13°48.1	39.0	121°33.2	14.6′	01°46.6	15.3′	56.9′
14	28°48.0	38.8	136°06.8	14.5′	02°01.9	15.4′	56.9′
15	43°47.9	·· 38.5	150°40.3	14.5′	02°17.3	15.3′	56.9′
16	58°47.7	38.3	165°13.8	14.5′	02°32.6	15.4′	57.0′
17	73°47.6	38.0	179°47.3	14.4′	02°48.0	15.3′	57.0′
18	88°47.5	N22°37.8	194°20.7	14.4′	N03°03.3	15.4′	57.0′
19	103°47.4	37.5	208°54.1	14.3′	03°18.7	15.3′	57.1′
20	118°47.3	37.2	223°27.4	14.3′	03°34.0	15.4′	57.1′
21	133°47.2	·· 37.0	238°00.7	14.2′	03°49.4	15.4′	57.1′
22	148°47.1	36.7	252°33.9	14.2′	04°04.8	15.3′	57.2′
23	163°47.0	36.4	267°07.1	14.1′	04°20.1	15.4′	57.2′
	SD = 15.7′	d = 0.2′	SD = 15.4′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.9	N22°36.2	281°40.3	14.1′	N04°35.5	15.3′	57.2′
1	193°46.8	35.9	296°13.3	14.0′	04°50.8	15.4′	57.3′
2	208°46.7	35.6	310°46.4	14.0′	05°06.2	15.3′	57.3′
3	223°46.6	·· 35.4	325°19.4	13.9′	05°21.5	15.4′	57.3′
4	238°46.5	35.1	339°52.3	13.9′	05°36.9	15.3′	57.3′
5	253°46.4	34.8	354°25.1	13.8′	05°52.2	15.3′	57.4′
6	268°46.3	N22°34.6	8°57.9	13.7′	N06°07.5	15.3′	57.4′
7	283°46.2	34.3	23°30.7	13.7′	06°22.8	15.3′	57.4′
8	298°46.1	34.0	38°03.4	13.6′	06°38.1	15.3′	57.5′
9	313°46.0	·· 33.8	52°36.0	13.6′	06°53.4	15.3′	57.5′
10	328°45.9	33.5	67°08.5	13.5′	07°08.7	15.3′	57.5′
11	343°45.8	33.2	81°41.0	13.4′	07°24.0	15.2′	57.6′
12	358°45.7	N22°33.0	96°13.4	13.3′	N07°39.2	15.2′	57.6′
13	13°45.6	32.7	110°45.8	13.3′	07°54.4	15.2′	57.6′
14	28°45.5	32.4	125°18.1	13.2′	08°09.6	15.2′	57.7′
15	43°45.4	·· 32.1	139°50.3	13.1′	08°24.8	15.2′	57.7′
16	58°45.3	31.9	154°22.4	13.1′	08°40.0	15.1′	57.7′
17	73°45.2	31.6	168°54.5	13.0′	08°55.1	15.1′	57.8′
18	88°45.1	N22°31.3	183°26.4	12.9′	N09°10.2	15.1′	57.8′
19	103°45.0	31.0	197°58.3	12.8′	09°25.3	15.1′	57.8′
20	118°44.9	30.8	212°30.2	12.7′	09°40.4	15.0′	57.9′
21	133°44.8	·· 30.5	227°01.9	12.7′	09°55.4	15.0′	57.9′
22	148°44.7	30.2	241°33.6	12.6′	10°10.4	15.0′	57.9′
23	163°44.6	29.9	256°05.1	12.5′	10°25.4	14.9′	58.0′
	SD = 15.7′	d = 0.3′	SD = 15.6′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.5	N22°29.6	270°36.6	12.4′	N10°40.3	14.9′	58.0′
1	193°44.4	29.4	285°08.0	12.3′	10°55.2	14.9′	58.0′
2	208°44.3	29.1	299°39.4	12.2′	11°10.1	14.8′	58.1′
3	223°44.2	·· 28.8	314°10.6	12.1′	11°24.9	14.8′	58.1′
4	238°44.1	28.5	328°41.7	12.0′	11°39.7	14.8′	58.1′
5	253°44.0	28.2	343°12.8	12.0′	11°54.5	14.7′	58.2′
6	268°43.9	N22°27.9	357°43.7	11.9′	N12°09.2	14.7′	58.2′
7	283°43.8	27.7	12°14.6	11.8′	12°23.9	14.6′	58.2′
8	298°43.7	27.4	26°45.3	11.7′	12°38.5	14.6′	58.3′
9	313°43.7	·· 27.1	41°16.0	11.6′	12°53.1	14.5′	58.3′
10	328°43.6	26.8	55°46.6	11.5′	13°07.6	14.5′	58.3′
11	343°43.5	26.5	70°17.0	11.4′	13°22.1	14.5′	58.4′
12	358°43.4	N22°26.2	84°47.4	11.3′	N13°36.6	14.3′	58.4′
13	13°43.3	25.9	99°17.7	11.2′	13°50.9	14.4′	58.4′
14	28°43.2	25.6	113°47.8	11.1′	14°05.3	14.2′	58.5′
15	43°43.1	·· 25.4	128°17.9	10.9′	14°19.5	14.3′	58.5′
16	58°43.0	25.1	142°47.8	10.8′	14°33.8	14.1′	58.5′
17	73°42.9	24.8	157°17.6	10.7′	14°47.9	14.1′	58.6′
18	88°42.8	N22°24.5	171°47.4	10.6′	N15°02.0	14.1′	58.6′
19	103°42.7	24.2	186°17.0	10.5′	15°16.1	13.9′	58.6′
20	118°42.6	23.9	200°46.5	10.4′	15°30.0	14.0′	58.7′
21	133°42.5	·· 23.6	215°15.9	10.3′	15°44.0	13.8′	58.7′
22	148°42.4	23.3	229°45.2	10.2′	15°57.8	13.8′	58.7′
23	163°42.3	23.0	244°14.3	10.0′	16°11.6	13.7′	58.8′
	SD = 15.7′	d = 0.3′	SD = 15.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	00:58	23:08	////	////
64°	////	////	01:54	22:14	////	////
62°	////	////	02:26	21:42	////	////
60°	////	01:20	02:50	21:19	22:48	////
N 58°	////	01:59	03:09	21:00	22:10	////
56°	////	02:25	03:24	20:45	21:44	////
54°	01:13	02:45	03:38	20:32	21:24	22:54
52°	01:49	03:02	03:49	20:20	21:07	22:19
50°	02:14	03:16	04:00	20:10	20:53	21:55
45°	02:56	03:44	04:21	19:49	20:25	21:13
N 40°	03:25	04:06	04:38	19:31	20:04	20:45
35°	03:47	04:23	04:53	19:17	19:46	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:55	05:22	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:15	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:10
35°	06:09	06:40	07:08	17:02	17:30	18:01
40°	06:18	06:51	07:22	16:49	17:19	17:53
45°	06:27	07:04	07:38	16:33	17:06	17:43
S 50°	06:38	07:19	07:57	16:13	16:51	17:32
52°	06:43	07:26	08:07	16:04	16:44	17:27
54°	06:49	07:34	08:17	15:53	16:36	17:22
56°	06:54	07:43	08:29	15:41	16:27	17:16
58°	07:01	07:52	08:43	15:27	16:18	17:10
S 60°	07:08	08:03	08:59	15:11	16:07	17:03

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	22:20	21:42	20:43	11:05	13:18	15:58
N 70°	22:26	21:57	21:18	11:03	13:05	15:25
68°	22:30	22:10	21:43	11:02	12:56	15:02
66°	22:34	22:20	22:03	11:00	12:47	14:44
64°	22:37	22:29	22:19	11:00	12:41	14:29
62°	22:40	22:36	22:32	10:59	12:35	14:17
60°	22:42	22:43	22:44	10:58	12:30	14:07
N 58°	22:45	22:48	22:54	10:57	12:25	13:58
56°	22:47	22:53	23:02	10:57	12:21	13:50
54°	22:48	22:58	23:10	10:56	12:18	13:44
52°	22:50	23:02	23:17	10:56	12:15	13:38
50°	22:52	23:06	23:23	10:55	12:12	13:32
45°	22:55	23:14	23:37	10:54	12:06	13:20
N 40°	22:58	23:21	23:48	10:54	12:00	13:10
35°	23:00	23:27	23:58	10:53	11:56	13:02
30°	23:02	23:33	·· ··	10:52	11:52	12:55
20°	23:06	23:42	·· ··	10:51	11:45	12:42
N 10°	23:09	23:50	·· ··	10:50	11:39	12:31
0°	23:12	23:58	·· ··	10:49	11:34	12:21
S 10°	23:16	·· ··	00:06	10:49	11:28	12:11
20°	23:19	·· ··	00:14	10:48	11:22	12:00
30°	23:23	·· ··	00:24	10:47	11:16	11:48
35°	23:25	·· ··	00:30	10:46	11:12	11:41
40°	23:28	·· ··	00:36	10:45	11:08	11:33
45°	23:31	·· ··	00:44	10:44	11:03	11:23
S 50°	23:35	·· ··	00:53	10:43	10:57	11:12
52°	23:37	·· ··	00:57	10:43	10:54	11:07
54°	23:38	·· ··	01:02	10:42	10:51	11:01
56°	23:41	·· ··	01:07	10:42	10:48	10:55
58°	23:43	·· ··	01:13	10:41	10:44	10:48
S 60°	23:45	·· ··	01:20	10:41	10:40	10:40

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 21-23 69-48%
06	04:42	04:47	12:05	04:39	17:01	
07	04:52	04:57	12:05	05:23	17:46	
08	05:02	05:07	12:05	06:09	18:34	

July 09, 10, 11 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°57.0	135°06.1	N13°08.5	221°30.9	N21°18.7	162°42.0	N20°10.5	272°41.0	N03°28.6
1	301°59.5	150°05.9	07.5	236°31.5	19.1	177°43.9	10.3	287°43.4	28.6
2	317°01.9	165°05.7	06.4	251°32.1	19.4	192°45.8	10.2	302°45.8	28.6
3	332°04.4	180°05.6	·· 05.3	266°32.7	·· 19.7	207°47.7	·· 10.1	317°48.2	·· 28.7
4	347°06.9	195°05.4	04.2	281°33.3	20.0	222°49.6	10.0	332°50.5	28.7
5	2°09.3	210°05.2	03.1	296°33.9	20.3	237°51.5	09.9	347°52.9	28.7
6	17°11.8	225°05.0	N13°02.0	311°34.6	N21°20.7	252°53.4	N20°09.7	2°55.3	N03°28.7
7	32°14.3	240°04.9	13°00.9	326°35.2	21.0	267°55.3	09.6	17°57.7	28.7
8	47°16.7	255°04.7	12°59.9	341°35.8	21.3	282°57.2	09.5	33°00.1	28.7
9	62°19.2	270°04.5	·· 58.8	356°36.4	·· 21.6	297°59.1	·· 09.4	48°02.5	·· 28.8
10	77°21.7	285°04.4	57.7	11°37.0	21.9	313°01.0	09.3	63°04.9	28.8
11	92°24.1	300°04.2	56.6	26°37.6	22.3	328°02.9	09.1	78°07.3	28.8
12	107°26.6	315°04.0	N12°55.5	41°38.2	N21°22.6	343°04.8	N20°09.0	93°09.7	N03°28.8
13	122°29.1	330°03.8	54.4	56°38.8	22.9	358°06.7	08.9	108°12.1	28.8
14	137°31.5	345°03.7	53.3	71°39.4	23.2	13°08.6	08.8	123°14.5	28.9
15	152°34.0	0°03.5	·· 52.3	86°40.0	·· 23.5	28°10.5	·· 08.7	138°16.9	·· 28.9
16	167°36.4	15°03.3	51.2	101°40.7	23.8	43°12.4	08.5	153°19.2	28.9
17	182°38.9	30°03.2	50.1	116°41.3	24.1	58°14.3	08.4	168°21.6	28.9
18	197°41.4	45°03.0	N12°49.0	131°41.9	N21°24.5	73°16.2	N20°08.3	183°24.0	N03°28.9
19	212°43.8	60°02.8	47.9	146°42.5	24.8	88°18.1	08.2	198°26.4	28.9
20	227°46.3	75°02.7	46.8	161°43.1	25.1	103°20.0	08.1	213°28.8	29.0
21	242°48.8	90°02.5	·· 45.7	176°43.7	·· 25.4	118°21.9	·· 07.9	228°31.2	·· 29.0
22	257°51.2	105°02.4	44.6	191°44.3	25.7	133°23.7	07.8	243°33.6	29.0
23	272°53.7	120°02.2	43.5	206°44.9	26.0	148°25.6	07.7	258°36.0	29.0
Mer.pass. 04:51		ν -0.2′	d 1.1′	m -4.10	ν 0.6′	d 0.3′	m 1.30	ν 1.9′	d 0.1′ m -1.80	ν 2.4′	d 0.0′ m 0.74

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°56.2	135°02.0	N12°42.4	221°45.5	N21°26.3	163°27.5	N20°07.6	273°38.4	N03°29.0
1	302°58.6	150°01.9	41.3	236°46.1	26.7	178°29.4	07.5	288°40.8	29.0
2	318°01.1	165°01.7	40.2	251°46.8	27.0	193°31.3	07.3	303°43.2	29.1
3	333°03.5	180°01.6	·· 39.1	266°47.4	·· 27.3	208°33.2	·· 07.2	318°45.6	·· 29.1
4	348°06.0	195°01.4	38.0	281°48.0	27.6	223°35.1	07.1	333°48.0	29.1
5	3°08.5	210°01.2	37.0	296°48.6	27.9	238°37.0	07.0	348°50.4	29.1
6	18°10.9	225°01.1	N12°35.9	311°49.2	N21°28.2	253°38.9	N20°06.9	3°52.8	N03°29.1
7	33°13.4	240°00.9	34.8	326°49.8	28.5	268°40.8	06.7	18°55.2	29.1
8	48°15.9	255°00.8	33.7	341°50.4	28.8	283°42.7	06.6	33°57.5	29.2
9	63°18.3	270°00.6	·· 32.6	356°51.0	·· 29.1	298°44.6	·· 06.5	48°59.9	·· 29.2
10	78°20.8	285°00.5	31.5	11°51.6	29.4	313°46.5	06.4	64°02.3	29.2
11	93°23.3	300°00.3	30.4	26°52.2	29.8	328°48.4	06.3	79°04.7	29.2
12	108°25.7	315°00.1	N12°29.3	41°52.8	N21°30.1	343°50.3	N20°06.1	94°07.1	N03°29.2
13	123°28.2	330°00.0	28.2	56°53.5	30.4	358°52.2	06.0	109°09.5	29.2
14	138°30.7	344°59.8	27.1	71°54.1	30.7	13°54.1	05.9	124°11.9	29.3
15	153°33.1	359°59.7	·· 26.0	86°54.7	·· 31.0	28°56.0	·· 05.8	139°14.3	·· 29.3
16	168°35.6	14°59.5	24.9	101°55.3	31.3	43°57.9	05.7	154°16.7	29.3
17	183°38.0	29°59.4	23.8	116°55.9	31.6	58°59.8	05.5	169°19.1	29.3
18	198°40.5	44°59.2	N12°22.7	131°56.5	N21°31.9	74°01.7	N20°05.4	184°21.5	N03°29.3
19	213°43.0	59°59.1	21.6	146°57.1	32.2	89°03.6	05.3	199°23.9	29.3
20	228°45.4	74°58.9	20.5	161°57.7	32.5	104°05.5	05.2	214°26.3	29.3
21	243°47.9	89°58.8	·· 19.4	176°58.3	·· 32.8	119°07.4	·· 05.1	229°28.7	·· 29.4
22	258°50.4	104°58.6	18.3	191°58.9	33.1	134°09.3	04.9	244°31.1	29.4
23	273°52.8	119°58.5	17.2	206°59.6	33.4	149°11.2	04.8	259°33.5	29.4
Mer.pass. 04:47		ν -0.2′	d 1.1′	m -4.10	ν 0.6′	d 0.3′	m 1.30	ν 1.9′	d 0.1′ m -1.80	ν 2.4′	d 0.0′ m 0.74

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°55.3	134°58.4	N12°16.0	222°00.2	N21°33.7	164°13.1	N20°04.7	274°35.9	N03°29.4
1	303°57.8	149°58.2	14.9	237°00.8	34.0	179°15.0	04.6	289°38.3	29.4
2	319°00.2	164°58.1	13.8	252°01.4	34.3	194°16.9	04.5	304°40.7	29.4
3	334°02.7	179°57.9	·· 12.7	267°02.0	·· 34.6	209°18.8	·· 04.3	319°43.1	·· 29.5
4	349°05.2	194°57.8	11.6	282°02.6	34.9	224°20.7	04.2	334°45.5	29.5
5	4°07.6	209°57.6	10.5	297°03.2	35.2	239°22.6	04.1	349°47.9	29.5
6	19°10.1	224°57.5	N12°09.4	312°03.8	N21°35.5	254°24.5	N20°04.0	4°50.3	N03°29.5
7	34°12.5	239°57.4	08.3	327°04.4	35.9	269°26.3	03.8	19°52.7	29.5
8	49°15.0	254°57.2	07.2	342°05.0	36.2	284°28.2	03.7	34°55.1	29.5
9	64°17.5	269°57.1	·· 06.1	357°05.6	·· 36.5	299°30.1	·· 03.6	49°57.5	·· 29.5
10	79°19.9	284°56.9	05.0	12°06.3	36.8	314°32.0	03.5	64°59.9	29.6
11	94°22.4	299°56.8	03.9	27°06.9	37.1	329°33.9	03.4	80°02.3	29.6
12	109°24.9	314°56.7	N12°02.8	42°07.5	N21°37.4	344°35.8	N20°03.2	95°04.7	N03°29.6
13	124°27.3	329°56.5	01.7	57°08.1	37.7	359°37.7	03.1	110°07.1	29.6
14	139°29.8	344°56.4	12°00.5	72°08.7	38.0	14°39.6	03.0	125°09.5	29.6
15	154°32.3	359°56.2	11°59.4	87°09.3	·· 38.2	29°41.5	·· 02.9	140°11.9	·· 29.6
16	169°34.7	14°56.1	58.3	102°09.9	38.5	44°43.4	02.8	155°14.3	29.6
17	184°37.2	29°56.0	57.2	117°10.5	38.8	59°45.3	02.6	170°16.7	29.7
18	199°39.7	44°55.8	N11°56.1	132°11.1	N21°39.1	74°47.2	N20°02.5	185°19.1	N03°29.7
19	214°42.1	59°55.7	55.0	147°11.7	39.4	89°49.1	02.4	200°21.5	29.7
20	229°44.6	74°55.6	53.9	162°12.3	39.7	104°51.0	02.3	215°23.9	29.7
21	244°47.0	89°55.4	·· 52.8	177°13.0	·· 40.0	119°52.9	·· 02.1	230°26.3	·· 29.7
22	259°49.5	104°55.3	51.6	192°13.6	40.3	134°54.8	02.0	245°28.7	29.7
23	274°52.0	119°55.2	50.5	207°14.2	40.6	149°56.7	01.9	260°31.1	29.7
Mer.pass. 04:44		ν -0.1′	d 1.1′	m -4.11	ν 0.6′	d 0.3′	m 1.30	ν 1.9′	d 0.1′ m -1.80	ν 2.4′	d 0.0′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°33.4	29°14.1
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°40.8
Diphda	348°46.0	-17°50.3
Achernar	335°19.4	-57°05.8
Hamal	327°49.9	23°35.2
Polaris	313°38.1	89°22.2
Acamar	315°11.0	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.8	6°22.4
Elnath	278°00.6	28°37.7
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.4
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°21.0	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.7	19°02.7
Rigil Kent.	139°38.3	-60°57.0
Kochab	137°19.3	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.2	-56°38.8
Deneb	49°24.5	45°22.4
Enif	33°37.3	9°59.8
Al Na'ir	27°31.0	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.5
Markab	13°28.5	15°20.9

Jul 09 Thu	SHA	Mer.pass
Venus	208°09.1	15:00
Mars	294°33.9	09:14
Jupiter	235°45.0	13:08
Saturn	345°44.0	05:48

Jul 10 Fri	SHA	Mer.pass
Venus	207°05.9	15:00
Mars	293°49.4	09:13
Jupiter	235°31.4	13:05
Saturn	345°42.2	05:45

Jul 11 Sat	SHA	Mer.pass
Venus	206°03.1	15:00
Mars	293°04.9	09:12
Jupiter	235°17.8	13:01
Saturn	345°40.6	05:41

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°42.2	N22°22.7	258°43.4	9.9′	N16°25.3	13.6′	58.8′
1	193°42.1	22.4	273°12.3	9.8′	16°38.9	13.6′	58.8′
2	208°42.0	22.1	287°41.1	9.7′	16°52.5	13.4′	58.9′
3	223°41.9	·· 21.8	302°09.8	9.6′	17°05.9	13.4′	58.9′
4	238°41.8	21.5	316°38.4	9.4′	17°19.3	13.4′	58.9′
5	253°41.8	21.2	331°06.8	9.3′	17°32.7	13.2′	59.0′
6	268°41.7	N22°20.9	345°35.2	9.2′	N17°45.9	13.2′	59.0′
7	283°41.6	20.6	0°03.4	9.1′	17°59.1	13.0′	59.0′
8	298°41.5	20.3	14°31.4	9.0′	18°12.1	13.0′	59.1′
9	313°41.4	·· 20.0	28°59.4	8.8′	18°25.1	12.9′	59.1′
10	328°41.3	19.7	43°27.2	8.7′	18°38.0	12.8′	59.1′
11	343°41.2	19.4	57°54.9	8.6′	18°50.8	12.7′	59.2′
12	358°41.1	N22°19.1	72°22.5	8.4′	N19°03.5	12.6′	59.2′
13	13°41.0	18.8	86°49.9	8.3′	19°16.1	12.5′	59.2′
14	28°40.9	18.5	101°17.2	8.2′	19°28.6	12.5′	59.3′
15	43°40.8	·· 18.2	115°44.4	8.1′	19°41.1	12.3′	59.3′
16	58°40.7	17.9	130°11.5	7.9′	19°53.4	12.2′	59.3′
17	73°40.6	17.6	144°38.4	7.8′	20°05.6	12.1′	59.4′
18	88°40.6	N22°17.3	159°05.2	7.7′	N20°17.7	12.0′	59.4′
19	103°40.5	16.9	173°31.8	7.5′	20°29.7	11.9′	59.4′
20	118°40.4	16.6	187°58.4	7.4′	20°41.6	11.8′	59.4′
21	133°40.3	·· 16.3	202°24.7	7.3′	20°53.4	11.6′	59.5′
22	148°40.2	16.0	216°51.0	7.1′	21°05.0	11.6′	59.5′
23	163°40.1	15.7	231°17.1	7.0′	21°16.6	11.4′	59.5′
	SD = 15.7′	d = 0.3′	SD = 16.0′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°40.0	N22°15.4	245°43.1	6.9′	N21°28.0	11.3′	59.6′
1	193°39.9	15.1	260°09.0	6.7′	21°39.3	11.2′	59.6′
2	208°39.8	14.8	274°34.7	6.6′	21°50.5	11.1′	59.6′
3	223°39.7	·· 14.4	289°00.3	6.4′	22°01.6	10.9′	59.7′
4	238°39.7	14.1	303°25.7	6.3′	22°12.5	10.8′	59.7′
5	253°39.6	13.8	317°51.0	6.2′	22°23.3	10.7′	59.7′
6	268°39.5	N22°13.5	332°16.2	6.0′	N22°34.0	10.5′	59.7′
7	283°39.4	13.2	346°41.2	5.9′	22°44.5	10.4′	59.8′
8	298°39.3	12.9	1°06.1	5.8′	22°54.9	10.3′	59.8′
9	313°39.2	·· 12.5	15°30.9	5.6′	23°05.2	10.1′	59.8′
10	328°39.1	12.2	29°55.5	5.5′	23°15.3	10.0′	59.9′
11	343°39.0	11.9	44°20.1	5.4′	23°25.3	9.9′	59.9′
12	358°38.9	N22°11.6	58°44.4	5.2′	N23°35.2	9.7′	59.9′
13	13°38.9	11.3	73°08.7	5.1′	23°44.9	9.5′	59.9′
14	28°38.8	10.9	87°32.8	5.0′	23°54.4	9.4′	60.0′
15	43°38.7	·· 10.6	101°56.7	4.8′	24°03.8	9.3′	60.0′
16	58°38.6	10.3	116°20.6	4.7′	24°13.1	9.1′	60.0′
17	73°38.5	10.0	130°44.3	4.6′	24°22.2	8.9′	60.1′
18	88°38.4	N22°09.6	145°07.9	4.5′	N24°31.1	8.8′	60.1′
19	103°38.3	09.3	159°31.3	4.3′	24°39.9	8.6′	60.1′
20	118°38.2	09.0	173°54.7	4.2′	24°48.5	8.5′	60.1′
21	133°38.2	·· 08.7	188°17.9	4.1′	24°57.0	8.3′	60.2′
22	148°38.1	08.3	202°40.9	3.9′	25°05.3	8.1′	60.2′
23	163°38.0	08.0	217°03.9	3.8′	25°13.4	8.0′	60.2′
	SD = 15.7′	d = 0.3′	SD = 16.2′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°37.9	N22°07.7	231°26.7	3.7′	N25°21.4	7.8′	60.2′
1	193°37.8	07.4	245°49.4	3.6′	25°29.2	7.6′	60.3′
2	208°37.7	07.0	260°12.0	3.5′	25°36.8	7.4′	60.3′
3	223°37.6	·· 06.7	274°34.5	3.3′	25°44.2	7.3′	60.3′
4	238°37.6	06.4	288°56.8	3.2′	25°51.5	7.1′	60.3′
5	253°37.5	06.0	303°19.0	3.1′	25°58.6	6.9′	60.4′
6	268°37.4	N22°05.7	317°41.2	3.0′	N26°05.5	6.7′	60.4′
7	283°37.3	05.4	332°03.2	2.9′	26°12.2	6.5′	60.4′
8	298°37.2	05.0	346°25.1	2.8′	26°18.7	6.4′	60.4′
9	313°37.1	·· 04.7	0°46.9	2.7′	26°25.1	6.2′	60.4′
10	328°37.1	04.4	15°08.6	2.6′	26°31.3	5.9′	60.5′
11	343°37.0	04.0	29°30.1	2.5′	26°37.2	5.8′	60.5′
12	358°36.9	N22°03.7	43°51.6	2.4′	N26°43.0	5.6′	60.5′
13	13°36.8	03.3	58°13.0	2.3′	26°48.6	5.4′	60.5′
14	28°36.7	03.0	72°34.3	2.2′	26°54.0	5.2′	60.5′
15	43°36.6	·· 02.7	86°55.5	2.1′	26°59.2	5.0′	60.6′
16	58°36.6	02.3	101°16.6	2.0′	27°04.2	4.9′	60.6′
17	73°36.5	02.0	115°37.6	1.9′	27°09.1	4.6′	60.6′
18	88°36.4	N22°01.7	129°58.5	1.8′	N27°13.7	4.4′	60.6′
19	103°36.3	01.3	144°19.3	1.8′	27°18.1	4.2′	60.6′
20	118°36.2	01.0	158°40.1	1.7′	27°22.3	4.0′	60.7′
21	133°36.1	·· 00.6	173°00.8	1.6′	27°26.3	3.8′	60.7′
22	148°36.1	22°00.3	187°21.4	1.5′	27°30.1	3.5′	60.7′
23	163°36.0	21°59.9	201°41.9	1.5′	27°33.6	3.4′	60.7′
	SD = 15.7′	d = 0.3′	SD = 16.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:12	22:54	////	////
64°	////	////	02:01	22:07	////	////
62°	////	////	02:32	21:37	////	////
60°	////	01:29	02:55	21:15	22:39	////
N 58°	////	02:05	03:13	20:57	22:05	////
56°	////	02:30	03:28	20:42	21:40	////
54°	01:22	02:49	03:41	20:29	21:21	22:47
52°	01:55	03:05	03:52	20:18	21:04	22:15
50°	02:18	03:19	04:02	20:08	20:51	21:52
45°	02:59	03:47	04:23	19:47	20:23	21:11
N 40°	03:27	04:08	04:40	19:30	20:03	20:43
35°	03:49	04:25	04:54	19:16	19:45	20:21
30°	04:07	04:39	05:06	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:37
N 10°	04:56	05:22	05:45	18:26	18:48	19:15
0°	05:13	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:39	07:07	17:04	17:32	18:03
40°	06:17	06:50	07:21	16:50	17:21	17:54
45°	06:26	07:03	07:36	16:35	17:08	17:45
S 50°	06:37	07:18	07:56	16:16	16:53	17:34
52°	06:42	07:25	08:05	16:06	16:46	17:29
54°	06:47	07:32	08:15	15:56	16:39	17:24
56°	06:52	07:41	08:26	15:45	16:31	17:19
58°	06:59	07:50	08:40	15:31	16:21	17:13
S 60°	07:05	08:01	08:55	15:16	16:11	17:06

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	20:53	▭	▭	17:42	▭	▭
66°	21:36	▭	▭	17:00	▭	▭
64°	22:06	21:41	▭	16:31	18:58	▭
62°	22:29	22:26	22:25	16:10	18:14	20:28
60°	22:47	22:55	23:18	15:52	17:45	19:35
N 58°	23:02	23:18	23:51	15:38	17:23	19:03
56°	23:15	23:37	·· ··	15:25	17:04	18:39
54°	23:27	23:53	·· ··	15:15	16:49	18:20
52°	23:37	·· ··	00:06	15:05	16:36	18:03
50°	23:46	·· ··	00:19	14:57	16:24	17:49
45°	·· ··	00:06	00:43	14:39	16:00	17:21
N 40°	·· ··	00:22	01:04	14:24	15:41	16:58
35°	·· ··	00:35	01:20	14:12	15:25	16:40
30°	00:07	00:47	01:35	14:01	15:12	16:24
20°	00:22	01:07	02:00	13:43	14:48	15:57
N 10°	00:35	01:25	02:21	13:27	14:28	15:34
0°	00:47	01:42	02:42	13:12	14:09	15:12
S 10°	01:00	01:59	03:02	12:58	13:51	14:51
20°	01:13	02:17	03:24	12:42	13:31	14:27
30°	01:29	02:38	03:50	12:24	13:08	14:01
35°	01:38	02:50	04:05	12:14	12:55	13:45
40°	01:48	03:05	04:22	12:02	12:39	13:27
45°	02:01	03:22	04:44	11:48	12:21	13:05
S 50°	02:16	03:43	05:11	11:32	11:58	12:37
52°	02:23	03:53	05:24	11:24	11:48	12:23
54°	02:31	04:05	05:39	11:15	11:35	12:08
56°	02:40	04:18	05:57	11:05	11:22	11:49
58°	02:50	04:33	06:19	10:54	11:05	11:27
S 60°	03:02	04:52	06:48	10:42	10:46	10:58

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 37-17%
09	05:11	05:16	12:05	07:00	19:27	
10	05:20	05:24	12:05	07:55	20:25	
11	05:28	05:32	12:06	08:57	21:29	

July 12, 13, 14 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	289°54.4	134°55.1	N11°49.4	222°14.8	N21°40.9	164°58.6	N20°01.8	275°33.5	N03°29.8
1	304°56.9	149°54.9	48.3	237°15.4	41.2	180°00.5	01.7	290°35.9	29.8
2	319°59.4	164°54.8	47.2	252°16.0	41.5	195°02.4	01.5	305°38.3	29.8
3	335°01.8	179°54.7	·· 46.1	267°16.6	·· 41.8	210°04.3	·· 01.4	320°40.7	·· 29.8
4	350°04.3	194°54.5	44.9	282°17.2	42.1	225°06.2	01.3	335°43.1	29.8
5	5°06.8	209°54.4	43.8	297°17.8	42.4	240°08.1	01.2	350°45.5	29.8
6	20°09.2	224°54.3	N11°42.7	312°18.4	N21°42.7	255°10.0	N20°01.0	5°47.9	N03°29.8
7	35°11.7	239°54.2	41.6	327°19.1	43.0	270°11.9	00.9	20°50.3	29.8
8	50°14.2	254°54.0	40.5	342°19.7	43.3	285°13.8	00.8	35°52.7	29.9
9	65°16.6	269°53.9	·· 39.4	357°20.3	·· 43.6	300°15.6	·· 00.7	50°55.1	·· 29.9
10	80°19.1	284°53.8	38.2	12°20.9	43.9	315°17.5	00.6	65°57.5	29.9
11	95°21.5	299°53.7	37.1	27°21.5	44.1	330°19.4	00.4	80°59.9	29.9
12	110°24.0	314°53.5	N11°36.0	42°22.1	N21°44.4	345°21.3	N20°00.3	96°02.3	N03°29.9
13	125°26.5	329°53.4	34.9	57°22.7	44.7	0°23.2	00.2	111°04.7	29.9
14	140°28.9	344°53.3	33.8	72°23.3	45.0	15°25.1	20°00.1	126°07.1	29.9
15	155°31.4	359°53.2	·· 32.6	87°23.9	·· 45.3	30°27.0	19°59.9	141°09.5	·· 30.0
16	170°33.9	14°53.1	31.5	102°24.5	45.6	45°28.9	59.8	156°11.9	30.0
17	185°36.3	29°52.9	30.4	117°25.1	45.9	60°30.8	59.7	171°14.3	30.0
18	200°38.8	44°52.8	N11°29.3	132°25.8	N21°46.2	75°32.7	N19°59.6	186°16.7	N03°30.0
19	215°41.3	59°52.7	28.1	147°26.4	46.5	90°34.6	59.5	201°19.1	30.0
20	230°43.7	74°52.6	27.0	162°27.0	46.7	105°36.5	59.3	216°21.5	30.0
21	245°46.2	89°52.5	·· 25.9	177°27.6	·· 47.0	120°38.4	·· 59.2	231°23.9	·· 30.0
22	260°48.7	104°52.4	24.8	192°28.2	47.3	135°40.3	59.1	246°26.4	30.0
23	275°51.1	119°52.2	23.7	207°28.8	47.6	150°42.2	59.0	261°28.8	30.0
Mer.pass. 04:40		ν -0.1′	d 1.1′	ν 0.6′	d 0.3′	ν 1.9′	d 0.1′	ν 2.4′	d 0.0′
		m -4.11		m 1.31		m -1.80		m 0.73	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	290°53.6	134°52.1	N11°22.5	222°29.4	N21°47.9	165°44.1	N19°58.8	276°31.2	N03°30.1
1	305°56.0	149°52.0	21.4	237°30.0	48.2	180°46.0	58.7	291°33.6	30.1
2	320°58.5	164°51.9	20.3	252°30.6	48.5	195°47.9	58.6	306°36.0	30.1
3	336°01.0	179°51.8	·· 19.2	267°31.2	·· 48.8	210°49.8	·· 58.5	321°38.4	·· 30.1
4	351°03.4	194°51.7	18.0	282°31.8	49.0	225°51.7	58.4	336°40.8	30.1
5	6°05.9	209°51.6	16.9	297°32.5	49.3	240°53.6	58.2	351°43.2	30.1
6	21°08.4	224°51.5	N11°15.8	312°33.1	N21°49.6	255°55.5	N19°58.1	6°45.6	N03°30.1
7	36°10.8	239°51.3	14.6	327°33.7	49.9	270°57.4	58.0	21°48.0	30.1
8	51°13.3	254°51.2	13.5	342°34.3	50.2	285°59.3	57.9	36°50.4	30.2
9	66°15.8	269°51.1	·· 12.4	357°34.9	·· 50.5	301°01.1	·· 57.7	51°52.8	·· 30.2
10	81°18.2	284°51.0	11.3	12°35.5	50.7	316°03.0	57.6	66°55.2	30.2
11	96°20.7	299°50.9	10.1	27°36.1	51.0	331°04.9	57.5	81°57.6	30.2
12	111°23.2	314°50.8	N11°09.0	42°36.7	N21°51.3	346°06.8	N19°57.4	97°00.0	N03°30.2
13	126°25.6	329°50.7	07.9	57°37.3	51.6	1°08.7	57.2	112°02.4	30.2
14	141°28.1	344°50.6	06.7	72°37.9	51.9	16°10.6	57.1	127°04.9	30.2
15	156°30.5	359°50.5	·· 05.6	87°38.5	·· 52.2	31°12.5	·· 57.0	142°07.3	·· 30.2
16	171°33.0	14°50.4	04.5	102°39.2	52.4	46°14.4	56.9	157°09.7	30.2
17	186°35.5	29°50.3	03.3	117°39.8	52.7	61°16.3	56.8	172°12.1	30.3
18	201°37.9	44°50.2	N11°02.2	132°40.4	N21°53.0	76°18.2	N19°56.6	187°14.5	N03°30.3
19	216°40.4	59°50.1	11°01.1	147°41.0	53.3	91°20.1	56.5	202°16.9	30.3
20	231°42.9	74°50.0	10°59.9	162°41.6	53.6	106°22.0	56.4	217°19.3	30.3
21	246°45.3	89°49.9	·· 58.8	177°42.2	·· 53.8	121°23.9	·· 56.3	232°21.7	·· 30.3
22	261°47.8	104°49.8	57.7	192°42.8	54.1	136°25.8	56.1	247°24.1	30.3
23	276°50.3	119°49.7	56.5	207°43.4	54.4	151°27.7	56.0	262°26.5	30.3
Mer.pass. 04:36		ν -0.1′	d 1.1′	ν 0.6′	d 0.3′	ν 1.9′	d 0.1′	ν 2.4′	d 0.0′
		m -4.12		m 1.31		m -1.79		m 0.72	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	291°52.7	134°49.6	N10°55.4	222°44.0	N21°54.7	166°29.6	N19°55.9	277°28.9	N03°30.3
1	306°55.2	149°49.5	54.3	237°44.6	54.9	181°31.5	55.8	292°31.3	30.3
2	321°57.7	164°49.4	53.1	252°45.3	55.2	196°33.4	55.6	307°33.8	30.3
3	337°00.1	179°49.3	·· 52.0	267°45.9	·· 55.5	211°35.3	·· 55.5	322°36.2	·· 30.4
4	352°02.6	194°49.2	50.9	282°46.5	55.8	226°37.2	55.4	337°38.6	30.4
5	7°05.0	209°49.1	49.7	297°47.1	56.1	241°39.1	55.3	352°41.0	30.4
6	22°07.5	224°49.0	N10°48.6	312°47.7	N21°56.3	256°40.9	N19°55.1	7°43.4	N03°30.4
7	37°10.0	239°48.9	47.5	327°48.3	56.6	271°42.8	55.0	22°45.8	30.4
8	52°12.4	254°48.8	46.3	342°48.9	56.9	286°44.7	54.9	37°48.2	30.4
9	67°14.9	269°48.7	·· 45.2	357°49.5	·· 57.2	301°46.6	·· 54.8	52°50.6	·· 30.4
10	82°17.4	284°48.6	44.0	12°50.1	57.4	316°48.5	54.7	67°53.0	30.4
11	97°19.8	299°48.5	42.9	27°50.7	57.7	331°50.4	54.5	82°55.4	30.4
12	112°22.3	314°48.4	N10°41.8	42°51.3	N21°58.0	346°52.3	N19°54.4	97°57.9	N03°30.4
13	127°24.8	329°48.4	40.6	57°52.0	58.3	1°54.2	54.3	113°00.3	30.5
14	142°27.2	344°48.3	39.5	72°52.6	58.5	16°56.1	54.2	128°02.7	30.5
15	157°29.7	359°48.2	·· 38.4	87°53.2	·· 58.8	31°58.0	·· 54.0	143°05.1	·· 30.5
16	172°32.2	14°48.1	37.2	102°53.8	59.1	46°59.9	53.9	158°07.5	30.5
17	187°34.6	29°48.0	36.1	117°54.4	59.3	62°01.8	53.8	173°09.9	30.5
18	202°37.1	44°47.9	N10°34.9	132°55.0	N21°59.6	77°03.7	N19°53.7	188°12.3	N03°30.5
19	217°39.5	59°47.8	33.8	147°55.6	21°59.9	92°05.6	53.5	203°14.7	30.5
20	232°42.0	74°47.7	32.6	162°56.2	22°00.2	107°07.5	53.4	218°17.2	30.5
21	247°44.5	89°47.7	·· 31.5	177°56.8	·· 00.4	122°09.4	·· 53.3	233°19.6	·· 30.5
22	262°46.9	104°47.6	30.4	192°57.4	00.7	137°11.3	53.2	248°22.0	30.5
23	277°49.4	119°47.5	29.2	207°58.1	01.0	152°13.2	53.0	263°24.4	30.5
Mer.pass. 04:32		ν -0.1′	d 1.1′	ν 0.6′	d 0.3′	ν 1.9′	d 0.1′	ν 2.4′	d 0.0′
		m -4.13		m 1.31		m -1.79		m 0.72	

Stars

	SHA	Dec
Alpheratz	357°33.4	29°14.2
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°40.8
Diphda	348°46.0	-17°50.3
Achernar	335°19.3	-57°05.8
Hamal	327°49.8	23°35.2
Polaris	313°36.3	89°22.2
Acamar	315°11.0	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.7	49°57.1
Aldebaran	290°38.4	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.7
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.0	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.4
Procyon	244°49.9	5°09.4
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°21.0	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.1	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.3	-60°57.0
Kochab	137°19.4	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.4	-34°22.3
Vega	80°31.9	38°48.5
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.2	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.3	9°59.9
Al Na'ir	27°31.0	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.6
Markab	13°28.5	15°20.9

Jul 12 Sun	**SHA**	**Mer.pass**
Venus	205°00.6	15:00
Mars	292°20.3	09:11
Jupiter	235°04.1	12:58
Saturn	345°39.0	05:37

Jul 13 Mon	**SHA**	**Mer.pass**
Venus	203°58.6	15:01
Mars	291°35.8	09:10
Jupiter	234°50.5	12:55
Saturn	345°37.6	05:33

Jul 14 Tue	**SHA**	**Mer.pass**
Venus	202°56.9	15:01
Mars	290°51.3	09:09
Jupiter	234°36.9	12:52
Saturn	345°36.2	05:29

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h

Sun	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°35.9	N21°59.6	216°02.4	1.4′	N27°37.0	3.2′	60.7′
1	193°35.8	59.3	230°22.8	1.3′	27°40.2	2.9′	60.7′
2	208°35.7	58.9	244°43.1	1.3′	27°43.1	2.8′	60.8′
3	223°35.7	·· 58.6	259°03.4	1.2′	27°45.9	2.5′	60.8′
4	238°35.6	58.2	273°23.6	1.2′	27°48.4	2.3′	60.8′
5	253°35.5	57.9	287°43.8	1.1′	27°50.7	2.1′	60.8′
6	268°35.4	N21°57.5	302°03.9	1.1′	N27°52.8	1.9′	60.8′
7	283°35.3	57.2	316°23.9	1.0′	27°54.7	1.7′	60.8′
8	298°35.3	56.8	330°44.0	1.0′	27°56.4	1.5′	60.8′
9	313°35.2	·· 56.5	345°03.9	0.9′	27°57.9	1.2′	60.8′
10	328°35.1	56.1	359°23.9	0.9′	27°59.1	1.0′	60.9′
11	343°35.0	55.8	13°43.8	0.9′	28°00.1	0.8′	60.9′
12	358°34.9	N21°55.4	28°03.7	0.9′	N28°00.9	0.6′	60.9′
13	13°34.9	55.1	42°23.6	0.8′	28°01.5	0.4′	60.9′
14	28°34.8	54.7	56°43.4	0.8′	28°01.9	0.1′	60.9′
15	43°34.7	·· 54.4	71°03.2	0.8′	28°02.0	0.0′	60.9′
16	58°34.6	54.0	85°23.0	0.8′	28°02.0	0.3′	60.9′
17	73°34.5	53.6	99°42.8	0.8′	28°01.7	0.5′	60.9′
18	88°34.5	N21°53.3	114°02.6	0.8′	N28°01.2	0.8′	60.9′
19	103°34.4	52.9	128°22.4	0.8′	28°00.4	0.9′	60.9′
20	118°34.3	52.6	142°42.1	0.8′	27°59.5	1.2′	60.9′
21	133°34.2	·· 52.2	157°01.9	0.8′	27°58.3	1.4′	61.0′
22	148°34.2	51.9	171°21.7	0.8′	27°56.9	1.6′	61.0′
23	163°34.1	51.5	185°41.5	0.8′	27°55.3	1.9′	61.0′
	SD = 15.7′	d = 0.3′		SD = 16.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.0	N21°51.1	200°01.3	0.8′	N27°53.4	2.0′	61.0′
1	193°33.9	50.8	214°21.2	0.9′	27°51.4	2.3′	61.0′
2	208°33.9	50.4	228°41.0	0.9′	27°49.1	2.5′	61.0′
3	223°33.8	·· 50.0	243°00.9	0.9′	27°46.6	2.7′	61.0′
4	238°33.7	49.7	257°20.8	0.9′	27°43.9	2.9′	61.0′
5	253°33.6	49.3	271°40.8	1.0′	27°41.0	3.1′	61.0′
6	268°33.6	N21°49.0	286°00.7	1.0′	N27°37.9	3.4′	61.0′
7	283°33.5	48.6	300°20.8	1.1′	27°34.5	3.6′	61.0′
8	298°33.4	48.2	314°40.8	1.1′	27°30.9	3.8′	61.0′
9	313°33.3	·· 47.9	329°00.9	1.2′	27°27.1	4.0′	61.0′
10	328°33.3	47.5	343°21.1	1.2′	27°23.1	4.2′	61.0′
11	343°33.2	47.1	357°41.3	1.3′	27°18.9	4.4′	61.0′
12	358°33.1	N21°46.8	12°01.5	1.3′	N27°14.5	4.6′	61.0′
13	13°33.0	46.4	26°21.9	1.4′	27°09.9	4.9′	61.0′
14	28°33.0	46.0	40°42.2	1.4′	27°05.0	5.0′	61.0′
15	43°32.9	·· 45.7	55°02.7	1.5′	27°00.0	5.3′	61.0′
16	58°32.8	45.3	69°23.2	1.6′	26°54.7	5.5′	61.0′
17	73°32.7	44.9	83°43.8	1.7′	26°49.2	5.7′	61.0′
18	88°32.7	N21°44.5	98°04.5	1.7′	N26°43.5	5.8′	61.0′
19	103°32.6	44.2	112°25.2	1.8′	26°37.7	6.1′	61.0′
20	118°32.5	43.8	126°46.0	1.9′	26°31.6	6.3′	60.9′
21	133°32.4	·· 43.4	141°06.9	2.0′	26°25.3	6.5′	60.9′
22	148°32.4	43.0	155°27.9	2.1′	26°18.8	6.6′	60.9′
23	163°32.3	42.7	169°49.0	2.2′	26°12.2	6.9′	60.9′
	SD = 15.7′	d = 0.4′		SD = 16.6′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.2	N21°42.3	184°10.1	2.3′	N26°05.3	7.1′	60.9′
1	193°32.2	41.9	198°31.4	2.4′	25°58.2	7.2′	60.9′
2	208°32.1	41.5	212°52.7	2.5′	25°51.0	7.5′	60.9′
3	223°32.0	·· 41.2	227°14.2	2.6′	25°43.5	7.6′	60.9′
4	238°31.9	40.8	241°35.7	2.7′	25°35.9	7.8′	60.9′
5	253°31.9	40.4	255°57.4	2.8′	25°28.1	8.0′	60.9′
6	268°31.8	N21°40.0	270°19.2	2.9′	N25°20.1	8.2′	60.9′
7	283°31.7	39.6	284°41.0	3.0′	25°11.9	8.4′	60.8′
8	298°31.7	39.3	299°03.0	3.1′	25°03.5	8.5′	60.8′
9	313°31.6	·· 38.9	313°25.1	3.2′	24°55.0	8.8′	60.8′
10	328°31.5	38.5	327°47.3	3.3′	24°46.2	8.9′	60.8′
11	343°31.5	38.1	342°09.6	3.4′	24°37.3	9.0′	60.8′
12	358°31.4	N21°37.7	356°32.0	3.5′	N24°28.3	9.3′	60.8′
13	13°31.3	37.4	10°54.5	3.7′	24°19.0	9.4′	60.8′
14	28°31.3	37.0	25°17.2	3.8′	24°09.6	9.6′	60.7′
15	43°31.2	·· 36.6	39°40.0	3.9′	24°00.0	9.7′	60.7′
16	58°31.1	36.2	54°02.9	4.0′	23°50.3	10.0′	60.7′
17	73°31.0	35.8	68°25.9	4.1′	23°40.3	10.0′	60.7′
18	88°31.0	N21°35.4	82°49.0	4.3′	N23°30.3	10.3′	60.7′
19	103°30.9	35.0	97°12.3	4.4′	23°20.0	10.3′	60.7′
20	118°30.8	34.6	111°35.7	4.5′	23°09.7	10.6′	60.6′
21	133°30.8	·· 34.3	125°59.2	4.6′	22°59.1	10.7′	60.6′
22	148°30.7	33.9	140°22.8	4.8′	22°48.4	10.8′	60.6′
23	163°30.6	33.5	154°46.6	4.9′	22°37.6	11.0′	60.6′
	SD = 15.7′	d = 0.4′		SD = 16.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:26	22:41	////	////
64°	////	////	02:10	22:00	////	////
62°	////	00:31	02:38	21:32	23:31	////
60°	////	01:38	03:00	21:10	22:30	////
N 58°	////	02:11	03:17	20:53	21:59	////
56°	00:29	02:35	03:32	20:39	21:35	23:34
54°	01:30	02:54	03:45	20:26	21:17	22:39
52°	02:01	03:09	03:56	20:15	21:01	22:09
50°	02:23	03:23	04:05	20:06	20:48	21:47
45°	03:02	03:50	04:26	19:45	20:21	21:08
N 40°	03:30	04:10	04:42	19:29	20:01	20:41
35°	03:51	04:27	04:56	19:15	19:44	20:20
30°	04:08	04:41	05:08	19:03	19:30	20:03
20°	04:35	05:04	05:28	18:43	19:07	19:36
N 10°	04:56	05:23	05:46	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:09	18:32	18:58
S 10°	05:30	05:56	06:18	17:53	18:16	18:42
20°	05:45	06:12	06:35	17:36	18:00	18:27
30°	05:59	06:29	06:55	17:17	17:43	18:12
35°	06:07	06:39	07:06	17:05	17:33	18:04
40°	06:16	06:49	07:19	16:53	17:23	17:56
45°	06:25	07:02	07:35	16:37	17:10	17:47
S 50°	06:35	07:16	07:53	16:19	16:56	17:37
52°	06:40	07:23	08:02	16:10	16:49	17:32
54°	06:45	07:30	08:12	16:00	16:42	17:27
56°	06:50	07:38	08:23	15:49	16:34	17:22
58°	06:56	07:47	08:36	15:36	16:25	17:16
S 60°	07:03	07:57	08:51	15:21	16:15	17:09

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	23:13
64°	▭	▭	00:04	▭	23:31	22:33
62°	23:11	·· ··	01:27	22:03	22:08	22:05
60°	·· ··	00:19	02:03	20:55	21:31	21:43
N 58°	·· ··	00:54	02:29	20:20	21:04	21:25
56°	00:15	01:19	02:50	19:55	20:43	21:10
54°	00:35	01:40	03:07	19:34	20:25	20:57
52°	00:51	01:57	03:22	19:17	20:10	20:46
50°	01:06	02:12	03:34	19:02	19:57	20:36
45°	01:35	02:41	04:00	18:33	19:30	20:14
N 40°	01:57	03:04	04:21	18:09	19:09	19:57
35°	02:16	03:24	04:38	17:50	18:51	19:42
30°	02:33	03:40	04:53	17:33	18:36	19:29
20°	03:00	04:08	05:18	17:05	18:09	19:07
N 10°	03:24	04:32	05:39	16:41	17:47	18:47
0°	03:47	04:54	05:59	16:19	17:25	18:29
S 10°	04:09	05:16	06:19	15:56	17:04	18:11
20°	04:33	05:40	06:41	15:32	16:41	17:51
30°	05:01	06:08	07:05	15:03	16:14	17:28
35°	05:18	06:24	07:20	14:47	15:58	17:15
40°	05:37	06:43	07:37	14:27	15:39	16:59
45°	06:01	07:06	07:56	14:03	15:17	16:40
S 50°	06:31	07:35	08:21	13:33	14:48	16:16
52°	06:46	07:50	08:33	13:18	14:34	16:05
54°	07:04	08:07	08:47	13:00	14:17	15:52
56°	07:25	08:27	09:02	12:39	13:58	15:37
58°	07:52	08:51	09:21	12:12	13:33	15:19
S 60°	08:30	09:25	09:43	11:34	13:00	14:57

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 27-0 9-0%
12	05:36	05:40	12:06	10:03	22:36	
13	05:44	05:48	12:06	11:10	23:43	
14	05:51	05:54	12:06	12:14	–:–	

July 15, 16, 17 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°51.9	134°47.4	N10°28.1	222°58.7	N22°01.2	167°15.1	N19°52.9	278°26.8	N03°30.6
1	307°54.3	149°47.3	26.9	237°59.3	01.5	182°17.0	52.8	293°29.2	30.6
2	322°56.8	164°47.2	25.8	252°59.9	01.8	197°18.8	52.7	308°31.6	30.6
3	337°59.3	179°47.2	·· 24.6	268°00.5	·· 02.0	212°20.7	·· 52.5	323°34.0	·· 30.6
4	353°01.7	194°47.1	23.5	283°01.1	02.3	227°22.6	52.4	338°36.5	30.6
5	8°04.2	209°47.0	22.4	298°01.7	02.6	242°24.5	52.3	353°38.9	30.6
6	23°06.6	224°46.9	N10°21.2	313°02.3	N22°02.8	257°26.4	N19°52.2	8°41.3	N03°30.6
7	38°09.1	239°46.8	20.1	328°02.9	03.1	272°28.3	52.0	23°43.7	30.6
8	53°11.6	254°46.8	18.9	343°03.5	03.4	287°30.2	51.9	38°46.1	30.6
9	68°14.0	269°46.7	·· 17.8	358°04.2	·· 03.6	302°32.1	·· 51.8	53°48.5	·· 30.6
10	83°16.5	284°46.6	16.6	13°04.8	03.9	317°34.0	51.7	68°50.9	30.6
11	98°19.0	299°46.5	15.5	28°05.4	04.2	332°35.9	51.5	83°53.4	30.6
12	113°21.4	314°46.5	N10°14.3	43°06.0	N22°04.4	347°37.8	N19°51.4	98°55.8	N03°30.7
13	128°23.9	329°46.4	13.2	58°06.6	04.7	2°39.7	51.3	113°58.2	30.7
14	143°26.4	344°46.3	12.0	73°07.2	05.0	17°41.6	51.2	129°00.6	30.7
15	158°28.8	359°46.2	·· 10.9	88°07.8	·· 05.2	32°43.5	·· 51.0	144°03.0	·· 30.7
16	173°31.3	14°46.2	09.7	103°08.4	05.5	47°45.4	50.9	159°05.4	30.7
17	188°33.8	29°46.1	08.6	118°09.0	05.8	62°47.3	50.8	174°07.9	30.7
18	203°36.2	44°46.0	N10°07.4	133°09.6	N22°06.0	77°49.2	N19°50.7	189°10.3	N03°30.7
19	218°38.7	59°45.9	06.3	148°10.3	06.3	92°51.1	50.5	204°12.7	30.7
20	233°41.1	74°45.9	05.1	163°10.9	06.5	107°53.0	50.4	219°15.1	30.7
21	248°43.6	89°45.8	·· 04.0	178°11.5	·· 06.8	122°54.8	·· 50.3	234°17.5	·· 30.7
22	263°46.1	104°45.7	02.8	193°12.1	07.1	137°56.7	50.2	249°19.9	30.7
23	278°48.5	119°45.7	01.7	208°12.7	07.3	152°58.6	50.0	264°22.4	30.7
Mer.pass. 04:28		ν -0.1′	d 1.1′	m -4.13	ν 0.6′	d 0.3′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.71

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	293°51.0	134°45.6	N10°00.5	223°13.3	N22°07.6	168°00.5	N19°49.9	279°24.8	N03°30.7
1	308°53.5	149°45.5	09°59.4	238°13.9	07.9	183°02.4	49.8	294°27.2	30.7
2	323°55.9	164°45.5	58.2	253°14.5	08.1	198°04.3	49.7	309°29.6	30.8
3	338°58.4	179°45.4	·· 57.1	268°15.1	·· 08.4	213°06.2	·· 49.5	324°32.0	·· 30.8
4	354°00.9	194°45.3	55.9	283°15.7	08.6	228°08.1	49.4	339°34.4	30.8
5	9°03.3	209°45.3	54.8	298°16.4	08.9	243°10.0	49.3	354°36.9	30.8
6	24°05.8	224°45.2	N09°53.6	313°17.0	N22°09.2	258°11.9	N19°49.2	9°39.3	N03°30.8
7	39°08.3	239°45.1	52.5	328°17.6	09.4	273°13.8	49.0	24°41.7	30.8
8	54°10.7	254°45.1	51.3	343°18.2	09.7	288°15.7	48.9	39°44.1	30.8
9	69°13.2	269°45.0	·· 50.1	358°18.8	·· 09.9	303°17.6	·· 48.8	54°46.5	·· 30.8
10	84°15.6	284°45.0	49.0	13°19.4	10.2	318°19.5	48.7	69°48.9	30.8
11	99°18.1	299°44.9	47.8	28°20.0	10.4	333°21.4	48.5	84°51.4	30.8
12	114°20.6	314°44.8	N09°46.7	43°20.6	N22°10.7	348°23.3	N19°48.4	99°53.8	N03°30.8
13	129°23.0	329°44.8	45.5	58°21.2	11.0	3°25.2	48.3	114°56.2	30.8
14	144°25.5	344°44.7	44.4	73°21.8	11.2	18°27.1	48.2	129°58.6	30.8
15	159°28.0	359°44.7	·· 43.2	88°22.5	·· 11.5	33°29.0	·· 48.0	145°01.0	·· 30.8
16	174°30.4	14°44.6	42.0	103°23.1	11.7	48°30.8	47.9	160°03.5	30.8
17	189°32.9	29°44.5	40.9	118°23.7	12.0	63°32.7	47.8	175°05.9	30.9
18	204°35.4	44°44.5	N09°39.7	133°24.3	N22°12.2	78°34.6	N19°47.7	190°08.3	N03°30.9
19	219°37.8	59°44.4	38.6	148°24.9	12.5	93°36.5	47.5	205°10.7	30.9
20	234°40.3	74°44.4	37.4	163°25.5	12.7	108°38.4	47.4	220°13.1	30.9
21	249°42.8	89°44.3	·· 36.3	178°26.1	·· 13.0	123°40.3	·· 47.3	235°15.6	·· 30.9
22	264°45.2	104°44.3	35.1	193°26.7	13.2	138°42.2	47.2	250°18.0	30.9
23	279°47.7	119°44.2	33.9	208°27.3	13.5	153°44.1	47.0	265°20.4	30.9
Mer.pass. 04:24		ν -0.1′	d 1.2′	m -4.14	ν 0.6′	d 0.3′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.71

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	294°50.1	134°44.2	N09°32.8	223°28.0	N22°13.7	168°46.0	N19°46.9	280°22.8	N03°30.9
1	309°52.6	149°44.1	31.6	238°28.6	14.0	183°47.9	46.8	295°25.2	30.9
2	324°55.1	164°44.1	30.5	253°29.2	14.2	198°49.8	46.7	310°27.7	30.9
3	339°57.5	179°44.0	·· 29.3	268°29.8	·· 14.5	213°51.7	·· 46.5	325°30.1	·· 30.9
4	355°00.0	194°44.0	28.1	283°30.4	14.7	228°53.6	46.4	340°32.5	30.9
5	10°02.5	209°43.9	27.0	298°31.0	15.0	243°55.5	46.3	355°34.9	30.9
6	25°04.9	224°43.9	N09°25.8	313°31.6	N22°15.2	258°57.4	N19°46.2	10°37.4	N03°30.9
7	40°07.4	239°43.8	24.6	328°32.2	15.5	273°59.3	46.0	25°39.8	30.9
8	55°09.9	254°43.8	23.5	343°32.8	15.7	289°01.2	45.9	40°42.2	30.9
9	70°12.3	269°43.7	·· 22.3	358°33.4	·· 16.0	304°03.1	·· 45.8	55°44.6	·· 30.9
10	85°14.8	284°43.7	21.2	13°34.1	16.2	319°04.9	45.6	70°47.0	30.9
11	100°17.2	299°43.6	20.0	28°34.7	16.5	334°06.8	45.5	85°49.5	30.9
12	115°19.7	314°43.6	N09°18.8	43°35.3	N22°16.7	349°08.7	N19°45.4	100°51.9	N03°30.9
13	130°22.2	329°43.5	17.7	58°35.9	17.0	4°10.6	45.3	115°54.3	31.0
14	145°24.6	344°43.5	16.5	73°36.5	17.2	19°12.5	45.1	130°56.7	31.0
15	160°27.1	359°43.4	·· 15.3	88°37.1	·· 17.5	34°14.4	·· 45.0	145°59.2	·· 31.0
16	175°29.6	14°43.4	14.2	103°37.7	17.7	49°16.3	44.9	161°01.6	31.0
17	190°32.0	29°43.4	13.0	118°38.3	18.0	64°18.2	44.8	176°04.0	31.0
18	205°34.5	44°43.3	N09°11.8	133°38.9	N22°18.2	79°20.1	N19°44.6	191°06.4	N03°31.0
19	220°37.0	59°43.3	10.7	148°39.6	18.5	94°22.0	44.5	206°08.9	31.0
20	235°39.4	74°43.2	09.5	163°40.2	18.7	109°23.9	44.4	221°11.3	31.0
21	250°41.9	89°43.2	·· 08.3	178°40.8	·· 19.0	124°25.8	·· 44.3	236°13.7	·· 31.0
22	265°44.4	104°43.2	07.2	193°41.4	19.2	139°27.7	44.1	251°16.1	31.0
23	280°46.8	119°43.1	06.0	208°42.0	19.4	154°29.6	44.0	266°18.6	31.0
Mer.pass. 04:20		ν -0.1′	d 1.2′	m -4.15	ν 0.6′	d 0.3′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.2
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°40.8
Diphda	348°46.0	-17°50.2
Achernar	335°19.3	-57°05.7
Hamal	327°49.8	23°35.2
Polaris	313°34.8	89°22.2
Acamar	315°11.0	-40°11.6
Menkar	314°04.9	4°11.7
Mirfak	308°26.7	49°57.2
Aldebaran	290°38.4	16°33.8
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.7
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°52.4	-52°42.4
Sirius	258°25.5	-16°45.1
Adhara	255°05.2	-29°00.4
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.9	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°21.0	-11°18.1
Alkaid	152°51.0	49°11.1
Hadar	148°34.1	-60°30.4
Menkent	147°56.0	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.3	-60°57.0
Kochab	137°19.4	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.7
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.4	-34°22.3
Vega	80°31.9	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.3	9°59.9
Al Na'ir	27°31.0	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.7	28°13.6
Markab	13°28.4	15°20.9

Jul 15 Wed	SHA	Mer.pass
Venus	201°55.5	15:01
Mars	290°06.8	09:08
Jupiter	234°23.2	12:49
Saturn	345°34.9	05:25

Jul 16 Thu	SHA	Mer.pass
Venus	200°54.6	15:01
Mars	289°22.3	09:07
Jupiter	234°09.5	12:46
Saturn	345°33.8	05:21

Jul 17 Fri	SHA	Mer.pass
Venus	199°54.0	15:01
Mars	288°37.8	09:06
Jupiter	233°55.9	12:43
Saturn	345°32.7	05:18

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.6	N21°33.1	169°10.5	5.0′	N22°26.6	11.1′	60.6′
1	193°30.5	32.7	183°34.5	5.2′	22°15.5	11.3′	60.5′
2	208°30.4	32.3	197°58.7	5.3′	22°04.2	11.4′	60.5′
3	223°30.4	·· 31.9	212°23.0	5.4′	21°52.8	11.6′	60.5′
4	238°30.3	31.5	226°47.4	5.6′	21°41.2	11.7′	60.5′
5	253°30.3	31.1	241°11.9	5.7′	21°29.5	11.8′	60.5′
6	268°30.2	N21°30.7	255°36.6	5.8′	N21°17.7	11.9′	60.4′
7	283°30.1	30.3	270°01.4	5.9′	21°05.8	12.1′	60.4′
8	298°30.1	29.9	284°26.4	6.1′	20°53.7	12.2′	60.4′
9	313°30.0	·· 29.5	298°51.5	6.2′	20°41.5	12.3′	60.4′
10	328°29.9	29.1	313°16.7	6.3′	20°29.2	12.5′	60.3′
11	343°29.9	28.7	327°42.0	6.5′	20°16.7	12.6′	60.3′
12	358°29.8	N21°28.3	342°07.5	6.6′	N20°04.1	12.7′	60.3′
13	13°29.7	27.9	356°33.1	6.7′	19°51.4	12.8′	60.3′
14	28°29.7	27.5	10°58.8	6.9′	19°38.6	12.9′	60.2′
15	43°29.6	·· 27.1	25°24.7	7.0′	19°25.7	13.0′	60.2′
16	58°29.5	26.7	39°50.7	7.1′	19°12.7	13.1′	60.2′
17	73°29.5	26.3	54°16.8	7.3′	18°59.6	13.3′	60.1′
18	88°29.4	N21°25.9	68°43.1	7.4′	N18°46.3	13.3′	60.1′
19	103°29.4	25.5	83°09.5	7.5′	18°33.0	13.5′	60.1′
20	118°29.3	25.1	97°36.0	7.7′	18°19.5	13.5′	60.1′
21	133°29.2	·· 24.7	112°02.7	7.8′	18°06.0	13.6′	60.0′
22	148°29.2	24.3	126°29.4	7.9′	17°52.4	13.8′	60.0′
23	163°29.1	23.9	140°56.3	8.0′	17°38.6	13.8′	60.0′
	SD = 15.7′	d = 0.4′	SD = 16.5′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.1	N21°23.5	155°23.4	8.2′	N17°24.8	13.9′	59.9′
1	193°29.0	23.1	169°50.5	8.3′	17°10.9	14.0′	59.9′
2	208°28.9	22.7	184°17.8	8.4′	16°56.9	14.1′	59.9′
3	223°28.9	·· 22.3	198°45.2	8.5′	16°42.8	14.1′	59.9′
4	238°28.8	21.9	213°12.8	8.7′	16°28.7	14.3′	59.8′
5	253°28.8	21.5	227°40.4	8.8′	16°14.4	14.3′	59.8′
6	268°28.7	N21°21.1	242°08.2	8.9′	N16°00.1	14.4′	59.8′
7	283°28.6	20.6	256°36.1	9.0′	15°45.7	14.5′	59.7′
8	298°28.6	20.2	271°04.2	9.1′	15°31.2	14.5′	59.7′
9	313°28.5	·· 19.8	285°32.3	9.3′	15°16.7	14.7′	59.7′
10	328°28.5	19.4	300°00.6	9.4′	15°02.0	14.6′	59.6′
11	343°28.4	19.0	314°29.0	9.5′	14°47.4	14.8′	59.6′
12	358°28.3	N21°18.6	328°57.5	9.6′	N14°32.6	14.8′	59.6′
13	13°28.3	18.2	343°26.1	9.7′	14°17.8	14.9′	59.5′
14	28°28.2	17.8	357°54.8	9.8′	14°02.9	14.9′	59.5′
15	43°28.2	·· 17.3	12°23.7	10.0′	13°48.0	15.0′	59.5′
16	58°28.1	16.9	26°52.6	10.1′	13°33.0	15.1′	59.4′
17	73°28.1	16.5	41°21.7	10.2′	13°17.9	15.1′	59.4′
18	88°28.0	N21°16.1	55°50.9	10.3′	N13°02.8	15.1′	59.4′
19	103°27.9	15.7	70°20.2	10.4′	12°47.7	15.3′	59.3′
20	118°27.9	15.3	84°49.6	10.5′	12°32.4	15.2′	59.3′
21	133°27.8	·· 14.8	99°19.1	10.6′	12°17.2	15.3′	59.2′
22	148°27.8	14.4	113°48.7	10.7′	12°01.9	15.4′	59.2′
23	163°27.7	14.0	128°18.4	10.8′	11°46.5	15.3′	59.2′
	SD = 15.7′	d = 0.4′	SD = 16.3′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.7	N21°13.6	142°48.3	10.9′	N11°31.2	15.5′	59.1′
1	193°27.6	13.1	157°18.2	11.0′	11°15.7	15.4′	59.1′
2	208°27.6	12.7	171°48.2	11.1′	11°00.3	15.5′	59.1′
3	223°27.5	·· 12.3	186°18.3	11.2′	10°44.8	15.6′	59.0′
4	238°27.4	11.9	200°48.6	11.3′	10°29.2	15.6′	59.0′
5	253°27.4	11.5	215°18.9	11.4′	10°13.6	15.6′	59.0′
6	268°27.3	N21°11.0	229°49.3	11.5′	N09°58.0	15.6′	58.9′
7	283°27.3	10.6	244°19.8	11.6′	09°42.4	15.7′	58.9′
8	298°27.2	10.2	258°50.4	11.7′	09°26.7	15.7′	58.8′
9	313°27.2	·· 09.7	273°21.1	11.8′	09°11.0	15.7′	58.8′
10	328°27.1	09.3	287°51.9	11.9′	08°55.3	15.7′	58.8′
11	343°27.1	08.9	302°22.8	12.0′	08°39.6	15.8′	58.7′
12	358°27.0	N21°08.5	316°53.7	12.0′	N08°23.8	15.7′	58.7′
13	13°27.0	08.0	331°24.8	12.1′	08°08.1	15.8′	58.7′
14	28°26.9	07.6	345°55.9	12.2′	07°52.3	15.9′	58.6′
15	43°26.9	·· 07.2	0°27.1	12.3′	07°36.4	15.8′	58.6′
16	58°26.8	06.7	14°58.4	12.4′	07°20.6	15.8′	58.5′
17	73°26.8	06.3	29°29.8	12.5′	07°04.8	15.9′	58.5′
18	88°26.7	N21°05.9	44°01.2	12.5′	N06°48.9	15.9′	58.5′
19	103°26.7	05.4	58°32.7	12.6′	06°33.0	15.8′	58.4′
20	118°26.6	05.0	73°04.4	12.7′	06°17.2	15.9′	58.4′
21	133°26.6	·· 04.6	87°36.0	12.8′	06°01.3	15.9′	58.3′
22	148°26.5	04.1	102°07.8	12.8′	05°45.4	15.9′	58.3′
23	163°26.5	03.7	116°39.6	12.9′	05°29.5	15.9′	58.3′
	SD = 15.7′	d = 0.4′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	////	////	01:40	22:29	////	////
64°	////	////	02:18	21:52	////	////
62°	////	00:57	02:45	21:26	23:09	////
60°	////	01:48	03:05	21:05	22:21	////
N 58°	////	02:18	03:22	20:49	21:52	////
56°	00:52	02:41	03:36	20:35	21:30	23:15
54°	01:39	02:59	03:48	20:23	21:12	22:31
52°	02:07	03:14	03:59	20:12	20:57	22:03
50°	02:28	03:27	04:09	20:03	20:45	21:43
45°	03:06	03:53	04:28	19:43	20:19	21:05
N 40°	03:33	04:13	04:45	19:27	19:59	20:39
35°	03:54	04:29	04:58	19:14	19:43	20:18
30°	04:10	04:43	05:10	19:02	19:29	20:01
20°	04:37	05:05	05:30	18:43	19:07	19:35
N 10°	04:57	05:24	05:47	18:26	18:48	19:15
0°	05:14	05:40	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:17	18:42
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:18	17:44	18:14
35°	06:06	06:38	07:05	17:07	17:35	18:06
40°	06:14	06:48	07:18	16:55	17:25	17:58
45°	06:23	07:00	07:33	16:40	17:13	17:49
S 50°	06:33	07:14	07:51	16:22	16:59	17:39
52°	06:38	07:20	07:59	16:13	16:52	17:35
54°	06:43	07:27	08:09	16:04	16:45	17:30
56°	06:48	07:35	08:20	15:53	16:38	17:25
58°	06:53	07:44	08:32	15:40	16:29	17:19
S 60°	06:59	07:54	08:47	15:26	16:19	17:13

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▭	03:24	06:35	▭	00:26 23:04	22:21
N 70°	▭	04:15	06:52	23:34	22:45	22:14
68°	▭	04:46	07:05	23:01	22:30	22:08
66°	02:34	05:09	07:15	22:37	22:17	22:02
64°	03:13	05:27	07:24	22:17	22:07	21:58
62°	03:40	05:41	07:31	22:02	21:58	21:54
60°	04:01	05:53	07:37	21:48	21:50	21:51
N 58°	04:18	06:04	07:43	21:37	21:43	21:48
56°	04:32	06:13	07:48	21:27	21:37	21:45
54°	04:44	06:21	07:52	21:18	21:32	21:42
52°	04:55	06:28	07:56	21:10	21:27	21:40
50°	05:05	06:35	08:00	21:02	21:22	21:38
45°	05:25	06:48	08:08	20:47	21:12	21:33
N 40°	05:41	07:00	08:14	20:34	21:04	21:30
35°	05:55	07:09	08:19	20:23	20:57	21:26
30°	06:07	07:18	08:24	20:13	20:51	21:23
20°	06:27	07:32	08:33	19:56	20:40	21:18
N 10°	06:44	07:45	08:40	19:42	20:30	21:14
0°	07:01	07:56	08:47	19:28	20:21	21:09
S 10°	07:17	08:08	08:54	19:14	20:11	21:05
20°	07:34	08:20	09:01	18:59	20:02	21:00
30°	07:54	08:34	09:09	18:41	19:50	20:55
35°	08:05	08:42	09:14	18:31	19:43	20:52
40°	08:18	08:52	09:19	18:19	19:36	20:48
45°	08:34	09:02	09:25	18:05	19:27	20:44
S 50°	08:53	09:15	09:32	17:48	19:16	20:39
52°	09:02	09:21	09:36	17:40	19:11	20:36
54°	09:11	09:28	09:39	17:30	19:05	20:34
56°	09:23	09:35	09:43	17:20	18:59	20:31
58°	09:35	09:43	09:48	17:08	18:52	20:28
S 60°	09:50	09:52	09:53	16:54	18:44	20:24

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 1-9%
15	05:58	06:01	12:06	13:14	00:45	
16	06:04	06:07	12:06	14:09	01:42	
17	06:09	06:12	12:06	14:58	02:34	

July 18, 19, 20 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	295°49.3	134°43.1	N09°04.8	223°42.6	N22°19.7	169°31.5	N19°43.9	281°21.0	N03°31.0
1	310°51.7	149°43.0	03.7	238°43.2	19.9	184°33.4	43.7	296°23.4	31.0
2	325°54.2	164°43.0	02.5	253°43.8	20.2	199°35.3	43.6	311°25.8	31.0
3	340°56.7	179°43.0	·· 01.3	268°44.4	·· 20.4	214°37.1	·· 43.5	326°28.3	·· 31.0
4	355°59.1	194°42.9	09°00.2	283°45.1	20.7	229°39.0	43.4	341°30.7	31.0
5	11°01.6	209°42.9	08°59.0	298°45.7	20.9	244°40.9	43.2	356°33.1	31.0
6	26°04.1	224°42.9	N08°57.8	313°46.3	N22°21.1	259°42.8	N19°43.1	11°35.5	N03°31.0
7	41°06.5	239°42.8	56.7	328°46.9	21.4	274°44.7	43.0	26°38.0	31.0
8	56°09.0	254°42.8	55.5	343°47.5	21.6	289°46.6	42.9	41°40.4	31.0
9	71°11.5	269°42.8	·· 54.3	358°48.1	·· 21.9	304°48.5	·· 42.7	56°42.8	·· 31.0
10	86°13.9	284°42.7	53.2	13°48.7	22.1	319°50.4	42.6	71°45.2	31.0
11	101°16.4	299°42.7	52.0	28°49.3	22.3	334°52.3	42.5	86°47.7	31.0
12	116°18.9	314°42.7	N08°50.8	43°49.9	N22°22.6	349°54.2	N19°42.4	101°50.1	N03°31.0
13	131°21.3	329°42.7	49.6	58°50.6	22.8	4°56.1	42.2	116°52.5	31.0
14	146°23.8	344°42.6	48.5	73°51.2	23.1	19°58.0	42.1	131°54.9	31.0
15	161°26.2	359°42.6	·· 47.3	88°51.8	·· 23.3	34°59.9	·· 42.0	146°57.4	·· 31.0
16	176°28.7	14°42.6	46.1	103°52.4	23.5	50°01.8	41.8	161°59.8	31.0
17	191°31.2	29°42.5	44.9	118°53.0	23.8	65°03.7	41.7	177°02.2	31.0
18	206°33.6	44°42.5	N08°43.8	133°53.6	N22°24.0	80°05.6	N19°41.6	192°04.7	N03°31.1
19	221°36.1	59°42.5	42.6	148°54.2	24.2	95°07.5	41.5	207°07.1	31.1
20	236°38.6	74°42.5	41.4	163°54.8	24.5	110°09.3	41.3	222°09.5	31.1
21	251°41.0	89°42.4	·· 40.3	178°55.5	·· 24.7	125°11.2	·· 41.2	237°11.9	·· 31.1
22	266°43.5	104°42.4	39.1	193°56.1	24.9	140°13.1	41.1	252°14.4	31.1
23	281°46.0	119°42.4	37.9	208°56.7	25.2	155°15.0	40.9	267°16.8	31.1
Mer.pass. 04:16		ν -0.0′	d 1.2′	m -4.16	ν 0.6′	d 0.2′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.70

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	296°48.4	134°42.4	N08°36.7	223°57.3	N22°25.4	170°16.9	N19°40.8	282°19.2	N03°31.1
1	311°50.9	149°42.3	35.6	238°57.9	25.6	185°18.8	40.7	297°21.6	31.1
2	326°53.3	164°42.3	34.4	253°58.5	25.9	200°20.7	40.6	312°24.1	31.1
3	341°55.8	179°42.3	·· 33.2	268°59.1	·· 26.1	215°22.6	·· 40.4	327°26.5	·· 31.1
4	356°58.3	194°42.3	32.0	283°59.7	26.3	230°24.5	40.3	342°28.9	31.1
5	12°00.7	209°42.3	30.9	299°00.3	26.6	245°26.4	40.2	357°31.4	31.1
6	27°03.2	224°42.2	N08°29.7	314°01.0	N22°26.8	260°28.3	N19°40.1	12°33.8	N03°31.1
7	42°05.7	239°42.2	28.5	329°01.6	27.0	275°30.2	39.9	27°36.2	31.1
8	57°08.1	254°42.2	27.3	344°02.2	27.3	290°32.1	39.8	42°38.7	31.1
9	72°10.6	269°42.2	·· 26.1	359°02.8	·· 27.5	305°34.0	·· 39.7	57°41.1	·· 31.1
10	87°13.1	284°42.2	25.0	14°03.4	27.7	320°35.9	39.5	72°43.5	31.1
11	102°15.5	299°42.2	23.8	29°04.0	28.0	335°37.8	39.4	87°45.9	31.1
12	117°18.0	314°42.1	N08°22.6	44°04.6	N22°28.2	350°39.7	N19°39.3	102°48.4	N03°31.1
13	132°20.5	329°42.1	21.4	59°05.2	28.4	5°41.5	39.2	117°50.8	31.1
14	147°22.9	344°42.1	20.3	74°05.9	28.7	20°43.4	39.0	132°53.2	31.1
15	162°25.4	359°42.1	·· 19.1	89°06.5	·· 28.9	35°45.3	·· 38.9	147°55.7	·· 31.1
16	177°27.8	14°42.1	17.9	104°07.1	29.1	50°47.2	38.8	162°58.1	31.1
17	192°30.3	29°42.1	16.7	119°07.7	29.3	65°49.1	38.6	178°00.5	31.1
18	207°32.8	44°42.1	N08°15.5	134°08.3	N22°29.6	80°51.0	N19°38.5	193°03.0	N03°31.1
19	222°35.2	59°42.1	14.4	149°08.9	29.8	95°52.9	38.4	208°05.4	31.1
20	237°37.7	74°42.0	13.2	164°09.5	30.0	110°54.8	38.3	223°07.8	31.1
21	252°40.2	89°42.0	·· 12.0	179°10.1	·· 30.3	125°56.7	·· 38.1	238°10.3	·· 31.1
22	267°42.6	104°42.0	10.8	194°10.8	30.5	140°58.6	38.0	253°12.7	31.1
23	282°45.1	119°42.0	09.6	209°11.4	30.7	156°00.5	37.9	268°15.1	31.1
Mer.pass. 04:12		ν -0.0′	d 1.2′	m -4.16	ν 0.6′	d 0.2′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.70

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	297°47.6	134°42.0	N08°08.5	224°12.0	N22°30.9	171°02.4	N19°37.8	283°17.6	N03°31.1
1	312°50.0	149°42.0	07.3	239°12.6	31.2	186°04.3	37.6	298°20.0	31.1
2	327°52.5	164°42.0	06.1	254°13.2	31.4	201°06.2	37.5	313°22.4	31.1
3	342°54.9	179°42.0	·· 04.9	269°13.8	·· 31.6	216°08.1	·· 37.4	328°24.9	·· 31.1
4	357°57.4	194°42.0	03.7	284°14.4	31.8	231°10.0	37.2	343°27.3	31.1
5	12°59.9	209°42.0	02.6	299°15.0	32.1	246°11.9	37.1	358°29.7	31.1
6	28°02.3	224°42.0	N08°01.4	314°15.7	N22°32.3	261°13.7	N19°37.0	13°32.2	N03°31.1
7	43°04.8	239°42.0	08°00.2	329°16.3	32.5	276°15.6	36.9	28°34.6	31.1
8	58°07.3	254°42.0	07°59.0	344°16.9	32.7	291°17.5	36.7	43°37.0	31.1
9	73°09.7	269°42.0	·· 57.8	359°17.5	·· 33.0	306°19.4	·· 36.6	58°39.5	·· 31.1
10	88°12.2	284°42.0	56.6	14°18.1	33.2	321°21.3	36.5	73°41.9	31.1
11	103°14.7	299°42.0	55.5	29°18.7	33.4	336°23.2	36.3	88°44.3	31.1
12	118°17.1	314°42.0	N07°54.3	44°19.3	N22°33.6	351°25.1	N19°36.2	103°46.8	N03°31.1
13	133°19.6	329°42.0	53.1	59°19.9	33.8	6°27.0	36.1	118°49.2	31.1
14	148°22.1	344°42.0	51.9	74°20.6	34.1	21°28.9	36.0	133°51.6	31.1
15	163°24.5	359°42.0	·· 50.7	89°21.2	·· 34.3	36°30.8	·· 35.8	148°54.1	·· 31.1
16	178°27.0	14°42.0	49.5	104°21.8	34.5	51°32.7	35.7	163°56.5	31.1
17	193°29.4	29°42.0	48.3	119°22.4	34.7	66°34.6	35.6	178°58.9	31.1
18	208°31.9	44°42.0	N07°47.2	134°23.0	N22°34.9	81°36.5	N19°35.4	194°01.4	N03°31.1
19	223°34.4	59°42.0	46.0	149°23.6	35.2	96°38.4	35.3	209°03.8	31.1
20	238°36.8	74°42.0	44.8	164°24.2	35.4	111°40.3	35.2	224°06.2	31.1
21	253°39.3	89°42.0	·· 43.6	179°24.9	·· 35.6	126°42.2	·· 35.0	239°08.7	·· 31.1
22	268°41.8	104°42.0	42.4	194°25.5	35.8	141°44.0	34.9	254°11.1	31.1
23	283°44.2	119°42.0	41.2	209°26.1	36.0	156°45.9	34.8	269°13.6	31.1
Mer.pass. 04:08		ν -0.0′	d 1.2′	m -4.17	ν 0.6′	d 0.2′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.2
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°40.8
Diphda	348°45.9	-17°50.2
Achernar	335°19.2	-57°05.7
Hamal	327°49.8	23°35.2
Polaris	313°33.4	89°22.2
Acamar	315°11.0	-40°11.6
Menkar	314°04.9	4°11.7
Mirfak	308°26.6	49°57.2
Aldebaran	290°38.4	16°33.8
Rigel	281°02.9	-8°10.1
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.7
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°52.4	-52°42.4
Sirius	258°25.5	-16°45.1
Adhara	255°05.2	-29°00.4
Procyon	244°49.8	5°09.4
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.4
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.9	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°12.0	55°49.2
Spica	158°21.0	-11°18.1
Alkaid	152°51.0	49°11.1
Hadar	148°34.1	-60°30.4
Menkent	147°56.1	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.4	-60°57.0
Kochab	137°19.5	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.7
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.4	-34°22.3
Vega	80°31.9	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.3	9°59.9
Al Na'ir	27°30.9	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.7	28°13.6
Markab	13°28.4	15°20.9

Jul 18 Sat	SHA	Mer.pass
Venus	198°53.8	15:01
Mars	287°53.3	09:05
Jupiter	233°42.2	12:40
Saturn	345°31.7	05:14

Jul 19 Sun	SHA	Mer.pass
Venus	197°53.9	15:01
Mars	287°08.9	09:04
Jupiter	233°28.5	12:37
Saturn	345°30.8	05:10

Jul 20 Mon	SHA	Mer.pass
Venus	196°54.5	15:01
Mars	286°24.4	09:03
Jupiter	233°14.8	12:34
Saturn	345°30.0	05:06

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°26.4	N21°03.3	131°11.5	13.0′	N05°13.6	15.9′	58.2′
1	193°26.4	02.8	145°43.5	13.0′	04°57.7	15.9′	58.2′
2	208°26.3	02.4	160°15.5	13.1′	04°41.8	15.9′	58.1′
3	223°26.3	·· 02.0	174°47.6	13.2′	04°25.9	15.9′	58.1′
4	238°26.2	01.5	189°19.8	13.2′	04°10.0	15.9′	58.1′
5	253°26.2	01.1	203°52.0	13.3′	03°54.1	15.9′	58.0′
6	268°26.1	N21°00.6	218°24.3	13.4′	N03°38.2	15.9′	58.0′
7	283°26.1	21°00.2	232°56.7	13.4′	03°22.3	15.9′	58.0′
8	298°26.0	20°59.8	247°29.1	13.5′	03°06.4	15.9′	57.9′
9	313°26.0	·· 59.3	262°01.5	13.5′	02°50.5	15.8′	57.9′
10	328°25.9	58.9	276°34.1	13.6′	02°34.7	15.9′	57.8′
11	343°25.9	58.4	291°06.6	13.6′	02°18.8	15.8′	57.8′
12	358°25.8	N20°58.0	305°39.3	13.7′	N02°03.0	15.9′	57.8′
13	13°25.8	57.5	320°11.9	13.7′	01°47.1	15.8′	57.7′
14	28°25.7	57.1	334°44.7	13.8′	01°31.3	15.8′	57.7′
15	43°25.7	·· 56.7	349°17.5	13.8′	01°15.5	15.8′	57.6′
16	58°25.6	56.2	3°50.3	13.9′	00°59.7	15.7′	57.6′
17	73°25.6	55.8	18°23.2	13.9′	00°44.0	15.8′	57.6′
18	88°25.5	N20°55.3	32°56.1	14.0′	N00°28.2	15.7′	57.5′
19	103°25.5	54.9	47°29.1	14.0′	N00°12.5	15.7′	57.5′
20	118°25.5	54.4	62°02.1	14.1′	S00°03.2	15.7′	57.4′
21	133°25.4	·· 54.0	76°35.1	14.1′	00°18.9	15.7′	57.4′
22	148°25.4	53.5	91°08.2	14.1′	00°34.6	15.6′	57.4′
23	163°25.3	53.1	105°41.4	14.2′	00°50.2	15.6′	57.3′
	SD = 15.7′	d = 0.4′		SD = 15.9′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.3	N20°52.6	120°14.5	14.2′	S01°05.8	15.6′	57.3′
1	193°25.2	52.2	134°47.7	14.2′	01°21.4	15.5′	57.3′
2	208°25.2	51.7	149°21.0	14.3′	01°36.9	15.6′	57.2′
3	223°25.1	·· 51.3	163°54.3	14.3′	01°52.5	15.5′	57.2′
4	238°25.1	50.8	178°27.6	14.3′	02°08.0	15.4′	57.1′
5	253°25.1	50.4	193°00.9	14.4′	02°23.4	15.5′	57.1′
6	268°25.0	N20°49.9	207°34.3	14.4′	S02°38.9	15.4′	57.1′
7	283°25.0	49.4	222°07.7	14.4′	02°54.3	15.3′	57.0′
8	298°24.9	49.0	236°41.1	14.4′	03°09.6	15.4′	57.0′
9	313°24.9	·· 48.5	251°14.5	14.5′	03°25.0	15.3′	57.0′
10	328°24.9	48.1	265°48.0	14.5′	03°40.3	15.2′	56.9′
11	343°24.8	47.6	280°21.5	14.5′	03°55.5	15.3′	56.9′
12	358°24.8	N20°47.2	294°55.0	14.5′	S04°10.8	15.1′	56.8′
13	13°24.7	46.7	309°28.5	14.6′	04°25.9	15.2′	56.8′
14	28°24.7	46.2	324°02.1	14.6′	04°41.1	15.1′	56.8′
15	43°24.7	·· 45.8	338°35.7	14.6′	04°56.2	15.1′	56.7′
16	58°24.6	45.3	353°09.2	14.6′	05°11.3	15.0′	56.7′
17	73°24.6	44.9	7°42.9	14.6′	05°26.3	15.0′	56.7′
18	88°24.5	N20°44.4	22°16.5	14.6′	S05°41.3	14.9′	56.6′
19	103°24.5	43.9	36°50.1	14.6′	05°56.2	14.9′	56.6′
20	118°24.5	43.5	51°23.7	14.7′	06°11.1	14.9′	56.6′
21	133°24.4	·· 43.0	65°57.4	14.7′	06°26.0	14.8′	56.5′
22	148°24.4	42.5	80°31.1	14.7′	06°40.8	14.7′	56.5′
23	163°24.3	42.1	95°04.7	14.7′	06°55.5	14.7′	56.4′
	SD = 15.7′	d = 0.5′		SD = 15.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.3	N20°41.6	109°38.4	14.7′	S07°10.2	14.7′	56.4′
1	193°24.3	41.1	124°12.1	14.7′	07°24.9	14.6′	56.4′
2	208°24.2	40.7	138°45.8	14.7′	07°39.5	14.6′	56.3′
3	223°24.2	·· 40.2	153°19.5	14.7′	07°54.1	14.5′	56.3′
4	238°24.2	39.7	167°53.2	14.7′	08°08.6	14.4′	56.3′
5	253°24.1	39.3	182°26.9	14.7′	08°23.0	14.4′	56.2′
6	268°24.1	N20°38.8	197°00.6	14.7′	S08°37.4	14.4′	56.2′
7	283°24.0	38.3	211°34.3	14.7′	08°51.8	14.3′	56.2′
8	298°24.0	37.9	226°08.0	14.7′	09°06.1	14.2′	56.1′
9	313°24.0	·· 37.4	240°41.6	14.7′	09°20.3	14.2′	56.1′
10	328°23.9	36.9	255°15.3	14.7′	09°34.5	14.2′	56.1′
11	343°23.9	36.4	269°49.0	14.7′	09°48.7	14.0′	56.0′
12	358°23.9	N20°36.0	284°22.7	14.7′	S10°02.7	14.0′	56.0′
13	13°23.8	35.5	298°56.3	14.7′	10°16.7	14.0′	56.0′
14	28°23.8	35.0	313°30.0	14.6′	10°30.7	13.9′	55.9′
15	43°23.8	·· 34.6	328°03.7	14.6′	10°44.6	13.8′	55.9′
16	58°23.7	34.1	342°37.3	14.6′	10°58.4	13.8′	55.9′
17	73°23.7	33.6	357°10.9	14.6′	11°12.2	13.7′	55.8′
18	88°23.7	N20°33.1	11°44.5	14.6′	S11°25.9	13.7′	55.8′
19	103°23.6	32.6	26°18.1	14.6′	11°39.6	13.6′	55.8′
20	118°23.6	32.2	40°51.7	14.6′	11°53.2	13.5′	55.8′
21	133°23.6	·· 31.7	55°25.3	14.6′	12°06.7	13.5′	55.7′
22	148°23.5	31.2	69°58.8	14.5′	12°20.2	13.4′	55.7′
23	163°23.5	30.7	84°32.4	14.5′	12°33.6	13.3′	55.7′
	SD = 15.7′	d = 0.5′		SD = 15.4′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	00:46	23:17	////	////
66°	////	////	01:53	22:16	////	////
64°	////	////	02:27	21:43	////	////
62°	////	01:15	02:52	21:19	22:53	////
60°	////	01:58	03:12	21:00	22:12	////
N 58°	////	02:26	03:28	20:44	21:45	////
56°	01:09	02:47	03:41	20:31	21:24	22:59
54°	01:48	03:04	03:53	20:19	21:07	22:22
52°	02:14	03:18	04:03	20:09	20:53	21:57
50°	02:34	03:31	04:12	20:00	20:41	21:38
45°	03:10	03:56	04:31	19:41	20:16	21:02
N 40°	03:36	04:15	04:47	19:25	19:57	20:36
35°	03:56	04:31	05:00	19:12	19:41	20:16
30°	04:12	04:45	05:11	19:01	19:28	20:00
20°	04:38	05:07	05:31	18:42	19:06	19:34
N 10°	04:58	05:25	05:47	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:44	06:11	06:34	17:38	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:04	17:09	17:37	18:08
40°	06:13	06:46	07:16	16:57	17:27	18:00
45°	06:21	06:58	07:30	16:43	17:15	17:52
S 50°	06:31	07:11	07:48	16:25	17:02	17:42
52°	06:35	07:17	07:56	16:17	16:56	17:38
54°	06:40	07:24	08:06	16:08	16:49	17:33
56°	06:45	07:32	08:16	15:57	16:41	17:29
58°	06:50	07:40	08:28	15:45	16:33	17:23
S 60°	06:56	07:49	08:42	15:31	16:24	17:18

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	08:58	11:10	13:24	21:47	21:13	20:32
N 70°	09:02	11:04	13:06	21:48	21:22	20:52
68°	09:06	10:59	12:52	21:49	21:30	21:08
66°	09:08	10:55	12:40	21:49	21:36	21:22
64°	09:10	10:51	12:31	21:50	21:41	21:33
62°	09:12	10:49	12:23	21:50	21:46	21:42
60°	09:14	10:46	12:16	21:50	21:50	21:50
N 58°	09:16	10:44	12:10	21:51	21:54	21:57
56°	09:17	10:42	12:04	21:51	21:57	22:04
54°	09:18	10:40	12:00	21:51	22:00	22:09
52°	09:19	10:38	11:55	21:52	22:03	22:14
50°	09:20	10:37	11:52	21:52	22:05	22:19
45°	09:22	10:34	11:43	21:52	22:10	22:29
N 40°	09:24	10:31	11:36	21:53	22:15	22:38
35°	09:26	10:29	11:30	21:53	22:19	22:45
30°	09:27	10:27	11:25	21:53	22:22	22:52
20°	09:29	10:24	11:16	21:54	22:28	23:03
N 10°	09:32	10:21	11:08	21:54	22:34	23:13
0°	09:33	10:18	11:01	21:55	22:39	23:22
S 10°	09:35	10:15	10:54	21:55	22:44	23:31
20°	09:38	10:12	10:46	21:56	22:49	23:41
30°	09:40	10:09	10:38	21:56	22:55	23:53
35°	09:41	10:07	10:33	21:56	22:59	·· ··
40°	09:43	10:05	10:27	21:57	23:03	·· ··
45°	09:45	10:03	10:21	21:57	23:07	·· ··
S 50°	09:47	10:00	10:13	21:57	23:13	·· ··
52°	09:48	09:59	10:10	21:57	23:15	·· ··
54°	09:49	09:57	10:06	21:58	23:18	·· ··
56°	09:50	09:56	10:02	21:58	23:22	·· ··
58°	09:51	09:54	09:57	21:58	23:25	·· ··
S 60°	09:53	09:52	09:52	21:58	23:29	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 17-36%
18	06:14	06:17	12:06	15:44	03:21	
19	06:19	06:21	12:06	16:28	04:06	
20	06:23	06:25	12:06	17:12	04:50	

July 21, 22, 23 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	298°46.7	134°42.0	N07°40.0	224°26.7	N22°36.2	171°47.8	N19°34.7	284°16.0	N03°31.1
1	313°49.2	149°42.0	38.8	239°27.3	36.5	186°49.7	34.5	299°18.4	31.1
2	328°51.6	164°42.0	37.7	254°27.9	36.7	201°51.6	34.4	314°20.9	31.1
3	343°54.1	179°42.0	·· 36.5	269°28.5	·· 36.9	216°53.5	·· 34.3	329°23.3	·· 31.1
4	358°56.6	194°42.1	35.3	284°29.1	37.1	231°55.4	34.1	344°25.7	31.1
5	13°59.0	209°42.1	34.1	299°29.8	37.3	246°57.3	34.0	359°28.2	31.1
6	29°01.5	224°42.1	N07°32.9	314°30.4	N22°37.5	261°59.2	N19°33.9	14°30.6	N03°31.1
7	44°03.9	239°42.1	31.7	329°31.0	37.8	277°01.1	33.8	29°33.1	31.1
8	59°06.4	254°42.1	30.5	344°31.6	38.0	292°03.0	33.6	44°35.5	31.1
9	74°08.9	269°42.1	·· 29.3	359°32.2	·· 38.2	307°04.9	·· 33.5	59°37.9	·· 31.1
10	89°11.3	284°42.1	28.2	14°32.8	38.4	322°06.8	33.4	74°40.4	31.1
11	104°13.8	299°42.1	27.0	29°33.4	38.6	337°08.7	33.2	89°42.8	31.1
12	119°16.3	314°42.1	N07°25.8	44°34.1	N22°38.8	352°10.6	N19°33.1	104°45.2	N03°31.1
13	134°18.7	329°42.2	24.6	59°34.7	39.0	7°12.5	33.0	119°47.7	31.1
14	149°21.2	344°42.2	23.4	74°35.3	39.3	22°14.4	32.9	134°50.1	31.1
15	164°23.7	359°42.2	·· 22.2	89°35.9	·· 39.5	37°16.2	·· 32.7	149°52.6	·· 31.1
16	179°26.1	14°42.2	21.0	104°36.5	39.7	52°18.1	32.6	164°55.0	31.1
17	194°28.6	29°42.2	19.8	119°37.1	39.9	67°20.0	32.5	179°57.4	31.1
18	209°31.0	44°42.2	N07°18.6	134°37.7	N22°40.1	82°21.9	N19°32.3	194°59.9	N03°31.0
19	224°33.5	59°42.3	17.4	149°38.4	40.3	97°23.8	32.2	210°02.3	31.0
20	239°36.0	74°42.3	16.2	164°39.0	40.5	112°25.7	32.1	225°04.8	31.0
21	254°38.4	89°42.3	·· 15.0	179°39.6	·· 40.7	127°27.6	·· 31.9	240°07.2	·· 31.0
22	269°40.9	104°42.3	13.9	194°40.2	40.9	142°29.5	31.8	255°09.6	31.0
23	284°43.4	119°42.4	12.7	209°40.8	41.1	157°31.4	31.7	270°12.1	31.0
Mer.pass. 04:04		ν 0.0′	d 1.2′	m -4.18	ν 0.6′	d 0.2′	m 1.31	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.69

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	299°45.8	134°42.4	N07°11.5	224°41.4	N22°41.4	172°33.3	N19°31.6	285°14.5	N03°31.0
1	314°48.3	149°42.4	10.3	239°42.0	41.6	187°35.2	31.4	300°17.0	31.0
2	329°50.8	164°42.4	09.1	254°42.7	41.8	202°37.1	31.3	315°19.4	31.0
3	344°53.2	179°42.4	·· 07.9	269°43.3	·· 42.0	217°39.0	·· 31.2	330°21.8	·· 31.0
4	359°55.7	194°42.5	06.7	284°43.9	42.2	232°40.9	31.0	345°24.3	31.0
5	14°58.2	209°42.5	05.5	299°44.5	42.4	247°42.8	30.9	0°26.7	31.0
6	30°00.6	224°42.5	N07°04.3	314°45.1	N22°42.6	262°44.7	N19°30.8	15°29.2	N03°31.0
7	45°03.1	239°42.5	03.1	329°45.7	42.8	277°46.6	30.6	30°31.6	31.0
8	60°05.5	254°42.6	01.9	344°46.3	43.0	292°48.4	30.5	45°34.1	31.0
9	75°08.0	269°42.6	07°00.7	359°47.0	·· 43.2	307°50.3	·· 30.4	60°36.5	·· 31.0
10	90°10.5	284°42.6	06°59.5	14°47.6	43.4	322°52.2	30.3	75°38.9	31.0
11	105°12.9	299°42.7	58.3	29°48.2	43.6	337°54.1	30.1	90°41.4	31.0
12	120°15.4	314°42.7	N06°57.1	44°48.8	N22°43.8	352°56.0	N19°30.0	105°43.8	N03°31.0
13	135°17.9	329°42.7	55.9	59°49.4	44.0	7°57.9	29.9	120°46.3	31.0
14	150°20.3	344°42.7	54.7	74°50.0	44.2	22°59.8	29.7	135°48.7	31.0
15	165°22.8	359°42.8	·· 53.6	89°50.7	·· 44.4	38°01.7	·· 29.6	150°51.2	·· 31.0
16	180°25.3	14°42.8	52.4	104°51.3	44.6	53°03.6	29.5	165°53.6	31.0
17	195°27.7	29°42.8	51.2	119°51.9	44.8	68°05.5	29.3	180°56.0	31.0
18	210°30.2	44°42.9	N06°50.0	134°52.5	N22°45.0	83°07.4	N19°29.2	195°58.5	N03°31.0
19	225°32.7	59°42.9	48.8	149°53.1	45.2	98°09.3	29.1	211°00.9	31.0
20	240°35.1	74°42.9	47.6	164°53.7	45.4	113°11.2	29.0	226°03.4	31.0
21	255°37.6	89°43.0	·· 46.4	179°54.3	·· 45.6	128°13.1	·· 28.8	241°05.8	·· 31.0
22	270°40.0	104°43.0	45.2	194°55.0	45.8	143°15.0	28.7	256°08.3	31.0
23	285°42.5	119°43.0	44.0	209°55.6	46.0	158°16.9	28.6	271°10.7	30.9
Mer.pass. 04:00		ν 0.0′	d 1.2′	m -4.19	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.68

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°45.0	134°43.1	N06°42.8	224°56.2	N22°46.2	173°18.8	N19°28.4	286°13.1	N03°30.9
1	315°47.4	149°43.1	41.6	239°56.8	46.4	188°20.6	28.3	301°15.6	30.9
2	330°49.9	164°43.2	40.4	254°57.4	46.6	203°22.5	28.2	316°18.0	30.9
3	345°52.4	179°43.2	·· 39.2	269°58.0	·· 46.8	218°24.4	·· 28.0	331°20.5	·· 30.9
4	0°54.8	194°43.2	38.0	284°58.7	47.0	233°26.3	27.9	346°22.9	30.9
5	15°57.3	209°43.3	36.8	299°59.3	47.2	248°28.2	27.8	1°25.4	30.9
6	30°59.8	224°43.3	N06°35.6	314°59.9	N22°47.4	263°30.1	N19°27.6	16°27.8	N03°30.9
7	46°02.2	239°43.4	34.4	330°00.5	47.6	278°32.0	27.5	31°30.3	30.9
8	61°04.7	254°43.4	33.2	345°01.1	47.8	293°33.9	27.4	46°32.7	30.9
9	76°07.1	269°43.4	·· 32.0	0°01.7	·· 48.0	308°35.8	·· 27.3	61°35.2	·· 30.9
10	91°09.6	284°43.5	30.8	15°02.3	48.2	323°37.7	27.1	76°37.6	30.9
11	106°12.1	299°43.5	29.6	30°03.0	48.4	338°39.6	27.0	91°40.0	30.9
12	121°14.5	314°43.6	N06°28.4	45°03.6	N22°48.6	353°41.5	N19°26.9	106°42.5	N03°30.9
13	136°17.0	329°43.6	27.2	60°04.2	48.8	8°43.4	26.7	121°44.9	30.9
14	151°19.5	344°43.7	26.0	75°04.8	49.0	23°45.3	26.6	136°47.4	30.9
15	166°21.9	359°43.7	·· 24.8	90°05.4	·· 49.2	38°47.2	·· 26.5	151°49.8	·· 30.9
16	181°24.4	14°43.7	23.6	105°06.0	49.4	53°49.1	26.3	166°52.3	30.9
17	196°26.9	29°43.8	22.4	120°06.7	49.6	68°51.0	26.2	181°54.7	30.9
18	211°29.3	44°43.8	N06°21.2	135°07.3	N22°49.8	83°52.8	N19°26.1	196°57.2	N03°30.9
19	226°31.8	59°43.9	20.0	150°07.9	50.0	98°54.7	25.9	211°59.6	30.8
20	241°34.3	74°43.9	18.8	165°08.5	50.2	113°56.6	25.8	227°02.1	30.8
21	256°36.7	89°44.0	·· 17.6	180°09.1	·· 50.4	128°58.5	·· 25.7	242°04.5	·· 30.8
22	271°39.2	104°44.0	16.4	195°09.7	50.6	144°00.4	25.5	257°07.0	30.8
23	286°41.6	119°44.1	15.2	210°10.4	50.7	159°02.3	25.4	272°09.4	30.8
Mer.pass. 03:56		ν 0.0′	d 1.2′	m -4.20	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.2
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°40.8
Diphda	348°45.9	-17°50.2
Achernar	335°19.2	-57°05.7
Hamal	327°49.8	23°35.3
Polaris	313°31.8	89°22.2
Acamar	315°10.9	-40°11.6
Menkar	314°04.9	4°11.7
Mirfak	308°26.6	49°57.2
Aldebaran	290°38.4	16°33.8
Rigel	281°02.9	-8°10.1
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.7
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°52.3	-52°42.4
Sirius	258°25.4	-16°45.1
Adhara	255°05.2	-29°00.4
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.4
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°58.9	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°12.0	55°49.2
Spica	158°21.0	-11°18.0
Alkaid	152°51.0	49°11.1
Hadar	148°34.1	-60°30.4
Menkent	147°56.1	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.4	-60°57.0
Kochab	137°19.5	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.7
Antares	112°14.0	-26°29.5
Atria	107°06.7	-69°04.7
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.2	9°59.9
Al Na'ir	27°30.9	-46°49.7
Fomalhaut	15°12.8	-29°28.7
Scheat	13°43.7	28°13.6
Markab	13°28.4	15°20.9

Jul 21 Tue	SHA	Mer.pass
Venus	195°55.3	15:01
Mars	285°40.0	09:02
Jupiter	233°01.1	12:31
Saturn	345°29.3	05:02

Jul 22 Wed	SHA	Mer.pass
Venus	194°56.5	15:01
Mars	284°55.6	09:01
Jupiter	232°47.5	12:28
Saturn	345°28.7	04:58

Jul 23 Thu	SHA	Mer.pass
Venus	193°58.1	15:01
Mars	284°11.2	09:00
Jupiter	232°33.8	12:25
Saturn	345°28.2	04:54

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°23.5	N20°30.3	99°05.9	14.5′	S12°46.9	13.2′	55.6′
1	193°23.4	29.8	113°39.4	14.5′	13°00.1	13.2′	55.6′
2	208°23.4	29.3	128°12.9	14.5′	13°13.3	13.2′	55.6′
3	223°23.4	·· 28.8	142°46.3	14.4′	13°26.5	13.0′	55.5′
4	238°23.3	28.3	157°19.8	14.4′	13°39.5	13.0′	55.5′
5	253°23.3	27.8	171°53.2	14.4′	13°52.5	12.9′	55.5′
6	268°23.3	N20°27.4	186°26.5	14.4′	S14°05.4	12.9′	55.5′
7	283°23.2	26.9	200°59.9	14.3′	14°18.3	12.7′	55.4′
8	298°23.2	26.4	215°33.2	14.3′	14°31.0	12.7′	55.4′
9	313°23.2	·· 25.9	230°06.6	14.3′	14°43.7	12.7′	55.4′
10	328°23.2	25.4	244°39.8	14.3′	14°56.4	12.5′	55.4′
11	343°23.1	24.9	259°13.1	14.2′	15°08.9	12.5′	55.3′
12	358°23.1	N20°24.4	273°46.3	14.2′	S15°21.4	12.4′	55.3′
13	13°23.1	24.0	288°19.5	14.2′	15°33.8	12.3′	55.3′
14	28°23.0	23.5	302°52.7	14.1′	15°46.1	12.3′	55.2′
15	43°23.0	·· 23.0	317°25.8	14.1′	15°58.4	12.1′	55.2′
16	58°23.0	22.5	331°58.9	14.1′	16°10.5	12.1′	55.2′
17	73°23.0	22.0	346°32.0	14.0′	16°22.6	12.0′	55.2′
18	88°22.9	N20°21.5	1°05.0	14.0′	S16°34.6	12.0′	55.1′
19	103°22.9	21.0	15°38.0	14.0′	16°46.6	11.8′	55.1′
20	118°22.9	20.5	30°10.9	13.9′	16°58.4	11.8′	55.1′
21	133°22.9	·· 20.0	44°43.9	13.9′	17°10.2	11.7′	55.1′
22	148°22.8	19.5	59°16.8	13.9′	17°21.9	11.6′	55.0′
23	163°22.8	19.1	73°49.6	13.8′	17°33.5	11.5′	55.0′
	SD = 15.7′	*d* = 0.5′	SD = 15.2′				

Wed	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°22.8	N20°18.6	88°22.4	13.8′	S17°45.0	11.5′	55.0′
1	193°22.8	18.1	102°55.2	13.7′	17°56.5	11.3′	55.0′
2	208°22.7	17.6	117°27.9	13.7′	18°07.8	11.3′	55.0′
3	223°22.7	·· 17.1	132°00.6	13.7′	18°19.1	11.2′	54.9′
4	238°22.7	16.6	146°33.3	13.6′	18°30.3	11.1′	54.9′
5	253°22.7	16.1	161°05.9	13.6′	18°41.4	11.0′	54.9′
6	268°22.6	N20°15.6	175°38.5	13.5′	S18°52.4	10.9′	54.9′
7	283°22.6	15.1	190°11.0	13.5′	19°03.3	10.8′	54.8′
8	298°22.6	14.6	204°43.5	13.4′	19°14.1	10.8′	54.8′
9	313°22.6	·· 14.1	219°15.9	13.4′	19°24.9	10.6′	54.8′
10	328°22.5	13.6	233°48.3	13.4′	19°35.5	10.6′	54.8′
11	343°22.5	13.1	248°20.7	13.3′	19°46.1	10.5′	54.8′
12	358°22.5	N20°12.6	262°53.0	13.3′	S19°56.6	10.4′	54.7′
13	13°22.5	12.1	277°25.2	13.2′	20°07.0	10.2′	54.7′
14	28°22.4	11.6	291°57.4	13.2′	20°17.2	10.2′	54.7′
15	43°22.4	·· 11.1	306°29.6	13.1′	20°27.4	10.1′	54.7′
16	58°22.4	10.6	321°01.7	13.1′	20°37.5	10.0′	54.7′
17	73°22.4	10.1	335°33.8	13.0′	20°47.5	9.9′	54.6′
18	88°22.4	N20°09.6	350°05.9	13.0′	S20°57.4	9.9′	54.6′
19	103°22.3	09.1	4°37.8	12.9′	21°07.3	9.7′	54.6′
20	118°22.3	08.6	19°09.8	12.9′	21°17.0	9.6′	54.6′
21	133°22.3	·· 08.0	33°41.7	12.8′	21°26.6	9.5′	54.6′
22	148°22.3	07.5	48°13.5	12.8′	21°36.1	9.4′	54.6′
23	163°22.3	07.0	62°45.3	12.7′	21°45.5	9.3′	54.5′
	SD = 15.7′	*d* = 0.5′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	*ν*	**Dec**	*d*	**HP**
0	178°22.2	N20°06.5	77°17.0	12.7′	S21°54.8	9.3′	54.5′
1	193°22.2	06.0	91°48.7	12.6′	22°04.1	9.1′	54.5′
2	208°22.2	05.5	106°20.4	12.6′	22°13.2	9.0′	54.5′
3	223°22.2	·· 05.0	120°51.9	12.5′	22°22.2	8.9′	54.5′
4	238°22.2	04.5	135°23.5	12.5′	22°31.1	8.8′	54.5′
5	253°22.1	04.0	149°55.0	12.4′	22°39.9	8.7′	54.4′
6	268°22.1	N20°03.5	164°26.4	12.4′	S22°48.6	8.6′	54.4′
7	283°22.1	02.9	178°57.8	12.3′	22°57.2	8.5′	54.4′
8	298°22.1	02.4	193°29.2	12.3′	23°05.7	8.4′	54.4′
9	313°22.1	·· 01.9	208°00.4	12.2′	23°14.1	8.3′	54.4′
10	328°22.1	01.4	222°31.7	12.2′	23°22.4	8.2′	54.4′
11	343°22.0	00.9	237°02.9	12.1′	23°30.6	8.0′	54.4′
12	358°22.0	N20°00.4	251°34.0	12.1′	S23°38.6	8.0′	54.3′
13	13°22.0	19°59.9	266°05.1	12.0′	23°46.6	7.8′	54.3′
14	28°22.0	59.3	280°36.1	12.0′	23°54.4	7.8′	54.3′
15	43°22.0	·· 58.8	295°07.1	11.9′	24°02.2	7.6′	54.3′
16	58°22.0	58.3	309°38.1	11.9′	24°09.8	7.5′	54.3′
17	73°21.9	57.8	324°09.0	11.8′	24°17.3	7.4′	54.3′
18	88°21.9	N19°57.3	338°39.8	11.8′	S24°24.7	7.3′	54.3′
19	103°21.9	56.8	353°10.6	11.7′	24°32.0	7.2′	54.3′
20	118°21.9	56.2	7°41.3	11.7′	24°39.2	7.1′	54.2′
21	133°21.9	·· 55.7	22°12.0	11.6′	24°46.3	6.9′	54.2′
22	148°21.9	55.2	36°42.6	11.6′	24°53.2	6.9′	54.2′
23	163°21.9	54.7	51°13.2	11.5′	25°00.1	6.7′	54.2′
	SD = 15.7′	*d* = 0.5′	SD = 14.9′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	01:14	22:52	////	////
66°	////	////	02:05	22:04	////	////
64°	////	////	02:37	21:34	////	////
62°	////	01:31	03:00	21:12	22:38	////
60°	////	02:08	03:18	20:54	22:03	////
N 58°	////	02:33	03:33	20:39	21:38	////
56°	01:23	02:53	03:46	20:26	21:18	22:46
54°	01:57	03:09	03:57	20:15	21:02	22:14
52°	02:21	03:23	04:07	20:05	20:49	21:50
50°	02:39	03:35	04:16	19:56	20:37	21:32
45°	03:14	03:59	04:34	19:38	20:13	20:58
N 40°	03:39	04:18	04:49	19:23	19:54	20:33
35°	03:59	04:34	05:02	19:11	19:39	20:14
30°	04:15	04:47	05:13	19:00	19:26	19:58
20°	04:40	05:08	05:32	18:41	19:05	19:33
N 10°	04:59	05:25	05:48	18:25	18:47	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:55	06:18	17:55	18:18	18:43
20°	05:43	06:10	06:34	17:40	18:03	18:30
30°	05:57	06:26	06:52	17:22	17:47	18:17
35°	06:04	06:35	07:02	17:11	17:39	18:10
40°	06:11	06:44	07:14	17:00	17:29	18:02
45°	06:19	06:55	07:28	16:46	17:18	17:54
S 50°	06:28	07:08	07:45	16:29	17:05	17:45
52°	06:32	07:14	07:53	16:21	16:59	17:41
54°	06:37	07:21	08:02	16:12	16:53	17:37
56°	06:41	07:28	08:12	16:02	16:46	17:32
58°	06:46	07:36	08:23	15:51	16:38	17:27
S 60°	06:52	07:45	08:36	15:37	16:29	17:22

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	16:09	▬	▬	19:20	▬	▬
N 70°	15:22	▬	▬	20:09	▬	▬
68°	14:52	17:24	▬	20:40	19:42	▬
66°	14:29	16:31	▬	21:04	20:36	▬
64°	14:12	15:59	18:02	21:22	21:09	20:44
62°	13:58	15:36	17:19	21:38	21:33	21:29
60°	13:46	15:17	16:50	21:51	21:53	21:58
N 58°	13:35	15:02	16:28	22:02	22:09	22:21
56°	13:27	14:49	16:10	22:12	22:23	22:39
54°	13:19	14:37	15:55	22:20	22:35	22:54
52°	13:12	14:27	15:42	22:28	22:45	23:08
50°	13:05	14:18	15:30	22:35	22:55	23:20
45°	12:52	14:00	15:06	22:50	23:15	23:44
N 40°	12:41	13:44	14:47	23:03	23:31	·· ··
35°	12:31	13:32	14:32	23:13	23:45	·· ··
30°	12:23	13:20	14:18	23:23	23:57	·· ··
20°	12:09	13:01	13:55	23:39	·· ··	00:17
N 10°	11:56	12:45	13:35	23:53	·· ··	00:35
0°	11:45	12:30	13:17	·· ··	00:06	00:52
S 10°	11:34	12:15	12:58	·· ··	00:20	01:09
20°	11:21	11:59	12:39	·· ··	00:34	01:27
30°	11:08	11:40	12:16	·· ··	00:51	01:48
35°	11:00	11:29	12:03	00:00	01:00	02:01
40°	10:51	11:17	11:48	00:07	01:11	02:15
45°	10:41	11:03	11:30	00:16	01:24	02:32
S 50°	10:28	10:46	11:08	00:27	01:40	02:53
52°	10:22	10:38	10:57	00:32	01:48	03:03
54°	10:16	10:29	10:45	00:38	01:56	03:14
56°	10:09	10:18	10:32	00:44	02:06	03:27
58°	10:01	10:07	10:16	00:51	02:17	03:43
S 60°	09:52	09:54	09:57	00:59	02:29	04:01

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 46-65%
21	06:26	06:28	12:06	17:56	05:33	
22	06:29	06:30	12:07	18:41	06:18	
23	06:31	06:32	12:07	19:28	07:04	

July 24, 25, 26 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	301°44.1	134°44.1	N06°14.0	225°11.0	N22°50.9	174°04.2	N19°25.3	287°11.9	N03°30.8
1	316°46.6	149°44.2	12.8	240°11.6	51.1	189°06.1	25.2	302°14.3	30.8
2	331°49.0	164°44.2	11.6	255°12.2	51.3	204°08.0	25.0	317°16.8	30.8
3	346°51.5	179°44.3	·· 10.4	270°12.8	·· 51.5	219°09.9	·· 24.9	332°19.2	·· 30.8
4	1°54.0	194°44.3	09.2	285°13.4	51.7	234°11.8	24.8	347°21.7	30.8
5	16°56.4	209°44.4	07.9	300°14.1	51.9	249°13.7	24.6	2°24.1	30.8
6	31°58.9	224°44.5	N06°06.7	315°14.7	N22°52.1	264°15.6	N19°24.5	17°26.6	N03°30.8
7	47°01.4	239°44.5	05.5	330°15.3	52.3	279°17.5	24.4	32°29.0	30.8
8	62°03.8	254°44.6	04.3	345°15.9	52.5	294°19.4	24.2	47°31.5	30.8
9	77°06.3	269°44.6	·· 03.1	0°16.5	·· 52.6	309°21.3	·· 24.1	62°33.9	·· 30.8
10	92°08.8	284°44.7	01.9	15°17.1	52.8	324°23.2	24.0	77°36.4	30.7
11	107°11.2	299°44.7	06°00.7	30°17.8	53.0	339°25.0	23.8	92°38.8	30.7
12	122°13.7	314°44.8	N05°59.5	45°18.4	N22°53.2	354°26.9	N19°23.7	107°41.3	N03°30.7
13	137°16.1	329°44.9	58.3	60°19.0	53.4	9°28.8	23.6	122°43.7	30.7
14	152°18.6	344°44.9	57.1	75°19.6	53.6	24°30.7	23.4	137°46.2	30.7
15	167°21.1	359°45.0	·· 55.9	90°20.2	·· 53.8	39°32.6	·· 23.3	152°48.6	·· 30.7
16	182°23.5	14°45.0	54.7	105°20.8	53.9	54°34.5	23.2	167°51.1	30.7
17	197°26.0	29°45.1	53.5	120°21.5	54.1	69°36.4	23.1	182°53.5	30.7
18	212°28.5	44°45.2	N05°52.3	135°22.1	N22°54.3	84°38.3	N19°22.9	197°56.0	N03°30.7
19	227°30.9	59°45.2	51.1	150°22.7	54.5	99°40.2	22.8	212°58.4	30.7
20	242°33.4	74°45.3	49.9	165°23.3	54.7	114°42.1	22.7	228°00.9	30.7
21	257°35.9	89°45.3	·· 48.7	180°23.9	·· 54.9	129°44.0	·· 22.5	243°03.3	·· 30.7
22	272°38.3	104°45.4	47.5	195°24.5	55.0	144°45.9	22.4	258°05.8	30.7
23	287°40.8	119°45.5	46.3	210°25.2	55.2	159°47.8	22.3	273°08.2	30.7
Mer.pass.	03:52	ν 0.1′	d 1.2′	m -4.20	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.79	ν 2.4′	d 0.0′ m 0.67

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	302°43.3	134°45.5	N05°45.0	225°25.8	N22°55.4	174°49.7	N19°22.1	288°10.7	N03°30.6
1	317°45.7	149°45.6	43.8	240°26.4	55.6	189°51.6	22.0	303°13.1	30.6
2	332°48.2	164°45.7	42.6	255°27.0	55.8	204°53.5	21.9	318°15.6	30.6
3	347°50.6	179°45.7	·· 41.4	270°27.6	·· 56.0	219°55.4	·· 21.7	333°18.0	·· 30.6
4	2°53.1	194°45.8	40.2	285°28.3	56.1	234°57.3	21.6	348°20.5	30.6
5	17°55.6	209°45.9	39.0	300°28.9	56.3	249°59.1	21.5	3°22.9	30.6
6	32°58.0	224°45.9	N05°37.8	315°29.5	N22°56.5	265°01.0	N19°21.3	18°25.4	N03°30.6
7	48°00.5	239°46.0	36.6	330°30.1	56.7	280°02.9	21.2	33°27.8	30.6
8	63°03.0	254°46.1	35.4	345°30.7	56.9	295°04.8	21.1	48°30.3	30.6
9	78°05.4	269°46.2	·· 34.2	0°31.3	·· 57.0	310°06.7	·· 20.9	63°32.8	·· 30.6
10	93°07.9	284°46.2	33.0	15°32.0	57.2	325°08.6	20.8	78°35.2	30.6
11	108°10.4	299°46.3	31.8	30°32.6	57.4	340°10.5	20.7	93°37.7	30.6
12	123°12.8	314°46.4	N05°30.6	45°33.2	N22°57.6	355°12.4	N19°20.5	108°40.1	N03°30.6
13	138°15.3	329°46.4	29.3	60°33.8	57.8	10°14.3	20.4	123°42.6	30.5
14	153°17.8	344°46.5	28.1	75°34.4	57.9	25°16.2	20.3	138°45.0	30.5
15	168°20.2	359°46.6	·· 26.9	90°35.1	·· 58.1	40°18.1	·· 20.1	153°47.5	·· 30.5
16	183°22.7	14°46.7	25.7	105°35.7	58.3	55°20.0	20.0	168°49.9	30.5
17	198°25.1	29°46.7	24.5	120°36.3	58.5	70°21.9	19.9	183°52.4	30.5
18	213°27.6	44°46.8	N05°23.3	135°36.9	N22°58.6	85°23.8	N19°19.7	198°54.8	N03°30.5
19	228°30.1	59°46.9	22.1	150°37.5	58.8	100°25.7	19.6	213°57.3	30.5
20	243°32.5	74°47.0	20.9	165°38.2	59.0	115°27.6	19.5	228°59.8	30.5
21	258°35.0	89°47.1	·· 19.7	180°38.8	·· 59.2	130°29.5	·· 19.3	244°02.2	·· 30.5
22	273°37.5	104°47.1	18.5	195°39.4	59.3	145°31.4	19.2	259°04.7	30.5
23	288°39.9	119°47.2	17.2	210°40.0	59.5	160°33.3	19.1	274°07.1	30.5
Mer.pass.	03:48	ν 0.1′	d 1.2′	m -4.21	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.67

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	303°42.4	134°47.3	N05°16.0	225°40.6	N22°59.7	175°35.1	N19°19.0	289°09.6	N03°30.4
1	318°44.9	149°47.4	14.8	240°41.2	22°59.9	190°37.0	18.8	304°12.0	30.4
2	333°47.3	164°47.5	13.6	255°41.9	23°00.0	205°38.9	18.7	319°14.5	30.4
3	348°49.8	179°47.5	·· 12.4	270°42.5	·· 00.2	220°40.8	·· 18.6	334°17.0	·· 30.4
4	3°52.2	194°47.6	11.2	285°43.1	00.4	235°42.7	18.4	349°19.4	30.4
5	18°54.7	209°47.7	10.0	300°43.7	00.6	250°44.6	18.3	4°21.9	30.4
6	33°57.2	224°47.8	N05°08.8	315°44.3	N23°00.7	265°46.5	N19°18.2	19°24.3	N03°30.4
7	48°59.6	239°47.9	07.6	330°45.0	00.9	280°48.4	18.0	34°26.8	30.4
8	64°02.1	254°47.9	06.3	345°45.6	01.1	295°50.3	17.9	49°29.2	30.4
9	79°04.6	269°48.0	·· 05.1	0°46.2	·· 01.2	310°52.2	·· 17.8	64°31.7	·· 30.4
10	94°07.0	284°48.1	03.9	15°46.8	01.4	325°54.1	17.6	79°34.2	30.3
11	109°09.5	299°48.2	02.7	30°47.4	01.6	340°56.0	17.5	94°36.6	30.3
12	124°12.0	314°48.3	N05°01.5	45°48.1	N23°01.7	355°57.9	N19°17.4	109°39.1	N03°30.3
13	139°14.4	329°48.4	05°00.3	60°48.7	01.9	10°59.8	17.2	124°41.5	30.3
14	154°16.9	344°48.5	04°59.1	75°49.3	02.1	26°01.7	17.1	139°44.0	30.3
15	169°19.4	359°48.6	·· 57.9	90°49.9	·· 02.3	41°03.6	·· 17.0	154°46.4	·· 30.3
16	184°21.8	14°48.6	56.6	105°50.5	02.4	56°05.5	16.8	169°48.9	30.3
17	199°24.3	29°48.7	55.4	120°51.2	02.6	71°07.4	16.7	184°51.4	30.3
18	214°26.7	44°48.8	N04°54.2	135°51.8	N23°02.8	86°09.2	N19°16.6	199°53.8	N03°30.3
19	229°29.2	59°48.9	53.0	150°52.4	02.9	101°11.1	16.4	214°56.3	30.3
20	244°31.7	74°49.0	51.8	165°53.0	03.1	116°13.0	16.3	229°58.7	30.2
21	259°34.1	89°49.1	·· 50.6	180°53.6	·· 03.3	131°14.9	·· 16.2	245°01.2	·· 30.2
22	274°36.6	104°49.2	49.4	195°54.3	03.4	146°16.8	16.0	260°03.7	30.2
23	289°39.1	119°49.3	48.1	210°54.9	03.6	161°18.7	15.9	275°06.1	30.2
Mer.pass.	03:45	ν 0.1′	d 1.2′	m -4.22	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°33.3	29°14.2
Ankaa	353°05.7	-42°09.4
Schedar	349°29.4	56°40.8
Diphda	348°45.9	-17°50.2
Achernar	335°19.2	-57°05.7
Hamal	327°49.7	23°35.3
Polaris	313°30.1	89°22.2
Acamar	315°10.9	-40°11.6
Menkar	314°04.9	4°11.7
Mirfak	308°26.6	49°57.2
Aldebaran	290°38.4	16°33.8
Rigel	281°02.9	-8°10.1
Capella	280°20.3	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.5	28°37.7
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°52.3	-52°42.4
Sirius	258°25.4	-16°45.1
Adhara	255°05.2	-29°00.4
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.4
Miaplacidus	221°38.9	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°58.9	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°12.0	55°49.2
Spica	158°21.0	-11°18.0
Alkaid	152°51.0	49°11.1
Hadar	148°34.1	-60°30.4
Menkent	147°56.1	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.4	-60°57.0
Kochab	137°19.6	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.7
Antares	112°14.0	-26°29.5
Atria	107°06.7	-69°04.7
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.2	9°59.9
Al Na'ir	27°30.9	-46°49.7
Fomalhaut	15°12.8	-29°28.7
Scheat	13°43.7	28°13.6
Markab	13°28.4	15°21.0

Jul 24 Fri	SHA	Mer.pass
Venus	193°00.0	15:01
Mars	283°26.9	08:59
Jupiter	232°20.1	12:22
Saturn	345°27.8	04:50

Jul 25 Sat	SHA	Mer.pass
Venus	192°02.3	15:01
Mars	282°42.5	08:58
Jupiter	232°06.4	12:19
Saturn	345°27.4	04:47

Jul 26 Sun	SHA	Mer.pass
Venus	191°04.9	15:01
Mars	281°58.2	08:57
Jupiter	231°52.8	12:16
Saturn	345°27.2	04:43

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°21.8	N19°54.2	65°43.8	11.5′	S25°06.8	6.6′	54.2′
1	193°21.8	53.6	80°14.3	11.4′	25°13.4	6.5′	54.2′
2	208°21.8	53.1	94°44.7	11.4′	25°19.9	6.3′	54.2′
3	223°21.8	·· 52.6	109°15.1	11.3′	25°26.2	6.3′	54.2′
4	238°21.8	52.1	123°45.5	11.3′	25°32.5	6.1′	54.2′
5	253°21.8	51.5	138°15.8	11.3′	25°38.6	6.0′	54.1′
6	268°21.8	N19°51.0	152°46.0	11.2′	S25°44.6	5.9′	54.1′
7	283°21.8	50.5	167°16.2	11.2′	25°50.5	5.8′	54.1′
8	298°21.7	50.0	181°46.4	11.1′	25°56.3	5.7′	54.1′
9	313°21.7	·· 49.4	196°16.5	11.1′	26°02.0	5.5′	54.1′
10	328°21.7	48.9	210°46.6	11.0′	26°07.5	5.4′	54.1′
11	343°21.7	48.4	225°16.6	11.0′	26°12.9	5.3′	54.1′
12	358°21.7	N19°47.8	239°46.6	10.9′	S26°18.2	5.2′	54.1′
13	13°21.7	47.3	254°16.5	10.9′	26°23.4	5.0′	54.1′
14	28°21.7	46.8	268°46.4	10.9′	26°28.4	4.9′	54.1′
15	43°21.7	·· 46.3	283°16.3	10.8′	26°33.3	4.8′	54.1′
16	58°21.7	45.7	297°46.1	10.8′	26°38.1	4.7′	54.1′
17	73°21.7	45.2	312°15.9	10.7′	26°42.8	4.5′	54.1′
18	88°21.6	N19°44.7	326°45.6	10.7′	S26°47.3	4.5′	54.1′
19	103°21.6	44.1	341°15.3	10.7′	26°51.8	4.2′	54.1′
20	118°21.6	43.6	355°45.0	10.6′	26°56.0	4.2′	54.0′
21	133°21.6	·· 43.1	10°14.6	10.6′	27°00.2	4.0′	54.0′
22	148°21.6	42.5	24°44.2	10.5′	27°04.2	3.9′	54.0′
23	163°21.6	42.0	39°13.8	10.5′	27°08.1	3.8′	54.0′
	SD = 15.7′	d = 0.5′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°21.6	N19°41.5	53°43.3	10.5′	S27°11.9	3.7′	54.0′
1	193°21.6	40.9	68°12.7	10.4′	27°15.6	3.5′	54.0′
2	208°21.6	40.4	82°42.2	10.4′	27°19.1	3.4′	54.0′
3	223°21.6	·· 39.8	97°11.6	10.4′	27°22.5	3.2′	54.0′
4	238°21.6	39.3	111°41.0	10.3′	27°25.7	3.2′	54.0′
5	253°21.6	38.8	126°10.3	10.3′	27°28.9	3.0′	54.0′
6	268°21.6	N19°38.2	140°39.7	10.3′	S27°31.9	2.8′	54.0′
7	283°21.6	37.7	155°08.9	10.3′	27°34.7	2.8′	54.0′
8	298°21.6	37.1	169°38.2	10.2′	27°37.5	2.6′	54.0′
9	313°21.6	·· 36.6	184°07.4	10.2′	27°40.1	2.5′	54.0′
10	328°21.5	36.1	198°36.6	10.2′	27°42.6	2.3′	54.0′
11	343°21.5	35.5	213°05.8	10.2′	27°44.9	2.2′	54.0′
12	358°21.5	N19°35.0	227°35.0	10.1′	S27°47.1	2.1′	54.0′
13	13°21.5	34.4	242°04.1	10.1′	27°49.2	1.9′	54.0′
14	28°21.5	33.9	256°33.2	10.1′	27°51.1	1.8′	54.0′
15	43°21.5	·· 33.4	271°02.3	10.1′	27°52.9	1.7′	54.0′
16	58°21.5	32.8	285°31.4	10.1′	27°54.6	1.5′	54.0′
17	73°21.5	32.3	300°00.4	10.0′	27°56.1	1.4′	54.0′
18	88°21.5	N19°31.7	314°29.5	10.0′	S27°57.5	1.3′	54.0′
19	103°21.5	31.2	328°58.5	10.0′	27°58.8	1.1′	54.0′
20	118°21.5	30.6	343°27.5	10.0′	27°59.9	1.0′	54.0′
21	133°21.5	·· 30.1	357°56.5	10.0′	28°00.9	0.9′	54.0′
22	148°21.5	29.5	12°25.5	10.0′	28°01.8	0.7′	54.0′
23	163°21.5	29.0	26°54.4	9.9′	28°02.5	0.6′	54.0′
	SD = 15.7′	d = 0.5′	SD = 14.7′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°21.5	N19°28.4	41°23.4	9.9′	S28°03.1	0.5′	54.0′
1	193°21.5	27.9	55°52.3	9.9′	28°03.6	0.3′	54.0′
2	208°21.5	27.3	70°21.2	9.9′	28°03.9	0.2′	54.0′
3	223°21.5	·· 26.8	84°50.2	9.9′	28°04.1	0.0′	54.0′
4	238°21.5	26.2	99°19.1	9.9′	28°04.1	0.1′	54.0′
5	253°21.5	25.7	113°48.0	9.9′	28°04.0	0.2′	54.0′
6	268°21.5	N19°25.1	128°16.9	9.9′	S28°03.8	0.4′	54.0′
7	283°21.5	24.6	142°45.8	9.9′	28°03.4	0.4′	54.0′
8	298°21.5	24.0	157°14.7	9.9′	28°03.0	0.7′	54.0′
9	313°21.5	·· 23.5	171°43.6	9.9′	28°02.3	0.8′	54.0′
10	328°21.5	22.9	186°12.5	9.9′	28°01.5	0.9′	54.0′
11	343°21.5	22.4	200°41.4	9.9′	28°00.6	1.0′	54.0′
12	358°21.5	N19°21.8	215°10.3	9.9′	S27°59.6	1.2′	54.0′
13	13°21.5	21.2	229°39.2	9.9′	27°58.4	1.3′	54.0′
14	28°21.5	20.7	244°08.1	9.9′	27°57.1	1.4′	54.0′
15	43°21.5	·· 20.1	258°37.0	9.9′	27°55.7	1.6′	54.1′
16	58°21.5	19.6	273°05.9	9.9′	27°54.1	1.7′	54.1′
17	73°21.5	19.0	287°34.9	9.9′	27°52.4	1.9′	54.1′
18	88°21.5	N19°18.4	302°03.8	10.0′	S27°50.5	2.0′	54.1′
19	103°21.5	17.9	316°32.8	10.0′	27°48.5	2.1′	54.1′
20	118°21.6	17.3	331°01.7	10.0′	27°46.4	2.3′	54.1′
21	133°21.6	·· 16.8	345°30.7	10.0′	27°44.1	2.4′	54.1′
22	148°21.6	16.2	359°59.7	10.0′	27°41.7	2.5′	54.1′
23	163°21.6	15.6	14°28.7	10.0′	27°39.2	2.7′	54.1′
	SD = 15.7′	d = 0.5′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	////	////	01:35	22:32	////	////
66°	////	////	02:18	21:52	////	////
64°	////	00:44	02:46	21:25	23:18	////
62°	////	01:45	03:07	21:04	22:24	////
60°	////	02:18	03:25	20:47	21:53	////
N 58°	00:40	02:41	03:39	20:33	21:30	23:23
56°	01:36	03:00	03:51	20:21	21:12	22:34
54°	02:06	03:15	04:02	20:10	20:57	22:05
52°	02:28	03:28	04:11	20:01	20:44	21:43
50°	02:45	03:40	04:20	19:53	20:33	21:26
45°	03:18	04:03	04:38	19:35	20:10	20:54
N 40°	03:43	04:21	04:52	19:21	19:52	20:30
35°	04:01	04:36	05:04	19:09	19:37	20:11
30°	04:17	04:48	05:15	18:58	19:24	19:56
20°	04:41	05:09	05:33	18:40	19:04	19:32
N 10°	05:00	05:26	05:49	18:24	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:09	06:33	17:41	18:04	18:31
30°	05:55	06:24	06:50	17:23	17:49	18:18
35°	06:02	06:33	07:00	17:13	17:41	18:11
40°	06:09	06:42	07:11	17:02	17:31	18:04
45°	06:17	06:53	07:25	16:49	17:21	17:57
S 50°	06:25	07:05	07:41	16:32	17:09	17:48
52°	06:29	07:11	07:49	16:25	17:03	17:45
54°	06:33	07:17	07:57	16:16	16:57	17:41
56°	06:37	07:24	08:07	16:07	16:50	17:36
58°	06:42	07:31	08:18	15:56	16:42	17:32
S 60°	06:47	07:40	08:30	15:44	16:34	17:27

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	19:07	▬	21:30	21:22	▬	22:34
60°	18:20	19:35	20:22	22:10	22:41	23:42
N 58°	17:49	18:58	19:47	22:41	23:18	·· ··
56°	17:26	18:32	19:21	23:04	23:44	·· ··
54°	17:08	18:11	19:01	23:23	·· ··	00:05
52°	16:52	17:54	18:44	23:39	·· ··	00:22
50°	16:38	17:39	18:29	23:53	·· ··	00:37
45°	16:10	17:09	18:00	·· ··	00:21	01:07
N 40°	15:49	16:46	17:37	00:04	00:44	01:31
35°	15:31	16:26	17:18	00:20	01:02	01:50
30°	15:15	16:10	17:01	00:35	01:18	02:07
20°	14:49	15:42	16:34	00:59	01:45	02:35
N 10°	14:26	15:18	16:10	01:20	02:08	02:59
0°	14:05	14:56	15:48	01:40	02:30	03:21
S 10°	13:45	14:34	15:25	02:00	02:51	03:43
20°	13:22	14:10	15:02	02:21	03:15	04:07
30°	12:57	13:43	14:34	02:46	03:42	04:35
35°	12:42	13:26	14:17	03:00	03:58	04:52
40°	12:24	13:07	13:58	03:17	04:17	05:11
45°	12:03	12:45	13:35	03:38	04:39	05:34
S 50°	11:37	12:15	13:05	04:03	05:08	06:04
52°	11:24	12:01	12:51	04:16	05:22	06:19
54°	11:09	11:44	12:33	04:30	05:39	06:36
56°	10:52	11:24	12:13	04:47	05:59	06:57
58°	10:32	11:00	11:47	05:07	06:23	07:22
S 60°	10:06	10:26	11:11	05:32	06:57	07:58

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 10-12 74-88%
24	06:33	06:33	12:07	20:18	07:53	
25	06:34	06:34	12:07	21:09	08:43	
26	06:34	06:34	12:07	22:00	09:34	

July 27, 28, 29 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	304°41.5	134°49.4	N04°46.9	225°55.5	N23°03.8	176°20.6	N19°15.8	290°08.6	N03°30.2
1	319°44.0	149°49.5	45.7	240°56.1	03.9	191°22.5	15.6	305°11.0	30.2
2	334°46.5	164°49.6	44.5	255°56.7	04.1	206°24.4	15.5	320°13.5	30.2
3	349°48.9	179°49.7	·· 43.3	270°57.4	·· 04.2	221°26.3	·· 15.4	335°16.0	·· 30.2
4	4°51.4	194°49.8	42.1	285°58.0	04.4	236°28.2	15.2	350°18.4	30.2
5	19°53.9	209°49.9	40.9	300°58.6	04.6	251°30.1	15.1	5°20.9	30.1
6	34°56.3	224°50.0	N04°39.6	315°59.2	N23°04.7	266°32.0	N19°15.0	20°23.3	N03°30.1
7	49°58.8	239°50.1	38.4	330°59.8	04.9	281°33.9	14.8	35°25.8	30.1
8	65°01.2	254°50.2	37.2	346°00.5	05.1	296°35.8	14.7	50°28.3	30.1
9	80°03.7	269°50.3	·· 36.0	1°01.1	·· 05.2	311°37.7	·· 14.6	65°30.7	·· 30.1
10	95°06.2	284°50.4	34.8	16°01.7	05.4	326°39.6	14.4	80°33.2	30.1
11	110°08.6	299°50.5	33.6	31°02.3	05.5	341°41.5	14.3	95°35.7	30.1
12	125°11.1	314°50.6	N04°32.4	46°02.9	N23°05.7	356°43.4	N19°14.2	110°38.1	N03°30.1
13	140°13.6	329°50.7	31.1	61°03.6	05.9	11°45.3	14.0	125°40.6	30.0
14	155°16.0	344°50.8	29.9	76°04.2	06.0	26°47.1	13.9	140°43.0	30.0
15	170°18.5	359°50.9	·· 28.7	91°04.8	·· 06.2	41°49.0	·· 13.8	155°45.5	·· 30.0
16	185°21.0	14°51.0	27.5	106°05.4	06.3	56°50.9	13.6	170°48.0	30.0
17	200°23.4	29°51.1	26.3	121°06.1	06.5	71°52.8	13.5	185°50.4	30.0
18	215°25.9	44°51.2	N04°25.1	136°06.7	N23°06.7	86°54.7	N19°13.4	200°52.9	N03°30.0
19	230°28.4	59°51.3	23.8	151°07.3	06.8	101°56.6	13.2	215°55.4	30.0
20	245°30.8	74°51.4	22.6	166°07.9	07.0	116°58.5	13.1	230°57.8	30.0
21	260°33.3	89°51.5	·· 21.4	181°08.5	·· 07.1	132°00.4	·· 13.0	246°00.3	·· 30.0
22	275°35.7	104°51.6	20.2	196°09.2	07.3	147°02.3	12.8	261°02.8	29.9
23	290°38.2	119°51.7	19.0	211°09.8	07.5	162°04.2	12.7	276°05.2	29.9
Mer.pass. 03:41		ν 0.1′	d 1.2′	m -4.23	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.66

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	305°40.7	134°51.8	N04°17.8	226°10.4	N23°07.6	177°06.1	N19°12.6	291°07.7	N03°29.9
1	320°43.1	149°51.9	16.5	241°11.0	07.8	192°08.0	12.4	306°10.1	29.9
2	335°45.6	164°52.0	15.3	256°11.7	07.9	207°09.9	12.3	321°12.6	29.9
3	350°48.1	179°52.1	·· 14.1	271°12.3	·· 08.1	222°11.8	·· 12.2	336°15.1	·· 29.9
4	5°50.5	194°52.2	12.9	286°12.9	08.2	237°13.7	12.0	351°17.5	29.9
5	20°53.0	209°52.4	11.7	301°13.5	08.4	252°15.6	11.9	6°20.0	29.9
6	35°55.5	224°52.5	N04°10.5	316°14.1	N23°08.5	267°17.5	N19°11.7	21°22.5	N03°29.8
7	50°57.9	239°52.6	09.2	331°14.8	08.7	282°19.4	11.6	36°24.9	29.8
8	66°00.4	254°52.7	08.0	346°15.4	08.8	297°21.3	11.5	51°27.4	29.8
9	81°02.9	269°52.8	·· 06.8	1°16.0	·· 09.0	312°23.2	·· 11.3	66°29.9	·· 29.8
10	96°05.3	284°52.9	05.6	16°16.6	09.2	327°25.1	11.2	81°32.3	29.8
11	111°07.8	299°53.0	04.4	31°17.3	09.3	342°26.9	11.1	96°34.8	29.8
12	126°10.2	314°53.2	N04°03.2	46°17.9	N23°09.5	357°28.8	N19°10.9	111°37.3	N03°29.8
13	141°12.7	329°53.3	01.9	61°18.5	09.6	12°30.7	10.8	126°39.7	29.7
14	156°15.2	344°53.4	04°00.7	76°19.1	09.8	27°32.6	10.7	141°42.2	29.7
15	171°17.6	359°53.5	03°59.5	91°19.7	·· 09.9	42°34.5	·· 10.5	156°44.7	·· 29.7
16	186°20.1	14°53.6	58.3	106°20.4	10.1	57°36.4	10.4	171°47.1	29.7
17	201°22.6	29°53.7	57.1	121°21.0	10.2	72°38.3	10.3	186°49.6	29.7
18	216°25.0	44°53.9	N03°55.8	136°21.6	N23°10.4	87°40.2	N19°10.1	201°52.1	N03°29.7
19	231°27.5	59°54.0	54.6	151°22.2	10.5	102°42.1	10.0	216°54.5	29.7
20	246°30.0	74°54.1	53.4	166°22.9	10.7	117°44.0	09.9	231°57.0	29.6
21	261°32.4	89°54.2	·· 52.2	181°23.5	·· 10.8	132°45.9	·· 09.7	246°59.5	·· 29.6
22	276°34.9	104°54.3	51.0	196°24.1	11.0	147°47.8	09.6	262°01.9	29.6
23	291°37.3	119°54.5	49.7	211°24.7	11.1	162°49.7	09.5	277°04.4	29.6
Mer.pass. 03:37		ν 0.1′	d 1.2′	m -4.24	ν 0.6′	d 0.2′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.65

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	306°39.8	134°54.6	N03°48.5	226°25.4	N23°11.3	177°51.6	N19°09.3	292°06.9	N03°29.6
1	321°42.3	149°54.7	47.3	241°26.0	11.4	192°53.5	09.2	307°09.3	29.6
2	336°44.7	164°54.8	46.1	256°26.6	11.6	207°55.4	09.1	322°11.8	29.6
3	351°47.2	179°54.9	·· 44.9	271°27.2	·· 11.7	222°57.3	·· 08.9	337°14.3	·· 29.6
4	6°49.7	194°55.1	43.6	286°27.8	11.8	237°59.2	08.8	352°16.7	29.5
5	21°52.1	209°55.2	42.4	301°28.5	12.0	253°01.1	08.7	7°19.2	29.5
6	36°54.6	224°55.3	N03°41.2	316°29.1	N23°12.1	268°03.0	N19°08.5	22°21.7	N03°29.5
7	51°57.1	239°55.4	40.0	331°29.7	12.3	283°04.9	08.4	37°24.2	29.5
8	66°59.5	254°55.6	38.8	346°30.3	12.4	298°06.8	08.3	52°26.6	29.5
9	82°02.0	269°55.7	·· 37.5	1°31.0	·· 12.6	313°08.6	·· 08.1	67°29.1	·· 29.5
10	97°04.5	284°55.8	36.3	16°31.6	12.7	328°10.5	08.0	82°31.6	29.4
11	112°06.9	299°56.0	35.1	31°32.2	12.9	343°12.4	07.9	97°34.0	29.4
12	127°09.4	314°56.1	N03°33.9	46°32.8	N23°13.0	358°14.3	N19°07.7	112°36.5	N03°29.4
13	142°11.8	329°56.2	32.7	61°33.5	13.1	13°16.2	07.6	127°39.0	29.4
14	157°14.3	344°56.3	31.4	76°34.1	13.3	28°18.1	07.5	142°41.4	29.4
15	172°16.8	359°56.5	·· 30.2	91°34.7	·· 13.4	43°20.0	·· 07.3	157°43.9	·· 29.4
16	187°19.2	14°56.6	29.0	106°35.3	13.6	58°21.9	07.2	172°46.4	29.4
17	202°21.7	29°56.7	27.8	121°36.0	13.7	73°23.8	07.1	187°48.9	29.3
18	217°24.2	44°56.9	N03°26.6	136°36.6	N23°13.9	88°25.7	N19°06.9	202°51.3	N03°29.3
19	232°26.6	59°57.0	25.3	151°37.2	14.0	103°27.6	06.8	217°53.8	29.3
20	247°29.1	74°57.1	24.1	166°37.8	14.1	118°29.5	06.6	232°56.3	29.3
21	262°31.6	89°57.3	·· 22.9	181°38.5	·· 14.3	133°31.4	·· 06.5	247°58.7	·· 29.3
22	277°34.0	104°57.4	21.7	196°39.1	14.4	148°33.3	06.4	263°01.2	29.3
23	292°36.5	119°57.5	20.5	211°39.7	14.6	163°35.2	06.2	278°03.7	29.2
Mer.pass. 03:33		ν 0.1′	d 1.2′	m -4.25	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.65

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.2
Ankaa	353°05.7	-42°09.4
Schedar	349°29.3	56°40.8
Diphda	348°45.9	-17°50.2
Achernar	335°19.1	-57°05.7
Hamal	327°49.7	23°35.3
Polaris	313°28.4	89°22.2
Acamar	315°10.9	-40°11.6
Menkar	314°04.9	4°11.7
Mirfak	308°26.5	49°57.2
Aldebaran	290°38.3	16°33.8
Rigel	281°02.9	-8°10.1
Capella	280°20.3	46°01.3
Bellatrix	278°21.7	6°22.5
Elnath	278°00.5	28°37.7
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°52.3	-52°42.4
Sirius	258°25.4	-16°45.0
Adhara	255°05.2	-29°00.4
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.6
Suhail	222°45.8	-43°32.4
Miaplacidus	221°38.9	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°59.0	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°12.0	55°49.2
Spica	158°21.0	-11°18.0
Alkaid	152°51.0	49°11.1
Hadar	148°34.2	-60°30.4
Menkent	147°56.1	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.4	-60°57.0
Kochab	137°19.6	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.7
Antares	112°14.0	-26°29.5
Atria	107°06.7	-69°04.7
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.2	9°59.9
Al Na'ir	27°30.9	-46°49.7
Fomalhaut	15°12.8	-29°28.7
Scheat	13°43.7	28°13.6
Markab	13°28.4	15°21.0

Jul 27 Mon	SHA	Mer.pass
Venus	190°07.8	15:01
Mars	281°14.0	08:56
Jupiter	231°39.1	12:13
Saturn	345°27.1	04:39

Jul 28 Tue	SHA	Mer.pass
Venus	189°11.1	15:00
Mars	280°29.7	08:55
Jupiter	231°25.4	12:10
Saturn	345°27.0	04:35

Jul 29 Wed	SHA	Mer.pass
Venus	188°14.8	15:00
Mars	279°45.5	08:54
Jupiter	231°11.8	12:07
Saturn	345°27.1	04:31

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°21.6	N19°15.1	28°57.7	10.0′	S27°36.5	2.8′	54.1′
1	193°21.6	14.5	43°26.8	10.1′	27°33.7	2.9′	54.1′
2	208°21.6	14.0	57°55.8	10.1′	27°30.8	3.1′	54.1′
3	223°21.6	·· 13.4	72°24.9	10.1′	27°27.7	3.2′	54.1′
4	238°21.6	12.8	86°54.0	10.1′	27°24.5	3.4′	54.1′
5	253°21.6	12.3	101°23.2	10.1′	27°21.1	3.4′	54.1′
6	268°21.6	N19°11.7	115°52.3	10.2′	S27°17.7	3.6′	54.1′
7	283°21.6	11.1	130°21.5	10.2′	27°14.1	3.8′	54.2′
8	298°21.6	10.6	144°50.7	10.2′	27°10.3	3.8′	54.2′
9	313°21.6	·· 10.0	159°19.9	10.2′	27°06.5	4.0′	54.2′
10	328°21.6	09.4	173°49.1	10.3′	27°02.5	4.2′	54.2′
11	343°21.7	08.9	188°18.4	10.3′	26°58.3	4.2′	54.2′
12	358°21.7	N19°08.3	202°47.7	10.3′	S26°54.1	4.4′	54.2′
13	13°21.7	07.7	217°17.1	10.4′	26°49.7	4.6′	54.2′
14	28°21.7	07.1	231°46.4	10.4′	26°45.1	4.6′	54.2′
15	43°21.7	·· 06.6	246°15.8	10.4′	26°40.5	4.8′	54.2′
16	58°21.7	06.0	260°45.3	10.5′	26°35.7	4.9′	54.2′
17	73°21.7	05.4	275°14.7	10.5′	26°30.8	5.1′	54.2′
18	88°21.7	N19°04.9	289°44.2	10.5′	S26°25.7	5.1′	54.2′
19	103°21.7	04.3	304°13.8	10.6′	26°20.6	5.3′	54.3′
20	118°21.7	03.7	318°43.3	10.6′	26°15.3	5.4′	54.3′
21	133°21.8	·· 03.1	333°12.9	10.6′	26°09.9	5.6′	54.3′
22	148°21.8	02.6	347°42.6	10.7′	26°04.3	5.7′	54.3′
23	163°21.8	02.0	2°12.3	10.7′	25°58.6	5.8′	54.3′
	SD = 15.7′	d = 0.6′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°21.8	N19°01.4	16°42.0	10.8′	S25°52.8	5.9′	54.3′
1	193°21.8	00.8	31°11.8	10.8′	25°46.9	6.1′	54.3′
2	208°21.8	19°00.3	45°41.6	10.8′	25°40.8	6.1′	54.3′
3	223°21.8	18°59.7	60°11.4	10.9′	25°34.7	6.3′	54.3′
4	238°21.8	59.1	74°41.3	10.9′	25°28.4	6.5′	54.3′
5	253°21.9	58.5	89°11.2	11.0′	25°21.9	6.5′	54.4′
6	268°21.9	N18°58.0	103°41.2	11.0′	S25°15.4	6.7′	54.4′
7	283°21.9	57.4	118°11.2	11.1′	25°08.7	6.8′	54.4′
8	298°21.9	56.8	132°41.3	11.1′	25°01.9	6.9′	54.4′
9	313°21.9	·· 56.2	147°11.4	11.2′	24°55.0	7.0′	54.4′
10	328°21.9	55.6	161°41.6	11.2′	24°48.0	7.1′	54.4′
11	343°21.9	55.1	176°11.8	11.2′	24°40.9	7.3′	54.4′
12	358°22.0	N18°54.5	190°42.0	11.3′	S24°33.6	7.4′	54.4′
13	13°22.0	53.9	205°12.3	11.3′	24°26.2	7.5′	54.5′
14	28°22.0	53.3	219°42.7	11.4′	24°18.7	7.6′	54.5′
15	43°22.0	·· 52.7	234°13.0	11.4′	24°11.1	7.7′	54.5′
16	58°22.0	52.1	248°43.5	11.5′	24°03.4	7.9′	54.5′
17	73°22.0	51.6	263°14.0	11.5′	23°55.5	7.9′	54.5′
18	88°22.0	N18°51.0	277°44.5	11.6′	S23°47.6	8.1′	54.5′
19	103°22.1	50.4	292°15.1	11.6′	23°39.5	8.2′	54.5′
20	118°22.1	49.8	306°45.8	11.7′	23°31.3	8.3′	54.5′
21	133°22.1	·· 49.2	321°16.4	11.7′	23°23.0	8.4′	54.6′
22	148°22.1	48.6	335°47.2	11.8′	23°14.6	8.5′	54.6′
23	163°22.1	48.0	350°18.0	11.8′	23°06.1	8.7′	54.6′
	SD = 15.7′	d = 0.6′	SD = 14.8′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°22.2	N18°47.4	4°48.8	11.9′	S22°57.4	8.7′	54.6′
1	193°22.2	46.9	19°19.7	11.9′	22°48.7	8.8′	54.6′
2	208°22.2	46.3	33°50.7	12.0′	22°39.9	9.0′	54.6′
3	223°22.2	·· 45.7	48°21.7	12.0′	22°30.9	9.0′	54.6′
4	238°22.2	45.1	62°52.7	12.1′	22°21.9	9.2′	54.6′
5	253°22.2	44.5	77°23.8	12.2′	22°12.7	9.3′	54.7′
6	268°22.3	N18°43.9	91°55.0	12.2′	S22°03.4	9.4′	54.7′
7	283°22.3	43.3	106°26.2	12.3′	21°54.0	9.4′	54.7′
8	298°22.3	42.7	120°57.4	12.3′	21°44.6	9.6′	54.7′
9	313°22.3	·· 42.1	135°28.7	12.4′	21°35.0	9.7′	54.7′
10	328°22.4	41.5	150°00.1	12.4′	21°25.3	9.8′	54.7′
11	343°22.4	40.9	164°31.5	12.5′	21°15.5	9.9′	54.7′
12	358°22.4	N18°40.3	179°03.0	12.5′	S21°05.6	10.0′	54.8′
13	13°22.4	39.7	193°34.5	12.6′	20°55.6	10.0′	54.8′
14	28°22.4	39.1	208°06.1	12.6′	20°45.6	10.2′	54.8′
15	43°22.5	·· 38.6	222°37.7	12.7′	20°35.4	10.3′	54.8′
16	58°22.5	38.0	237°09.4	12.7′	20°25.1	10.4′	54.8′
17	73°22.5	37.4	251°41.1	12.8′	20°14.7	10.4′	54.8′
18	88°22.5	N18°36.8	266°12.9	12.8′	S20°04.3	10.6′	54.9′
19	103°22.6	36.2	280°44.7	12.9′	19°53.7	10.6′	54.9′
20	118°22.6	35.6	295°16.6	12.9′	19°43.1	10.8′	54.9′
21	133°22.6	·· 35.0	309°48.5	13.0′	19°32.3	10.8′	54.9′
22	148°22.6	34.4	324°20.5	13.0′	19°21.5	11.0′	54.9′
23	163°22.6	33.8	338°52.5	13.1′	19°10.5	11.0′	54.9′
	SD = 15.7′	d = 0.6′	SD = 14.9′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	00:36	23:21	////	////
68°	////	////	01:53	22:15	////	////
66°	////	////	02:30	21:40	////	////
64°	////	01:13	02:55	21:15	22:54	////
62°	////	01:58	03:15	20:56	22:11	////
60°	////	02:27	03:31	20:40	21:43	////
N 58°	01:06	02:49	03:45	20:27	21:22	23:01
56°	01:48	03:06	03:56	20:15	21:05	22:22
54°	02:15	03:21	04:07	20:05	20:51	21:56
52°	02:35	03:33	04:16	19:56	20:39	21:36
50°	02:51	03:44	04:24	19:48	20:28	21:20
45°	03:23	04:06	04:41	19:32	20:06	20:49
N 40°	03:46	04:24	04:55	19:18	19:48	20:26
35°	04:04	04:38	05:06	19:06	19:34	20:08
30°	04:19	04:50	05:17	18:56	19:22	19:54
20°	04:42	05:10	05:34	18:39	19:02	19:30
N 10°	05:01	05:27	05:49	18:24	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:08	06:32	17:42	18:05	18:32
30°	05:54	06:23	06:48	17:25	17:51	18:19
35°	06:00	06:31	06:58	17:16	17:43	18:13
40°	06:07	06:40	07:09	17:05	17:34	18:07
45°	06:14	06:50	07:22	16:52	17:24	17:59
S 50°	06:22	07:01	07:37	16:36	17:12	17:52
52°	06:26	07:07	07:45	16:29	17:07	17:48
54°	06:29	07:13	07:53	16:21	17:01	17:44
56°	06:33	07:19	08:02	16:12	16:55	17:40
58°	06:38	07:26	08:12	16:02	16:47	17:36
S 60°	06:42	07:34	08:24	15:50	16:39	17:32

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	23:18	▬	▬	▬
68°	▬	▬	22:26	▬	▬	▬
66°	▬	22:37	21:53	▬	▬	00:56
64°	▬	21:46	21:29	▬	▬	01:46
62°	21:19	21:14	21:09	·· ··	00:30	02:17
60°	20:42	20:50	20:54	·· ··	01:07	02:41
N 58°	20:15	20:31	20:40	00:16	01:33	02:59
56°	19:54	20:15	20:28	00:41	01:54	03:15
54°	19:37	20:01	20:18	01:02	02:11	03:28
52°	19:22	19:49	20:09	01:18	02:26	03:40
50°	19:09	19:38	20:01	01:33	02:38	03:50
45°	18:42	19:16	19:43	02:02	03:04	04:11
N 40°	18:21	18:58	19:29	02:25	03:25	04:28
35°	18:03	18:43	19:17	02:44	03:42	04:43
30°	17:48	18:29	19:06	03:00	03:57	04:55
20°	17:22	18:07	18:47	03:27	04:22	05:16
N 10°	17:00	17:47	18:31	03:51	04:43	05:35
0°	16:39	17:28	18:16	04:12	05:03	05:52
S 10°	16:18	17:10	18:01	04:34	05:23	06:09
20°	15:55	16:50	17:44	04:57	05:44	06:27
30°	15:29	16:27	17:26	05:24	06:08	06:47
35°	15:14	16:13	17:15	05:40	06:22	06:59
40°	14:56	15:58	17:02	05:59	06:39	07:13
45°	14:34	15:39	16:47	06:21	06:59	07:29
S 50°	14:06	15:15	16:28	06:49	07:23	07:49
52°	13:53	15:04	16:19	07:03	07:35	07:58
54°	13:37	14:51	16:09	07:18	07:48	08:09
56°	13:19	14:36	15:58	07:37	08:04	08:20
58°	12:56	14:18	15:45	08:00	08:22	08:34
S 60°	12:26	13:56	15:30	08:30	08:44	08:50

Day	**Sun** Eqn.of Time 00^h mm:ss	Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 13-15 94-100%
27	06:34	06:33	12:07	22:51	10:26	
28	06:33	06:32	12:07	23:40	11:16	
29	06:31	06:30	12:07	–:–	12:04	

July 30, 31, 01 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	307°39.0	134°57.7	N03°19.2	226°40.3	N23°14.7	178°37.1	N19°06.1	293°06.2	N03°29.2
1	322°41.4	149°57.8	18.0	241°41.0	14.8	193°39.0	06.0	308°08.6	29.2
2	337°43.9	164°58.0	16.8	256°41.6	15.0	208°40.9	05.8	323°11.1	29.2
3	352°46.3	179°58.1	·· 15.6	271°42.2	·· 15.1	223°42.8	·· 05.7	338°13.6	·· 29.2
4	7°48.8	194°58.2	14.4	286°42.8	15.3	238°44.7	05.6	353°16.0	29.2
5	22°51.3	209°58.4	13.1	301°43.5	15.4	253°46.6	05.4	8°18.5	29.2
6	37°53.7	224°58.5	N03°11.9	316°44.1	N23°15.5	268°48.5	N19°05.3	23°21.0	N03°29.1
7	52°56.2	239°58.6	10.7	331°44.7	15.7	283°50.4	05.2	38°23.5	29.1
8	67°58.7	254°58.8	09.5	346°45.3	15.8	298°52.3	05.0	53°25.9	29.1
9	83°01.1	269°58.9	·· 08.2	1°46.0	·· 15.9	313°54.2	·· 04.9	68°28.4	·· 29.1
10	98°03.6	284°59.1	07.0	16°46.6	16.1	328°56.1	04.7	83°30.9	29.1
11	113°06.1	299°59.2	05.8	31°47.2	16.2	343°58.0	04.6	98°33.4	29.1
12	128°08.5	314°59.4	N03°04.6	46°47.8	N23°16.3	358°59.9	N19°04.5	113°35.8	N03°29.0
13	143°11.0	329°59.5	03.4	61°48.5	16.5	14°01.7	04.3	128°38.3	29.0
14	158°13.5	344°59.6	02.1	76°49.1	16.6	29°03.6	04.2	143°40.8	29.0
15	173°15.9	359°59.8	03°00.9	91°49.7	·· 16.7	44°05.5	·· 04.1	158°43.3	·· 29.0
16	188°18.4	14°59.9	02°59.7	106°50.3	16.9	59°07.4	03.9	173°45.7	29.0
17	203°20.8	30°00.1	58.5	121°51.0	17.0	74°09.3	03.8	188°48.2	29.0
18	218°23.3	45°00.2	N02°57.2	136°51.6	N23°17.1	89°11.2	N19°03.7	203°50.7	N03°28.9
19	233°25.8	60°00.4	56.0	151°52.2	17.3	104°13.1	03.5	218°53.2	28.9
20	248°28.2	75°00.5	54.8	166°52.9	17.4	119°15.0	03.4	233°55.6	28.9
21	263°30.7	90°00.7	·· 53.6	181°53.5	·· 17.5	134°16.9	·· 03.2	248°58.1	·· 28.9
22	278°33.2	105°00.8	52.4	196°54.1	17.7	149°18.8	03.1	264°00.6	28.9
23	293°35.6	120°01.0	51.1	211°54.7	17.8	164°20.7	03.0	279°03.1	28.9
Mer.pass.	03:29	ν 0.1′	d 1.2′	m -4.26	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.64

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	308°38.1	135°01.1	N02°49.9	226°55.4	N23°17.9	179°22.6	N19°02.8	294°05.5	N03°28.8
1	323°40.6	150°01.3	48.7	241°56.0	18.1	194°24.5	02.7	309°08.0	28.8
2	338°43.0	165°01.4	47.5	256°56.6	18.2	209°26.4	02.6	324°10.5	28.8
3	353°45.5	180°01.6	·· 46.2	271°57.2	·· 18.3	224°28.3	·· 02.4	339°13.0	·· 28.8
4	8°47.9	195°01.7	45.0	286°57.9	18.5	239°30.2	02.3	354°15.4	28.8
5	23°50.4	210°01.9	43.8	301°58.5	18.6	254°32.1	02.2	9°17.9	28.7
6	38°52.9	225°02.0	N02°42.6	316°59.1	N23°18.7	269°34.0	N19°02.0	24°20.4	N03°28.7
7	53°55.3	240°02.2	41.3	331°59.7	18.8	284°35.9	01.9	39°22.9	28.7
8	68°57.8	255°02.3	40.1	347°00.4	19.0	299°37.8	01.8	54°25.4	28.7
9	84°00.3	270°02.5	·· 38.9	2°01.0	·· 19.1	314°39.7	·· 01.6	69°27.8	·· 28.7
10	99°02.7	285°02.6	37.7	17°01.6	19.2	329°41.6	01.5	84°30.3	28.7
11	114°05.2	300°02.8	36.5	32°02.3	19.4	344°43.5	01.3	99°32.8	28.6
12	129°07.7	315°03.0	N02°35.2	47°02.9	N23°19.5	359°45.4	N19°01.2	114°35.3	N03°28.6
13	144°10.1	330°03.1	34.0	62°03.5	19.6	14°47.3	01.1	129°37.7	28.6
14	159°12.6	345°03.3	32.8	77°04.1	19.7	29°49.2	00.9	144°40.2	28.6
15	174°15.1	0°03.4	·· 31.6	92°04.8	·· 19.9	44°51.1	·· 00.8	159°42.7	·· 28.6
16	189°17.5	15°03.6	30.3	107°05.4	20.0	59°53.0	00.7	174°45.2	28.5
17	204°20.0	30°03.8	29.1	122°06.0	20.1	74°54.8	00.5	189°47.7	28.5
18	219°22.4	45°03.9	N02°27.9	137°06.7	N23°20.2	89°56.7	N19°00.4	204°50.1	N03°28.5
19	234°24.9	60°04.1	26.7	152°07.3	20.4	104°58.6	00.3	219°52.6	28.5
20	249°27.4	75°04.2	25.4	167°07.9	20.5	120°00.5	00.1	234°55.1	28.5
21	264°29.8	90°04.4	·· 24.2	182°08.5	·· 20.6	135°02.4	19°00.0	249°57.6	·· 28.5
22	279°32.3	105°04.6	23.0	197°09.2	20.7	150°04.3	18°59.8	265°00.1	28.4
23	294°34.8	120°04.7	21.8	212°09.8	20.8	165°06.2	59.7	280°02.5	28.4
Mer.pass.	03:25	ν 0.2′	d 1.2′	m -4.26	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.64

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	309°37.2	135°04.9	N02°20.5	227°10.4	N23°21.0	180°08.1	N18°59.6	295°05.0	N03°28.4
1	324°39.7	150°05.0	19.3	242°11.1	21.1	195°10.0	59.4	310°07.5	28.4
2	339°42.2	165°05.2	18.1	257°11.7	21.2	210°11.9	59.3	325°10.0	28.4
3	354°44.6	180°05.4	·· 16.9	272°12.3	·· 21.3	225°13.8	·· 59.2	340°12.5	·· 28.3
4	9°47.1	195°05.5	15.6	287°12.9	21.5	240°15.7	59.0	355°14.9	28.3
5	24°49.6	210°05.7	14.4	302°13.6	21.6	255°17.6	58.9	10°17.4	28.3
6	39°52.0	225°05.9	N02°13.2	317°14.2	N23°21.7	270°19.5	N18°58.8	25°19.9	N03°28.3
7	54°54.5	240°06.0	12.0	332°14.8	21.8	285°21.4	58.6	40°22.4	28.3
8	69°56.9	255°06.2	10.8	347°15.5	21.9	300°23.3	58.5	55°24.9	28.2
9	84°59.4	270°06.4	·· 09.5	2°16.1	·· 22.1	315°25.2	·· 58.3	70°27.3	·· 28.2
10	100°01.9	285°06.6	08.3	17°16.7	22.2	330°27.1	58.2	85°29.8	28.2
11	115°04.3	300°06.7	07.1	32°17.3	22.3	345°29.0	58.1	100°32.3	28.2
12	130°06.8	315°06.9	N02°05.9	47°18.0	N23°22.4	0°30.9	N18°57.9	115°34.8	N03°28.2
13	145°09.3	330°07.1	04.6	62°18.6	22.5	15°32.8	57.8	130°37.3	28.1
14	160°11.7	345°07.2	03.4	77°19.2	22.6	30°34.7	57.7	145°39.7	28.1
15	175°14.2	0°07.4	·· 02.2	92°19.9	·· 22.8	45°36.6	·· 57.5	160°42.2	·· 28.1
16	190°16.7	15°07.6	02°01.0	107°20.5	22.9	60°38.5	57.4	175°44.7	28.1
17	205°19.1	30°07.8	01°59.7	122°21.1	23.0	75°40.4	57.2	190°47.2	28.1
18	220°21.6	45°07.9	N01°58.5	137°21.8	N23°23.1	90°42.3	N18°57.1	205°49.7	N03°28.0
19	235°24.0	60°08.1	57.3	152°22.4	23.2	105°44.2	57.0	220°52.2	28.0
20	250°26.5	75°08.3	56.1	167°23.0	23.3	120°46.1	56.8	235°54.6	28.0
21	265°29.0	90°08.5	·· 54.8	182°23.6	·· 23.5	135°48.0	·· 56.7	250°57.1	·· 28.0
22	280°31.4	105°08.6	53.6	197°24.3	23.6	150°49.9	56.6	265°59.6	28.0
23	295°33.9	120°08.8	52.4	212°24.9	23.7	165°51.8	56.4	281°02.1	27.9
Mer.pass.	03:21	ν 0.2′	d 1.2′	m -4.27	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.63

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.2
Ankaa	353°05.6	-42°09.4
Schedar	349°29.3	56°40.8
Diphda	348°45.8	-17°50.2
Achernar	335°19.1	-57°05.7
Hamal	327°49.7	23°35.3
Polaris	313°26.8	89°22.2
Acamar	315°10.8	-40°11.5
Menkar	314°04.8	4°11.7
Mirfak	308°26.5	49°57.2
Aldebaran	290°38.3	16°33.8
Rigel	281°02.8	-8°10.1
Capella	280°20.3	46°01.3
Bellatrix	278°21.7	6°22.5
Elnath	278°00.5	28°37.7
Alnilam	275°36.6	-1°11.0
Betelgeuse	270°50.9	7°24.8
Canopus	263°52.3	-52°42.4
Sirius	258°25.4	-16°45.0
Adhara	255°05.2	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.6
Suhail	222°45.8	-43°32.4
Miaplacidus	221°39.0	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°59.0	-63°15.1
Gacrux	171°50.5	-57°16.0
Alioth	166°12.0	55°49.2
Spica	158°21.0	-11°18.0
Alkaid	152°51.0	49°11.1
Hadar	148°34.2	-60°30.4
Menkent	147°56.1	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.5	-60°57.0
Kochab	137°19.7	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.7
Antares	112°14.0	-26°29.5
Atria	107°06.7	-69°04.7
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.9
Deneb	49°24.4	45°22.6
Enif	33°37.2	9°59.9
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.8	-29°28.6
Scheat	13°43.6	28°13.6
Markab	13°28.3	15°21.0

Jul 30 Thu	SHA	Mer.pass
Venus	187°18.7	15:00
Mars	279°01.4	08:53
Jupiter	230°58.1	12:04
Saturn	345°27.2	04:27

Jul 31 Fri	SHA	Mer.pass
Venus	186°23.0	15:00
Mars	278°17.3	08:52
Jupiter	230°44.5	12:01
Saturn	345°27.4	04:23

Aug 01 Sat	SHA	Mer.pass
Venus	185°27.7	15:00
Mars	277°33.2	08:51
Jupiter	230°30.9	11:58
Saturn	345°27.8	04:19

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°22.7	N18°33.2	353°24.6	13.1′	S18°59.5	11.1′	54.9′
1	193°22.7	32.6	7°56.8	13.2′	18°48.4	11.2′	55.0′
2	208°22.7	32.0	22°28.9	13.2′	18°37.2	11.3′	55.0′
3	223°22.7	·· 31.4	37°01.2	13.3′	18°25.9	11.3′	55.0′
4	238°22.8	30.7	51°33.5	13.3′	18°14.6	11.5′	55.0′
5	253°22.8	30.1	66°05.8	13.4′	18°03.1	11.5′	55.0′
6	268°22.8	N18°29.5	80°38.2	13.4′	S17°51.6	11.7′	55.0′
7	283°22.9	28.9	95°10.6	13.5′	17°39.9	11.7′	55.1′
8	298°22.9	28.3	109°43.1	13.5′	17°28.2	11.8′	55.1′
9	313°22.9	·· 27.7	124°15.6	13.6′	17°16.4	11.8′	55.1′
10	328°22.9	27.1	138°48.2	13.6′	17°04.6	12.0′	55.1′
11	343°23.0	26.5	153°20.8	13.7′	16°52.6	12.0′	55.1′
12	358°23.0	N18°25.9	167°53.4	13.7′	S16°40.6	12.1′	55.1′
13	13°23.0	25.3	182°26.1	13.7′	16°28.5	12.2′	55.2′
14	28°23.0	24.7	196°58.9	13.8′	16°16.3	12.3′	55.2′
15	43°23.1	·· 24.1	211°31.7	13.8′	16°04.0	12.3′	55.2′
16	58°23.1	23.5	226°04.5	13.9′	15°51.7	12.4′	55.2′
17	73°23.1	22.9	240°37.4	13.9′	15°39.3	12.5′	55.2′
18	88°23.2	N18°22.2	255°10.3	14.0′	S15°26.8	12.5′	55.3′
19	103°23.2	21.6	269°43.3	14.0′	15°14.3	12.7′	55.3′
20	118°23.2	21.0	284°16.3	14.0′	15°01.6	12.7′	55.3′
21	133°23.2	·· 20.4	298°49.3	14.1′	14°48.9	12.7′	55.3′
22	148°23.3	19.8	313°22.4	14.1′	14°36.2	12.9′	55.3′
23	163°23.3	19.2	327°55.5	14.2′	14°23.3	12.9′	55.3′
	SD = 15.7′	d = 0.6′	SD = 15.0′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°23.3	N18°18.6	342°28.7	14.2′	S14°10.4	13.0′	55.4′
1	193°23.4	18.0	357°01.9	14.2′	13°57.4	13.0′	55.4′
2	208°23.4	17.3	11°35.1	14.3′	13°44.4	13.1′	55.4′
3	223°23.4	·· 16.7	26°08.4	14.3′	13°31.3	13.2′	55.4′
4	238°23.5	16.1	40°41.7	14.3′	13°18.1	13.2′	55.4′
5	253°23.5	15.5	55°15.0	14.4′	13°04.9	13.3′	55.5′
6	268°23.5	N18°14.9	69°48.4	14.4′	S12°51.6	13.4′	55.5′
7	283°23.6	14.3	84°21.8	14.4′	12°38.2	13.4′	55.5′
8	298°23.6	13.6	98°55.3	14.5′	12°24.8	13.5′	55.5′
9	313°23.6	·· 13.0	113°28.7	14.5′	12°11.3	13.5′	55.5′
10	328°23.7	12.4	128°02.2	14.5′	11°57.8	13.6′	55.5′
11	343°23.7	11.8	142°35.8	14.6′	11°44.2	13.7′	55.6′
12	358°23.7	N18°11.2	157°09.3	14.6′	S11°30.5	13.7′	55.6′
13	13°23.8	10.5	171°42.9	14.6′	11°16.8	13.8′	55.6′
14	28°23.8	09.9	186°16.6	14.6′	11°03.0	13.8′	55.6′
15	43°23.8	·· 09.3	200°50.2	14.7′	10°49.2	13.9′	55.6′
16	58°23.9	08.7	215°23.9	14.7′	10°35.3	13.9′	55.7′
17	73°23.9	08.1	229°57.6	14.7′	10°21.4	14.0′	55.7′
18	88°23.9	N18°07.4	244°31.3	14.7′	S10°07.4	14.0′	55.7′
19	103°24.0	06.8	259°05.0	14.8′	09°53.4	14.1′	55.7′
20	118°24.0	06.2	273°38.8	14.8′	09°39.3	14.1′	55.7′
21	133°24.1	·· 05.6	288°12.6	14.8′	09°25.2	14.2′	55.8′
22	148°24.1	04.9	302°46.4	14.8′	09°11.0	14.2′	55.8′
23	163°24.1	04.3	317°20.3	14.9′	08°56.8	14.3′	55.8′
	SD = 15.7′	d = 0.6′	SD = 15.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°24.2	N18°03.7	331°54.1	14.9′	S08°42.5	14.3′	55.8′
1	193°24.2	03.1	346°28.0	14.9′	08°28.2	14.3′	55.8′
2	208°24.2	02.4	1°01.9	14.9′	08°13.9	14.4′	55.9′
3	223°24.3	·· 01.8	15°35.8	14.9′	07°59.5	14.5′	55.9′
4	238°24.3	01.2	30°09.7	14.9′	07°45.0	14.5′	55.9′
5	253°24.4	18°00.5	44°43.6	14.9′	07°30.5	14.5′	55.9′
6	268°24.4	N17°59.9	59°17.6	15.0′	S07°16.0	14.5′	55.9′
7	283°24.4	59.3	73°51.5	15.0′	07°01.5	14.6′	56.0′
8	298°24.5	58.7	88°25.5	15.0′	06°46.9	14.7′	56.0′
9	313°24.5	·· 58.0	102°59.5	15.0′	06°32.2	14.7′	56.0′
10	328°24.5	57.4	117°33.4	15.0′	06°17.5	14.7′	56.0′
11	343°24.6	56.8	132°07.4	15.0′	06°02.8	14.7′	56.0′
12	358°24.6	N17°56.1	146°41.4	15.0′	S05°48.1	14.8′	56.1′
13	13°24.7	55.5	161°15.4	15.0′	05°33.3	14.8′	56.1′
14	28°24.7	54.9	175°49.5	15.0′	05°18.5	14.9′	56.1′
15	43°24.8	·· 54.2	190°23.5	15.0′	05°03.6	14.8′	56.1′
16	58°24.8	53.6	204°57.5	15.0′	04°48.8	14.9′	56.1′
17	73°24.8	53.0	219°31.5	15.0′	04°33.9	15.0′	56.2′
18	88°24.9	N17°52.3	234°05.5	15.0′	S04°18.9	14.9′	56.2′
19	103°24.9	51.7	248°39.6	15.0′	04°04.0	15.0′	56.2′
20	118°25.0	51.1	263°13.6	15.0′	03°49.0	15.0′	56.2′
21	133°25.0	·· 50.4	277°47.6	15.0′	03°34.0	15.1′	56.3′
22	148°25.0	49.8	292°21.6	15.0′	03°18.9	15.0′	56.3′
23	163°25.1	49.1	306°55.6	15.0′	03°03.9	15.1′	56.3′
	SD = 15.8′	d = 0.6′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	01:17	22:47	////	////
68°	////	////	02:10	21:59	////	////
66°	////	////	02:42	21:28	////	////
64°	////	01:33	03:05	21:06	22:34	////
62°	////	02:11	03:23	20:48	21:58	////
60°	////	02:37	03:38	20:33	21:33	////
N 58°	01:25	02:57	03:51	20:20	21:14	22:43
56°	01:59	03:13	04:02	20:10	20:58	22:11
54°	02:23	03:27	04:12	20:00	20:45	21:47
52°	02:42	03:39	04:20	19:52	20:33	21:29
50°	02:57	03:49	04:28	19:44	20:23	21:14
45°	03:27	04:10	04:44	19:28	20:02	20:44
N 40°	03:49	04:27	04:57	19:15	19:45	20:23
35°	04:07	04:41	05:09	19:04	19:32	20:05
30°	04:21	04:52	05:18	18:54	19:20	19:51
20°	04:44	05:12	05:35	18:38	19:01	19:29
N 10°	05:01	05:27	05:50	18:23	18:45	19:11
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:54	06:16	17:57	18:19	18:44
20°	05:41	06:07	06:30	17:43	18:06	18:33
30°	05:52	06:21	06:46	17:27	17:52	18:21
35°	05:58	06:29	06:55	17:18	17:45	18:15
40°	06:04	06:37	07:06	17:07	17:36	18:09
45°	06:11	06:47	07:18	16:55	17:27	18:02
S 50°	06:18	06:58	07:33	16:40	17:16	17:55
52°	06:22	07:03	07:40	16:33	17:11	17:52
54°	06:25	07:08	07:48	16:26	17:05	17:48
56°	06:29	07:14	07:56	16:17	16:59	17:45
58°	06:33	07:21	08:06	16:08	16:53	17:41
S 60°	06:37	07:29	08:17	15:56	16:45	17:37

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	22:40	21:50	21:14	▬	04:09	06:31
N 70°	22:11	21:36	21:09	01:55	04:37	06:43
68°	21:49	21:25	21:05	02:46	04:57	06:52
66°	21:31	21:16	21:02	03:18	05:13	06:59
64°	21:17	21:08	20:59	03:41	05:26	07:05
62°	21:05	21:01	20:57	03:59	05:37	07:11
60°	20:55	20:55	20:55	04:14	05:46	07:15
N 58°	20:46	20:50	20:53	04:27	05:54	07:19
56°	20:38	20:45	20:51	04:38	06:01	07:23
54°	20:31	20:41	20:49	04:48	06:07	07:26
52°	20:24	20:37	20:48	04:56	06:13	07:29
50°	20:18	20:33	20:46	05:04	06:18	07:32
45°	20:06	20:26	20:44	05:20	06:29	07:37
N 40°	19:55	20:19	20:41	05:33	06:38	07:42
35°	19:47	20:14	20:39	05:44	06:45	07:46
30°	19:39	20:09	20:37	05:54	06:52	07:50
20°	19:25	20:00	20:34	06:10	07:03	07:56
N 10°	19:13	19:53	20:31	06:25	07:13	08:01
0°	19:02	19:45	20:28	06:38	07:23	08:06
S 10°	18:50	19:38	20:26	06:51	07:32	08:11
20°	18:38	19:31	20:23	07:06	07:42	08:16
30°	18:24	19:22	20:20	07:22	07:53	08:22
35°	18:16	19:17	20:18	07:31	07:59	08:25
40°	18:07	19:11	20:16	07:41	08:06	08:29
45°	17:56	19:04	20:13	07:54	08:15	08:33
S 50°	17:42	18:56	20:10	08:09	08:25	08:39
52°	17:36	18:52	20:09	08:16	08:29	08:41
54°	17:29	18:48	20:07	08:23	08:34	08:43
56°	17:21	18:44	20:06	08:32	08:40	08:46
58°	17:13	18:39	20:04	08:41	08:46	08:49
S 60°	17:02	18:33	20:02	08:52	08:53	08:53

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 16-18 100-94%
30	06:29	06:28	12:06	00:27	12:50	
31	06:27	06:25	12:06	01:12	13:34	
01	06:23	06:21	12:06	01:56	14:17	

August 02, 03, 04 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	310°36.4	135°09.0	N01°51.2	227°25.5	N23°23.8	180°53.7	N18°56.3	296°04.6	N03°27.9
1	325°38.8	150°09.2	49.9	242°26.2	23.9	195°55.6	56.2	311°07.1	27.9
2	340°41.3	165°09.3	48.7	257°26.8	24.0	210°57.5	56.0	326°09.5	27.9
3	355°43.8	180°09.5	·· 47.5	272°27.4	·· 24.1	225°59.3	·· 55.9	341°12.0	·· 27.9
4	10°46.2	195°09.7	46.3	287°28.1	24.2	241°01.2	55.7	356°14.5	27.8
5	25°48.7	210°09.9	45.0	302°28.7	24.4	256°03.1	55.6	11°17.0	27.8
6	40°51.2	225°10.1	N01°43.8	317°29.3	N23°24.5	271°05.0	N18°55.5	26°19.5	N03°27.8
7	55°53.6	240°10.2	42.6	332°30.0	24.6	286°06.9	55.3	41°22.0	27.8
8	70°56.1	255°10.4	41.4	347°30.6	24.7	301°08.8	55.2	56°24.5	27.8
9	85°58.5	270°10.6	·· 40.1	2°31.2	·· 24.8	316°10.7	·· 55.1	71°26.9	·· 27.7
10	101°01.0	285°10.8	38.9	17°31.8	24.9	331°12.6	54.9	86°29.4	27.7
11	116°03.5	300°11.0	37.7	32°32.5	25.0	346°14.5	54.8	101°31.9	27.7
12	131°05.9	315°11.2	N01°36.5	47°33.1	N23°25.1	1°16.4	N18°54.6	116°34.4	N03°27.7
13	146°08.4	330°11.3	35.2	62°33.7	25.2	16°18.3	54.5	131°36.9	27.6
14	161°10.9	345°11.5	34.0	77°34.4	25.3	31°20.2	54.4	146°39.4	27.6
15	176°13.3	0°11.7	·· 32.8	92°35.0	·· 25.5	46°22.1	·· 54.2	161°41.9	·· 27.6
16	191°15.8	15°11.9	31.6	107°35.6	25.6	61°24.0	54.1	176°44.3	27.6
17	206°18.3	30°12.1	30.3	122°36.3	25.7	76°25.9	54.0	191°46.8	27.6
18	221°20.7	45°12.3	N01°29.1	137°36.9	N23°25.8	91°27.8	N18°53.8	206°49.3	N03°27.5
19	236°23.2	60°12.5	27.9	152°37.5	25.9	106°29.7	53.7	221°51.8	27.5
20	251°25.6	75°12.7	26.7	167°38.2	26.0	121°31.6	53.5	236°54.3	27.5
21	266°28.1	90°12.8	·· 25.4	182°38.8	·· 26.1	136°33.5	·· 53.4	251°56.8	·· 27.5
22	281°30.6	105°13.0	24.2	197°39.4	26.2	151°35.4	53.3	266°59.3	27.4
23	296°33.0	120°13.2	23.0	212°40.1	26.3	166°37.3	53.1	282°01.8	27.4
Mer.pass. 03:17		ν 0.2′	d 1.2′	m -4.28	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.63

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	311°35.5	135°13.4	N01°21.8	227°40.7	N23°26.4	181°39.2	N18°53.0	297°04.2	N03°27.4
1	326°38.0	150°13.6	20.5	242°41.3	26.5	196°41.1	52.9	312°06.7	27.4
2	341°40.4	165°13.8	19.3	257°42.0	26.6	211°43.0	52.7	327°09.2	27.4
3	356°42.9	180°14.0	·· 18.1	272°42.6	·· 26.7	226°44.9	·· 52.6	342°11.7	·· 27.3
4	11°45.4	195°14.2	16.9	287°43.2	26.8	241°46.8	52.4	357°14.2	27.3
5	26°47.8	210°14.4	15.6	302°43.9	26.9	256°48.7	52.3	12°16.7	27.3
6	41°50.3	225°14.6	N01°14.4	317°44.5	N23°27.0	271°50.6	N18°52.2	27°19.2	N03°27.3
7	56°52.8	240°14.8	13.2	332°45.1	27.1	286°52.5	52.0	42°21.7	27.2
8	71°55.2	255°15.0	12.0	347°45.8	27.2	301°54.4	51.9	57°24.2	27.2
9	86°57.7	270°15.2	·· 10.7	2°46.4	·· 27.3	316°56.3	·· 51.8	72°26.6	·· 27.2
10	102°00.1	285°15.4	09.5	17°47.0	27.4	331°58.2	51.6	87°29.1	27.2
11	117°02.6	300°15.6	08.3	32°47.7	27.5	347°00.1	51.5	102°31.6	27.2
12	132°05.1	315°15.7	N01°07.1	47°48.3	N23°27.6	2°02.0	N18°51.3	117°34.1	N03°27.1
13	147°07.5	330°15.9	05.8	62°48.9	27.8	17°03.9	51.2	132°36.6	27.1
14	162°10.0	345°16.1	04.6	77°49.6	27.9	32°05.8	51.1	147°39.1	27.1
15	177°12.5	0°16.3	·· 03.4	92°50.2	·· 28.0	47°07.7	·· 50.9	162°41.6	·· 27.1
16	192°14.9	15°16.5	02.2	107°50.8	28.0	62°09.6	50.8	177°44.1	27.0
17	207°17.4	30°16.7	01°00.9	122°51.5	28.1	77°11.5	50.6	192°46.6	27.0
18	222°19.9	45°16.9	N00°59.7	137°52.1	N23°28.2	92°13.4	N18°50.5	207°49.1	N03°27.0
19	237°22.3	60°17.1	58.5	152°52.7	28.3	107°15.3	50.4	222°51.5	27.0
20	252°24.8	75°17.4	57.3	167°53.4	28.4	122°17.2	50.2	237°54.0	26.9
21	267°27.3	90°17.6	·· 56.0	182°54.0	·· 28.5	137°19.1	·· 50.1	252°56.5	·· 26.9
22	282°29.7	105°17.8	54.8	197°54.6	28.6	152°21.0	50.0	267°59.0	26.9
23	297°32.2	120°18.0	53.6	212°55.3	28.7	167°22.9	49.8	283°01.5	26.9
Mer.pass. 03:13		ν 0.2′	d 1.2′	m -4.29	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.62

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	312°34.6	135°18.2	N00°52.4	227°55.9	N23°28.8	182°24.8	N18°49.7	298°04.0	N03°26.9
1	327°37.1	150°18.4	51.1	242°56.5	28.9	197°26.7	49.5	313°06.5	26.8
2	342°39.6	165°18.6	49.9	257°57.2	29.0	212°28.6	49.4	328°09.0	26.8
3	357°42.0	180°18.8	·· 48.7	272°57.8	·· 29.1	227°30.5	·· 49.3	343°11.5	·· 26.8
4	12°44.5	195°19.0	47.5	287°58.4	29.2	242°32.4	49.1	358°14.0	26.8
5	27°47.0	210°19.2	46.2	302°59.1	29.3	257°34.3	49.0	13°16.5	26.7
6	42°49.4	225°19.4	N00°45.0	317°59.7	N23°29.4	272°36.2	N18°48.9	28°19.0	N03°26.7
7	57°51.9	240°19.6	43.8	333°00.4	29.5	287°38.0	48.7	43°21.4	26.7
8	72°54.4	255°19.8	42.6	348°01.0	29.6	302°39.9	48.6	58°23.9	26.7
9	87°56.8	270°20.0	·· 41.3	3°01.6	·· 29.7	317°41.8	·· 48.4	73°26.4	·· 26.6
10	102°59.3	285°20.2	40.1	18°02.3	29.8	332°43.7	48.3	88°28.9	26.6
11	118°01.7	300°20.5	38.9	33°02.9	29.9	347°45.6	48.2	103°31.4	26.6
12	133°04.2	315°20.7	N00°37.7	48°03.5	N23°30.0	2°47.5	N18°48.0	118°33.9	N03°26.6
13	148°06.7	330°20.9	36.4	63°04.2	30.1	17°49.4	47.9	133°36.4	26.5
14	163°09.1	345°21.1	35.2	78°04.8	30.1	32°51.3	47.7	148°38.9	26.5
15	178°11.6	0°21.3	·· 34.0	93°05.4	·· 30.2	47°53.2	·· 47.6	163°41.4	·· 26.5
16	193°14.1	15°21.5	32.8	108°06.1	30.3	62°55.1	47.5	178°43.9	26.5
17	208°16.5	30°21.7	31.5	123°06.7	30.4	77°57.0	47.3	193°46.4	26.4
18	223°19.0	45°21.9	N00°30.3	138°07.3	N23°30.5	92°58.9	N18°47.2	208°48.9	N03°26.4
19	238°21.5	60°22.2	29.1	153°08.0	30.6	108°00.8	47.0	223°51.4	26.4
20	253°23.9	75°22.4	27.9	168°08.6	30.7	123°02.7	46.9	238°53.9	26.4
21	268°26.4	90°22.6	·· 26.6	183°09.3	·· 30.8	138°04.6	·· 46.8	253°56.4	·· 26.3
22	283°28.9	105°22.8	25.4	198°09.9	30.9	153°06.5	46.6	268°58.9	26.3
23	298°31.3	120°23.0	24.2	213°10.5	31.0	168°08.4	46.5	284°01.4	26.3
Mer.pass. 03:09		ν 0.2′	d 1.2′	m -4.30	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.62

Stars

	SHA	**Dec**
Alpheratz	357°33.2	29°14.2
Ankaa	353°05.6	-42°09.4
Schedar	349°29.3	56°40.9
Diphda	348°45.8	-17°50.2
Achernar	335°19.1	-57°05.7
Hamal	327°49.7	23°35.3
Polaris	313°25.4	89°22.2
Acamar	315°10.8	-40°11.5
Menkar	314°04.8	4°11.7
Mirfak	308°26.5	49°57.2
Aldebaran	290°38.3	16°33.8
Rigel	281°02.8	-8°10.1
Capella	280°20.3	46°01.3
Bellatrix	278°21.7	6°22.5
Elnath	278°00.5	28°37.7
Alnilam	275°36.6	-1°11.0
Betelgeuse	270°50.9	7°24.8
Canopus	263°52.3	-52°42.3
Sirius	258°25.4	-16°45.0
Adhara	255°05.2	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.6
Suhail	222°45.8	-43°32.4
Miaplacidus	221°39.0	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°40.0	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°59.0	-63°15.1
Gacrux	171°50.5	-57°16.0
Alioth	166°12.1	55°49.2
Spica	158°21.0	-11°18.0
Alkaid	152°51.1	49°11.1
Hadar	148°34.2	-60°30.3
Menkent	147°56.1	-36°30.2
Arcturus	145°46.7	19°02.8
Rigil Kent.	139°38.5	-60°57.0
Kochab	137°19.7	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.7
Antares	112°14.0	-26°29.5
Atria	107°06.7	-69°04.7
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.2	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.6
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.9
Deneb	49°24.4	45°22.6
Enif	33°37.2	9°59.9
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.8	-29°28.7
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Aug 02 Sun	**SHA**	**Mer.pass**
Venus	184°32.6	14:59
Mars	276°49.2	08:50
Jupiter	230°17.3	11:55
Saturn	345°28.2	04:15

Aug 03 Mon	**SHA**	**Mer.pass**
Venus	183°37.9	14:59
Mars	276°05.2	08:49
Jupiter	230°03.7	11:52
Saturn	345°28.7	04:11

Aug 04 Tue	**SHA**	**Mer.pass**
Venus	182°43.5	14:59
Mars	275°21.3	08:48
Jupiter	229°50.1	11:49
Saturn	345°29.4	04:07

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.1	N17°48.5	321°29.6	15.0′	S02°48.8	15.1′	56.3′
1	193°25.2	47.9	336°03.6	15.0′	02°33.7	15.2′	56.3′
2	208°25.2	47.2	350°37.6	15.0′	02°18.5	15.1′	56.4′
3	223°25.3	·· 46.6	5°11.6	15.0′	02°03.4	15.2′	56.4′
4	238°25.3	45.9	19°45.5	15.0′	01°48.2	15.2′	56.4′
5	253°25.4	45.3	34°19.5	14.9′	01°33.0	15.2′	56.4′
6	268°25.4	N17°44.7	48°53.4	14.9′	S01°17.8	15.2′	56.5′
7	283°25.4	44.0	63°27.3	14.9′	01°02.6	15.2′	56.5′
8	298°25.5	43.4	78°01.3	14.9′	00°47.4	15.3′	56.5′
9	313°25.5	·· 42.7	92°35.1	14.9′	00°32.1	15.3′	56.5′
10	328°25.6	42.1	107°09.0	14.9′	00°16.8	15.2′	56.5′
11	343°25.6	41.4	121°42.9	14.8′	S00°01.6	15.3′	56.6′
12	358°25.7	N17°40.8	136°16.7	14.8′	N00°13.7	15.3′	56.6′
13	13°25.7	40.2	150°50.5	14.8′	00°29.0	15.3′	56.6′
14	28°25.8	39.5	165°24.3	14.8′	00°44.3	15.3′	56.6′
15	43°25.8	·· 38.9	179°58.1	14.7′	00°59.6	15.3′	56.7′
16	58°25.9	38.2	194°31.8	14.7′	01°14.9	15.4′	56.7′
17	73°25.9	37.6	209°05.6	14.7′	01°30.3	15.3′	56.7′
18	88°26.0	N17°36.9	223°39.3	14.7′	N01°45.6	15.3′	56.7′
19	103°26.0	36.3	238°12.9	14.6′	02°00.9	15.4′	56.7′
20	118°26.1	35.6	252°46.5	14.6′	02°16.3	15.3′	56.8′
21	133°26.1	·· 35.0	267°20.1	14.6′	02°31.6	15.3′	56.8′
22	148°26.2	34.3	281°53.7	14.5′	02°46.9	15.4′	56.8′
23	163°26.2	33.7	296°27.3	14.5′	03°02.3	15.3′	56.8′
	SD = 15.8′	d = 0.6′		SD = 15.4′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.3	N17°33.0	311°00.8	14.5′	N03°17.6	15.4′	56.9′
1	193°26.3	32.4	325°34.2	14.4′	03°33.0	15.3′	56.9′
2	208°26.4	31.7	340°07.6	14.4′	03°48.3	15.3′	56.9′
3	223°26.4	·· 31.1	354°41.0	14.3′	04°03.6	15.3′	56.9′
4	238°26.5	30.4	9°14.4	14.3′	04°18.9	15.3′	56.9′
5	253°26.5	29.8	23°47.7	14.3′	04°34.2	15.4′	57.0′
6	268°26.6	N17°29.1	38°21.0	14.2′	N04°49.6	15.2′	57.0′
7	283°26.6	28.5	52°54.2	14.2′	05°04.8	15.3′	57.0′
8	298°26.7	27.8	67°27.4	14.1′	05°20.1	15.3′	57.0′
9	313°26.7	·· 27.2	82°00.5	14.1′	05°35.4	15.3′	57.1′
10	328°26.8	26.5	96°33.6	14.0′	05°50.7	15.2′	57.1′
11	343°26.8	25.8	111°06.6	14.0′	06°05.9	15.2′	57.1′
12	358°26.9	N17°25.2	125°39.6	13.9′	N06°21.1	15.3′	57.1′
13	13°26.9	24.5	140°12.5	13.9′	06°36.4	15.2′	57.2′
14	28°27.0	23.9	154°45.4	13.8′	06°51.6	15.1′	57.2′
15	43°27.0	·· 23.2	169°18.2	13.8′	07°06.7	15.2′	57.2′
16	58°27.1	22.6	183°51.0	13.7′	07°21.9	15.1′	57.2′
17	73°27.1	21.9	198°23.7	13.7′	07°37.0	15.1′	57.3′
18	88°27.2	N17°21.2	212°56.4	13.6′	N07°52.1	15.1′	57.3′
19	103°27.2	20.6	227°29.0	13.5′	08°07.2	15.1′	57.3′
20	118°27.3	19.9	242°01.5	13.5′	08°22.3	15.0′	57.3′
21	133°27.4	·· 19.3	256°34.0	13.4′	08°37.3	15.1′	57.4′
22	148°27.4	18.6	271°06.4	13.3′	08°52.4	14.9′	57.4′
23	163°27.5	17.9	285°38.7	13.3′	09°07.3	15.0′	57.4′
	SD = 15.8′	d = 0.7′		SD = 15.5′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.5	N17°17.3	300°11.0	13.2′	N09°22.3	14.9′	57.4′
1	193°27.6	16.6	314°43.2	13.1′	09°37.2	14.9′	57.4′
2	208°27.6	15.9	329°15.4	13.1′	09°52.1	14.9′	57.5′
3	223°27.7	·· 15.3	343°47.5	13.0′	10°07.0	14.8′	57.5′
4	238°27.7	14.6	358°19.5	12.9′	10°21.8	14.8′	57.5′
5	253°27.8	13.9	12°51.4	12.9′	10°36.6	14.7′	57.5′
6	268°27.9	N17°13.3	27°23.3	12.8′	N10°51.3	14.8′	57.6′
7	283°27.9	12.6	41°55.0	12.7′	11°06.1	14.6′	57.6′
8	298°28.0	12.0	56°26.8	12.6′	11°20.7	14.7′	57.6′
9	313°28.0	·· 11.3	70°58.4	12.6′	11°35.4	14.6′	57.6′
10	328°28.1	10.6	85°29.9	12.5′	11°50.0	14.5′	57.7′
11	343°28.2	10.0	100°01.4	12.4′	12°04.5	14.5′	57.7′
12	358°28.2	N17°09.3	114°32.8	12.3′	N12°19.0	14.4′	57.7′
13	13°28.3	08.6	129°04.1	12.2′	12°33.4	14.4′	57.7′
14	28°28.3	07.9	143°35.4	12.1′	12°47.8	14.4′	57.8′
15	43°28.4	·· 07.3	158°06.5	12.1′	13°02.2	14.3′	57.8′
16	58°28.4	06.6	172°37.6	12.0′	13°16.5	14.3′	57.8′
17	73°28.5	05.9	187°08.5	11.9′	13°30.8	14.1′	57.8′
18	88°28.6	N17°05.3	201°39.4	11.8′	N13°44.9	14.2′	57.9′
19	103°28.6	04.6	216°10.2	11.7′	13°59.1	14.1′	57.9′
20	118°28.7	03.9	230°40.9	11.6′	14°13.2	14.0′	57.9′
21	133°28.8	·· 03.2	245°11.5	11.5′	14°27.2	14.0′	57.9′
22	148°28.8	02.6	259°42.0	11.4′	14°41.2	13.9′	58.0′
23	163°28.9	01.9	274°12.5	11.3′	14°55.1	13.8′	58.0′
	SD = 15.8′	d = 0.7′		SD = 15.7′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	////	////	01:43	22:23	////	////
68°	////	////	02:25	21:43	////	////
66°	////	00:53	02:53	21:16	23:08	////
64°	////	01:51	03:14	20:56	22:17	////
62°	////	02:23	03:31	20:39	21:46	////
60°	00:48	02:46	03:45	20:25	21:24	23:15
N 58°	01:40	03:05	03:57	20:14	21:06	22:28
56°	02:10	03:20	04:08	20:03	20:51	22:00
54°	02:32	03:33	04:17	19:55	20:38	21:39
52°	02:49	03:44	04:25	19:47	20:27	21:21
50°	03:04	03:54	04:32	19:39	20:17	21:07
45°	03:32	04:14	04:48	19:24	19:58	20:39
N 40°	03:53	04:30	05:00	19:12	19:42	20:19
35°	04:10	04:43	05:11	19:01	19:29	20:02
30°	04:23	04:54	05:20	18:52	19:18	19:48
20°	04:45	05:13	05:36	18:36	18:59	19:27
N 10°	05:02	05:28	05:50	18:22	18:44	19:10
0°	05:16	05:41	06:03	18:10	18:31	18:56
S 10°	05:28	05:53	06:15	17:57	18:19	18:44
20°	05:39	06:06	06:29	17:44	18:07	18:33
30°	05:50	06:19	06:44	17:29	17:54	18:22
35°	05:56	06:26	06:53	17:20	17:47	18:17
40°	06:02	06:34	07:03	17:10	17:39	18:11
45°	06:08	06:43	07:14	16:58	17:30	18:05
S 50°	06:15	06:53	07:29	16:44	17:20	17:58
52°	06:17	06:58	07:35	16:38	17:15	17:56
54°	06:21	07:03	07:42	16:31	17:10	17:53
56°	06:24	07:09	07:50	16:23	17:04	17:49
58°	06:28	07:15	08:00	16:14	16:58	17:46
S 60°	06:31	07:22	08:10	16:03	16:51	17:42

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	20:41	20:06	19:17	08:40	10:50	13:16
N 70°	20:45	20:18	19:44	08:41	10:41	12:52
68°	20:47	20:28	20:04	08:42	10:34	12:34
66°	20:49	20:36	20:20	08:43	10:28	12:19
64°	20:51	20:43	20:33	08:43	10:23	12:07
62°	20:53	20:49	20:45	08:44	10:18	11:57
60°	20:54	20:54	20:54	08:44	10:14	11:49
N 58°	20:55	20:59	21:03	08:44	10:11	11:41
56°	20:57	21:03	21:11	08:45	10:08	11:35
54°	20:58	21:06	21:17	08:45	10:06	11:29
52°	20:58	21:10	21:23	08:45	10:03	11:24
50°	20:59	21:13	21:29	08:46	10:01	11:19
45°	21:01	21:20	21:41	08:46	09:56	11:09
N 40°	21:03	21:26	21:51	08:47	09:52	11:01
35°	21:04	21:31	22:00	08:47	09:49	10:53
30°	21:05	21:35	22:07	08:47	09:46	10:47
20°	21:08	21:43	22:20	08:48	09:41	10:36
N 10°	21:10	21:50	22:32	08:48	09:37	10:27
0°	21:11	21:56	22:43	08:49	09:32	10:18
S 10°	21:13	22:03	22:54	08:49	09:28	10:09
20°	21:15	22:10	23:06	08:50	09:24	10:00
30°	21:18	22:18	23:20	08:50	09:19	09:49
35°	21:19	22:22	23:28	08:50	09:16	09:43
40°	21:21	22:28	23:37	08:51	09:13	09:36
45°	21:23	22:34	23:48	08:51	09:09	09:28
S 50°	21:25	22:41	·· ··	08:51	09:04	09:19
52°	21:26	22:45	·· ··	08:52	09:02	09:14
54°	21:27	22:49	·· ··	08:52	09:00	09:10
56°	21:28	22:53	·· ··	08:52	08:58	09:04
58°	21:29	22:58	·· ··	08:52	08:55	08:58
S 60°	21:31	23:03	·· ··	08:52	08:52	08:52

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	19-21	89-72%
02	06:19	06:17	12:06	02:39	15:00		
03	06:15	06:13	12:06	03:22	15:44		
04	06:10	06:07	12:06	04:07	16:30		

August 05, 06, 07 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	313°33.8	135°23.2	N00°23.0	228°11.2	N23°31.0	183°10.3	N18°46.4	299°03.9	N03°26.3
1	328°36.2	150°23.5	21.8	243°11.8	31.1	198°12.2	46.2	314°06.3	26.2
2	343°38.7	165°23.7	20.5	258°12.4	31.2	213°14.1	46.1	329°08.8	26.2
3	358°41.2	180°23.9	·· 19.3	273°13.1	·· 31.3	228°16.0	·· 45.9	344°11.3	·· 26.2
4	13°43.6	195°24.1	18.1	288°13.7	31.4	243°17.9	45.8	359°13.8	26.2
5	28°46.1	210°24.3	16.9	303°14.4	31.5	258°19.8	45.7	14°16.3	26.1
6	43°48.6	225°24.6	N00°15.6	318°15.0	N23°31.6	273°21.7	N18°45.5	29°18.8	N03°26.1
7	58°51.0	240°24.8	14.4	333°15.6	31.7	288°23.6	45.4	44°21.3	26.1
8	73°53.5	255°25.0	13.2	348°16.3	31.7	303°25.5	45.2	59°23.8	26.1
9	88°56.0	270°25.2	·· 12.0	3°16.9	·· 31.8	318°27.4	·· 45.1	74°26.3	·· 26.0
10	103°58.4	285°25.5	10.7	18°17.5	31.9	333°29.3	45.0	89°28.8	26.0
11	119°00.9	300°25.7	09.5	33°18.2	32.0	348°31.2	44.8	104°31.3	26.0
12	134°03.3	315°25.9	N00°08.3	48°18.8	N23°32.1	3°33.1	N18°44.7	119°33.8	N03°26.0
13	149°05.8	330°26.1	07.1	63°19.5	32.2	18°35.0	44.5	134°36.3	25.9
14	164°08.3	345°26.4	05.8	78°20.1	32.2	33°36.9	44.4	149°38.8	25.9
15	179°10.7	0°26.6	·· 04.6	93°20.7	·· 32.3	48°38.8	·· 44.3	164°41.3	·· 25.9
16	194°13.2	15°26.8	03.4	108°21.4	32.4	63°40.7	44.1	179°43.8	25.8
17	209°15.7	30°27.0	02.2	123°22.0	32.5	78°42.6	44.0	194°46.3	25.8
18	224°18.1	45°27.3	N00°00.9	138°22.7	N23°32.6	93°44.5	N18°43.9	209°48.8	N03°25.8
19	239°20.6	60°27.5	S00°00.3	153°23.3	32.7	108°46.4	43.7	224°51.3	25.8
20	254°23.1	75°27.7	01.5	168°23.9	32.7	123°48.3	43.6	239°53.8	25.7
21	269°25.5	90°28.0	·· 02.7	183°24.6	·· 32.8	138°50.2	·· 43.4	254°56.3	·· 25.7
22	284°28.0	105°28.2	03.9	198°25.2	32.9	153°52.1	43.3	269°58.8	25.7
23	299°30.5	120°28.4	05.2	213°25.8	33.0	168°54.0	43.2	285°01.3	25.7
Mer.pass. 03:05		ν 0.2′	d 1.2′	m -4.31	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.61

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	314°32.9	135°28.7	S00°06.4	228°26.5	N23°33.1	183°55.9	N18°43.0	300°03.8	N03°25.6
1	329°35.4	150°28.9	07.6	243°27.1	33.1	198°57.8	42.9	315°06.3	25.6
2	344°37.8	165°29.1	08.8	258°27.8	33.2	213°59.7	42.7	330°08.8	25.6
3	359°40.3	180°29.4	·· 10.1	273°28.4	·· 33.3	229°01.6	·· 42.6	345°11.3	·· 25.6
4	14°42.8	195°29.6	11.3	288°29.0	33.4	244°03.5	42.5	0°13.8	25.5
5	29°45.2	210°29.8	12.5	303°29.7	33.4	259°05.4	42.3	15°16.3	25.5
6	44°47.7	225°30.1	S00°13.7	318°30.3	N23°33.5	274°07.3	N18°42.2	30°18.8	N03°25.5
7	59°50.2	240°30.3	15.0	333°31.0	33.6	289°09.2	42.0	45°21.3	25.4
8	74°52.6	255°30.5	16.2	348°31.6	33.7	304°11.1	41.9	60°23.8	25.4
9	89°55.1	270°30.8	·· 17.4	3°32.2	·· 33.8	319°13.0	·· 41.8	75°26.3	·· 25.4
10	104°57.6	285°31.0	18.6	18°32.9	33.8	334°14.9	41.6	90°28.8	25.4
11	120°00.0	300°31.2	19.9	33°33.5	33.9	349°16.8	41.5	105°31.3	25.3
12	135°02.5	315°31.5	S00°21.1	48°34.2	N23°34.0	4°18.7	N18°41.3	120°33.8	N03°25.3
13	150°05.0	330°31.7	22.3	63°34.8	34.1	19°20.6	41.2	135°36.3	25.3
14	165°07.4	345°32.0	23.5	78°35.4	34.1	34°22.5	41.1	150°38.8	25.3
15	180°09.9	0°32.2	·· 24.7	93°36.1	·· 34.2	49°24.4	·· 40.9	165°41.3	·· 25.2
16	195°12.3	15°32.4	26.0	108°36.7	34.3	64°26.3	40.8	180°43.8	25.2
17	210°14.8	30°32.7	27.2	123°37.4	34.4	79°28.2	40.6	195°46.3	25.2
18	225°17.3	45°32.9	S00°28.4	138°38.0	N23°34.4	94°30.1	N18°40.5	210°48.8	N03°25.1
19	240°19.7	60°33.2	29.6	153°38.7	34.5	109°32.0	40.4	225°51.3	25.1
20	255°22.2	75°33.4	30.9	168°39.3	34.6	124°33.9	40.2	240°53.8	25.1
21	270°24.7	90°33.7	·· 32.1	183°39.9	·· 34.6	139°35.8	·· 40.1	255°56.3	·· 25.1
22	285°27.1	105°33.9	33.3	198°40.6	34.7	154°37.7	39.9	270°58.8	25.0
23	300°29.6	120°34.1	34.5	213°41.2	34.8	169°39.6	39.8	286°01.3	25.0
Mer.pass. 03:01		ν 0.2′	d 1.2′	m -4.32	ν 0.6′	d 0.1′	m 1.30	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.61

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	315°32.1	135°34.4	S00°35.7	228°41.9	N23°34.9	184°41.5	N18°39.7	301°03.8	N03°25.0
1	330°34.5	150°34.6	37.0	243°42.5	34.9	199°43.4	39.5	316°06.3	24.9
2	345°37.0	165°34.9	38.2	258°43.1	35.0	214°45.3	39.4	331°08.8	24.9
3	0°39.5	180°35.1	·· 39.4	273°43.8	·· 35.1	229°47.2	·· 39.2	346°11.3	·· 24.9
4	15°41.9	195°35.4	40.6	288°44.4	35.1	244°49.1	39.1	1°13.8	24.9
5	30°44.4	210°35.6	41.9	303°45.1	35.2	259°51.0	39.0	16°16.4	24.8
6	45°46.8	225°35.9	S00°43.1	318°45.7	N23°35.3	274°52.9	N18°38.8	31°18.9	N03°24.8
7	60°49.3	240°36.1	44.3	333°46.4	35.3	289°54.8	38.7	46°21.4	24.8
8	75°51.8	255°36.4	45.5	348°47.0	35.4	304°56.7	38.5	61°23.9	24.7
9	90°54.2	270°36.6	·· 46.7	3°47.6	·· 35.5	319°58.6	·· 38.4	76°26.4	·· 24.7
10	105°56.7	285°36.9	48.0	18°48.3	35.6	335°00.5	38.3	91°28.9	24.7
11	120°59.2	300°37.1	49.2	33°48.9	35.6	350°02.4	38.1	106°31.4	24.7
12	136°01.6	315°37.4	S00°50.4	48°49.6	N23°35.7	5°04.3	N18°38.0	121°33.9	N03°24.6
13	151°04.1	330°37.6	51.6	63°50.2	35.8	20°06.2	37.8	136°36.4	24.6
14	166°06.6	345°37.9	52.8	78°50.9	35.8	35°08.1	37.7	151°38.9	24.6
15	181°09.0	0°38.1	·· 54.1	93°51.5	·· 35.9	50°10.0	·· 37.6	166°41.4	·· 24.5
16	196°11.5	15°38.4	55.3	108°52.1	35.9	65°11.9	37.4	181°43.9	24.5
17	211°13.9	30°38.7	56.5	123°52.8	36.0	80°13.8	37.3	196°46.4	24.5
18	226°16.4	45°38.9	S00°57.7	138°53.4	N23°36.1	95°15.7	N18°37.1	211°48.9	N03°24.4
19	241°18.9	60°39.2	00°58.9	153°54.1	36.1	110°17.6	37.0	226°51.4	24.4
20	256°21.3	75°39.4	01°00.2	168°54.7	36.2	125°19.6	36.9	241°53.9	24.4
21	271°23.8	90°39.7	·· 01.4	183°55.4	·· 36.3	140°21.5	·· 36.7	256°56.4	·· 24.4
22	286°26.3	105°39.9	02.6	198°56.0	36.3	155°23.4	36.6	271°58.9	24.3
23	301°28.7	120°40.2	03.8	213°56.7	36.4	170°25.3	36.4	287°01.5	24.3
Mer.pass. 02:57		ν 0.2′	d 1.2′	m -4.33	ν 0.6′	d 0.1′	m 1.29	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.60

Stars

	SHA	Dec
Alpheratz	357°33.2	29°14.3
Ankaa	353°05.6	-42°09.4
Schedar	349°29.2	56°40.9
Diphda	348°45.8	-17°50.2
Achernar	335°19.0	-57°05.7
Hamal	327°49.7	23°35.3
Polaris	313°23.7	89°22.2
Acamar	315°10.8	-40°11.5
Menkar	314°04.8	4°11.8
Mirfak	308°26.4	49°57.2
Aldebaran	290°38.3	16°33.8
Rigel	281°02.8	-8°10.1
Capella	280°20.2	46°01.3
Bellatrix	278°21.7	6°22.5
Elnath	278°00.4	28°37.7
Alnilam	275°36.6	-1°11.0
Betelgeuse	270°50.9	7°24.8
Canopus	263°52.3	-52°42.3
Sirius	258°25.4	-16°45.0
Adhara	255°05.2	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.6
Suhail	222°45.8	-43°32.4
Miaplacidus	221°39.0	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°40.0	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°59.0	-63°15.0
Gacrux	171°50.5	-57°16.0
Alioth	166°12.1	55°49.2
Spica	158°21.0	-11°18.0
Alkaid	152°51.1	49°11.1
Hadar	148°34.2	-60°30.3
Menkent	147°56.1	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.5	-60°57.0
Kochab	137°19.8	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.7
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.2	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.9
Deneb	49°24.4	45°22.6
Enif	33°37.2	9°59.9
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.8	-29°28.7
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Aug 05 Wed	SHA	Mer.pass
Venus	181°49.5	14:58
Mars	274°37.4	08:47
Jupiter	229°36.6	11:46
Saturn	345°30.1	04:03

Aug 06 Thu	SHA	Mer.pass
Venus	180°55.7	14:58
Mars	273°53.6	08:46
Jupiter	229°23.0	11:43
Saturn	345°30.9	03:59

Aug 07 Fri	SHA	Mer.pass
Venus	180°02.3	14:57
Mars	273°09.8	08:45
Jupiter	229°09.5	11:40
Saturn	345°31.8	03:55

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.9	N17°01.2	288°42.8	11.2′	N15°08.9	13.8′	58.0′
1	193°29.0	17°00.6	303°13.0	11.1′	15°22.7	13.7′	58.0′
2	208°29.1	16°59.9	317°43.2	11.0′	15°36.4	13.6′	58.1′
3	223°29.1	·· 59.2	332°13.2	10.9′	15°50.0	13.6′	58.1′
4	238°29.2	58.5	346°43.1	10.8′	16°03.6	13.5′	58.1′
5	253°29.2	57.9	1°13.0	10.7′	16°17.1	13.4′	58.1′
6	268°29.3	N16°57.2	15°42.7	10.6′	N16°30.5	13.4′	58.2′
7	283°29.4	56.5	30°12.3	10.5′	16°43.9	13.3′	58.2′
8	298°29.4	55.8	44°41.9	10.4′	16°57.2	13.2′	58.2′
9	313°29.5	·· 55.1	59°11.3	10.3′	17°10.4	13.1′	58.2′
10	328°29.6	54.5	73°40.6	10.2′	17°23.5	13.0′	58.3′
11	343°29.6	53.8	88°09.8	10.1′	17°36.5	13.0′	58.3′
12	358°29.7	N16°53.1	102°38.9	10.0′	N17°49.5	12.8′	58.3′
13	13°29.8	52.4	117°07.9	9.9′	18°02.3	12.8′	58.3′
14	28°29.8	51.7	131°36.8	9.8′	18°15.1	12.7′	58.4′
15	43°29.9	·· 51.1	146°05.6	9.7′	18°27.8	12.7′	58.4′
16	58°30.0	50.4	160°34.2	9.6′	18°40.5	12.5′	58.4′
17	73°30.0	49.7	175°02.8	9.4′	18°53.0	12.4′	58.4′
18	88°30.1	N16°49.0	189°31.2	9.3′	N19°05.4	12.3′	58.5′
19	103°30.2	48.3	203°59.6	9.2′	19°17.7	12.3′	58.5′
20	118°30.2	47.6	218°27.8	9.1′	19°30.0	12.1′	58.5′
21	133°30.3	·· 47.0	232°55.9	9.0′	19°42.1	12.1′	58.5′
22	148°30.4	46.3	247°23.8	8.9′	19°54.2	11.9′	58.6′
23	163°30.4	45.6	261°51.7	8.7′	20°06.1	11.8′	58.6′
	SD = 15.8′	d = 0.7′		SD = 15.8′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.5	N16°44.9	276°19.5	8.6′	N20°17.9	11.8′	58.6′
1	193°30.6	44.2	290°47.1	8.5′	20°29.7	11.6′	58.6′
2	208°30.6	43.5	305°14.6	8.4′	20°41.3	11.5′	58.7′
3	223°30.7	·· 42.8	319°42.0	8.3′	20°52.8	11.4′	58.7′
4	238°30.8	42.2	334°09.3	8.2′	21°04.2	11.3′	58.7′
5	253°30.8	41.5	348°36.4	8.0′	21°15.5	11.2′	58.7′
6	268°30.9	N16°40.8	3°03.5	7.9′	N21°26.7	11.1′	58.8′
7	283°31.0	40.1	17°30.4	7.8′	21°37.8	10.9′	58.8′
8	298°31.0	39.4	31°57.2	7.7′	21°48.7	10.9′	58.8′
9	313°31.1	·· 38.7	46°23.9	7.6′	21°59.6	10.7′	58.8′
10	328°31.2	38.0	60°50.4	7.4′	22°10.3	10.6′	58.8′
11	343°31.3	37.3	75°16.9	7.3′	22°20.9	10.4′	58.9′
12	358°31.3	N16°36.6	89°43.2	7.2′	N22°31.3	10.4′	58.9′
13	13°31.4	36.0	104°09.4	7.1′	22°41.7	10.2′	58.9′
14	28°31.5	35.3	118°35.5	7.0′	22°51.9	10.1′	58.9′
15	43°31.5	·· 34.6	133°01.4	6.8′	23°02.0	9.9′	59.0′
16	58°31.6	33.9	147°27.3	6.7′	23°11.9	9.8′	59.0′
17	73°31.7	33.2	161°53.0	6.6′	23°21.7	9.7′	59.0′
18	88°31.8	N16°32.5	176°18.6	6.5′	N23°31.4	9.5′	59.0′
19	103°31.8	31.8	190°44.1	6.4′	23°40.9	9.5′	59.1′
20	118°31.9	31.1	205°09.4	6.2′	23°50.4	9.2′	59.1′
21	133°32.0	·· 30.4	219°34.7	6.1′	23°59.6	9.1′	59.1′
22	148°32.1	29.7	233°59.8	6.0′	24°08.7	9.0′	59.1′
23	163°32.1	29.0	248°24.8	5.9′	24°17.7	8.8′	59.2′
	SD = 15.8′	d = 0.7′		SD = 16.0′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.2	N16°28.3	262°49.7	5.8′	N24°26.5	8.7′	59.2′
1	193°32.3	27.6	277°14.5	5.7′	24°35.2	8.5′	59.2′
2	208°32.3	26.9	291°39.1	5.5′	24°43.7	8.4′	59.2′
3	223°32.4	·· 26.2	306°03.6	5.4′	24°52.1	8.2′	59.2′
4	238°32.5	25.5	320°28.1	5.3′	25°00.3	8.1′	59.3′
5	253°32.6	24.8	334°52.4	5.2′	25°08.4	7.9′	59.3′
6	268°32.6	N16°24.1	349°16.6	5.1′	N25°16.3	7.8′	59.3′
7	283°32.7	23.4	3°40.6	5.0′	25°24.1	7.6′	59.3′
8	298°32.8	22.7	18°04.6	4.9′	25°31.7	7.4′	59.4′
9	313°32.9	·· 22.0	32°28.5	4.8′	25°39.1	7.2′	59.4′
10	328°33.0	21.3	46°52.2	4.6′	25°46.3	7.1′	59.4′
11	343°33.0	20.6	61°15.9	4.5′	25°53.4	7.0′	59.4′
12	358°33.1	N16°19.9	75°39.4	4.4′	N26°00.4	6.7′	59.4′
13	13°33.2	19.2	90°02.9	4.3′	26°07.1	6.6′	59.5′
14	28°33.3	18.5	104°26.2	4.2′	26°13.7	6.4′	59.5′
15	43°33.3	·· 17.8	118°49.4	4.1′	26°20.1	6.3′	59.5′
16	58°33.4	17.1	133°12.5	4.0′	26°26.4	6.1′	59.5′
17	73°33.5	16.4	147°35.6	3.9′	26°32.5	5.9′	59.5′
18	88°33.6	N16°15.7	161°58.5	3.8′	N26°38.4	5.7′	59.6′
19	103°33.6	15.0	176°21.3	3.7′	26°44.1	5.5′	59.6′
20	118°33.7	14.3	190°44.1	3.7′	26°49.6	5.4′	59.6′
21	133°33.8	·· 13.6	205°06.7	3.6′	26°55.0	5.1′	59.6′
22	148°33.9	12.9	219°29.3	3.5′	27°00.1	5.0′	59.6′
23	163°34.0	12.2	233°51.8	3.4′	27°05.1	4.8′	59.7′
	SD = 15.8′	d = 0.7′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	////	00:58	23:01	////	////
N 70°	////	////	02:04	22:02	////	////
68°	////	////	02:40	21:29	////	////
66°	////	01:23	03:04	21:04	22:41	////
64°	////	02:06	03:24	20:46	22:01	////
62°	////	02:34	03:39	20:30	21:34	////
60°	01:15	02:56	03:52	20:18	21:14	22:50
N 58°	01:54	03:13	04:04	20:07	20:57	22:14
56°	02:20	03:27	04:13	19:57	20:43	21:49
54°	02:40	03:39	04:22	19:49	20:31	21:30
52°	02:56	03:49	04:29	19:41	20:21	21:14
50°	03:10	03:59	04:36	19:34	20:12	21:01
45°	03:36	04:18	04:51	19:20	19:53	20:34
N 40°	03:57	04:33	05:03	19:08	19:38	20:14
35°	04:13	04:46	05:13	18:58	19:26	19:59
30°	04:26	04:56	05:22	18:49	19:15	19:46
20°	04:46	05:14	05:37	18:34	18:58	19:25
N 10°	05:03	05:28	05:50	18:21	18:43	19:09
0°	05:16	05:41	06:02	18:09	18:31	18:56
S 10°	05:27	05:53	06:15	17:57	18:19	18:45
20°	05:38	06:04	06:27	17:45	18:08	18:34
30°	05:48	06:17	06:42	17:30	17:55	18:24
35°	05:53	06:24	06:50	17:22	17:49	18:19
40°	05:59	06:31	06:59	17:13	17:41	18:14
45°	06:04	06:39	07:10	17:02	17:33	18:08
S 50°	06:10	06:49	07:24	16:49	17:23	18:02
52°	06:13	06:54	07:30	16:42	17:19	17:59
54°	06:16	06:58	07:37	16:36	17:14	17:57
56°	06:19	07:04	07:44	16:28	17:09	17:54
58°	06:22	07:09	07:53	16:20	17:03	17:51
S 60°	06:25	07:16	08:03	16:10	16:57	17:47

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°	18:36			15:44		
68°	19:26			14:55		
66°	19:58	19:05		14:25	17:12	
64°	20:22	20:03		14:02	16:14	
62°	20:41	20:37	20:34	13:44	15:41	17:49
60°	20:56	21:02	21:16	13:29	15:17	17:07
N 58°	21:10	21:22	21:45	13:17	14:58	16:38
56°	21:21	21:39	22:08	13:06	14:42	16:16
54°	21:32	21:53	22:26	12:57	14:28	15:58
52°	21:41	22:05	22:42	12:48	14:16	15:43
50°	21:49	22:16	22:56	12:41	14:05	15:30
45°	22:07	22:40	23:23	12:25	13:44	15:02
N 40°	22:21	22:58	23:46	12:12	13:26	14:41
35°	22:33	23:14	·· ··	12:01	13:11	14:23
30°	22:44	23:28	·· ··	11:51	12:58	14:08
20°	23:03	23:51	·· ··	11:35	12:37	13:42
N 10°	23:19	·· ··	00:11	11:20	12:18	13:20
0°	23:34	·· ··	00:31	11:07	12:00	12:59
S 10°	23:50	·· ··	00:50	10:54	11:43	12:38
20°	·· ··	00:07	01:11	10:40	11:25	12:16
30°	·· ··	00:26	01:35	10:24	11:03	11:51
35°	·· ··	00:37	01:49	10:14	10:51	11:36
40°	·· ··	00:50	02:06	10:04	10:37	11:18
45°	·· ··	01:06	02:25	09:51	10:20	10:58
S 50°	00:01	01:25	02:51	09:36	09:59	10:32
52°	00:08	01:34	03:03	09:29	09:50	10:19
54°	00:15	01:45	03:17	09:22	09:39	10:04
56°	00:22	01:56	03:33	09:13	09:26	09:48
58°	00:31	02:10	03:53	09:03	09:12	09:28
S 60°	00:41	02:26	04:17	08:52	08:55	09:03

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 62-40%
05	06:04	06:01	12:06	04:55	17:21	
06	05:58	05:55	12:06	05:47	18:15	
07	05:51	05:48	12:06	06:45	19:15	

August 08, 09, 10 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	316°31.2	135°40.5	S01°05.1	228°57.3	N23°36.5	185°27.2	N18°36.3	302°04.0	N03°24.3
1	331°33.7	150°40.7	06.3	243°57.9	36.5	200°29.1	36.2	317°06.5	24.2
2	346°36.1	165°41.0	07.5	258°58.6	36.6	215°31.0	36.0	332°09.0	24.2
3	1°38.6	180°41.2	·· 08.7	273°59.2	·· 36.6	230°32.9	·· 35.9	347°11.5	·· 24.2
4	16°41.1	195°41.5	09.9	288°59.9	36.7	245°34.8	35.7	2°14.0	24.1
5	31°43.5	210°41.8	11.2	304°00.5	36.8	260°36.7	35.6	17°16.5	24.1
6	46°46.0	225°42.0	S01°12.4	319°01.2	N23°36.8	275°38.6	N18°35.5	32°19.0	N03°24.1
7	61°48.4	240°42.3	13.6	334°01.8	36.9	290°40.5	35.3	47°21.5	24.1
8	76°50.9	255°42.5	14.8	349°02.5	37.0	305°42.4	35.2	62°24.0	24.0
9	91°53.4	270°42.8	·· 16.0	4°03.1	·· 37.0	320°44.3	·· 35.0	77°26.5	·· 24.0
10	106°55.8	285°43.1	17.3	19°03.8	37.1	335°46.2	34.9	92°29.0	24.0
11	121°58.3	300°43.3	18.5	34°04.4	37.1	350°48.1	34.8	107°31.6	23.9
12	137°00.8	315°43.6	S01°19.7	49°05.0	N23°37.2	5°50.0	N18°34.6	122°34.1	N03°23.9
13	152°03.2	330°43.9	20.9	64°05.7	37.2	20°51.9	34.5	137°36.6	23.9
14	167°05.7	345°44.1	22.1	79°06.3	37.3	35°53.8	34.3	152°39.1	23.8
15	182°08.2	0°44.4	·· 23.3	94°07.0	·· 37.4	50°55.7	·· 34.2	167°41.6	·· 23.8
16	197°10.6	15°44.7	24.6	109°07.6	37.4	65°57.6	34.1	182°44.1	23.8
17	212°13.1	30°44.9	25.8	124°08.3	37.5	80°59.5	33.9	197°46.6	23.7
18	227°15.6	45°45.2	S01°27.0	139°08.9	N23°37.5	96°01.4	N18°33.8	212°49.1	N03°23.7
19	242°18.0	60°45.5	28.2	154°09.6	37.6	111°03.3	33.6	227°51.6	23.7
20	257°20.5	75°45.8	29.4	169°10.2	37.6	126°05.2	33.5	242°54.1	23.7
21	272°22.9	90°46.0	·· 30.7	184°10.9	·· 37.7	141°07.1	·· 33.3	257°56.7	·· 23.6
22	287°25.4	105°46.3	31.9	199°11.5	37.8	156°09.0	33.2	272°59.2	23.6
23	302°27.9	120°46.6	33.1	214°12.2	37.8	171°10.9	33.1	288°01.7	23.6
Mer.pass. 02:53		ν 0.3′	d 1.2′	m -4.34	ν 0.6′	d 0.1′	m 1.29	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.60

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	317°30.3	135°46.8	S01°34.3	229°12.8	N23°37.9	186°12.8	N18°32.9	303°04.2	N03°23.5
1	332°32.8	150°47.1	35.5	244°13.5	37.9	201°14.7	32.8	318°06.7	23.5
2	347°35.3	165°47.4	36.7	259°14.1	38.0	216°16.6	32.6	333°09.2	23.5
3	2°37.7	180°47.7	·· 38.0	274°14.7	·· 38.0	231°18.5	·· 32.5	348°11.7	·· 23.4
4	17°40.2	195°47.9	39.2	289°15.4	38.1	246°20.4	32.4	3°14.2	23.4
5	32°42.7	210°48.2	40.4	304°16.0	38.1	261°22.3	32.2	18°16.7	23.4
6	47°45.1	225°48.5	S01°41.6	319°16.7	N23°38.2	276°24.2	N18°32.1	33°19.3	N03°23.3
7	62°47.6	240°48.8	42.8	334°17.3	38.2	291°26.1	31.9	48°21.8	23.3
8	77°50.1	255°49.0	44.1	349°18.0	38.3	306°28.0	31.8	63°24.3	23.3
9	92°52.5	270°49.3	·· 45.3	4°18.6	·· 38.3	321°29.9	·· 31.7	78°26.8	·· 23.2
10	107°55.0	285°49.6	46.5	19°19.3	38.4	336°31.8	31.5	93°29.3	23.2
11	122°57.4	300°49.9	47.7	34°19.9	38.4	351°33.7	31.4	108°31.8	23.2
12	137°59.9	315°50.2	S01°48.9	49°20.6	N23°38.5	6°35.6	N18°31.2	123°34.3	N03°23.1
13	153°02.4	330°50.4	50.1	64°21.2	38.5	21°37.5	31.1	138°36.8	23.1
14	168°04.8	345°50.7	51.4	79°21.9	38.6	36°39.4	31.0	153°39.4	23.1
15	183°07.3	0°51.0	·· 52.6	94°22.5	·· 38.6	51°41.3	·· 30.8	168°41.9	·· 23.0
16	198°09.8	15°51.3	53.8	109°23.2	38.7	66°43.2	30.7	183°44.4	23.0
17	213°12.2	30°51.6	55.0	124°23.8	38.7	81°45.1	30.5	198°46.9	23.0
18	228°14.7	45°51.9	S01°56.2	139°24.5	N23°38.8	96°47.0	N18°30.4	213°49.4	N03°23.0
19	243°17.2	60°52.1	57.4	154°25.1	38.8	111°49.0	30.2	228°51.9	22.9
20	258°19.6	75°52.4	58.7	169°25.8	38.9	126°50.9	30.1	243°54.4	22.9
21	273°22.1	90°52.7	01°59.9	184°26.4	·· 38.9	141°52.8	·· 30.0	258°57.0	·· 22.9
22	288°24.6	105°53.0	02°01.1	199°27.1	39.0	156°54.7	29.8	273°59.5	22.8
23	303°27.0	120°53.3	02.3	214°27.7	39.0	171°56.6	29.7	289°02.0	22.8
Mer.pass. 02:50		ν 0.3′	d 1.2′	m -4.35	ν 0.6′	d 0.1′	m 1.29	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.59

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	318°29.5	135°53.6	S02°03.5	229°28.4	N23°39.1	186°58.5	N18°29.5	304°04.5	N03°22.8
1	333°31.9	150°53.8	04.7	244°29.0	39.1	202°00.4	29.4	319°07.0	22.7
2	348°34.4	165°54.1	05.9	259°29.7	39.2	217°02.3	29.3	334°09.5	22.7
3	3°36.9	180°54.4	·· 07.2	274°30.3	·· 39.2	232°04.2	·· 29.1	349°12.1	·· 22.7
4	18°39.3	195°54.7	08.4	289°31.0	39.3	247°06.1	29.0	4°14.6	22.6
5	33°41.8	210°55.0	09.6	304°31.6	39.3	262°08.0	28.8	19°17.1	22.6
6	48°44.3	225°55.3	S02°10.8	319°32.3	N23°39.3	277°09.9	N18°28.7	34°19.6	N03°22.6
7	63°46.7	240°55.6	12.0	334°32.9	39.4	292°11.8	28.5	49°22.1	22.5
8	78°49.2	255°55.9	13.2	349°33.6	39.4	307°13.7	28.4	64°24.6	22.5
9	93°51.7	270°56.2	·· 14.5	4°34.2	·· 39.5	322°15.6	·· 28.3	79°27.1	·· 22.5
10	108°54.1	285°56.5	15.7	19°34.9	39.5	337°17.5	28.1	94°29.7	22.4
11	123°56.6	300°56.8	16.9	34°35.5	39.6	352°19.4	28.0	109°32.2	22.4
12	138°59.1	315°57.0	S02°18.1	49°36.2	N23°39.6	7°21.3	N18°27.8	124°34.7	N03°22.4
13	154°01.5	330°57.3	19.3	64°36.8	39.6	22°23.2	27.7	139°37.2	22.3
14	169°04.0	345°57.6	20.5	79°37.5	39.7	37°25.1	27.6	154°39.7	22.3
15	184°06.4	0°57.9	·· 21.7	94°38.1	·· 39.7	52°27.0	·· 27.4	169°42.3	·· 22.3
16	199°08.9	15°58.2	23.0	109°38.8	39.8	67°28.9	27.3	184°44.8	22.2
17	214°11.4	30°58.5	24.2	124°39.5	39.8	82°30.8	27.1	199°47.3	22.2
18	229°13.8	45°58.8	S02°25.4	139°40.1	N23°39.8	97°32.7	N18°27.0	214°49.8	N03°22.1
19	244°16.3	60°59.1	26.6	154°40.8	39.9	112°34.6	26.8	229°52.3	22.1
20	259°18.8	75°59.4	27.8	169°41.4	39.9	127°36.5	26.7	244°54.8	22.1
21	274°21.2	90°59.7	·· 29.0	184°42.1	·· 40.0	142°38.4	·· 26.6	259°57.4	·· 22.0
22	289°23.7	106°00.0	30.2	199°42.7	40.0	157°40.3	26.4	274°59.9	22.0
23	304°26.2	121°00.3	31.4	214°43.4	40.0	172°42.3	26.3	290°02.4	22.0
Mer.pass. 02:46		ν 0.3′	d 1.2′	m -4.36	ν 0.7′	d 0.0′	m 1.29	ν 1.9′	d 0.1′ m -1.78	ν 2.5′	d 0.0′ m 0.59

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.3
Ankaa	353°05.6	-42°09.4
Schedar	349°29.2	56°40.9
Diphda	348°45.8	-17°50.2
Achernar	335°19.0	-57°05.7
Hamal	327°49.6	23°35.3
Polaris	313°21.8	89°22.2
Acamar	315°10.8	-40°11.5
Menkar	314°04.8	4°11.8
Mirfak	308°26.4	49°57.2
Aldebaran	290°38.2	16°33.8
Rigel	281°02.8	-8°10.1
Capella	280°20.2	46°01.3
Bellatrix	278°21.7	6°22.5
Elnath	278°00.4	28°37.7
Alnilam	275°36.6	-1°11.0
Betelgeuse	270°50.9	7°24.8
Canopus	263°52.2	-52°42.3
Sirius	258°25.4	-16°45.0
Adhara	255°05.1	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°14.8	-59°35.6
Suhail	222°45.8	-43°32.4
Miaplacidus	221°39.0	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°40.0	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°59.1	-63°15.0
Gacrux	171°50.5	-57°16.0
Alioth	166°12.1	55°49.1
Spica	158°21.0	-11°18.0
Alkaid	152°51.1	49°11.1
Hadar	148°34.3	-60°30.3
Menkent	147°56.1	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.5	-60°57.0
Kochab	137°19.9	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.7
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.2	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.1	-56°38.9
Deneb	49°24.4	45°22.6
Enif	33°37.2	10°00.0
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.7	-29°28.6
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Aug 08 Sat	SHA	Mer.pass
Venus	179°09.3	14:57
Mars	272°26.1	08:44
Jupiter	228°56.0	11:37
Saturn	345°32.8	03:51

Aug 09 Sun	SHA	Mer.pass
Venus	178°16.5	14:57
Mars	271°42.5	08:43
Jupiter	228°42.5	11:34
Saturn	345°33.8	03:47

Aug 10 Mon	SHA	Mer.pass
Venus	177°24.1	14:56
Mars	270°58.9	08:42
Jupiter	228°29.0	11:31
Saturn	345°35.0	03:43

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°34.0	N16°11.5	248°14.2	3.3′	N27°09.9	4.6′	59.7′
1	193°34.1	10.8	262°36.5	3.2′	27°14.5	4.4′	59.7′
2	208°34.2	10.0	276°58.7	3.1′	27°18.9	4.3′	59.7′
3	223°34.3	·· 09.3	291°20.8	3.1′	27°23.2	4.0′	59.7′
4	238°34.4	08.6	305°42.9	3.0′	27°27.2	3.9′	59.7′
5	253°34.4	07.9	320°04.9	2.9′	27°31.1	3.6′	59.8′
6	268°34.5	N16°07.2	334°26.8	2.8′	N27°34.7	3.5′	59.8′
7	283°34.6	06.5	348°48.7	2.8′	27°38.2	3.3′	59.8′
8	298°34.7	05.8	3°10.5	2.7′	27°41.5	3.0′	59.8′
9	313°34.8	·· 05.1	17°32.2	2.7′	27°44.5	2.9′	59.8′
10	328°34.9	04.4	31°53.8	2.6′	27°47.4	2.7′	59.8′
11	343°34.9	03.6	46°15.4	2.5′	27°50.1	2.5′	59.9′
12	358°35.0	N16°02.9	60°37.0	2.5′	N27°52.6	2.2′	59.9′
13	13°35.1	02.2	74°58.4	2.4′	27°54.8	2.1′	59.9′
14	28°35.2	01.5	89°19.9	2.4′	27°56.9	1.9′	59.9′
15	43°35.3	·· 00.8	103°41.3	2.3′	27°58.8	1.7′	59.9′
16	58°35.4	16°00.1	118°02.6	2.3′	28°00.5	1.4′	59.9′
17	73°35.4	15°59.4	132°23.9	2.3′	28°01.9	1.3′	60.0′
18	88°35.5	N15°58.6	146°45.1	2.2′	N28°03.2	1.1′	60.0′
19	103°35.6	57.9	161°06.4	2.2′	28°04.3	0.8′	60.0′
20	118°35.7	57.2	175°27.5	2.2′	28°05.1	0.7′	60.0′
21	133°35.8	·· 56.5	189°48.7	2.1′	28°05.8	0.4′	60.0′
22	148°35.9	55.8	204°09.8	2.1′	28°06.2	0.2′	60.0′
23	163°35.9	55.1	218°30.9	2.1′	28°06.4	0.1′	60.0′
	SD = 15.8′	d = 0.7′	SD = 16.3′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°36.0	N15°54.3	232°52.0	2.1′	N28°06.5	0.2′	60.1′
1	193°36.1	53.6	247°13.0	2.0′	28°06.3	0.4′	60.1′
2	208°36.2	52.9	261°34.1	2.0′	28°05.9	0.6′	60.1′
3	223°36.3	·· 52.2	275°55.1	2.0′	28°05.3	0.8′	60.1′
4	238°36.4	51.5	290°16.1	2.0′	28°04.5	1.0′	60.1′
5	253°36.5	50.7	304°37.1	2.0′	28°03.5	1.2′	60.1′
6	268°36.6	N15°50.0	318°58.1	2.0′	N28°02.3	1.4′	60.1′
7	283°36.6	49.3	333°19.1	2.0′	28°00.9	1.7′	60.1′
8	298°36.7	48.6	347°40.2	2.0′	27°59.2	1.8′	60.1′
9	313°36.8	·· 47.9	2°01.2	2.0′	27°57.4	2.1′	60.2′
10	328°36.9	47.1	16°22.2	2.0′	27°55.3	2.2′	60.2′
11	343°37.0	46.4	30°43.2	2.0′	27°53.1	2.5′	60.2′
12	358°37.1	N15°45.7	45°04.3	2.1′	N27°50.6	2.7′	60.2′
13	13°37.2	45.0	59°25.3	2.1′	27°47.9	2.8′	60.2′
14	28°37.3	44.2	73°46.4	2.1′	27°45.1	3.1′	60.2′
15	43°37.4	·· 43.5	88°07.5	2.1′	27°42.0	3.3′	60.2′
16	58°37.4	42.8	102°28.7	2.2′	27°38.7	3.5′	60.2′
17	73°37.5	42.1	116°49.8	2.2′	27°35.2	3.7′	60.2′
18	88°37.6	N15°41.3	131°11.0	2.2′	N27°31.5	3.9′	60.2′
19	103°37.7	40.6	145°32.3	2.3′	27°27.6	4.1′	60.2′
20	118°37.8	39.9	159°53.5	2.3′	27°23.5	4.3′	60.2′
21	133°37.9	·· 39.1	174°14.9	2.4′	27°19.2	4.5′	60.2′
22	148°38.0	38.4	188°36.2	2.4′	27°14.7	4.8′	60.3′
23	163°38.1	37.7	202°57.6	2.5′	27°09.9	4.9′	60.3′
	SD = 15.8′	d = 0.7′	SD = 16.4′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°38.2	N15°37.0	217°19.1	2.5′	N27°05.0	5.1′	60.3′
1	193°38.3	36.2	231°40.6	2.6′	26°59.9	5.3′	60.3′
2	208°38.4	35.5	246°02.2	2.6′	26°54.6	5.5′	60.3′
3	223°38.4	·· 34.8	260°23.8	2.7′	26°49.1	5.7′	60.3′
4	238°38.5	34.0	274°45.5	2.7′	26°43.4	5.9′	60.3′
5	253°38.6	33.3	289°07.2	2.8′	26°37.5	6.1′	60.3′
6	268°38.7	N15°32.6	303°29.0	2.9′	N26°31.4	6.3′	60.3′
7	283°38.8	31.8	317°50.9	2.9′	26°25.1	6.5′	60.3′
8	298°38.9	31.1	332°12.8	3.0′	26°18.6	6.6′	60.3′
9	313°39.0	·· 30.4	346°34.9	3.1′	26°12.0	6.9′	60.3′
10	328°39.1	29.6	0°56.9	3.2′	26°05.1	7.0′	60.3′
11	343°39.2	28.9	15°19.1	3.2′	25°58.1	7.3′	60.3′
12	358°39.3	N15°28.2	29°41.4	3.3′	N25°50.8	7.4′	60.3′
13	13°39.4	27.4	44°03.7	3.4′	25°43.4	7.6′	60.3′
14	28°39.5	26.7	58°26.1	3.5′	25°35.8	7.7′	60.3′
15	43°39.6	·· 26.0	72°48.6	3.6′	25°28.1	8.0′	60.3′
16	58°39.7	25.2	87°11.2	3.7′	25°20.1	8.1′	60.3′
17	73°39.8	24.5	101°33.9	3.8′	25°12.0	8.4′	60.3′
18	88°39.9	N15°23.8	115°56.6	3.9′	N25°03.6	8.4′	60.3′
19	103°40.0	23.0	130°19.5	3.9′	24°55.2	8.7′	60.3′
20	118°40.0	22.3	144°42.4	4.0′	24°46.5	8.8′	60.3′
21	133°40.1	·· 21.6	159°05.5	4.1′	24°37.7	9.1′	60.3′
22	148°40.2	20.8	173°28.6	4.2′	24°28.6	9.1′	60.3′
23	163°40.3	20.1	187°51.8	4.3′	24°19.5	9.4′	60.3′
	SD = 15.8′	d = 0.7′	SD = 16.4′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	01:35	22:28	////	////
N 70°	////	////	02:23	21:43	////	////
68°	////	00:28	02:53	21:14	23:22	////
66°	////	01:46	03:16	20:53	22:20	////
64°	////	02:21	03:33	20:36	21:46	////
62°	00:26	02:46	03:48	20:22	21:23	23:27
60°	01:35	03:05	04:00	20:10	21:04	22:31
N 58°	02:07	03:20	04:10	19:59	20:49	22:01
56°	02:30	03:34	04:19	19:51	20:36	21:38
54°	02:48	03:45	04:27	19:43	20:25	21:21
52°	03:03	03:55	04:34	19:36	20:15	21:06
50°	03:16	04:04	04:41	19:29	20:06	20:54
45°	03:41	04:22	04:54	19:16	19:48	20:29
N 40°	04:00	04:36	05:06	19:05	19:34	20:10
35°	04:15	04:48	05:15	18:55	19:22	19:55
30°	04:28	04:58	05:24	18:47	19:12	19:43
20°	04:48	05:15	05:38	18:33	18:56	19:23
N 10°	05:03	05:29	05:51	18:20	18:42	19:08
0°	05:16	05:41	06:02	18:09	18:30	18:55
S 10°	05:27	05:52	06:14	17:58	18:19	18:45
20°	05:36	06:03	06:26	17:46	18:09	18:35
30°	05:46	06:14	06:39	17:32	17:57	18:26
35°	05:51	06:21	06:47	17:24	17:51	18:21
40°	05:55	06:28	06:56	17:16	17:44	18:16
45°	06:01	06:35	07:06	17:05	17:36	18:11
S 50°	06:06	06:44	07:19	16:53	17:27	18:06
52°	06:08	06:49	07:25	16:47	17:23	18:03
54°	06:11	06:53	07:31	16:41	17:19	18:01
56°	06:13	06:58	07:38	16:34	17:14	17:59
58°	06:16	07:03	07:46	16:26	17:09	17:56
S 60°	06:19	07:09	07:55	16:17	17:03	17:53

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	▭	▭	▭	20:59
62°	20:37	22:32	·· ··	20:00	20:22	20:19
60°	21:56	23:22	·· ··	18:41	19:32	19:51
N 58°	22:32	23:53	·· ··	18:05	19:00	19:29
56°	22:59	·· ··	00:16	17:39	18:37	19:11
54°	23:19	·· ··	00:36	17:18	18:17	18:56
52°	23:37	·· ··	00:52	17:01	18:01	18:43
50°	23:51	·· ··	01:05	16:46	17:47	18:31
45°	·· ··	00:22	01:34	16:16	17:18	18:07
N 40°	·· ··	00:45	01:56	15:52	16:55	17:47
35°	00:04	01:04	02:14	15:33	16:37	17:31
30°	00:20	01:21	02:30	15:17	16:20	17:17
20°	00:47	01:49	02:57	14:49	15:53	16:52
N 10°	01:10	02:13	03:20	14:24	15:29	16:31
0°	01:32	02:36	03:41	14:02	15:07	16:11
S 10°	01:53	02:59	04:02	13:40	14:45	15:51
20°	02:17	03:23	04:25	13:15	14:21	15:29
30°	02:44	03:51	04:51	12:47	13:53	15:04
35°	03:01	04:08	05:07	12:31	13:36	14:49
40°	03:20	04:28	05:25	12:12	13:17	14:32
45°	03:43	04:51	05:47	11:48	12:54	14:11
S 50°	04:12	05:22	06:14	11:18	12:23	13:45
52°	04:27	05:37	06:27	11:03	12:08	13:32
54°	04:44	05:54	06:42	10:46	11:51	13:17
56°	05:04	06:15	07:00	10:26	11:30	13:00
58°	05:30	06:42	07:22	10:00	11:03	12:38
S 60°	06:05	07:20	07:50	09:24	10:26	12:11

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 25-27 29-10%
08	05:44	05:40	12:06	07:47	20:19	
09	05:36	05:32	12:06	08:52	21:24	
10	05:27	05:23	12:05	09:56	22:27	

August 11, 12, 13 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	319°28.6	136°00.6	S02°32.7	229°44.0	N23°40.1	187°44.2	N18°26.1	305°04.9	N03°21.9
1	334°31.1	151°00.9	33.9	244°44.7	40.1	202°46.1	26.0	320°07.4	21.9
2	349°33.6	166°01.2	35.1	259°45.3	40.2	217°48.0	25.9	335°10.0	21.9
3	4°36.0	181°01.5	·· 36.3	274°46.0	·· 40.2	232°49.9	·· 25.7	350°12.5	·· 21.8
4	19°38.5	196°01.8	37.5	289°46.6	40.2	247°51.8	25.6	5°15.0	21.8
5	34°40.9	211°02.1	38.7	304°47.3	40.3	262°53.7	25.4	20°17.5	21.8
6	49°43.4	226°02.4	S02°39.9	319°47.9	N23°40.3	277°55.6	N18°25.3	35°20.0	N03°21.7
7	64°45.9	241°02.7	41.1	334°48.6	40.3	292°57.5	25.1	50°22.6	21.7
8	79°48.3	256°03.0	42.3	349°49.3	40.4	307°59.4	25.0	65°25.1	21.7
9	94°50.8	271°03.3	·· 43.6	4°49.9	·· 40.4	323°01.3	·· 24.9	80°27.6	·· 21.6
10	109°53.3	286°03.7	44.8	19°50.6	40.4	338°03.2	24.7	95°30.1	21.6
11	124°55.7	301°04.0	46.0	34°51.2	40.5	353°05.1	24.6	110°32.6	21.6
12	139°58.2	316°04.3	S02°47.2	49°51.9	N23°40.5	8°07.0	N18°24.4	125°35.2	N03°21.5
13	155°00.7	331°04.6	48.4	64°52.5	40.5	23°08.9	24.3	140°37.7	21.5
14	170°03.1	346°04.9	49.6	79°53.2	40.6	38°10.8	24.2	155°40.2	21.5
15	185°05.6	1°05.2	·· 50.8	94°53.8	·· 40.6	53°12.7	·· 24.0	170°42.7	·· 21.4
16	200°08.0	16°05.5	52.0	109°54.5	40.6	68°14.6	23.9	185°45.2	21.4
17	215°10.5	31°05.8	53.2	124°55.2	40.7	83°16.5	23.7	200°47.8	21.3
18	230°13.0	46°06.1	S02°54.5	139°55.8	N23°40.7	98°18.4	N18°23.6	215°50.3	N03°21.3
19	245°15.4	61°06.4	55.7	154°56.5	40.7	113°20.3	23.4	230°52.8	21.3
20	260°17.9	76°06.7	56.9	169°57.1	40.8	128°22.2	23.3	245°55.3	21.2
21	275°20.4	91°07.1	·· 58.1	184°57.8	·· 40.8	143°24.2	·· 23.2	260°57.8	·· 21.2
22	290°22.8	106°07.4	02°59.3	199°58.4	40.8	158°26.1	23.0	276°00.4	21.2
23	305°25.3	121°07.7	03°00.5	214°59.1	40.9	173°28.0	22.9	291°02.9	21.1
Mer.pass.	02:42	ν 0.3′	d 1.2′	m -4.37	ν 0.7′	d 0.0′	m 1.29	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.58

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	320°27.8	136°08.0	S03°01.7	229°59.7	N23°40.9	188°29.9	N18°22.7	306°05.4	N03°21.1
1	335°30.2	151°08.3	02.9	245°00.4	40.9	203°31.8	22.6	321°07.9	21.1
2	350°32.7	166°08.6	04.1	260°01.1	40.9	218°33.7	22.4	336°10.5	21.0
3	5°35.2	181°09.0	·· 05.3	275°01.7	·· 41.0	233°35.6	·· 22.3	351°13.0	·· 21.0
4	20°37.6	196°09.3	06.5	290°02.4	41.0	248°37.5	22.2	6°15.5	21.0
5	35°40.1	211°09.6	07.8	305°03.0	41.0	263°39.4	22.0	21°18.0	20.9
6	50°42.5	226°09.9	S03°09.0	320°03.7	N23°41.1	278°41.3	N18°21.9	36°20.6	N03°20.9
7	65°45.0	241°10.2	10.2	335°04.3	41.1	293°43.2	21.7	51°23.1	20.8
8	80°47.5	256°10.5	11.4	350°05.0	41.1	308°45.1	21.6	66°25.6	20.8
9	95°49.9	271°10.9	·· 12.6	5°05.7	·· 41.1	323°47.0	·· 21.5	81°28.1	·· 20.8
10	110°52.4	286°11.2	13.8	20°06.3	41.2	338°48.9	21.3	96°30.7	20.7
11	125°54.9	301°11.5	15.0	35°07.0	41.2	353°50.8	21.2	111°33.2	20.7
12	140°57.3	316°11.8	S03°16.2	50°07.6	N23°41.2	8°52.7	N18°21.0	126°35.7	N03°20.7
13	155°59.8	331°12.2	17.4	65°08.3	41.2	23°54.6	20.9	141°38.2	20.6
14	171°02.3	346°12.5	18.6	80°09.0	41.3	38°56.5	20.7	156°40.7	20.6
15	186°04.7	1°12.8	·· 19.8	95°09.6	·· 41.3	53°58.5	·· 20.6	171°43.3	·· 20.5
16	201°07.2	16°13.1	21.0	110°10.3	41.3	69°00.4	20.5	186°45.8	20.5
17	216°09.7	31°13.4	22.2	125°10.9	41.3	84°02.3	20.3	201°48.3	20.5
18	231°12.1	46°13.8	S03°23.4	140°11.6	N23°41.4	99°04.2	N18°20.2	216°50.9	N03°20.4
19	246°14.6	61°14.1	24.7	155°12.2	41.4	114°06.1	20.0	231°53.4	20.4
20	261°17.0	76°14.4	25.9	170°12.9	41.4	129°08.0	19.9	246°55.9	20.4
21	276°19.5	91°14.8	·· 27.1	185°13.6	·· 41.4	144°09.9	·· 19.7	261°58.4	·· 20.3
22	291°22.0	106°15.1	28.3	200°14.2	41.5	159°11.8	19.6	277°01.0	20.3
23	306°24.4	121°15.4	29.5	215°14.9	41.5	174°13.7	19.5	292°03.5	20.2
Mer.pass.	02:38	ν 0.3′	d 1.2′	m -4.38	ν 0.7′	d 0.0′	m 1.29	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.58

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	321°26.9	136°15.7	S03°30.7	230°15.5	N23°41.5	189°15.6	N18°19.3	307°06.0	N03°20.2
1	336°29.4	151°16.1	31.9	245°16.2	41.5	204°17.5	19.2	322°08.5	20.2
2	351°31.8	166°16.4	33.1	260°16.9	41.5	219°19.4	19.0	337°11.1	20.1
3	6°34.3	181°16.7	·· 34.3	275°17.5	·· 41.6	234°21.3	·· 18.9	352°13.6	·· 20.1
4	21°36.8	196°17.1	35.5	290°18.2	41.6	249°23.2	18.7	7°16.1	20.1
5	36°39.2	211°17.4	36.7	305°18.8	41.6	264°25.1	18.6	22°18.6	20.0
6	51°41.7	226°17.7	S03°37.9	320°19.5	N23°41.6	279°27.0	N18°18.5	37°21.2	N03°20.0
7	66°44.2	241°18.1	39.1	335°20.2	41.6	294°29.0	18.3	52°23.7	19.9
8	81°46.6	256°18.4	40.3	350°20.8	41.7	309°30.9	18.2	67°26.2	19.9
9	96°49.1	271°18.7	·· 41.5	5°21.5	·· 41.7	324°32.8	·· 18.0	82°28.8	·· 19.9
10	111°51.5	286°19.1	42.7	20°22.2	41.7	339°34.7	17.9	97°31.3	19.8
11	126°54.0	301°19.4	43.9	35°22.8	41.7	354°36.6	17.7	112°33.8	19.8
12	141°56.5	316°19.7	S03°45.1	50°23.5	N23°41.7	9°38.5	N18°17.6	127°36.3	N03°19.8
13	156°58.9	331°20.1	46.3	65°24.1	41.8	24°40.4	17.5	142°38.9	19.7
14	172°01.4	346°20.4	47.5	80°24.8	41.8	39°42.3	17.3	157°41.4	19.7
15	187°03.9	1°20.7	·· 48.7	95°25.5	·· 41.8	54°44.2	·· 17.2	172°43.9	·· 19.6
16	202°06.3	16°21.1	49.9	110°26.1	41.8	69°46.1	17.0	187°46.5	19.6
17	217°08.8	31°21.4	51.1	125°26.8	41.8	84°48.0	16.9	202°49.0	19.6
18	232°11.3	46°21.8	S03°52.3	140°27.5	N23°41.8	99°49.9	N18°16.7	217°51.5	N03°19.5
19	247°13.7	61°22.1	53.5	155°28.1	41.8	114°51.8	16.6	232°54.0	19.5
20	262°16.2	76°22.4	54.7	170°28.8	41.9	129°53.7	16.5	247°56.6	19.4
21	277°18.6	91°22.8	·· 55.9	185°29.4	·· 41.9	144°55.6	·· 16.3	262°59.1	·· 19.4
22	292°21.1	106°23.1	57.1	200°30.1	41.9	159°57.6	16.2	278°01.6	19.4
23	307°23.6	121°23.5	58.3	215°30.8	41.9	174°59.5	16.0	293°04.2	19.3
Mer.pass.	02:34	ν 0.3′	d 1.2′	m -4.40	ν 0.7′	d 0.0′	m 1.29	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.57

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.3
Ankaa	353°05.5	-42°09.4
Schedar	349°29.2	56°40.9
Diphda	348°45.8	-17°50.2
Achernar	335°19.0	-57°05.7
Hamal	327°49.6	23°35.3
Polaris	313°20.1	89°22.2
Acamar	315°10.7	-40°11.5
Menkar	314°04.7	4°11.8
Mirfak	308°26.4	49°57.2
Aldebaran	290°38.2	16°33.8
Rigel	281°02.8	-8°10.1
Capella	280°20.2	46°01.3
Bellatrix	278°21.6	6°22.5
Elnath	278°00.4	28°37.7
Alnilam	275°36.6	-1°11.0
Betelgeuse	270°50.9	7°24.8
Canopus	263°52.2	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.1	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°14.8	-59°35.6
Suhail	222°45.8	-43°32.3
Miaplacidus	221°39.0	-69°49.6
Alphard	217°46.8	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.4
Acrux	172°59.1	-63°15.0
Gacrux	171°50.5	-57°15.9
Alioth	166°12.1	55°49.1
Spica	158°21.0	-11°18.0
Alkaid	152°51.1	49°11.0
Hadar	148°34.3	-60°30.3
Menkent	147°56.1	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.5	-60°57.0
Kochab	137°19.9	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.7
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.2	51°29.3
Kaus Aust.	83°30.4	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.3	8°56.5
Peacock	53°03.0	-56°38.9
Deneb	49°24.4	45°22.6
Enif	33°37.2	10°00.0
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.7	-29°28.6
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Aug 11 Tue	SHA	Mer.pass
Venus	176°32.0	14:56
Mars	270°15.4	08:41
Jupiter	228°15.5	11:28
Saturn	345°36.3	03:39

Aug 12 Wed	SHA	Mer.pass
Venus	175°40.2	14:55
Mars	269°32.0	08:40
Jupiter	228°02.1	11:25
Saturn	345°37.7	03:35

Aug 13 Thu	SHA	Mer.pass
Venus	174°48.8	14:55
Mars	268°48.6	08:39
Jupiter	227°48.7	11:22
Saturn	345°39.1	03:31

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°40.4	N15°19.3	202°15.2	4.4′	N24°10.1	9.5′	60.3′
1	193°40.5	18.6	216°38.6	4.5′	24°00.6	9.6′	60.2′
2	208°40.6	17.9	231°02.2	4.6′	23°51.0	9.9′	60.2′
3	223°40.7	·· 17.1	245°25.8	4.7′	23°41.1	10.0′	60.2′
4	238°40.8	16.4	259°49.6	4.9′	23°31.1	10.1′	60.2′
5	253°40.9	15.6	274°13.4	5.0′	23°21.0	10.3′	60.2′
6	268°41.0	N15°14.9	288°37.4	5.1′	N23°10.7	10.5′	60.2′
7	283°41.1	14.1	303°01.4	5.2′	23°00.2	10.6′	60.2′
8	298°41.2	13.4	317°25.6	5.3′	22°49.6	10.7′	60.2′
9	313°41.3	·· 12.7	331°49.9	5.4′	22°38.9	10.9′	60.2′
10	328°41.4	11.9	346°14.3	5.5′	22°28.0	11.1′	60.2′
11	343°41.5	11.2	0°38.8	5.6′	22°16.9	11.2′	60.2′
12	358°41.6	N15°10.4	15°03.4	5.7′	N22°05.7	11.3′	60.2′
13	13°41.7	09.7	29°28.2	5.8′	21°54.4	11.5′	60.1′
14	28°41.8	08.9	43°53.0	6.0′	21°42.9	11.6′	60.1′
15	43°41.9	·· 08.2	58°18.0	6.1′	21°31.3	11.7′	60.1′
16	58°42.0	07.4	72°43.0	6.2′	21°19.6	11.9′	60.1′
17	73°42.1	06.7	87°08.2	6.3′	21°07.7	12.0′	60.1′
18	88°42.2	N15°06.0	101°33.5	6.4′	N20°55.7	12.2′	60.1′
19	103°42.3	05.2	115°58.9	6.5′	20°43.5	12.2′	60.1′
20	118°42.4	04.5	130°24.4	6.6′	20°31.3	12.4′	60.1′
21	133°42.5	·· 03.7	144°50.1	6.8′	20°18.9	12.5′	60.0′
22	148°42.6	03.0	159°15.8	6.9′	20°06.4	12.7′	60.0′
23	163°42.7	02.2	173°41.7	7.0′	19°53.7	12.7′	60.0′
	SD = 15.8′	d = 0.7′	SD = 16.4′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°42.9	N15°01.5	188°07.7	7.1′	N19°41.0	12.9′	60.0′
1	193°43.0	00.7	202°33.8	7.2′	19°28.1	13.0′	60.0′
2	208°43.1	15°00.0	217°00.0	7.3′	19°15.1	13.1′	60.0′
3	223°43.2	14°59.2	231°26.3	7.4′	19°02.0	13.2′	60.0′
4	238°43.3	58.5	245°52.8	7.6′	18°48.8	13.3′	59.9′
5	253°43.4	57.7	260°19.3	7.7′	18°35.5	13.4′	59.9′
6	268°43.5	N14°57.0	274°46.0	7.8′	N18°22.1	13.5′	59.9′
7	283°43.6	56.2	289°12.8	7.9′	18°08.6	13.7′	59.9′
8	298°43.7	55.4	303°39.7	8.0′	17°54.9	13.7′	59.9′
9	313°43.8	·· 54.7	318°06.7	8.1′	17°41.2	13.8′	59.9′
10	328°43.9	53.9	332°33.8	8.2′	17°27.4	13.9′	59.8′
11	343°44.0	53.2	347°01.0	8.3′	17°13.5	14.0′	59.8′
12	358°44.1	N14°52.4	1°28.4	8.5′	N16°59.5	14.1′	59.8′
13	13°44.2	51.7	15°55.8	8.6′	16°45.4	14.2′	59.8′
14	28°44.3	50.9	30°23.4	8.7′	16°31.2	14.3′	59.8′
15	43°44.4	·· 50.2	44°51.1	8.8′	16°16.9	14.4′	59.7′
16	58°44.5	49.4	59°18.8	8.9′	16°02.5	14.4′	59.7′
17	73°44.6	48.7	73°46.7	9.0′	15°48.1	14.5′	59.7′
18	88°44.8	N14°47.9	88°14.7	9.1′	N15°33.6	14.6′	59.7′
19	103°44.9	47.1	102°42.8	9.2′	15°19.0	14.7′	59.6′
20	118°45.0	46.4	117°11.0	9.3′	15°04.3	14.8′	59.6′
21	133°45.1	·· 45.6	131°39.3	9.4′	14°49.5	14.8′	59.6′
22	148°45.2	44.9	146°07.8	9.5′	14°34.7	14.9′	59.6′
23	163°45.3	44.1	160°36.3	9.6′	14°19.8	14.9′	59.6′
	SD = 15.8′	d = 0.7′	SD = 16.4′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°45.4	N14°43.3	175°04.9	9.7′	N14°04.9	15.1′	59.5′
1	193°45.5	42.6	189°33.6	9.8′	13°49.8	15.1′	59.5′
2	208°45.6	41.8	204°02.4	9.9′	13°34.7	15.1′	59.5′
3	223°45.7	·· 41.1	218°31.4	10.0′	13°19.6	15.2′	59.5′
4	238°45.8	40.3	233°00.4	10.1′	13°04.4	15.3′	59.4′
5	253°46.0	39.5	247°29.5	10.2′	12°49.1	15.3′	59.4′
6	268°46.1	N14°38.8	261°58.7	10.3′	N12°33.8	15.4′	59.4′
7	283°46.2	38.0	276°28.0	10.4′	12°18.4	15.5′	59.4′
8	298°46.3	37.3	290°57.4	10.5′	12°02.9	15.5′	59.3′
9	313°46.4	·· 36.5	305°26.9	10.6′	11°47.4	15.5′	59.3′
10	328°46.5	35.7	319°56.5	10.7′	11°31.9	15.6′	59.3′
11	343°46.6	35.0	334°26.2	10.8′	11°16.3	15.6′	59.3′
12	358°46.7	N14°34.2	348°56.0	10.9′	N11°00.7	15.7′	59.2′
13	13°46.8	33.4	3°25.9	11.0′	10°45.0	15.7′	59.2′
14	28°47.0	32.7	17°55.8	11.0′	10°29.3	15.8′	59.2′
15	43°47.1	·· 31.9	32°25.9	11.1′	10°13.5	15.7′	59.1′
16	58°47.2	31.1	46°56.0	11.2′	09°57.8	15.9′	59.1′
17	73°47.3	30.4	61°26.2	11.3′	09°41.9	15.8′	59.1′
18	88°47.4	N14°29.6	75°56.5	11.4′	N09°26.1	15.9′	59.1′
19	103°47.5	28.8	90°26.8	11.5′	09°10.2	16.0′	59.0′
20	118°47.6	28.1	104°57.3	11.5′	08°54.2	15.9′	59.0′
21	133°47.7	·· 27.3	119°27.8	11.6′	08°38.3	16.0′	59.0′
22	148°47.9	26.5	133°58.5	11.7′	08°22.3	16.0′	58.9′
23	163°48.0	25.8	148°29.1	11.8′	08°06.3	16.0′	58.9′
	SD = 15.8′	d = 0.8′	SD = 16.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:02	22:02	////	////
N 70°	////	////	02:40	21:25	////	////
68°	////	01:16	03:07	21:00	22:45	////
66°	////	02:04	03:27	20:41	22:01	////
64°	////	02:34	03:43	20:25	21:32	////
62°	01:08	02:56	03:56	20:12	21:11	22:54
60°	01:51	03:14	04:07	20:02	20:54	22:14
N 58°	02:19	03:28	04:17	19:52	20:40	21:48
56°	02:39	03:40	04:25	19:44	20:28	21:28
54°	02:56	03:51	04:32	19:36	20:18	21:12
52°	03:10	04:00	04:39	19:30	20:08	20:58
50°	03:22	04:09	04:45	19:24	20:00	20:47
45°	03:46	04:26	04:58	19:11	19:43	20:23
N 40°	04:04	04:39	05:09	19:01	19:30	20:06
35°	04:18	04:51	05:18	18:52	19:19	19:51
30°	04:30	05:00	05:26	18:44	19:09	19:39
20°	04:49	05:16	05:39	18:31	18:54	19:21
N 10°	05:03	05:29	05:51	18:19	18:41	19:06
0°	05:15	05:40	06:02	18:08	18:30	18:55
S 10°	05:26	05:51	06:12	17:58	18:20	18:45
20°	05:35	06:01	06:24	17:47	18:09	18:36
30°	05:43	06:12	06:37	17:34	17:59	18:27
35°	05:48	06:18	06:44	17:27	17:53	18:23
40°	05:52	06:24	06:52	17:18	17:47	18:19
45°	05:57	06:31	07:02	17:09	17:39	18:14
S 50°	06:01	06:40	07:14	16:57	17:31	18:10
52°	06:03	06:43	07:19	16:52	17:28	18:08
54°	06:05	06:47	07:25	16:46	17:24	18:06
56°	06:08	06:52	07:32	16:39	17:19	18:03
58°	06:10	06:57	07:39	16:32	17:14	18:01
S 60°	06:12	07:02	07:47	16:24	17:09	17:59

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▭	▭	03:24	▭	21:46	20:52
N 70°	▭	00:25	03:51	22:49	21:17	20:39
68°	▭	01:33	04:11	21:40	20:55	20:29
66°	▭	02:09	04:26	21:03	20:38	20:21
64°	00:08	02:34	04:39	20:36	20:23	20:14
62°	00:48	02:54	04:49	20:15	20:11	20:07
60°	01:15	03:10	04:58	19:58	20:01	20:02
N 58°	01:36	03:23	05:06	19:44	19:52	19:57
56°	01:53	03:35	05:13	19:31	19:44	19:53
54°	02:08	03:45	05:19	19:21	19:37	19:49
52°	02:21	03:54	05:25	19:11	19:30	19:45
50°	02:32	04:02	05:30	19:02	19:25	19:42
45°	02:55	04:19	05:40	18:44	19:12	19:35
N 40°	03:14	04:33	05:49	18:28	19:01	19:29
35°	03:29	04:44	05:57	18:15	18:52	19:24
30°	03:42	04:54	06:03	18:04	18:44	19:19
20°	04:05	05:12	06:15	17:45	18:30	19:11
N 10°	04:25	05:27	06:25	17:27	18:18	19:04
0°	04:43	05:41	06:34	17:11	18:07	18:58
S 10°	05:01	05:55	06:43	16:55	17:55	18:51
20°	05:21	06:10	06:53	16:37	17:42	18:43
30°	05:43	06:27	07:04	16:17	17:28	18:35
35°	05:56	06:36	07:10	16:05	17:19	18:30
40°	06:11	06:48	07:17	15:51	17:10	18:25
45°	06:29	07:01	07:26	15:35	16:58	18:18
S 50°	06:51	07:16	07:36	15:14	16:44	18:10
52°	07:01	07:24	07:40	15:05	16:37	18:06
54°	07:13	07:32	07:46	14:53	16:30	18:02
56°	07:26	07:41	07:51	14:41	16:22	17:58
58°	07:41	07:51	07:57	14:26	16:13	17:53
S 60°	08:00	08:03	08:04	14:09	16:02	17:47

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 28-1 4-0%
11	05:18	05:13	12:05	10:57	23:26	
12	05:09	05:04	12:05	11:54	–:–	
13	04:58	04:53	12:05	12:46	00:20	

August 14, 15, 16 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	322°26.0	136°23.8	S03°59.5	230°31.4	N23°41.9	190°01.4	N18°15.9	308°06.7	N03°19.3
1	337°28.5	151°24.2	04°00.7	245°32.1	41.9	205°03.3	15.7	323°09.2	19.3
2	352°31.0	166°24.5	01.9	260°32.8	41.9	220°05.2	15.6	338°11.8	19.2
3	7°33.4	181°24.9	·· 03.1	275°33.4	·· 42.0	235°07.1	·· 15.5	353°14.3	·· 19.2
4	22°35.9	196°25.2	04.3	290°34.1	42.0	250°09.0	15.3	8°16.8	19.1
5	37°38.4	211°25.5	05.5	305°34.7	42.0	265°10.9	15.2	23°19.3	19.1
6	52°40.8	226°25.9	S04°06.7	320°35.4	N23°42.0	280°12.8	N18°15.0	38°21.9	N03°19.1
7	67°43.3	241°26.2	07.9	335°36.1	42.0	295°14.7	14.9	53°24.4	19.0
8	82°45.8	256°26.6	09.1	350°36.7	42.0	310°16.6	14.7	68°26.9	19.0
9	97°48.2	271°26.9	·· 10.3	5°37.4	·· 42.0	325°18.5	·· 14.6	83°29.5	·· 18.9
10	112°50.7	286°27.3	11.5	20°38.1	42.0	340°20.4	14.5	98°32.0	18.9
11	127°53.1	301°27.6	12.7	35°38.7	42.0	355°22.4	14.3	113°34.5	18.9
12	142°55.6	316°28.0	S04°13.9	50°39.4	N23°42.1	10°24.3	N18°14.2	128°37.1	N03°18.8
13	157°58.1	331°28.3	15.1	65°40.1	42.1	25°26.2	14.0	143°39.6	18.8
14	173°00.5	346°28.7	16.3	80°40.7	42.1	40°28.1	13.9	158°42.1	18.7
15	188°03.0	1°29.0	·· 17.5	95°41.4	·· 42.1	55°30.0	·· 13.7	173°44.7	·· 18.7
16	203°05.5	16°29.4	18.7	110°42.1	42.1	70°31.9	13.6	188°47.2	18.7
17	218°07.9	31°29.8	19.9	125°42.7	42.1	85°33.8	13.5	203°49.7	18.6
18	233°10.4	46°30.1	S04°21.1	140°43.4	N23°42.1	100°35.7	N18°13.3	218°52.3	N03°18.6
19	248°12.9	61°30.5	22.3	155°44.1	42.1	115°37.6	13.2	233°54.8	18.5
20	263°15.3	76°30.8	23.5	170°44.7	42.1	130°39.5	13.0	248°57.3	18.5
21	278°17.8	91°31.2	·· 24.7	185°45.4	·· 42.1	145°41.4	·· 12.9	263°59.9	·· 18.5
22	293°20.2	106°31.5	25.9	200°46.1	42.1	160°43.3	12.7	279°02.4	18.4
23	308°22.7	121°31.9	27.1	215°46.7	42.1	175°45.3	12.6	294°04.9	18.4
Mer.pass. 02:30		ν 0.3′	d 1.2′	m -4.41	ν 0.7′	d 0.0′	m 1.28	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.57

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	323°25.2	136°32.3	S04°28.3	230°47.4	N23°42.1	190°47.2	N18°12.5	309°07.5	N03°18.3
1	338°27.6	151°32.6	29.5	245°48.1	42.1	205°49.1	12.3	324°10.0	18.3
2	353°30.1	166°33.0	30.7	260°48.7	42.2	220°51.0	12.2	339°12.5	18.3
3	8°32.6	181°33.3	·· 31.9	275°49.4	·· 42.2	235°52.9	·· 12.0	354°15.1	·· 18.2
4	23°35.0	196°33.7	33.1	290°50.1	42.2	250°54.8	11.9	9°17.6	18.2
5	38°37.5	211°34.1	34.3	305°50.7	42.2	265°56.7	11.7	24°20.1	18.1
6	53°40.0	226°34.4	S04°35.5	320°51.4	N23°42.2	280°58.6	N18°11.6	39°22.7	N03°18.1
7	68°42.4	241°34.8	36.7	335°52.1	42.2	296°00.5	11.5	54°25.2	18.0
8	83°44.9	256°35.1	37.9	350°52.7	42.2	311°02.4	11.3	69°27.7	18.0
9	98°47.4	271°35.5	·· 39.0	5°53.4	·· 42.2	326°04.3	·· 11.2	84°30.3	·· 18.0
10	113°49.8	286°35.9	40.2	20°54.1	42.2	341°06.3	11.0	99°32.8	17.9
11	128°52.3	301°36.2	41.4	35°54.7	42.2	356°08.2	10.9	114°35.3	17.9
12	143°54.7	316°36.6	S04°42.6	50°55.4	N23°42.2	11°10.1	N18°10.7	129°37.9	N03°17.8
13	158°57.2	331°37.0	43.8	65°56.1	42.2	26°12.0	10.6	144°40.4	17.8
14	173°59.7	346°37.3	45.0	80°56.8	42.2	41°13.9	10.4	159°43.0	17.8
15	189°02.1	1°37.7	·· 46.2	95°57.4	·· 42.2	56°15.8	·· 10.3	174°45.5	·· 17.7
16	204°04.6	16°38.1	47.4	110°58.1	42.2	71°17.7	10.2	189°48.0	17.7
17	219°07.1	31°38.5	48.6	125°58.8	42.2	86°19.6	10.0	204°50.6	17.6
18	234°09.5	46°38.8	S04°49.8	140°59.4	N23°42.2	101°21.5	N18°09.9	219°53.1	N03°17.6
19	249°12.0	61°39.2	51.0	156°00.1	42.2	116°23.4	09.7	234°55.6	17.6
20	264°14.5	76°39.6	52.2	171°00.8	42.2	131°25.3	09.6	249°58.2	17.5
21	279°16.9	91°39.9	·· 53.4	186°01.4	·· 42.2	146°27.3	·· 09.4	265°00.7	·· 17.5
22	294°19.4	106°40.3	54.5	201°02.1	42.2	161°29.2	09.3	280°03.2	17.4
23	309°21.8	121°40.7	55.7	216°02.8	42.2	176°31.1	09.2	295°05.8	17.4
Mer.pass. 02:26		ν 0.4′	d 1.2′	m -4.42	ν 0.7′	d 0.0′	m 1.28	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.56

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	324°24.3	136°41.1	S04°56.9	231°03.5	N23°42.2	191°33.0	N18°09.0	310°08.3	N03°17.3
1	339°26.8	151°41.4	58.1	246°04.1	42.2	206°34.9	08.9	325°10.9	17.3
2	354°29.2	166°41.8	04°59.3	261°04.8	42.2	221°36.8	08.7	340°13.4	17.3
3	9°31.7	181°42.2	05°00.5	276°05.5	·· 42.2	236°38.7	·· 08.6	355°15.9	·· 17.2
4	24°34.2	196°42.6	01.7	291°06.1	42.2	251°40.6	08.4	10°18.5	17.2
5	39°36.6	211°42.9	02.9	306°06.8	42.2	266°42.5	08.3	25°21.0	17.1
6	54°39.1	226°43.3	S05°04.1	321°07.5	N23°42.2	281°44.4	N18°08.1	40°23.6	N03°17.1
7	69°41.6	241°43.7	05.3	336°08.2	42.1	296°46.4	08.0	55°26.1	17.0
8	84°44.0	256°44.1	06.4	351°08.8	42.1	311°48.3	07.9	70°28.6	17.0
9	99°46.5	271°44.5	·· 07.6	6°09.5	·· 42.1	326°50.2	·· 07.7	85°31.2	·· 17.0
10	114°49.0	286°44.8	08.8	21°10.2	42.1	341°52.1	07.6	100°33.7	16.9
11	129°51.4	301°45.2	10.0	36°10.8	42.1	356°54.0	07.4	115°36.2	16.9
12	144°53.9	316°45.6	S05°11.2	51°11.5	N23°42.1	11°55.9	N18°07.3	130°38.8	N03°16.8
13	159°56.3	331°46.0	12.4	66°12.2	42.1	26°57.8	07.1	145°41.3	16.8
14	174°58.8	346°46.4	13.6	81°12.9	42.1	41°59.7	07.0	160°43.9	16.8
15	190°01.3	1°46.7	·· 14.8	96°13.5	·· 42.1	57°01.6	·· 06.9	175°46.4	·· 16.7
16	205°03.7	16°47.1	15.9	111°14.2	42.1	72°03.5	06.7	190°48.9	16.7
17	220°06.2	31°47.5	17.1	126°14.9	42.1	87°05.5	06.6	205°51.5	16.6
18	235°08.7	46°47.9	S05°18.3	141°15.6	N23°42.1	102°07.4	N18°06.4	220°54.0	N03°16.6
19	250°11.1	61°48.3	19.5	156°16.2	42.1	117°09.3	06.3	235°56.6	16.5
20	265°13.6	76°48.7	20.7	171°16.9	42.1	132°11.2	06.1	250°59.1	16.5
21	280°16.1	91°49.1	·· 21.9	186°17.6	·· 42.0	147°13.1	·· 06.0	266°01.6	·· 16.5
22	295°18.5	106°49.5	23.1	201°18.3	42.0	162°15.0	05.8	281°04.2	16.4
23	310°21.0	121°49.8	24.2	216°18.9	42.0	177°16.9	05.7	296°06.7	16.4
Mer.pass. 02:22		ν 0.4′	d 1.2′	m -4.43	ν 0.7′	d 0.0′	m 1.28	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.56

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.3
Ankaa	353°05.5	-42°09.4
Schedar	349°29.1	56°40.9
Diphda	348°45.7	-17°50.2
Achernar	335°18.9	-57°05.7
Hamal	327°49.6	23°35.3
Polaris	313°18.7	89°22.3
Acamar	315°10.7	-40°11.5
Menkar	314°04.7	4°11.8
Mirfak	308°26.3	49°57.2
Aldebaran	290°38.2	16°33.8
Rigel	281°02.7	-8°10.1
Capella	280°20.1	46°01.3
Bellatrix	278°21.6	6°22.5
Elnath	278°00.4	28°37.7
Alnilam	275°36.5	-1°11.0
Betelgeuse	270°50.8	7°24.8
Canopus	263°52.2	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.1	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°14.8	-59°35.5
Suhail	222°45.8	-43°32.3
Miaplacidus	221°39.0	-69°49.5
Alphard	217°46.8	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.6
Denebola	182°23.8	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.1	-63°15.0
Gacrux	171°50.6	-57°15.9
Alioth	166°12.1	55°49.1
Spica	158°21.0	-11°18.0
Alkaid	152°51.1	49°11.0
Hadar	148°34.3	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.6	-60°57.0
Kochab	137°20.0	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.7
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.2	51°29.3
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.0	-56°38.9
Deneb	49°24.4	45°22.6
Enif	33°37.2	10°00.0
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.7	-29°28.7
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Aug 14 Fri	SHA	Mer.pass
Venus	173°57.8	14:54
Mars	268°05.4	08:38
Jupiter	227°35.3	11:18
Saturn	345°40.7	03:27

Aug 15 Sat	SHA	Mer.pass
Venus	173°07.1	14:53
Mars	267°22.2	08:36
Jupiter	227°22.0	11:15
Saturn	345°42.3	03:23

Aug 16 Sun	SHA	Mer.pass
Venus	172°16.7	14:53
Mars	266°39.1	08:35
Jupiter	227°08.7	11:12
Saturn	345°44.0	03:19

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°48.1	N14°25.0	162°59.9	11.8′	N07°50.3	16.1′	58.9′
1	193°48.2	24.2	177°30.7	11.9′	07°34.2	16.0′	58.8′
2	208°48.3	23.5	192°01.7	12.0′	07°18.2	16.1′	58.8′
3	223°48.4	·· 22.7	206°32.7	12.1′	07°02.1	16.1′	58.8′
4	238°48.6	21.9	221°03.7	12.1′	06°46.0	16.2′	58.7′
5	253°48.7	21.1	235°34.8	12.2′	06°29.8	16.1′	58.7′
6	268°48.8	N14°20.4	250°06.0	12.3′	N06°13.7	16.2′	58.7′
7	283°48.9	19.6	264°37.3	12.3′	05°57.5	16.1′	58.7′
8	298°49.0	18.8	279°08.6	12.4′	05°41.4	16.2′	58.6′
9	313°49.1	·· 18.1	293°40.0	12.5′	05°25.2	16.2′	58.6′
10	328°49.3	17.3	308°11.5	12.5′	05°09.0	16.2′	58.6′
11	343°49.4	16.5	322°43.0	12.6′	04°52.8	16.1′	58.5′
12	358°49.5	N14°15.7	337°14.6	12.6′	N04°36.7	16.2′	58.5′
13	13°49.6	15.0	351°46.2	12.7′	04°20.5	16.2′	58.5′
14	28°49.7	14.2	6°17.9	12.8′	04°04.3	16.2′	58.4′
15	43°49.8	·· 13.4	20°49.7	12.8′	03°48.1	16.2′	58.4′
16	58°50.0	12.6	35°21.5	12.9′	03°31.9	16.2′	58.4′
17	73°50.1	11.9	49°53.4	12.9′	03°15.7	16.2′	58.3′
18	88°50.2	N14°11.1	64°25.3	13.0′	N02°59.5	16.2′	58.3′
19	103°50.3	10.3	78°57.3	13.0′	02°43.3	16.2′	58.3′
20	118°50.4	09.5	93°29.3	13.1′	02°27.1	16.1′	58.2′
21	133°50.6	·· 08.8	108°01.4	13.1′	02°11.0	16.2′	58.2′
22	148°50.7	08.0	122°33.5	13.2′	01°54.8	16.1′	58.2′
23	163°50.8	07.2	137°05.7	13.2′	01°38.7	16.2′	58.1′
	SD = 15.8′	d = 0.8′	SD = 16.1′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°50.9	N14°06.4	151°37.9	13.3′	N01°22.5	16.1′	58.1′
1	193°51.0	05.6	166°10.1	13.3′	01°06.4	16.1′	58.1′
2	208°51.2	04.9	180°42.4	13.3′	00°50.3	16.1′	58.0′
3	223°51.3	·· 04.1	195°14.8	13.4′	00°34.2	16.0′	58.0′
4	238°51.4	03.3	209°47.2	13.4′	00°18.2	16.1′	57.9′
5	253°51.5	02.5	224°19.6	13.5′	N00°02.1	16.0′	57.9′
6	268°51.6	N14°01.7	238°52.1	13.5′	S00°13.9	16.0′	57.9′
7	283°51.8	01.0	253°24.6	13.5′	00°29.9	16.0′	57.8′
8	298°51.9	14°00.2	267°57.1	13.6′	00°45.9	16.0′	57.8′
9	313°52.0	13°59.4	282°29.7	13.6′	01°01.9	15.9′	57.8′
10	328°52.1	58.6	297°02.3	13.6′	01°17.8	15.9′	57.7′
11	343°52.3	57.8	311°34.9	13.7′	01°33.7	15.9′	57.7′
12	358°52.4	N13°57.1	326°07.6	13.7′	S01°49.6	15.9′	57.7′
13	13°52.5	56.3	340°40.3	13.7′	02°05.5	15.8′	57.6′
14	28°52.6	55.5	355°13.0	13.8′	02°21.3	15.8′	57.6′
15	43°52.8	·· 54.7	9°45.8	13.8′	02°37.1	15.8′	57.6′
16	58°52.9	53.9	24°18.5	13.8′	02°52.9	15.7′	57.5′
17	73°53.0	53.1	38°51.3	13.8′	03°08.6	15.7′	57.5′
18	88°53.1	N13°52.3	53°24.2	13.8′	S03°24.3	15.6′	57.5′
19	103°53.3	51.6	67°57.0	13.9′	03°39.9	15.7′	57.4′
20	118°53.4	50.8	82°29.9	13.9′	03°55.6	15.6′	57.4′
21	133°53.5	·· 50.0	97°02.8	13.9′	04°11.2	15.5′	57.4′
22	148°53.6	49.2	111°35.7	13.9′	04°26.7	15.5′	57.3′
23	163°53.8	48.4	126°08.6	13.9′	04°42.2	15.5′	57.3′
	SD = 15.8′	d = 0.8′	SD = 15.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°53.9	N13°47.6	140°41.6	14.0′	S04°57.7	15.4′	57.2′
1	193°54.0	46.8	155°14.5	14.0′	05°13.1	15.4′	57.2′
2	208°54.1	46.0	169°47.5	14.0′	05°28.5	15.3′	57.2′
3	223°54.3	·· 45.3	184°20.5	14.0′	05°43.8	15.3′	57.1′
4	238°54.4	44.5	198°53.5	14.0′	05°59.1	15.3′	57.1′
5	253°54.5	43.7	213°26.5	14.0′	06°14.4	15.2′	57.1′
6	268°54.6	N13°42.9	227°59.5	14.0′	S06°29.6	15.1′	57.0′
7	283°54.8	42.1	242°32.5	14.0′	06°44.7	15.1′	57.0′
8	298°54.9	41.3	257°05.6	14.0′	06°59.8	15.1′	57.0′
9	313°55.0	·· 40.5	271°38.6	14.0′	07°14.9	15.0′	56.9′
10	328°55.2	39.7	286°11.7	14.1′	07°29.9	14.9′	56.9′
11	343°55.3	38.9	300°44.7	14.1′	07°44.8	14.9′	56.9′
12	358°55.4	N13°38.1	315°17.8	14.1′	S07°59.7	14.9′	56.8′
13	13°55.5	37.3	329°50.8	14.1′	08°14.6	14.7′	56.8′
14	28°55.7	36.6	344°23.9	14.1′	08°29.3	14.8′	56.8′
15	43°55.8	·· 35.8	358°56.9	14.1′	08°44.1	14.7′	56.7′
16	58°55.9	35.0	13°30.0	14.1′	08°58.8	14.6′	56.7′
17	73°56.1	34.2	28°03.1	14.1′	09°13.4	14.5′	56.7′
18	88°56.2	N13°33.4	42°36.1	14.0′	S09°27.9	14.5′	56.6′
19	103°56.3	32.6	57°09.2	14.0′	09°42.4	14.5′	56.6′
20	118°56.5	31.8	71°42.2	14.0′	09°56.9	14.4′	56.6′
21	133°56.6	·· 31.0	86°15.2	14.0′	10°11.3	14.3′	56.5′
22	148°56.7	30.2	100°48.3	14.0′	10°25.6	14.2′	56.5′
23	163°56.9	29.4	115°21.3	14.0′	10°39.8	14.2′	56.5′
	SD = 15.8′	d = 0.8′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:24	21:39	////	////
N 70°	////	////	02:56	21:09	23:31	////
68°	////	01:43	03:19	20:46	22:19	////
66°	////	02:21	03:37	20:29	21:44	////
64°	////	02:47	03:52	20:15	21:19	23:35
62°	01:32	03:07	04:04	20:03	21:00	22:31
60°	02:06	03:23	04:14	19:53	20:44	21:59
N 58°	02:30	03:36	04:23	19:44	20:31	21:36
56°	02:49	03:47	04:31	19:37	20:20	21:18
54°	03:04	03:57	04:38	19:30	20:10	21:03
52°	03:17	04:06	04:44	19:24	20:02	20:51
50°	03:28	04:14	04:50	19:18	19:54	20:40
45°	03:50	04:30	05:02	19:07	19:38	20:18
N 40°	04:07	04:42	05:12	18:57	19:26	20:01
35°	04:21	04:53	05:20	18:49	19:15	19:47
30°	04:32	05:02	05:27	18:41	19:06	19:36
20°	04:50	05:17	05:40	18:29	18:52	19:19
N 10°	05:04	05:29	05:51	18:18	18:40	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:25	05:50	06:11	17:58	18:20	18:45
20°	05:33	05:59	06:22	17:47	18:10	18:36
30°	05:41	06:09	06:34	17:36	18:00	18:28
35°	05:45	06:15	06:41	17:29	17:55	18:25
40°	05:49	06:20	06:48	17:21	17:49	18:21
45°	05:52	06:27	06:57	17:12	17:43	18:17
S 50°	05:56	06:34	07:08	17:01	17:35	18:13
52°	05:58	06:38	07:13	16:57	17:32	18:12
54°	06:00	06:41	07:19	16:51	17:28	18:10
56°	06:02	06:45	07:25	16:45	17:24	18:08
58°	06:04	06:50	07:32	16:38	17:20	18:06
S 60°	06:06	06:55	07:39	16:31	17:15	18:05

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	06:03	08:21	10:36	20:14	19:40	19:02
N 70°	06:13	08:20	10:23	20:11	19:45	19:17
68°	06:20	08:19	10:14	20:09	19:50	19:29
66°	06:26	08:18	10:06	20:07	19:53	19:39
64°	06:31	08:17	09:59	20:05	19:57	19:48
62°	06:36	08:16	09:53	20:03	19:59	19:55
60°	06:40	08:16	09:48	20:02	20:02	20:01
N 58°	06:43	08:15	09:44	20:01	20:04	20:07
56°	06:46	08:15	09:40	20:00	20:06	20:12
54°	06:49	08:14	09:37	19:59	20:08	20:17
52°	06:51	08:14	09:33	19:58	20:09	20:21
50°	06:53	08:13	09:31	19:57	20:11	20:24
45°	06:58	08:13	09:25	19:55	20:14	20:33
N 40°	07:02	08:12	09:19	19:53	20:16	20:39
35°	07:06	08:11	09:15	19:52	20:19	20:45
30°	07:09	08:11	09:11	19:51	20:21	20:50
20°	07:14	08:10	09:05	19:49	20:24	20:59
N 10°	07:19	08:10	08:59	19:47	20:27	21:07
0°	07:23	08:09	08:54	19:45	20:30	21:15
S 10°	07:27	08:08	08:48	19:43	20:33	21:23
20°	07:32	08:08	08:43	19:41	20:37	21:31
30°	07:37	08:07	08:37	19:39	20:40	21:40
35°	07:40	08:07	08:33	19:38	20:42	21:45
40°	07:43	08:06	08:29	19:36	20:45	21:51
45°	07:47	08:06	08:24	19:34	20:47	21:58
S 50°	07:52	08:05	08:19	19:32	20:51	22:07
52°	07:54	08:05	08:16	19:31	20:52	22:11
54°	07:56	08:05	08:14	19:30	20:54	22:15
56°	07:58	08:05	08:11	19:29	20:56	22:20
58°	08:01	08:04	08:07	19:27	20:58	22:26
S 60°	08:04	08:04	08:04	19:26	21:00	22:32

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 2-4 2-13%
14	04:48	04:42	12:05	13:34	01:10	
15	04:36	04:30	12:05	14:20	01:57	
16	04:24	04:18	12:04	15:04	02:42	

August 17, 18, 19 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	325°23.5	136°50.2	S05°25.4	231°19.6	N23°42.0	192°18.8	N18°05.6	311°09.3	N03°16.3
1	340°25.9	151°50.6	26.6	246°20.3	42.0	207°20.7	05.4	326°11.8	16.3
2	355°28.4	166°51.0	27.8	261°20.9	42.0	222°22.7	05.3	341°14.4	16.2
3	10°30.8	181°51.4	·· 29.0	276°21.6	·· 42.0	237°24.6	·· 05.1	356°16.9	·· 16.2
4	25°33.3	196°51.8	30.2	291°22.3	42.0	252°26.5	05.0	11°19.4	16.1
5	40°35.8	211°52.2	31.3	306°23.0	42.0	267°28.4	04.8	26°22.0	16.1
6	55°38.2	226°52.6	S05°32.5	321°23.7	N23°41.9	282°30.3	N18°04.7	41°24.5	N03°16.1
7	70°40.7	241°53.0	33.7	336°24.3	41.9	297°32.2	04.5	56°27.1	16.0
8	85°43.2	256°53.4	34.9	351°25.0	41.9	312°34.1	04.4	71°29.6	16.0
9	100°45.6	271°53.8	·· 36.1	6°25.7	·· 41.9	327°36.0	·· 04.3	86°32.1	·· 15.9
10	115°48.1	286°54.2	37.3	21°26.4	41.9	342°38.0	04.1	101°34.7	15.9
11	130°50.6	301°54.6	38.4	36°27.0	41.9	357°39.9	04.0	116°37.2	15.8
12	145°53.0	316°55.0	S05°39.6	51°27.7	N23°41.9	12°41.8	N18°03.8	131°39.8	N03°15.8
13	160°55.5	331°55.4	40.8	66°28.4	41.9	27°43.7	03.7	146°42.3	15.8
14	175°57.9	346°55.8	42.0	81°29.1	41.8	42°45.6	03.5	161°44.9	15.7
15	191°00.4	1°56.2	·· 43.2	96°29.7	·· 41.8	57°47.5	·· 03.4	176°47.4	·· 15.7
16	206°02.9	16°56.6	44.3	111°30.4	41.8	72°49.4	03.3	191°50.0	15.6
17	221°05.3	31°57.0	45.5	126°31.1	41.8	87°51.3	03.1	206°52.5	15.6
18	236°07.8	46°57.4	S05°46.7	141°31.8	N23°41.8	102°53.2	N18°03.0	221°55.0	N03°15.5
19	251°10.3	61°57.8	47.9	156°32.4	41.8	117°55.2	02.8	236°57.6	15.5
20	266°12.7	76°58.2	49.1	171°33.1	41.7	132°57.1	02.7	252°00.1	15.4
21	281°15.2	91°58.6	·· 50.2	186°33.8	·· 41.7	147°59.0	·· 02.5	267°02.7	·· 15.4
22	296°17.7	106°59.0	51.4	201°34.5	41.7	163°00.9	02.4	282°05.2	15.4
23	311°20.1	121°59.4	52.6	216°35.2	41.7	178°02.8	02.2	297°07.8	15.3
Mer.pass. 02:18		ν 0.4′	d 1.2′	m -4.44	ν 0.7′	d 0.0′	m 1.28	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.55

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	326°22.6	136°59.8	S05°53.8	231°35.8	N23°41.7	193°04.7	N18°02.1	312°10.3	N03°15.3
1	341°25.1	152°00.2	55.0	246°36.5	41.6	208°06.6	02.0	327°12.9	15.2
2	356°27.5	167°00.6	56.1	261°37.2	41.6	223°08.5	01.8	342°15.4	15.2
3	11°30.0	182°01.0	·· 57.3	276°37.9	·· 41.6	238°10.5	·· 01.7	357°17.9	·· 15.1
4	26°32.4	197°01.4	58.5	291°38.6	41.6	253°12.4	01.5	12°20.5	15.1
5	41°34.9	212°01.8	05°59.7	306°39.2	41.6	268°14.3	01.4	27°23.0	15.0
6	56°37.4	227°02.2	S06°00.8	321°39.9	N23°41.5	283°16.2	N18°01.2	42°25.6	N03°15.0
7	71°39.8	242°02.6	02.0	336°40.6	41.5	298°18.1	01.1	57°28.1	14.9
8	86°42.3	257°03.1	03.2	351°41.3	41.5	313°20.0	00.9	72°30.7	14.9
9	101°44.8	272°03.5	·· 04.4	6°42.0	·· 41.5	328°21.9	·· 00.8	87°33.2	·· 14.9
10	116°47.2	287°03.9	05.5	21°42.6	41.5	343°23.8	00.7	102°35.8	14.8
11	131°49.7	302°04.3	06.7	36°43.3	41.4	358°25.8	00.5	117°38.3	14.8
12	146°52.2	317°04.7	S06°07.9	51°44.0	N23°41.4	13°27.7	N18°00.4	132°40.9	N03°14.7
13	161°54.6	332°05.1	09.1	66°44.7	41.4	28°29.6	00.2	147°43.4	14.7
14	176°57.1	347°05.5	10.2	81°45.4	41.4	43°31.5	18°00.1	162°45.9	14.6
15	191°59.6	2°06.0	·· 11.4	96°46.0	·· 41.4	58°33.4	17°59.9	177°48.5	·· 14.6
16	207°02.0	17°06.4	12.6	111°46.7	41.3	73°35.3	59.8	192°51.0	14.5
17	222°04.5	32°06.8	13.8	126°47.4	41.3	88°37.2	59.6	207°53.6	14.5
18	237°06.9	47°07.2	S06°14.9	141°48.1	N23°41.3	103°39.2	N17°59.5	222°56.1	N03°14.4
19	252°09.4	62°07.6	16.1	156°48.8	41.3	118°41.1	59.4	237°58.7	14.4
20	267°11.9	77°08.0	17.3	171°49.4	41.2	133°43.0	59.2	253°01.2	14.4
21	282°14.3	92°08.5	·· 18.4	186°50.1	·· 41.2	148°44.9	·· 59.1	268°03.8	·· 14.3
22	297°16.8	107°08.9	19.6	201°50.8	41.2	163°46.8	58.9	283°06.3	14.3
23	312°19.3	122°09.3	20.8	216°51.5	41.2	178°48.7	58.8	298°08.9	14.2
Mer.pass. 02:14		ν 0.4′	d 1.2′	m -4.45	ν 0.7′	d 0.0′	m 1.28	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.55

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	327°21.7	137°09.7	S06°22.0	231°52.2	N23°41.1	193°50.6	N17°58.6	313°11.4	N03°14.2
1	342°24.2	152°10.2	23.1	246°52.9	41.1	208°52.5	58.5	328°14.0	14.1
2	357°26.7	167°10.6	24.3	261°53.5	41.1	223°54.5	58.3	343°16.5	14.1
3	12°29.1	182°11.0	·· 25.5	276°54.2	·· 41.0	238°56.4	·· 58.2	358°19.1	·· 14.0
4	27°31.6	197°11.4	26.6	291°54.9	41.0	253°58.3	58.1	13°21.6	14.0
5	42°34.0	212°11.9	27.8	306°55.6	41.0	269°00.2	57.9	28°24.2	13.9
6	57°36.5	227°12.3	S06°29.0	321°56.3	N23°41.0	284°02.1	N17°57.8	43°26.7	N03°13.9
7	72°39.0	242°12.7	30.2	336°57.0	40.9	299°04.0	57.6	58°29.3	13.8
8	87°41.4	257°13.1	31.3	351°57.6	40.9	314°05.9	57.5	73°31.8	13.8
9	102°43.9	272°13.6	·· 32.5	6°58.3	·· 40.9	329°07.9	·· 57.3	88°34.4	·· 13.8
10	117°46.4	287°14.0	33.7	21°59.0	40.8	344°09.8	57.2	103°36.9	13.7
11	132°48.8	302°14.4	34.8	36°59.7	40.8	359°11.7	57.0	118°39.5	13.7
12	147°51.3	317°14.9	S06°36.0	52°00.4	N23°40.8	14°13.6	N17°56.9	133°42.0	N03°13.6
13	162°53.8	332°15.3	37.2	67°01.1	40.8	29°15.5	56.7	148°44.6	13.6
14	177°56.2	347°15.7	38.3	82°01.7	40.7	44°17.4	56.6	163°47.1	13.5
15	192°58.7	2°16.2	·· 39.5	97°02.4	·· 40.7	59°19.4	·· 56.5	178°49.7	·· 13.5
16	208°01.2	17°16.6	40.7	112°03.1	40.7	74°21.3	56.3	193°52.2	13.4
17	223°03.6	32°17.0	41.8	127°03.8	40.6	89°23.2	56.2	208°54.8	13.4
18	238°06.1	47°17.5	S06°43.0	142°04.5	N23°40.6	104°25.1	N17°56.0	223°57.3	N03°13.3
19	253°08.5	62°17.9	44.2	157°05.2	40.6	119°27.0	55.9	238°59.9	13.3
20	268°11.0	77°18.3	45.3	172°05.9	40.5	134°28.9	55.7	254°02.4	13.2
21	283°13.5	92°18.8	·· 46.5	187°06.5	·· 40.5	149°30.8	·· 55.6	269°05.0	·· 13.2
22	298°15.9	107°19.2	47.7	202°07.2	40.5	164°32.8	55.4	284°07.5	13.1
23	313°18.4	122°19.6	48.8	217°07.9	40.4	179°34.7	55.3	299°10.1	13.1
Mer.pass. 02:10		ν 0.4′	d 1.2′	m -4.46	ν 0.7′	d 0.0′	m 1.28	ν 1.9′	d 0.1′ m -1.79	ν 2.5′	d 0.0′ m 0.54

Stars	SHA	Dec
Alpheratz	357°33.1	29°14.3
Ankaa	353°05.5	-42°09.4
Schedar	349°29.1	56°40.9
Diphda	348°45.7	-17°50.2
Achernar	335°18.9	-57°05.7
Hamal	327°49.6	23°35.3
Polaris	313°17.1	89°22.3
Acamar	315°10.7	-40°11.5
Menkar	314°04.7	4°11.8
Mirfak	308°26.3	49°57.2
Aldebaran	290°38.2	16°33.8
Rigel	281°02.7	-8°10.1
Capella	280°20.1	46°01.3
Bellatrix	278°21.6	6°22.5
Elnath	278°00.3	28°37.7
Alnilam	275°36.5	-1°11.0
Betelgeuse	270°50.8	7°24.8
Canopus	263°52.2	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.1	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°14.8	-59°35.5
Suhail	222°45.8	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°46.8	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.1	-63°15.0
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.1
Spica	158°21.1	-11°18.0
Alkaid	152°51.2	49°11.0
Hadar	148°34.3	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.6	-60°57.0
Kochab	137°20.0	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.9	-69°04.7
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.3	51°29.3
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°38.9
Deneb	49°24.4	45°22.7
Enif	33°37.2	10°00.0
Al Na'ir	27°30.8	-46°49.7
Fomalhaut	15°12.7	-29°28.7
Scheat	13°43.6	28°13.7
Markab	13°28.3	15°21.0

Aug 17 Mon	SHA	Mer.pass
Venus	171°26.8	14:52
Mars	265°56.1	08:34
Jupiter	226°55.4	11:09
Saturn	345°45.8	03:15

Aug 18 Tue	SHA	Mer.pass
Venus	170°37.2	14:52
Mars	265°13.3	08:33
Jupiter	226°42.1	11:06
Saturn	345°47.7	03:11

Aug 19 Wed	SHA	Mer.pass
Venus	169°48.0	14:51
Mars	264°30.4	08:32
Jupiter	226°28.9	11:03
Saturn	345°49.7	03:07

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	178°57.0	N13°28.6	129°54.3	14.0′	S10°54.0	14.2′	56.4′
1	193°57.1	27.8	144°27.3	14.0′	11°08.2	14.0′	56.4′
2	208°57.2	27.0	159°00.3	14.0′	11°22.2	14.0′	56.4′
3	223°57.4	·· 26.2	173°33.3	14.0′	11°36.2	13.9′	56.3′
4	238°57.5	25.4	188°06.2	14.0′	11°50.1	13.9′	56.3′
5	253°57.6	24.6	202°39.2	13.9′	12°04.0	13.8′	56.3′
6	268°57.8	N13°23.8	217°12.1	13.9′	S12°17.8	13.7′	56.2′
7	283°57.9	23.0	231°45.1	13.9′	12°31.5	13.7′	56.2′
8	298°58.0	22.2	246°18.0	13.9′	12°45.2	13.6′	56.2′
9	313°58.2	·· 21.4	260°50.9	13.9′	12°58.8	13.5′	56.1′
10	328°58.3	20.6	275°23.7	13.9′	13°12.3	13.4′	56.1′
11	343°58.4	19.8	289°56.6	13.8′	13°25.7	13.4′	56.1′
12	358°58.6	N13°19.0	304°29.4	13.8′	S13°39.1	13.3′	56.0′
13	13°58.7	18.2	319°02.2	13.8′	13°52.4	13.2′	56.0′
14	28°58.9	17.4	333°35.0	13.8′	14°05.6	13.1′	56.0′
15	43°59.0	·· 16.6	348°07.8	13.7′	14°18.7	13.1′	55.9′
16	58°59.1	15.8	2°40.5	13.7′	14°31.8	12.9′	55.9′
17	73°59.3	15.0	17°13.2	13.7′	14°44.7	13.0′	55.9′
18	88°59.4	N13°14.2	31°45.9	13.7′	S14°57.7	12.8′	55.9′
19	103°59.5	13.4	46°18.6	13.6′	15°10.5	12.7′	55.8′
20	118°59.7	12.6	60°51.3	13.6′	15°23.2	12.7′	55.8′
21	133°59.8	·· 11.8	75°23.9	13.6′	15°35.9	12.6′	55.8′
22	148°59.9	11.0	89°56.5	13.6′	15°48.5	12.5′	55.7′
23	164°00.1	10.2	104°29.0	13.5′	16°01.0	12.4′	55.7′
	SD = 15.8′	d = 0.8′	SD = 15.4′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°00.2	N13°09.4	119°01.6	13.5′	S16°13.4	12.3′	55.7′
1	194°00.4	08.6	133°34.1	13.5′	16°25.7	12.3′	55.6′
2	209°00.5	07.8	148°06.5	13.4′	16°38.0	12.2′	55.6′
3	224°00.6	·· 07.0	162°39.0	13.4′	16°50.2	12.0′	55.6′
4	239°00.8	06.2	177°11.4	13.4′	17°02.2	12.0′	55.6′
5	254°00.9	05.3	191°43.7	13.3′	17°14.2	11.9′	55.5′
6	269°01.0	N13°04.5	206°16.1	13.3′	S17°26.1	11.9′	55.5′
7	284°01.2	03.7	220°48.4	13.3′	17°38.0	11.7′	55.5′
8	299°01.3	02.9	235°20.7	13.2′	17°49.7	11.6′	55.5′
9	314°01.5	·· 02.1	249°52.9	13.2′	18°01.3	11.6′	55.4′
10	329°01.6	01.3	264°25.1	13.2′	18°12.9	11.4′	55.4′
11	344°01.7	13°00.5	278°57.3	13.1′	18°24.3	11.4′	55.4′
12	359°01.9	N12°59.7	293°29.4	13.1′	S18°35.7	11.3′	55.3′
13	14°02.0	58.9	308°01.5	13.1′	18°47.0	11.2′	55.3′
14	29°02.2	58.1	322°33.6	13.0′	18°58.2	11.1′	55.3′
15	44°02.3	·· 57.3	337°05.6	13.0′	19°09.3	11.0′	55.3′
16	59°02.4	56.4	351°37.6	12.9′	19°20.3	10.9′	55.2′
17	74°02.6	55.6	6°09.5	12.9′	19°31.2	10.8′	55.2′
18	89°02.7	N12°54.8	20°41.4	12.9′	S19°42.0	10.7′	55.2′
19	104°02.9	54.0	35°13.3	12.8′	19°52.7	10.6′	55.2′
20	119°03.0	53.2	49°45.1	12.8′	20°03.3	10.5′	55.1′
21	134°03.1	·· 52.4	64°16.9	12.7′	20°13.8	10.4′	55.1′
22	149°03.3	51.6	78°48.6	12.7′	20°24.2	10.3′	55.1′
23	164°03.4	50.8	93°20.3	12.7′	20°34.5	10.2′	55.1′
	SD = 15.8′	d = 0.8′	SD = 15.2′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°03.6	N12°49.9	107°51.9	12.6′	S20°44.7	10.2′	55.1′
1	194°03.7	49.1	122°23.6	12.6′	20°54.9	10.0′	55.0′
2	209°03.9	48.3	136°55.1	12.5′	21°04.9	9.9′	55.0′
3	224°04.0	·· 47.5	151°26.7	12.5′	21°14.8	9.8′	55.0′
4	239°04.1	46.7	165°58.1	12.4′	21°24.6	9.7′	55.0′
5	254°04.3	45.9	180°29.6	12.4′	21°34.3	9.6′	54.9′
6	269°04.4	N12°45.0	195°01.0	12.4′	S21°43.9	9.5′	54.9′
7	284°04.6	44.2	209°32.3	12.3′	21°53.4	9.4′	54.9′
8	299°04.7	43.4	224°03.6	12.3′	22°02.8	9.3′	54.9′
9	314°04.9	·· 42.6	238°34.9	12.2′	22°12.1	9.2′	54.9′
10	329°05.0	41.8	253°06.1	12.2′	22°21.3	9.1′	54.8′
11	344°05.2	41.0	267°37.3	12.1′	22°30.4	8.9′	54.8′
12	359°05.3	N12°40.1	282°08.4	12.1′	S22°39.3	8.9′	54.8′
13	14°05.4	39.3	296°39.5	12.0′	22°48.2	8.7′	54.8′
14	29°05.6	38.5	311°10.6	12.0′	22°56.9	8.7′	54.8′
15	44°05.7	·· 37.7	325°41.6	12.0′	23°05.6	8.5′	54.7′
16	59°05.9	36.9	340°12.5	11.9′	23°14.1	8.4′	54.7′
17	74°06.0	36.1	354°43.4	11.9′	23°22.5	8.3′	54.7′
18	89°06.2	N12°35.2	9°14.3	11.8′	S23°30.8	8.2′	54.7′
19	104°06.3	34.4	23°45.1	11.8′	23°39.0	8.1′	54.7′
20	119°06.5	33.6	38°15.9	11.7′	23°47.1	8.0′	54.6′
21	134°06.6	·· 32.8	52°46.6	11.7′	23°55.1	7.8′	54.6′
22	149°06.8	31.9	67°17.3	11.6′	24°02.9	7.8′	54.6′
23	164°06.9	31.1	81°48.0	11.6′	24°10.7	7.6′	54.6′
	SD = 15.8′	d = 0.8′	SD = 15.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	02:44	21:19	////	////
N 70°	////	01:13	03:11	20:53	22:44	////
68°	////	02:05	03:32	20:33	21:57	////
66°	////	02:36	03:48	20:17	21:28	////
64°	01:04	02:59	04:01	20:05	21:06	22:54
62°	01:51	03:17	04:12	19:54	20:48	22:12
60°	02:19	03:31	04:21	19:45	20:34	21:45
N 58°	02:40	03:44	04:30	19:37	20:22	21:24
56°	02:57	03:54	04:37	19:30	20:12	21:08
54°	03:11	04:03	04:43	19:23	20:03	20:54
52°	03:23	04:11	04:49	19:18	19:55	20:43
50°	03:34	04:18	04:54	19:13	19:48	20:32
45°	03:55	04:34	05:05	19:02	19:33	20:12
N 40°	04:11	04:46	05:14	18:53	19:21	19:56
35°	04:24	04:56	05:22	18:45	19:12	19:43
30°	04:34	05:04	05:29	18:38	19:03	19:33
20°	04:51	05:18	05:41	18:27	18:49	19:16
N 10°	05:04	05:29	05:51	18:17	18:38	19:03
0°	05:15	05:39	06:01	18:07	18:28	18:53
S 10°	05:23	05:48	06:10	17:58	18:20	18:44
20°	05:31	05:57	06:20	17:48	18:11	18:37
30°	05:38	06:06	06:31	17:37	18:02	18:30
35°	05:41	06:11	06:37	17:31	17:57	18:27
40°	05:45	06:16	06:44	17:24	17:52	18:24
45°	05:48	06:22	06:53	17:16	17:46	18:20
S 50°	05:51	06:29	07:03	17:06	17:39	18:17
52°	05:53	06:32	07:07	17:01	17:36	18:16
54°	05:54	06:35	07:12	16:56	17:33	18:15
56°	05:55	06:39	07:18	16:51	17:30	18:13
58°	05:57	06:43	07:24	16:44	17:26	18:12
S 60°	05:58	06:47	07:31	16:37	17:22	18:11

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	13:04	▬	▬	18:09	▬	▬
N 70°	12:34	15:32	▬	18:41	17:19	▬
68°	12:12	14:28	▬	19:04	18:24	▬
66°	11:55	13:53	16:25	19:23	19:00	18:06
64°	11:41	13:28	15:25	19:38	19:26	19:07
62°	11:30	13:09	14:51	19:51	19:46	19:41
60°	11:20	12:53	14:27	20:02	20:03	20:07
N 58°	11:12	12:40	14:07	20:11	20:17	20:27
56°	11:04	12:28	13:51	20:20	20:29	20:43
54°	10:58	12:18	13:38	20:27	20:40	20:57
52°	10:52	12:09	13:26	20:34	20:49	21:10
50°	10:46	12:01	13:15	20:40	20:58	21:21
45°	10:35	11:45	12:53	20:53	21:16	21:44
N 40°	10:26	11:31	12:36	21:04	21:31	22:02
35°	10:18	11:19	12:21	21:13	21:43	22:18
30°	10:11	11:09	12:08	21:21	21:55	22:31
20°	09:58	10:52	11:46	21:35	22:14	22:55
N 10°	09:48	10:37	11:28	21:48	22:30	23:15
0°	09:38	10:23	11:10	22:00	22:46	23:33
S 10°	09:29	10:10	10:53	22:12	23:01	23:52
20°	09:18	09:55	10:35	22:24	23:18	·· ··
30°	09:07	09:39	10:13	22:39	23:38	·· ··
35°	09:00	09:29	10:01	22:47	23:49	·· ··
40°	08:53	09:18	09:47	22:57	·· ··	00:02
45°	08:44	09:05	09:31	23:09	·· ··	00:18
S 50°	08:33	08:50	09:10	23:22	·· ··	00:37
52°	08:28	08:43	09:01	23:29	·· ··	00:46
54°	08:23	08:35	08:50	23:36	·· ··	00:56
56°	08:17	08:26	08:37	23:44	·· ··	01:08
58°	08:11	08:16	08:23	23:54	·· ··	01:21
S 60°	08:03	08:04	08:07	·· ··	00:04	01:37

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 5-7 21-39%
17	04:12	04:06	12:04	15:49	03:27	
18	03:59	03:52	12:04	16:35	04:12	
19	03:46	03:39	12:04	17:22	04:58	

August 20, 21, 22 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	328°20.9	137°20.1	S06°50.0	232°08.6	N23°40.4	194°36.6	N17°55.2	314°12.6	N03°13.0
1	343°23.3	152°20.5	51.2	247°09.3	40.4	209°38.5	55.0	329°15.2	13.0
2	358°25.8	167°21.0	52.3	262°10.0	40.3	224°40.4	54.9	344°17.7	13.0
3	13°28.3	182°21.4	·· 53.5	277°10.7	·· 40.3	239°42.3	·· 54.7	359°20.3	·· 12.9
4	28°30.7	197°21.8	54.6	292°11.4	40.3	254°44.2	54.6	14°22.8	12.9
5	43°33.2	212°22.3	55.8	307°12.0	40.2	269°46.2	54.4	29°25.4	12.8
6	58°35.7	227°22.7	S06°57.0	322°12.7	N23°40.2	284°48.1	N17°54.3	44°27.9	N03°12.8
7	73°38.1	242°23.2	58.1	337°13.4	40.2	299°50.0	54.1	59°30.5	12.7
8	88°40.6	257°23.6	06°59.3	352°14.1	40.1	314°51.9	54.0	74°33.1	12.7
9	103°43.0	272°24.1	07°00.5	7°14.8	·· 40.1	329°53.8	·· 53.9	89°35.6	·· 12.6
10	118°45.5	287°24.5	01.6	22°15.5	40.0	344°55.7	53.7	104°38.2	12.6
11	133°48.0	302°25.0	02.8	37°16.2	40.0	359°57.7	53.6	119°40.7	12.5
12	148°50.4	317°25.4	S07°03.9	52°16.9	N23°40.0	14°59.6	N17°53.4	134°43.3	N03°12.5
13	163°52.9	332°25.9	05.1	67°17.5	39.9	30°01.5	53.3	149°45.8	12.4
14	178°55.4	347°26.3	06.3	82°18.2	39.9	45°03.4	53.1	164°48.4	12.4
15	193°57.8	2°26.8	·· 07.4	97°18.9	·· 39.9	60°05.3	·· 53.0	179°50.9	·· 12.3
16	209°00.3	17°27.2	08.6	112°19.6	39.8	75°07.2	52.8	194°53.5	12.3
17	224°02.8	32°27.7	09.7	127°20.3	39.8	90°09.2	52.7	209°56.0	12.2
18	239°05.2	47°28.1	S07°10.9	142°21.0	N23°39.7	105°11.1	N17°52.5	224°58.6	N03°12.2
19	254°07.7	62°28.6	12.0	157°21.7	39.7	120°13.0	52.4	240°01.1	12.1
20	269°10.1	77°29.0	13.2	172°22.4	39.7	135°14.9	52.3	255°03.7	12.1
21	284°12.6	92°29.5	·· 14.4	187°23.1	·· 39.6	150°16.8	·· 52.1	270°06.3	·· 12.0
22	299°15.1	107°29.9	15.5	202°23.8	39.6	165°18.7	52.0	285°08.8	12.0
23	314°17.5	122°30.4	16.7	217°24.4	39.5	180°20.7	51.8	300°11.4	11.9
Mer.pass.	02:06	ν 0.4′	d 1.2′	m -4.47	ν 0.7′	d 0.0′	m 1.27	ν 1.9′	d 0.1′ m -1.79	ν 2.6′	d 0.0′ m 0.54

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	329°20.0	137°30.8	S07°17.8	232°25.1	N23°39.5	195°22.6	N17°51.7	315°13.9	N03°11.9
1	344°22.5	152°31.3	19.0	247°25.8	39.5	210°24.5	51.5	330°16.5	11.8
2	359°24.9	167°31.8	20.1	262°26.5	39.4	225°26.4	51.4	345°19.0	11.8
3	14°27.4	182°32.2	·· 21.3	277°27.2	·· 39.4	240°28.3	·· 51.2	0°21.6	·· 11.7
4	29°29.9	197°32.7	22.5	292°27.9	39.3	255°30.2	51.1	15°24.1	11.7
5	44°32.3	212°33.1	23.6	307°28.6	39.3	270°32.2	51.0	30°26.7	11.7
6	59°34.8	227°33.6	S07°24.8	322°29.3	N23°39.2	285°34.1	N17°50.8	45°29.3	N03°11.6
7	74°37.3	242°34.1	25.9	337°30.0	39.2	300°36.0	50.7	60°31.8	11.6
8	89°39.7	257°34.5	27.1	352°30.7	39.2	315°37.9	50.5	75°34.4	11.5
9	104°42.2	272°35.0	·· 28.2	7°31.4	·· 39.1	330°39.8	·· 50.4	90°36.9	·· 11.5
10	119°44.6	287°35.5	29.4	22°32.1	39.1	345°41.7	50.2	105°39.5	11.4
11	134°47.1	302°35.9	30.5	37°32.7	39.0	0°43.7	50.1	120°42.0	11.4
12	149°49.6	317°36.4	S07°31.7	52°33.4	N23°39.0	15°45.6	N17°49.9	135°44.6	N03°11.3
13	164°52.0	332°36.9	32.8	67°34.1	38.9	30°47.5	49.8	150°47.2	11.3
14	179°54.5	347°37.3	34.0	82°34.8	38.9	45°49.4	49.6	165°49.7	11.2
15	194°57.0	2°37.8	·· 35.1	97°35.5	·· 38.8	60°51.3	·· 49.5	180°52.3	·· 11.2
16	209°59.4	17°38.3	36.3	112°36.2	38.8	75°53.2	49.4	195°54.8	11.1
17	225°01.9	32°38.7	37.4	127°36.9	38.7	90°55.2	49.2	210°57.4	11.1
18	240°04.4	47°39.2	S07°38.6	142°37.6	N23°38.7	105°57.1	N17°49.1	225°59.9	N03°11.0
19	255°06.8	62°39.7	39.7	157°38.3	38.6	120°59.0	48.9	241°02.5	11.0
20	270°09.3	77°40.1	40.9	172°39.0	38.6	136°00.9	48.8	256°05.1	10.9
21	285°11.8	92°40.6	·· 42.0	187°39.7	·· 38.6	151°02.8	·· 48.6	271°07.6	·· 10.9
22	300°14.2	107°41.1	43.2	202°40.4	38.5	166°04.8	48.5	286°10.2	10.8
23	315°16.7	122°41.6	44.3	217°41.1	38.5	181°06.7	48.3	301°12.7	10.8
Mer.pass.	02:02	ν 0.5′	d 1.2′	m -4.49	ν 0.7′	d 0.0′	m 1.27	ν 1.9′	d 0.1′ m -1.79	ν 2.6′	d 0.0′ m 0.53

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330°19.1	137°42.0	S07°45.5	232°41.8	N23°38.4	196°08.6	N17°48.2	316°15.3	N03°10.7
1	345°21.6	152°42.5	46.6	247°42.5	38.4	211°10.5	48.0	331°17.9	10.7
2	0°24.1	167°43.0	47.8	262°43.2	38.3	226°12.4	47.9	346°20.4	10.6
3	15°26.5	182°43.5	·· 48.9	277°43.9	·· 38.3	241°14.3	·· 47.8	1°23.0	·· 10.6
4	30°29.0	197°44.0	50.1	292°44.6	38.2	256°16.3	47.6	16°25.5	10.5
5	45°31.5	212°44.4	51.2	307°45.2	38.2	271°18.2	47.5	31°28.1	10.5
6	60°33.9	227°44.9	S07°52.4	322°45.9	N23°38.1	286°20.1	N17°47.3	46°30.7	N03°10.4
7	75°36.4	242°45.4	53.5	337°46.6	38.1	301°22.0	47.2	61°33.2	10.4
8	90°38.9	257°45.9	54.7	352°47.3	38.0	316°23.9	47.0	76°35.8	10.3
9	105°41.3	272°46.4	·· 55.8	7°48.0	·· 37.9	331°25.9	·· 46.9	91°38.3	·· 10.3
10	120°43.8	287°46.8	57.0	22°48.7	37.9	346°27.8	46.7	106°40.9	10.2
11	135°46.3	302°47.3	58.1	37°49.4	37.8	1°29.7	46.6	121°43.5	10.2
12	150°48.7	317°47.8	S07°59.2	52°50.1	N23°37.8	16°31.6	N17°46.4	136°46.0	N03°10.1
13	165°51.2	332°48.3	08°00.4	67°50.8	37.7	31°33.5	46.3	151°48.6	10.1
14	180°53.6	347°48.8	01.5	82°51.5	37.7	46°35.5	46.2	166°51.1	10.0
15	195°56.1	2°49.3	·· 02.7	97°52.2	·· 37.6	61°37.4	·· 46.0	181°53.7	·· 10.0
16	210°58.6	17°49.8	03.8	112°52.9	37.6	76°39.3	45.9	196°56.3	09.9
17	226°01.0	32°50.2	05.0	127°53.6	37.5	91°41.2	45.7	211°58.8	09.9
18	241°03.5	47°50.7	S08°06.1	142°54.3	N23°37.5	106°43.1	N17°45.6	227°01.4	N03°09.8
19	256°06.0	62°51.2	07.2	157°55.0	37.4	121°45.1	45.4	242°03.9	09.7
20	271°08.4	77°51.7	08.4	172°55.7	37.4	136°47.0	45.3	257°06.5	09.7
21	286°10.9	92°52.2	·· 09.5	187°56.4	·· 37.3	151°48.9	·· 45.1	272°09.1	·· 09.6
22	301°13.4	107°52.7	10.7	202°57.1	37.2	166°50.8	45.0	287°11.6	09.6
23	316°15.8	122°53.2	11.8	217°57.8	37.2	181°52.7	44.8	302°14.2	09.5
Mer.pass.	01:58	ν 0.5′	d 1.1′	m -4.50	ν 0.7′	d 0.0′	m 1.27	ν 1.9′	d 0.1′ m -1.79	ν 2.6′	d 0.1′ m 0.53

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.3
Ankaa	353°05.5	-42°09.4
Schedar	349°29.1	56°40.9
Diphda	348°45.7	-17°50.2
Achernar	335°18.9	-57°05.7
Hamal	327°49.5	23°35.3
Polaris	313°15.3	89°22.3
Acamar	315°10.7	-40°11.5
Menkar	314°04.7	4°11.8
Mirfak	308°26.3	49°57.2
Aldebaran	290°38.1	16°33.8
Rigel	281°02.7	-8°10.1
Capella	280°20.1	46°01.3
Bellatrix	278°21.6	6°22.5
Elnath	278°00.3	28°37.7
Alnilam	275°36.5	-1°11.0
Betelgeuse	270°50.8	7°24.8
Canopus	263°52.1	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.1	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°14.8	-59°35.5
Suhail	222°45.8	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°46.8	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.1	-63°15.0
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.1
Spica	158°21.1	-11°18.0
Alkaid	152°51.2	49°11.0
Hadar	148°34.4	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.6	-60°57.0
Kochab	137°20.1	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.9	-69°04.7
Sabik	102°01.1	-15°45.4
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.6
Eltanin	90°41.3	51°29.3
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°38.9
Deneb	49°24.4	45°22.7
Enif	33°37.1	10°00.0
Al Na'ir	27°30.8	-46°49.8
Fomalhaut	15°12.7	-29°28.7
Scheat	13°43.6	28°13.7
Markab	13°28.2	15°21.1

Aug 20 Thu	SHA	Mer.pass
Venus	168°59.2	14:50
Mars	263°47.7	08:31
Jupiter	226°15.7	11:00
Saturn	345°51.8	03:03

Aug 21 Fri	SHA	Mer.pass
Venus	168°10.8	14:49
Mars	263°05.1	08:30
Jupiter	226°02.6	10:57
Saturn	345°53.9	02:59

Aug 22 Sat	SHA	Mer.pass
Venus	167°22.9	14:49
Mars	262°22.6	08:29
Jupiter	225°49.4	10:54
Saturn	345°56.2	02:54

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°07.1	N12°30.3	96°18.6	11.6′	S24°18.3	7.5′	54.6′
1	194°07.2	29.5	110°49.1	11.5′	24°25.8	7.4′	54.6′
2	209°07.4	28.7	125°19.6	11.5′	24°33.2	7.3′	54.5′
3	224°07.5	·· 27.8	139°50.1	11.4′	24°40.5	7.2′	54.5′
4	239°07.7	27.0	154°20.5	11.4′	24°47.7	7.0′	54.5′
5	254°07.8	26.2	168°50.9	11.3′	24°54.7	6.9′	54.5′
6	269°08.0	N12°25.4	183°21.2	11.3′	S25°01.6	6.8′	54.5′
7	284°08.1	24.5	197°51.5	11.3′	25°08.4	6.7′	54.5′
8	299°08.3	23.7	212°21.8	11.2′	25°15.1	6.6′	54.5′
9	314°08.4	·· 22.9	226°52.0	11.2′	25°21.7	6.4′	54.4′
10	329°08.6	22.1	241°22.2	11.1′	25°28.1	6.4′	54.4′
11	344°08.7	21.2	255°52.3	11.1′	25°34.5	6.2′	54.4′
12	359°08.9	N12°20.4	270°22.4	11.0′	S25°40.7	6.1′	54.4′
13	14°09.0	19.6	284°52.4	11.0′	25°46.8	5.9′	54.4′
14	29°09.2	18.8	299°22.4	11.0′	25°52.7	5.9′	54.4′
15	44°09.3	·· 17.9	313°52.4	10.9′	25°58.6	5.7′	54.4′
16	59°09.5	17.1	328°22.3	10.9′	26°04.3	5.6′	54.4′
17	74°09.6	16.3	342°52.2	10.8′	26°09.9	5.4′	54.3′
18	89°09.8	N12°15.4	357°22.0	10.8′	S26°15.3	5.4′	54.3′
19	104°09.9	14.6	11°51.8	10.8′	26°20.7	5.2′	54.3′
20	119°10.1	13.8	26°21.6	10.7′	26°25.9	5.1′	54.3′
21	134°10.2	·· 13.0	40°51.3	10.7′	26°31.0	4.9′	54.3′
22	149°10.4	12.1	55°21.0	10.7′	26°35.9	4.9′	54.3′
23	164°10.5	11.3	69°50.7	10.6′	26°40.8	4.7′	54.3′
	SD = 15.8′	d = 0.8′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°10.7	N12°10.5	84°20.3	10.6′	S26°45.5	4.6′	54.3′
1	194°10.8	09.6	98°49.9	10.6′	26°50.1	4.4′	54.3′
2	209°11.0	08.8	113°19.5	10.5′	26°54.5	4.3′	54.2′
3	224°11.1	·· 08.0	127°49.0	10.5′	26°58.8	4.2′	54.2′
4	239°11.3	07.1	142°18.5	10.5′	27°03.0	4.1′	54.2′
5	254°11.4	06.3	156°48.0	10.4′	27°07.1	3.9′	54.2′
6	269°11.6	N12°05.5	171°17.4	10.4′	S27°11.0	3.8′	54.2′
7	284°11.8	04.6	185°46.8	10.4′	27°14.8	3.7′	54.2′
8	299°11.9	03.8	200°16.2	10.3′	27°18.5	3.5′	54.2′
9	314°12.1	·· 03.0	214°45.5	10.3′	27°22.0	3.5′	54.2′
10	329°12.2	02.1	229°14.8	10.3′	27°25.5	3.2′	54.2′
11	344°12.4	01.3	243°44.1	10.3′	27°28.7	3.2′	54.2′
12	359°12.5	N12°00.5	258°13.4	10.2′	S27°31.9	3.0′	54.2′
13	14°12.7	11°59.6	272°42.6	10.2′	27°34.9	2.9′	54.2′
14	29°12.8	58.8	287°11.8	10.2′	27°37.8	2.7′	54.2′
15	44°13.0	·· 58.0	301°41.0	10.2′	27°40.5	2.7′	54.2′
16	59°13.2	57.1	316°10.2	10.1′	27°43.2	2.5′	54.2′
17	74°13.3	56.3	330°39.3	10.1′	27°45.7	2.3′	54.2′
18	89°13.5	N11°55.5	345°08.4	10.1′	S27°48.0	2.2′	54.1′
19	104°13.6	54.6	359°37.5	10.1′	27°50.2	2.1′	54.1′
20	119°13.8	53.8	14°06.6	10.1′	27°52.3	2.0′	54.1′
21	134°13.9	·· 53.0	28°35.7	10.0′	27°54.3	1.8′	54.1′
22	149°14.1	52.1	43°04.7	10.0′	27°56.1	1.7′	54.1′
23	164°14.3	51.3	57°33.8	10.0′	27°57.8	1.5′	54.1′
	SD = 15.8′	d = 0.8′	SD = 14.8′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°14.4	N11°50.4	72°02.8	10.0′	S27°59.3	1.4′	54.1′
1	194°14.6	49.6	86°31.8	10.0′	28°00.7	1.3′	54.1′
2	209°14.7	48.8	101°00.8	10.0′	28°02.0	1.1′	54.1′
3	224°14.9	·· 47.9	115°29.7	10.0′	28°03.1	1.1′	54.1′
4	239°15.0	47.1	129°58.7	10.0′	28°04.2	0.8′	54.1′
5	254°15.2	46.2	144°27.7	9.9′	28°05.0	0.8′	54.1′
6	269°15.4	N11°45.4	158°56.6	9.9′	S28°05.8	0.6′	54.1′
7	284°15.5	44.6	173°25.5	9.9′	28°06.4	0.4′	54.1′
8	299°15.7	43.7	187°54.5	9.9′	28°06.8	0.4′	54.1′
9	314°15.8	·· 42.9	202°23.4	9.9′	28°07.2	0.1′	54.1′
10	329°16.0	42.0	216°52.3	9.9′	28°07.3	0.1′	54.1′
11	344°16.2	41.2	231°21.2	9.9′	28°07.4	0.1′	54.1′
12	359°16.3	N11°40.4	245°50.1	9.9′	S28°07.3	0.2′	54.1′
13	14°16.5	39.5	260°19.1	9.9′	28°07.1	0.4′	54.1′
14	29°16.6	38.7	274°48.0	9.9′	28°06.7	0.4′	54.1′
15	44°16.8	·· 37.8	289°16.9	9.9′	28°06.3	0.7′	54.1′
16	59°17.0	37.0	303°45.8	9.9′	28°05.6	0.7′	54.1′
17	74°17.1	36.1	318°14.7	9.9′	28°04.9	0.9′	54.1′
18	89°17.3	N11°35.3	332°43.6	9.9′	S28°04.0	1.1′	54.1′
19	104°17.4	34.5	347°12.5	9.9′	28°02.9	1.1′	54.1′
20	119°17.6	33.6	1°41.5	9.9′	28°01.8	1.3′	54.1′
21	134°17.8	·· 32.8	16°10.4	9.9′	28°00.5	1.5′	54.1′
22	149°17.9	31.9	30°39.3	9.9′	27°59.0	1.5′	54.1′
23	164°18.1	31.1	45°08.3	10.0′	27°57.5	1.8′	54.1′
	SD = 15.8′	d = 0.8′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	////	03:02	20:59	23:32	////
N 70°	////	01:44	03:26	20:37	22:14	////
68°	////	02:24	03:44	20:20	21:38	////
66°	////	02:50	03:58	20:06	21:12	23:37
64°	01:32	03:10	04:10	19:54	20:53	22:28
62°	02:07	03:27	04:20	19:44	20:37	21:55
60°	02:32	03:40	04:29	19:36	20:24	21:31
N 58°	02:51	03:51	04:36	19:29	20:13	21:13
56°	03:06	04:01	04:43	19:22	20:04	20:58
54°	03:19	04:09	04:48	19:17	19:56	20:46
52°	03:30	04:17	04:54	19:11	19:48	20:35
50°	03:40	04:23	04:59	19:07	19:42	20:25
45°	03:59	04:37	05:09	18:57	19:28	20:06
N 40°	04:14	04:49	05:17	18:48	19:17	19:51
35°	04:26	04:58	05:24	18:41	19:08	19:39
30°	04:37	05:06	05:31	18:35	19:00	19:29
20°	04:52	05:19	05:42	18:24	18:47	19:14
N 10°	05:04	05:30	05:51	18:15	18:37	19:02
0°	05:14	05:39	06:00	18:06	18:28	18:52
S 10°	05:22	05:47	06:08	17:58	18:19	18:44
20°	05:29	05:55	06:17	17:49	18:12	18:37
30°	05:35	06:03	06:28	17:39	18:03	18:31
35°	05:38	06:08	06:34	17:33	17:59	18:29
40°	05:41	06:12	06:40	17:27	17:54	18:26
45°	05:43	06:18	06:48	17:19	17:49	18:24
S 50°	05:46	06:24	06:57	17:10	17:43	18:21
52°	05:47	06:26	07:01	17:06	17:41	18:20
54°	05:48	06:29	07:06	17:01	17:38	18:19
56°	05:49	06:32	07:11	16:56	17:35	18:18
58°	05:50	06:36	07:16	16:51	17:32	18:18
S 60°	05:51	06:39	07:23	16:44	17:28	18:17

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	16:39	18:41	▬	19:35	19:19	▬
60°	16:00	17:23	18:22	20:15	20:37	21:26
N 58°	15:32	16:48	17:44	20:43	21:13	22:03
56°	15:11	16:22	17:18	21:05	21:39	22:29
54°	14:54	16:02	16:57	21:23	21:59	22:50
52°	14:39	15:45	16:40	21:38	22:16	23:08
50°	14:26	15:30	16:25	21:51	22:31	23:23
45°	13:59	15:00	15:54	22:18	23:01	23:53
N 40°	13:38	14:37	15:31	22:40	23:24	·· ··
35°	13:21	14:18	15:12	22:58	23:43	·· ··
30°	13:06	14:02	14:55	23:13	·· ··	00:00
20°	12:41	13:35	14:27	23:39	·· ··	00:28
N 10°	12:19	13:11	14:03	·· ··	00:02	00:52
0°	11:59	12:49	13:41	·· ··	00:23	01:14
S 10°	11:39	12:27	13:18	·· ··	00:44	01:36
20°	11:17	12:04	12:54	00:13	01:07	02:00
30°	10:53	11:37	12:26	00:36	01:33	02:28
35°	10:38	11:21	12:10	00:50	01:49	02:45
40°	10:21	11:02	11:50	01:06	02:07	03:04
45°	10:01	10:40	11:27	01:25	02:29	03:27
S 50°	09:36	10:11	10:57	01:49	02:57	03:57
52°	09:24	09:57	10:42	02:01	03:11	04:12
54°	09:11	09:41	10:25	02:14	03:27	04:29
56°	08:55	09:22	10:04	02:30	03:46	04:50
58°	08:36	08:59	09:38	02:48	04:09	05:16
S 60°	08:13	08:27	09:02	03:11	04:40	05:52

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 8-10 49-68%
20	03:32	03:25	12:03	18:11	05:46	
21	03:17	03:10	12:03	19:02	06:36	
22	03:02	02:55	12:03	19:53	07:27	

August 23, 24, 25 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	331°18.3	137°53.7	S08°12.9	232°58.5	N23°37.1	196°54.7	N17°44.7	317°16.8	N03°09.5
1	346°20.7	152°54.2	14.1	247°59.2	37.1	211°56.6	44.6	332°19.3	09.4
2	1°23.2	167°54.7	15.2	262°59.9	37.0	226°58.5	44.4	347°21.9	09.4
3	16°25.7	182°55.2	·· 16.4	278°00.6	·· 37.0	242°00.4	·· 44.3	2°24.4	·· 09.3
4	31°28.1	197°55.7	17.5	293°01.3	36.9	257°02.3	44.1	17°27.0	09.3
5	46°30.6	212°56.2	18.6	308°02.0	36.8	272°04.3	44.0	32°29.6	09.2
6	61°33.1	227°56.7	S08°19.8	323°02.7	N23°36.8	287°06.2	N17°43.8	47°32.1	N03°09.2
7	76°35.5	242°57.2	20.9	338°03.4	36.7	302°08.1	43.7	62°34.7	09.1
8	91°38.0	257°57.7	22.0	353°04.1	36.7	317°10.0	43.5	77°37.3	09.1
9	106°40.5	272°58.2	·· 23.2	8°04.8	·· 36.6	332°11.9	·· 43.4	92°39.8	·· 09.0
10	121°42.9	287°58.7	24.3	23°05.5	36.5	347°13.9	43.2	107°42.4	09.0
11	136°45.4	302°59.2	25.4	38°06.2	36.5	2°15.8	43.1	122°44.9	08.9
12	151°47.9	317°59.7	S08°26.6	53°06.9	N23°36.4	17°17.7	N17°43.0	137°47.5	N03°08.9
13	166°50.3	333°00.2	27.7	68°07.6	36.4	32°19.6	42.8	152°50.1	08.8
14	181°52.8	348°00.7	28.9	83°08.3	36.3	47°21.5	42.7	167°52.6	08.8
15	196°55.2	3°01.2	·· 30.0	98°09.0	·· 36.2	62°23.5	·· 42.5	182°55.2	·· 08.7
16	211°57.7	18°01.7	31.1	113°09.7	36.2	77°25.4	42.4	197°57.8	08.7
17	227°00.2	33°02.2	32.3	128°10.4	36.1	92°27.3	42.2	213°00.3	08.6
18	242°02.6	48°02.7	S08°33.4	143°11.1	N23°36.1	107°29.2	N17°42.1	228°02.9	N03°08.6
19	257°05.1	63°03.2	34.5	158°11.8	36.0	122°31.1	41.9	243°05.5	08.5
20	272°07.6	78°03.7	35.7	173°12.5	35.9	137°33.1	41.8	258°08.0	08.5
21	287°10.0	93°04.2	·· 36.8	188°13.2	·· 35.9	152°35.0	·· 41.6	273°10.6	·· 08.4
22	302°12.5	108°04.7	37.9	203°13.9	35.8	167°36.9	41.5	288°13.2	08.4
23	317°15.0	123°05.3	39.0	218°14.6	35.7	182°38.8	41.4	303°15.7	08.3
Mer.pass. 01:54		ν 0.5′	d 1.1′	m -4.51	ν 0.7′	d 0.1′	m 1.27	ν 1.9′	d 0.1′ m -1.79	ν 2.6′	d 0.1′ m 0.52

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°17.4	138°05.8	S08°40.2	233°15.3	N23°35.7	197°40.8	N17°41.2	318°18.3	N03°08.2
1	347°19.9	153°06.3	41.3	248°16.0	35.6	212°42.7	41.1	333°20.9	08.2
2	2°22.4	168°06.8	42.4	263°16.8	35.5	227°44.6	40.9	348°23.4	08.1
3	17°24.8	183°07.3	·· 43.6	278°17.5	·· 35.5	242°46.5	·· 40.8	3°26.0	·· 08.1
4	32°27.3	198°07.8	44.7	293°18.2	35.4	257°48.4	40.6	18°28.6	08.0
5	47°29.7	213°08.4	45.8	308°18.9	35.4	272°50.4	40.5	33°31.1	08.0
6	62°32.2	228°08.9	S08°47.0	323°19.6	N23°35.3	287°52.3	N17°40.3	48°33.7	N03°07.9
7	77°34.7	243°09.4	48.1	338°20.3	35.2	302°54.2	40.2	63°36.3	07.9
8	92°37.1	258°09.9	49.2	353°21.0	35.2	317°56.1	40.0	78°38.8	07.8
9	107°39.6	273°10.4	·· 50.3	8°21.7	·· 35.1	332°58.0	·· 39.9	93°41.4	·· 07.8
10	122°42.1	288°11.0	51.5	23°22.4	35.0	348°00.0	39.8	108°44.0	07.7
11	137°44.5	303°11.5	52.6	38°23.1	35.0	3°01.9	39.6	123°46.5	07.7
12	152°47.0	318°12.0	S08°53.7	53°23.8	N23°34.9	18°03.8	N17°39.5	138°49.1	N03°07.6
13	167°49.5	333°12.5	54.8	68°24.5	34.8	33°05.7	39.3	153°51.7	07.6
14	182°51.9	348°13.0	56.0	83°25.2	34.7	48°07.7	39.2	168°54.2	07.5
15	197°54.4	3°13.6	·· 57.1	98°25.9	·· 34.7	63°09.6	·· 39.0	183°56.8	·· 07.5
16	212°56.9	18°14.1	58.2	113°26.6	34.6	78°11.5	38.9	198°59.4	07.4
17	227°59.3	33°14.6	08°59.3	128°27.3	34.5	93°13.4	38.7	214°01.9	07.3
18	243°01.8	48°15.2	S09°00.5	143°28.0	N23°34.5	108°15.3	N17°38.6	229°04.5	N03°07.3
19	258°04.2	63°15.7	01.6	158°28.8	34.4	123°17.3	38.4	244°07.1	07.2
20	273°06.7	78°16.2	02.7	173°29.5	34.3	138°19.2	38.3	259°09.6	07.2
21	288°09.2	93°16.7	·· 03.8	188°30.2	·· 34.3	153°21.1	·· 38.1	274°12.2	·· 07.1
22	303°11.6	108°17.3	04.9	203°30.9	34.2	168°23.0	38.0	289°14.8	07.1
23	318°14.1	123°17.8	06.1	218°31.6	34.1	183°25.0	37.9	304°17.3	07.0
Mer.pass. 01:51		ν 0.5′	d 1.1′	m -4.52	ν 0.7′	d 0.1′	m 1.26	ν 1.9′	d 0.1′ m -1.79	ν 2.6′	d 0.1′ m 0.52

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	333°16.6	138°18.3	S09°07.2	233°32.3	N23°34.0	198°26.9	N17°37.7	319°19.9	N03°07.0
1	348°19.0	153°18.9	08.3	248°33.0	34.0	213°28.8	37.6	334°22.5	06.9
2	3°21.5	168°19.4	09.4	263°33.7	33.9	228°30.7	37.4	349°25.0	06.9
3	18°24.0	183°19.9	·· 10.5	278°34.4	·· 33.8	243°32.7	·· 37.3	4°27.6	·· 06.8
4	33°26.4	198°20.5	11.7	293°35.1	33.8	258°34.6	37.1	19°30.2	06.8
5	48°28.9	213°21.0	12.8	308°35.8	33.7	273°36.5	37.0	34°32.7	06.7
6	63°31.3	228°21.6	S09°13.9	323°36.5	N23°33.6	288°38.4	N17°36.8	49°35.3	N03°06.6
7	78°33.8	243°22.1	15.0	338°37.3	33.5	303°40.4	36.7	64°37.9	06.6
8	93°36.3	258°22.6	16.1	353°38.0	33.5	318°42.3	36.5	79°40.5	06.5
9	108°38.7	273°23.2	·· 17.3	8°38.7	·· 33.4	333°44.2	·· 36.4	94°43.0	·· 06.5
10	123°41.2	288°23.7	18.4	23°39.4	33.3	348°46.1	36.3	109°45.6	06.4
11	138°43.7	303°24.3	19.5	38°40.1	33.2	3°48.0	36.1	124°48.2	06.4
12	153°46.1	318°24.8	S09°20.6	53°40.8	N23°33.2	18°50.0	N17°36.0	139°50.7	N03°06.3
13	168°48.6	333°25.4	21.7	68°41.5	33.1	33°51.9	35.8	154°53.3	06.3
14	183°51.1	348°25.9	22.8	83°42.2	33.0	48°53.8	35.7	169°55.9	06.2
15	198°53.5	3°26.4	·· 24.0	98°42.9	·· 32.9	63°55.7	·· 35.5	184°58.5	·· 06.2
16	213°56.0	18°27.0	25.1	113°43.7	32.9	78°57.7	35.4	200°01.0	06.1
17	228°58.5	33°27.5	26.2	128°44.4	32.8	93°59.6	35.2	215°03.6	06.0
18	244°00.9	48°28.1	S09°27.3	143°45.1	N23°32.7	109°01.5	N17°35.1	230°06.2	N03°06.0
19	259°03.4	63°28.6	28.4	158°45.8	32.6	124°03.4	34.9	245°08.7	05.9
20	274°05.8	78°29.2	29.5	173°46.5	32.5	139°05.4	34.8	260°11.3	05.9
21	289°08.3	93°29.7	·· 30.6	188°47.2	·· 32.5	154°07.3	·· 34.6	275°13.9	·· 05.8
22	304°10.8	108°30.3	31.7	203°47.9	32.4	169°09.2	34.5	290°16.5	05.8
23	319°13.2	123°30.8	32.9	218°48.6	32.3	184°11.1	34.4	305°19.0	05.7
Mer.pass. 01:47		ν 0.5′	d 1.1′	m -4.53	ν 0.7′	d 0.1′	m 1.26	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.51

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.3
Ankaa	353°05.5	-42°09.4
Schedar	349°29.1	56°41.0
Diphda	348°45.7	-17°50.2
Achernar	335°18.8	-57°05.7
Hamal	327°49.5	23°35.4
Polaris	313°13.6	89°22.3
Acamar	315°10.6	-40°11.5
Menkar	314°04.7	4°11.8
Mirfak	308°26.2	49°57.2
Aldebaran	290°38.1	16°33.8
Rigel	281°02.7	-8°10.1
Capella	280°20.0	46°01.3
Bellatrix	278°21.5	6°22.5
Elnath	278°00.3	28°37.7
Alnilam	275°36.5	-1°11.0
Betelgeuse	270°50.8	7°24.8
Canopus	263°52.1	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.1	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°14.8	-59°35.5
Suhail	222°45.8	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°46.7	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.1	-63°15.0
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.1
Spica	158°21.1	-11°18.0
Alkaid	152°51.2	49°11.0
Hadar	148°34.4	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.7	-60°57.0
Kochab	137°20.2	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°06.9	-69°04.7
Sabik	102°01.1	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°38.9
Deneb	49°24.5	45°22.7
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.7	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Aug 23 Sun	SHA	Mer.pass
Venus	166°35.4	14:48
Mars	261°40.2	08:28
Jupiter	225°36.4	10:51
Saturn	345°58.5	02:50

Aug 24 Mon	SHA	Mer.pass
Venus	165°48.4	14:47
Mars	260°57.9	08:27
Jupiter	225°23.3	10:48
Saturn	346°00.9	02:46

Aug 25 Tue	SHA	Mer.pass
Venus	165°01.8	14:46
Mars	260°15.7	08:25
Jupiter	225°10.3	10:45
Saturn	346°03.3	02:42

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°18.3	N11°30.2	59°37.2	10.0′	S27°55.7	1.8′	54.2′
1	194°18.4	29.4	74°06.2	10.0′	27°53.9	2.0′	54.2′
2	209°18.6	28.5	88°35.2	10.0′	27°51.9	2.1′	54.2′
3	224°18.7	·· 27.7	103°04.2	10.0′	27°49.8	2.3′	54.2′
4	239°18.9	26.8	117°33.2	10.0′	27°47.5	2.4′	54.2′
5	254°19.1	26.0	132°02.2	10.0′	27°45.1	2.5′	54.2′
6	269°19.2	N11°25.2	146°31.2	10.1′	S27°42.6	2.6′	54.2′
7	284°19.4	24.3	161°00.3	10.1′	27°40.0	2.8′	54.2′
8	299°19.6	23.5	175°29.3	10.1′	27°37.2	3.0′	54.2′
9	314°19.7	·· 22.6	189°58.4	10.1′	27°34.2	3.0′	54.2′
10	329°19.9	21.8	204°27.5	10.1′	27°31.2	3.2′	54.2′
11	344°20.1	20.9	218°56.7	10.2′	27°28.0	3.3′	54.2′
12	359°20.2	N11°20.1	233°25.8	10.2′	S27°24.7	3.5′	54.2′
13	14°20.4	19.2	247°55.0	10.2′	27°21.2	3.6′	54.2′
14	29°20.6	18.4	262°24.2	10.2′	27°17.6	3.7′	54.2′
15	44°20.7	·· 17.5	276°53.4	10.2′	27°13.9	3.9′	54.2′
16	59°20.9	16.7	291°22.7	10.3′	27°10.0	4.0′	54.3′
17	74°21.1	15.8	305°51.9	10.3′	27°06.0	4.1′	54.3′
18	89°21.2	N11°15.0	320°21.2	10.3′	S27°01.9	4.2′	54.3′
19	104°21.4	14.1	334°50.6	10.4′	26°57.7	4.4′	54.3′
20	119°21.6	13.3	349°19.9	10.4′	26°53.3	4.5′	54.3′
21	134°21.7	·· 12.4	3°49.3	10.4′	26°48.8	4.7′	54.3′
22	149°21.9	11.6	18°18.7	10.4′	26°44.1	4.7′	54.3′
23	164°22.1	10.7	32°48.2	10.5′	26°39.4	4.9′	54.3′
	SD = 15.8′	d = 0.8′		SD = 14.8′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°22.2	N11°09.8	47°17.6	10.5′	S26°34.5	5.1′	54.3′
1	194°22.4	09.0	61°47.2	10.5′	26°29.4	5.1′	54.3′
2	209°22.6	08.1	76°16.7	10.6′	26°24.3	5.3′	54.3′
3	224°22.7	·· 07.3	90°46.3	10.6′	26°19.0	5.4′	54.4′
4	239°22.9	06.4	105°15.9	10.7′	26°13.6	5.6′	54.4′
5	254°23.1	05.6	119°45.6	10.7′	26°08.0	5.6′	54.4′
6	269°23.2	N11°04.7	134°15.2	10.7′	S26°02.4	5.8′	54.4′
7	284°23.4	03.9	148°45.0	10.8′	25°56.6	5.9′	54.4′
8	299°23.6	03.0	163°14.7	10.8′	25°50.7	6.1′	54.4′
9	314°23.7	·· 02.2	177°44.5	10.8′	25°44.6	6.2′	54.4′
10	329°23.9	01.3	192°14.4	10.9′	25°38.4	6.3′	54.4′
11	344°24.1	11°00.4	206°44.2	10.9′	25°32.1	6.4′	54.4′
12	359°24.2	N10°59.6	221°14.2	11.0′	S25°25.7	6.5′	54.5′
13	14°24.4	58.7	235°44.1	11.0′	25°19.2	6.7′	54.5′
14	29°24.6	57.9	250°14.1	11.0′	25°12.5	6.7′	54.5′
15	44°24.8	·· 57.0	264°44.2	11.1′	25°05.8	6.9′	54.5′
16	59°24.9	56.2	279°14.2	11.1′	24°58.9	7.1′	54.5′
17	74°25.1	55.3	293°44.4	11.2′	24°51.8	7.1′	54.5′
18	89°25.3	N10°54.4	308°14.5	11.2′	S24°44.7	7.3′	54.5′
19	104°25.4	53.6	322°44.7	11.3′	24°37.4	7.4′	54.6′
20	119°25.6	52.7	337°15.0	11.3′	24°30.0	7.5′	54.6′
21	134°25.8	·· 51.9	351°45.3	11.3′	24°22.5	7.6′	54.6′
22	149°25.9	51.0	6°15.7	11.4′	24°14.9	7.7′	54.6′
23	164°26.1	50.1	20°46.0	11.4′	24°07.2	7.9′	54.6′
	SD = 15.8′	d = 0.9′		SD = 14.8′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°26.3	N10°49.3	35°16.5	11.5′	S23°59.3	7.9′	54.6′
1	194°26.5	48.4	49°47.0	11.5′	23°51.4	8.1′	54.6′
2	209°26.6	47.6	64°17.5	11.6′	23°43.3	8.2′	54.7′
3	224°26.8	·· 46.7	78°48.1	11.6′	23°35.1	8.3′	54.7′
4	239°27.0	45.8	93°18.7	11.7′	23°26.8	8.4′	54.7′
5	254°27.2	45.0	107°49.4	11.7′	23°18.4	8.6′	54.7′
6	269°27.3	N10°44.1	122°20.1	11.8′	S23°09.8	8.6′	54.7′
7	284°27.5	43.3	136°50.8	11.8′	23°01.2	8.8′	54.7′
8	299°27.7	42.4	151°21.6	11.9′	22°52.4	8.8′	54.7′
9	314°27.8	·· 41.5	165°52.5	11.9′	22°43.6	9.0′	54.8′
10	329°28.0	40.7	180°23.4	12.0′	22°34.6	9.1′	54.8′
11	344°28.2	39.8	194°54.3	12.0′	22°25.5	9.2′	54.8′
12	359°28.4	N10°38.9	209°25.3	12.0′	S22°16.3	9.3′	54.8′
13	14°28.5	38.1	223°56.4	12.1′	22°07.0	9.4′	54.8′
14	29°28.7	37.2	238°27.5	12.1′	21°57.6	9.5′	54.8′
15	44°28.9	·· 36.3	252°58.6	12.2′	21°48.1	9.6′	54.9′
16	59°29.1	35.5	267°29.8	12.2′	21°38.5	9.7′	54.9′
17	74°29.2	34.6	282°01.1	12.3′	21°28.8	9.9′	54.9′
18	89°29.4	N10°33.7	296°32.3	12.3′	S21°18.9	9.9′	54.9′
19	104°29.6	32.9	311°03.7	12.4′	21°09.0	10.0′	54.9′
20	119°29.8	32.0	325°35.1	12.4′	20°59.0	10.1′	54.9′
21	134°29.9	·· 31.1	340°06.5	12.5′	20°48.9	10.3′	55.0′
22	149°30.1	30.3	354°38.0	12.5′	20°38.6	10.3′	55.0′
23	164°30.3	29.4	9°09.5	12.6′	20°28.3	10.4′	55.0′
	SD = 15.8′	d = 0.9′		SD = 14.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	01:15	03:20	20:41	22:38	////
N 70°	////	02:09	03:40	20:22	21:50	////
68°	////	02:41	03:56	20:06	21:20	////
66°	01:05	03:04	04:08	19:54	20:58	22:50
64°	01:53	03:22	04:19	19:44	20:40	22:07
62°	02:22	03:36	04:28	19:35	20:26	21:39
60°	02:43	03:48	04:36	19:27	20:15	21:19
N 58°	03:00	03:58	04:43	19:21	20:04	21:02
56°	03:14	04:07	04:48	19:15	19:56	20:48
54°	03:26	04:15	04:54	19:10	19:48	20:37
52°	03:36	04:22	04:59	19:05	19:41	20:27
50°	03:45	04:28	05:03	19:01	19:35	20:18
45°	04:04	04:41	05:12	18:52	19:22	20:00
N 40°	04:18	04:52	05:20	18:44	19:12	19:46
35°	04:29	05:00	05:27	18:37	19:04	19:35
30°	04:39	05:08	05:33	18:32	18:56	19:26
20°	04:53	05:20	05:42	18:22	18:45	19:11
N 10°	05:05	05:30	05:51	18:14	18:35	19:00
0°	05:14	05:38	05:59	18:06	18:27	18:51
S 10°	05:21	05:46	06:07	17:58	18:19	18:44
20°	05:27	05:53	06:15	17:50	18:12	18:38
30°	05:32	06:00	06:24	17:41	18:05	18:33
35°	05:35	06:04	06:30	17:35	18:01	18:31
40°	05:37	06:08	06:36	17:30	17:57	18:29
45°	05:39	06:13	06:43	17:23	17:53	18:27
S 50°	05:40	06:18	06:51	17:15	17:48	18:25
52°	05:41	06:20	06:55	17:11	17:45	18:25
54°	05:42	06:23	06:59	17:07	17:43	18:24
56°	05:42	06:25	07:04	17:02	17:40	18:24
58°	05:43	06:28	07:09	16:57	17:38	18:23
S 60°	05:43	06:31	07:14	16:51	17:34	18:23

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	21:04	▬	▬	23:57
66°	▬	▬	20:17	▬	▬	▬
64°	▬	20:10	19:47	▬	23:09	·· ··
62°	19:36	19:29	19:24	21:59	23:49	·· ··
60°	18:49	19:01	19:05	22:45	·· ··	00:17
N 58°	18:19	18:39	18:50	23:14	·· ··	00:38
56°	17:56	18:21	18:36	23:37	·· ··	00:56
54°	17:37	18:06	18:25	23:56	·· ··	01:11
52°	17:22	17:52	18:15	·· ··	00:11	01:23
50°	17:08	17:41	18:06	·· ··	00:25	01:35
45°	16:40	17:17	17:46	·· ··	00:52	01:58
N 40°	16:18	16:57	17:30	00:16	01:14	02:16
35°	15:59	16:41	17:17	00:35	01:32	02:32
30°	15:43	16:27	17:05	00:52	01:47	02:45
20°	15:17	16:03	16:45	01:19	02:13	03:08
N 10°	14:53	15:42	16:27	01:43	02:36	03:28
0°	14:32	15:22	16:11	02:05	02:56	03:46
S 10°	14:10	15:03	15:54	02:28	03:17	04:04
20°	13:47	14:42	15:36	02:51	03:39	04:23
30°	13:20	14:17	15:16	03:19	04:05	04:45
35°	13:04	14:03	15:04	03:35	04:20	04:58
40°	12:45	13:46	14:50	03:54	04:37	05:13
45°	12:23	13:26	14:33	04:17	04:58	05:31
S 50°	11:54	13:01	14:13	04:46	05:24	05:52
52°	11:40	12:48	14:03	05:00	05:36	06:03
54°	11:23	12:34	13:52	05:17	05:51	06:14
56°	11:04	12:18	13:39	05:37	06:08	06:27
58°	10:39	11:58	13:24	06:01	06:28	06:43
S 60°	10:06	11:33	13:07	06:35	06:53	07:01

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age 11-13 / 76-90%
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
23	02:47	02:39	12:03	20:44	08:19	
24	02:31	02:23	12:02	21:34	09:09	
25	02:15	02:07	12:02	22:22	09:58	

August 26, 27, 28 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	334°15.7	138°31.4	S09°34.0	233°49.4	N23°32.2	199°13.1	N17°34.2	320°21.6	N03°05.7
1	349°18.2	153°32.0	35.1	248°50.1	32.2	214°15.0	34.1	335°24.2	05.6
2	4°20.6	168°32.5	36.2	263°50.8	32.1	229°16.9	33.9	350°26.7	05.6
3	19°23.1	183°33.1	·· 37.3	278°51.5	·· 32.0	244°18.8	·· 33.8	5°29.3	·· 05.5
4	34°25.6	198°33.6	38.4	293°52.2	31.9	259°20.8	33.6	20°31.9	05.4
5	49°28.0	213°34.2	39.5	308°52.9	31.8	274°22.7	33.5	35°34.5	05.4
6	64°30.5	228°34.7	S09°40.6	323°53.6	N23°31.8	289°24.6	N17°33.3	50°37.0	N03°05.3
7	79°33.0	243°35.3	41.7	338°54.3	31.7	304°26.5	33.2	65°39.6	05.3
8	94°35.4	258°35.9	42.8	353°55.1	31.6	319°28.5	33.0	80°42.2	05.2
9	109°37.9	273°36.4	·· 43.9	8°55.8	·· 31.5	334°30.4	·· 32.9	95°44.8	·· 05.2
10	124°40.3	288°37.0	45.0	23°56.5	31.4	349°32.3	32.7	110°47.3	05.1
11	139°42.8	303°37.6	46.2	38°57.2	31.3	4°34.2	32.6	125°49.9	05.1
12	154°45.3	318°38.1	S09°47.3	53°57.9	N23°31.3	19°36.2	N17°32.5	140°52.5	N03°05.0
13	169°47.7	333°38.7	48.4	68°58.6	31.2	34°38.1	32.3	155°55.0	04.9
14	184°50.2	348°39.2	49.5	83°59.4	31.1	49°40.0	32.2	170°57.6	04.9
15	199°52.7	3°39.8	·· 50.6	99°00.1	·· 31.0	64°41.9	·· 32.0	186°00.2	·· 04.8
16	214°55.1	18°40.4	51.7	114°00.8	30.9	79°43.9	31.9	201°02.8	04.8
17	229°57.6	33°41.0	52.8	129°01.5	30.8	94°45.8	31.7	216°05.3	04.7
18	245°00.1	48°41.5	S09°53.9	144°02.2	N23°30.8	109°47.7	N17°31.6	231°07.9	N03°04.7
19	260°02.5	63°42.1	55.0	159°02.9	30.7	124°49.7	31.4	246°10.5	04.6
20	275°05.0	78°42.7	56.1	174°03.7	30.6	139°51.6	31.3	261°13.1	04.5
21	290°07.5	93°43.2	·· 57.2	189°04.4	·· 30.5	154°53.5	·· 31.1	276°15.6	·· 04.5
22	305°09.9	108°43.8	58.3	204°05.1	30.4	169°55.4	31.0	291°18.2	04.4
23	320°12.4	123°44.4	59.4	219°05.8	30.3	184°57.4	30.8	306°20.8	04.4
Mer.pass. 01:43		ν 0.6′	d 1.1′	m -4.55	ν 0.7′	d 0.1′	m 1.26	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.51

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°14.8	138°45.0	S10°00.5	234°06.5	N23°30.3	199°59.3	N17°30.7	321°23.4	N03°04.3
1	350°17.3	153°45.5	01.6	249°07.2	30.2	215°01.2	30.6	336°25.9	04.3
2	5°19.8	168°46.1	02.7	264°08.0	30.1	230°03.1	30.4	351°28.5	04.2
3	20°22.2	183°46.7	·· 03.8	279°08.7	·· 30.0	245°05.1	·· 30.3	6°31.1	·· 04.2
4	35°24.7	198°47.3	04.9	294°09.4	29.9	260°07.0	30.1	21°33.7	04.1
5	50°27.2	213°47.9	06.0	309°10.1	29.8	275°08.9	30.0	36°36.2	04.0
6	65°29.6	228°48.4	S10°07.1	324°10.8	N23°29.7	290°10.8	N17°29.8	51°38.8	N03°04.0
7	80°32.1	243°49.0	08.2	339°11.6	29.6	305°12.8	29.7	66°41.4	03.9
8	95°34.6	258°49.6	09.3	354°12.3	29.6	320°14.7	29.5	81°44.0	03.9
9	110°37.0	273°50.2	·· 10.4	9°13.0	·· 29.5	335°16.6	·· 29.4	96°46.6	·· 03.8
10	125°39.5	288°50.8	11.5	24°13.7	29.4	350°18.6	29.2	111°49.1	03.8
11	140°41.9	303°51.4	12.6	39°14.4	29.3	5°20.5	29.1	126°51.7	03.7
12	155°44.4	318°51.9	S10°13.7	54°15.1	N23°29.2	20°22.4	N17°29.0	141°54.3	N03°03.6
13	170°46.9	333°52.5	14.7	69°15.9	29.1	35°24.3	28.8	156°56.9	03.6
14	185°49.3	348°53.1	15.8	84°16.6	29.0	50°26.3	28.7	171°59.4	03.5
15	200°51.8	3°53.7	·· 16.9	99°17.3	·· 28.9	65°28.2	·· 28.5	187°02.0	·· 03.5
16	215°54.3	18°54.3	18.0	114°18.0	28.8	80°30.1	28.4	202°04.6	03.4
17	230°56.7	33°54.9	19.1	129°18.8	28.7	95°32.0	28.2	217°07.2	03.4
18	245°59.2	48°55.5	S10°20.2	144°19.5	N23°28.6	110°34.0	N17°28.1	232°09.7	N03°03.3
19	261°01.7	63°56.1	21.3	159°20.2	28.6	125°35.9	27.9	247°12.3	03.2
20	276°04.1	78°56.7	22.4	174°20.9	28.5	140°37.8	27.8	262°14.9	03.2
21	291°06.6	93°57.3	·· 23.5	189°21.6	·· 28.4	155°39.8	·· 27.6	277°17.5	·· 03.1
22	306°09.1	108°57.9	24.6	204°22.4	28.3	170°41.7	27.5	292°20.1	03.1
23	321°11.5	123°58.5	25.7	219°23.1	28.2	185°43.6	27.3	307°22.6	03.0
Mer.pass. 01:39		ν 0.6′	d 1.1′	m -4.56	ν 0.7′	d 0.1′	m 1.26	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.50

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	336°14.0	138°59.1	S10°26.8	234°23.8	N23°28.1	200°45.5	N17°27.2	322°25.2	N03°03.0
1	351°16.4	153°59.7	27.8	249°24.5	28.0	215°47.5	27.1	337°27.8	02.9
2	6°18.9	169°00.3	28.9	264°25.2	27.9	230°49.4	26.9	352°30.4	02.8
3	21°21.4	184°00.9	·· 30.0	279°26.0	·· 27.8	245°51.3	·· 26.8	7°33.0	·· 02.8
4	36°23.8	199°01.5	31.1	294°26.7	27.7	260°53.3	26.6	22°35.5	02.7
5	51°26.3	214°02.1	32.2	309°27.4	27.6	275°55.2	26.5	37°38.1	02.7
6	66°28.8	229°02.7	S10°33.3	324°28.1	N23°27.5	290°57.1	N17°26.3	52°40.7	N03°02.6
7	81°31.2	244°03.3	34.4	339°28.9	27.4	305°59.0	26.2	67°43.3	02.6
8	96°33.7	259°03.9	35.5	354°29.6	27.3	321°01.0	26.0	82°45.8	02.5
9	111°36.2	274°04.5	·· 36.5	9°30.3	·· 27.2	336°02.9	·· 25.9	97°48.4	·· 02.4
10	126°38.6	289°05.1	37.6	24°31.0	27.1	351°04.8	25.7	112°51.0	02.4
11	141°41.1	304°05.7	38.7	39°31.8	27.0	6°06.8	25.6	127°53.6	02.3
12	156°43.5	319°06.3	S10°39.8	54°32.5	N23°26.9	21°08.7	N17°25.4	142°56.2	N03°02.3
13	171°46.0	334°06.9	40.9	69°33.2	26.9	36°10.6	25.3	157°58.7	02.2
14	186°48.5	349°07.5	42.0	84°33.9	26.8	51°12.6	25.2	173°01.3	02.2
15	201°50.9	4°08.1	·· 43.0	99°34.7	·· 26.7	66°14.5	·· 25.0	188°03.9	·· 02.1
16	216°53.4	19°08.7	44.1	114°35.4	26.6	81°16.4	24.9	203°06.5	02.0
17	231°55.9	34°09.4	45.2	129°36.1	26.5	96°18.3	24.7	218°09.1	02.0
18	246°58.3	49°10.0	S10°46.3	144°36.8	N23°26.4	111°20.3	N17°24.6	233°11.7	N03°01.9
19	262°00.8	64°10.6	47.4	159°37.6	26.3	126°22.2	24.4	248°14.2	01.9
20	277°03.3	79°11.2	48.4	174°38.3	26.2	141°24.1	24.3	263°16.8	01.8
21	292°05.7	94°11.8	·· 49.5	189°39.0	·· 26.1	156°26.1	·· 24.1	278°19.4	·· 01.7
22	307°08.2	109°12.4	50.6	204°39.7	26.0	171°28.0	24.0	293°22.0	01.7
23	322°10.7	124°13.1	51.7	219°40.5	25.9	186°29.9	23.8	308°24.6	01.6
Mer.pass. 01:35		ν 0.6′	d 1.1′	m -4.57	ν 0.7′	d 0.1′	m 1.25	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.50

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.3
Ankaa	353°05.4	-42°09.4
Schedar	349°29.0	56°41.0
Diphda	348°45.7	-17°50.2
Achernar	335°18.8	-57°05.7
Hamal	327°49.5	23°35.4
Polaris	313°12.0	89°22.3
Acamar	315°10.6	-40°11.5
Menkar	314°04.6	4°11.8
Mirfak	308°26.2	49°57.2
Aldebaran	290°38.1	16°33.8
Rigel	281°02.6	-8°10.1
Capella	280°20.0	46°01.3
Bellatrix	278°21.5	6°22.5
Elnath	278°00.3	28°37.8
Alnilam	275°36.5	-1°10.9
Betelgeuse	270°50.8	7°24.8
Canopus	263°52.1	-52°42.3
Sirius	258°25.2	-16°45.0
Adhara	255°05.0	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°15.9	27°57.7
Avior	234°14.8	-59°35.5
Suhail	222°45.7	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°46.7	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°15.0
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.1
Spica	158°21.1	-11°18.0
Alkaid	152°51.2	49°11.0
Hadar	148°34.4	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.7	-60°57.0
Kochab	137°20.2	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.6	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°07.0	-69°04.7
Sabik	102°01.1	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.1	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°38.9
Deneb	49°24.5	45°22.7
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.7	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Aug 26 Wed	SHA	Mer.pass
Venus	164°15.7	14:45
Mars	259°33.6	08:24
Jupiter	224°57.4	10:42
Saturn	346°05.9	02:38

Aug 27 Thu	SHA	Mer.pass
Venus	163°30.1	14:44
Mars	258°51.7	08:23
Jupiter	224°44.4	10:39
Saturn	346°08.5	02:34

Aug 28 Fri	SHA	Mer.pass
Venus	162°45.1	14:43
Mars	258°09.8	08:22
Jupiter	224°31.6	10:36
Saturn	346°11.2	02:30

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°30.5	N10°28.5	23°41.1	12.6′	S20°17.9	10.6′	55.0′
1	194°30.6	27.7	38°12.7	12.7′	20°07.3	10.6′	55.0′
2	209°30.8	26.8	52°44.3	12.7′	19°56.7	10.7′	55.1′
3	224°31.0	·· 25.9	67°16.1	12.8′	19°46.0	10.8′	55.1′
4	239°31.2	25.1	81°47.8	12.8′	19°35.2	10.9′	55.1′
5	254°31.4	24.2	96°19.6	12.9′	19°24.3	11.0′	55.1′
6	269°31.5	N10°23.3	110°51.5	12.9′	S19°13.3	11.1′	55.1′
7	284°31.7	22.5	125°23.4	12.9′	19°02.2	11.2′	55.2′
8	299°31.9	21.6	139°55.3	13.0′	18°51.0	11.3′	55.2′
9	314°32.1	·· 20.7	154°27.3	13.0′	18°39.7	11.3′	55.2′
10	329°32.2	19.9	168°59.3	13.1′	18°28.4	11.5′	55.2′
11	344°32.4	19.0	183°31.4	13.1′	18°16.9	11.6′	55.2′
12	359°32.6	N10°18.1	198°03.5	13.2′	S18°05.3	11.6′	55.2′
13	14°32.8	17.2	212°35.7	13.2′	17°53.7	11.7′	55.3′
14	29°33.0	16.4	227°07.9	13.3′	17°42.0	11.8′	55.3′
15	44°33.1	·· 15.5	241°40.2	13.3′	17°30.2	11.9′	55.3′
16	59°33.3	14.6	256°12.4	13.3′	17°18.3	12.0′	55.3′
17	74°33.5	13.8	270°44.8	13.4′	17°06.3	12.0′	55.3′
18	89°33.7	N10°12.9	285°17.2	13.4′	S16°54.3	12.2′	55.4′
19	104°33.8	12.0	299°49.6	13.5′	16°42.1	12.2′	55.4′
20	119°34.0	11.1	314°22.0	13.5′	16°29.9	12.3′	55.4′
21	134°34.2	·· 10.3	328°54.5	13.5′	16°17.6	12.4′	55.4′
22	149°34.4	09.4	343°27.1	13.6′	16°05.2	12.5′	55.5′
23	164°34.6	08.5	357°59.6	13.6′	15°52.7	12.5′	55.5′
	SD = 15.8′	d = 0.9′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°34.7	N10°07.7	12°32.3	13.7′	S15°40.2	12.6′	55.5′
1	194°34.9	06.8	27°04.9	13.7′	15°27.6	12.7′	55.5′
2	209°35.1	05.9	41°37.6	13.7′	15°14.9	12.8′	55.5′
3	224°35.3	·· 05.0	56°10.3	13.8′	15°02.1	12.8′	55.6′
4	239°35.5	04.2	70°43.1	13.8′	14°49.3	12.9′	55.6′
5	254°35.7	03.3	85°15.9	13.8′	14°36.4	13.0′	55.6′
6	269°35.8	N10°02.4	99°48.7	13.9′	S14°23.4	13.1′	55.6′
7	284°36.0	01.5	114°21.6	13.9′	14°10.3	13.1′	55.6′
8	299°36.2	10°00.6	128°54.5	13.9′	13°57.2	13.2′	55.7′
9	314°36.4	09°59.8	143°27.4	14.0′	13°44.0	13.3′	55.7′
10	329°36.6	58.9	158°00.4	14.0′	13°30.7	13.3′	55.7′
11	344°36.7	58.0	172°33.4	14.0′	13°17.4	13.4′	55.7′
12	359°36.9	N09°57.1	187°06.4	14.1′	S13°04.0	13.5′	55.7′
13	14°37.1	56.3	201°39.5	14.1′	12°50.5	13.5′	55.8′
14	29°37.3	55.4	216°12.6	14.1′	12°37.0	13.6′	55.8′
15	44°37.5	·· 54.5	230°45.7	14.1′	12°23.4	13.7′	55.8′
16	59°37.7	53.6	245°18.8	14.2′	12°09.7	13.7′	55.8′
17	74°37.8	52.8	259°52.0	14.2′	11°56.0	13.8′	55.9′
18	89°38.0	N09°51.9	274°25.2	14.2′	S11°42.2	13.9′	55.9′
19	104°38.2	51.0	288°58.4	14.3′	11°28.3	13.9′	55.9′
20	119°38.4	50.1	303°31.7	14.3′	11°14.4	13.9′	55.9′
21	134°38.6	·· 49.2	318°05.0	14.3′	11°00.5	14.1′	55.9′
22	149°38.8	48.4	332°38.3	14.3′	10°46.4	14.0′	56.0′
23	164°38.9	47.5	347°11.6	14.3′	10°32.4	14.2′	56.0′
	SD = 15.8′	d = 0.9′	SD = 15.1′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°39.1	N09°46.6	1°44.9	14.4′	S10°18.2	14.2′	56.0′
1	194°39.3	45.7	16°18.3	14.4′	10°04.0	14.2′	56.0′
2	209°39.5	44.8	30°51.7	14.4′	09°49.8	14.3′	56.0′
3	224°39.7	·· 43.9	45°25.1	14.4′	09°35.5	14.3′	56.1′
4	239°39.9	43.1	59°58.5	14.4′	09°21.2	14.4′	56.1′
5	254°40.0	42.2	74°31.9	14.5′	09°06.8	14.5′	56.1′
6	269°40.2	N09°41.3	89°05.4	14.5′	S08°52.3	14.5′	56.1′
7	284°40.4	40.4	103°38.9	14.5′	08°37.8	14.5′	56.2′
8	299°40.6	39.5	118°12.4	14.5′	08°23.3	14.6′	56.2′
9	314°40.8	·· 38.7	132°45.9	14.5′	08°08.7	14.6′	56.2′
10	329°41.0	37.8	147°19.4	14.5′	07°54.1	14.7′	56.2′
11	344°41.2	36.9	161°52.9	14.5′	07°39.4	14.7′	56.2′
12	359°41.3	N09°36.0	176°26.4	14.5′	S07°24.7	14.8′	56.3′
13	14°41.5	35.1	191°00.0	14.6′	07°09.9	14.8′	56.3′
14	29°41.7	34.2	205°33.5	14.6′	06°55.1	14.9′	56.3′
15	44°41.9	·· 33.4	220°07.1	14.6′	06°40.2	14.8′	56.3′
16	59°42.1	32.5	234°40.7	14.6′	06°25.4	15.0′	56.4′
17	74°42.3	31.6	249°14.2	14.6′	06°10.4	14.9′	56.4′
18	89°42.5	N09°30.7	263°47.8	14.6′	S05°55.5	15.0′	56.4′
19	104°42.7	29.8	278°21.4	14.6′	05°40.5	15.0′	56.4′
20	119°42.8	28.9	292°55.0	14.6′	05°25.5	15.1′	56.4′
21	134°43.0	·· 28.0	307°28.6	14.6′	05°10.4	15.1′	56.5′
22	149°43.2	27.2	322°02.2	14.6′	04°55.3	15.1′	56.5′
23	164°43.4	26.3	336°35.8	14.6′	04°40.2	15.2′	56.5′
	SD = 15.8′	d = 0.9′	SD = 15.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	////	01:49	03:36	20:23	22:06	////
N 70°	////	02:29	03:53	20:07	21:28	////
68°	////	02:56	04:07	19:53	21:03	23:29
66°	01:34	03:16	04:19	19:42	20:43	22:22
64°	02:10	03:32	04:28	19:33	20:28	21:48
62°	02:35	03:45	04:36	19:25	20:15	21:25
60°	02:54	03:56	04:43	19:19	20:05	21:06
N 58°	03:09	04:06	04:49	19:13	19:56	20:51
56°	03:22	04:14	04:54	19:07	19:48	20:39
54°	03:33	04:21	04:59	19:03	19:41	20:28
52°	03:43	04:27	05:04	18:58	19:34	20:19
50°	03:51	04:33	05:07	18:55	19:29	20:11
45°	04:08	04:45	05:16	18:46	19:17	19:54
N 40°	04:21	04:55	05:23	18:39	19:07	19:41
35°	04:32	05:03	05:29	18:34	19:00	19:31
30°	04:41	05:10	05:34	18:28	18:53	19:22
20°	04:54	05:21	05:43	18:20	18:42	19:08
N 10°	05:05	05:30	05:51	18:12	18:33	18:58
0°	05:13	05:37	05:58	18:05	18:26	18:50
S 10°	05:19	05:44	06:05	17:58	18:19	18:44
20°	05:25	05:51	06:13	17:51	18:13	18:39
30°	05:29	05:57	06:21	17:42	18:07	18:34
35°	05:31	06:00	06:26	17:38	18:03	18:33
40°	05:32	06:04	06:31	17:32	18:00	18:31
45°	05:34	06:08	06:38	17:26	17:56	18:30
S 50°	05:35	06:12	06:45	17:19	17:52	18:29
52°	05:35	06:14	06:48	17:16	17:50	18:29
54°	05:35	06:16	06:52	17:12	17:48	18:29
56°	05:35	06:18	06:56	17:08	17:46	18:29
58°	05:35	06:21	07:01	17:03	17:44	18:29
S 60°	05:35	06:23	07:06	16:58	17:41	18:29

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	21:22	20:18	19:38	▬	01:18	03:56
N 70°	20:41	20:00	19:31	▬	01:57	04:12
68°	20:13	19:45	19:24	·· ··	02:24	04:24
66°	19:51	19:33	19:19	00:42	02:44	04:34
64°	19:34	19:23	19:15	01:12	03:00	04:43
62°	19:19	19:15	19:11	01:34	03:14	04:50
60°	19:07	19:07	19:07	01:52	03:25	04:56
N 58°	18:56	19:01	19:04	02:06	03:35	05:02
56°	18:47	18:55	19:01	02:19	03:43	05:06
54°	18:39	18:50	18:59	02:30	03:50	05:11
52°	18:32	18:45	18:57	02:40	03:57	05:14
50°	18:25	18:41	18:54	02:48	04:03	05:18
45°	18:10	18:31	18:50	03:06	04:16	05:25
N 40°	17:59	18:23	18:46	03:21	04:26	05:32
35°	17:48	18:17	18:43	03:33	04:35	05:37
30°	17:39	18:11	18:40	03:44	04:43	05:42
20°	17:24	18:00	18:35	04:03	04:57	05:50
N 10°	17:10	17:51	18:30	04:19	05:08	05:57
0°	16:57	17:42	18:26	04:33	05:19	06:03
S 10°	16:45	17:34	18:22	04:48	05:30	06:10
20°	16:31	17:24	18:17	05:04	05:41	06:17
30°	16:15	17:14	18:12	05:22	05:54	06:24
35°	16:06	17:07	18:09	05:32	06:02	06:29
40°	15:55	17:00	18:06	05:44	06:10	06:34
45°	15:42	16:52	18:02	05:58	06:20	06:39
S 50°	15:27	16:42	17:57	06:14	06:32	06:46
52°	15:20	16:37	17:55	06:22	06:37	06:49
54°	15:12	16:32	17:52	06:31	06:43	06:53
56°	15:03	16:27	17:50	06:40	06:50	06:57
58°	14:53	16:20	17:47	06:52	06:57	07:01
S 60°	14:41	16:13	17:43	07:04	07:05	07:05

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 95-100%
26	01:58	01:50	12:02	23:08	10:45	
27	01:41	01:32	12:02	23:53	11:31	
28	01:24	01:15	12:01	–:–	12:15	

August 29, 30, 31 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	337°13.1	139°13.7	S10°52.7	234°41.2	N23°25.8	201°31.9	N17°23.7	323°27.1	N03°01.6
1	352°15.6	154°14.3	53.8	249°41.9	25.7	216°33.8	23.5	338°29.7	01.5
2	7°18.0	169°14.9	54.9	264°42.7	25.6	231°35.7	23.4	353°32.3	01.5
3	22°20.5	184°15.6	·· 56.0	279°43.4	·· 25.5	246°37.6	·· 23.2	8°34.9	·· 01.4
4	37°23.0	199°16.2	57.1	294°44.1	25.4	261°39.6	23.1	23°37.5	01.3
5	52°25.4	214°16.8	58.1	309°44.8	25.3	276°41.5	23.0	38°40.0	01.3
6	67°27.9	229°17.4	S10°59.2	324°45.6	N23°25.2	291°43.4	N17°22.8	53°42.6	N03°01.2
7	82°30.4	244°18.1	11°00.3	339°46.3	25.1	306°45.4	22.7	68°45.2	01.2
8	97°32.8	259°18.7	01.4	354°47.0	24.9	321°47.3	22.5	83°47.8	01.1
9	112°35.3	274°19.3	·· 02.4	9°47.8	·· 24.8	336°49.2	·· 22.4	98°50.4	·· 01.0
10	127°37.8	289°20.0	03.5	24°48.5	24.7	351°51.2	22.2	113°53.0	01.0
11	142°40.2	304°20.6	04.6	39°49.2	24.6	6°53.1	22.1	128°55.5	00.9
12	157°42.7	319°21.2	S11°05.6	54°49.9	N23°24.5	21°55.0	N17°21.9	143°58.1	N03°00.9
13	172°45.1	334°21.9	06.7	69°50.7	24.4	36°57.0	21.8	159°00.7	00.8
14	187°47.6	349°22.5	07.8	84°51.4	24.3	51°58.9	21.6	174°03.3	00.7
15	202°50.1	4°23.1	·· 08.9	99°52.1	·· 24.2	67°00.8	·· 21.5	189°05.9	·· 00.7
16	217°52.5	19°23.8	09.9	114°52.9	24.1	82°02.7	21.3	204°08.5	00.6
17	232°55.0	34°24.4	11.0	129°53.6	24.0	97°04.7	21.2	219°11.0	00.6
18	247°57.5	49°25.0	S11°12.1	144°54.3	N23°23.9	112°06.6	N17°21.1	234°13.6	N03°00.5
19	262°59.9	64°25.7	13.1	159°55.1	23.8	127°08.5	20.9	249°16.2	00.4
20	278°02.4	79°26.3	14.2	174°55.8	23.7	142°10.5	20.8	264°18.8	00.4
21	293°04.9	94°27.0	·· 15.3	189°56.5	·· 23.6	157°12.4	·· 20.6	279°21.4	·· 00.3
22	308°07.3	109°27.6	16.3	204°57.3	23.5	172°14.3	20.5	294°24.0	00.3
23	323°09.8	124°28.2	17.4	219°58.0	23.4	187°16.3	20.3	309°26.6	00.2
Mer.pass.	01:31	ν 0.6′	d 1.1′	m -4.58	ν 0.7′	d 0.1′	m 1.25	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.49

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	338°12.3	139°28.9	S11°18.5	234°58.7	N23°23.3	202°18.2	N17°20.2	324°29.1	N03°00.1
1	353°14.7	154°29.5	19.5	249°59.4	23.2	217°20.1	20.0	339°31.7	00.1
2	8°17.2	169°30.2	20.6	265°00.2	23.0	232°22.1	19.9	354°34.3	00.0
3	23°19.6	184°30.8	·· 21.7	280°00.9	·· 22.9	247°24.0	·· 19.7	9°36.9	03°00.0
4	38°22.1	199°31.5	22.7	295°01.6	22.8	262°25.9	19.6	24°39.5	02°59.9
5	53°24.6	214°32.1	23.8	310°02.4	22.7	277°27.9	19.4	39°42.1	59.8
6	68°27.0	229°32.8	S11°24.8	325°03.1	N23°22.6	292°29.8	N17°19.3	54°44.6	N02°59.8
7	83°29.5	244°33.4	25.9	340°03.8	22.5	307°31.7	19.2	69°47.2	59.7
8	98°32.0	259°34.1	27.0	355°04.6	22.4	322°33.7	19.0	84°49.8	59.7
9	113°34.4	274°34.7	·· 28.0	10°05.3	·· 22.3	337°35.6	·· 18.9	99°52.4	·· 59.6
10	128°36.9	289°35.4	29.1	25°06.0	22.2	352°37.5	18.7	114°55.0	59.5
11	143°39.4	304°36.1	30.1	40°06.8	22.1	7°39.5	18.6	129°57.6	59.5
12	158°41.8	319°36.7	S11°31.2	55°07.5	N23°21.9	22°41.4	N17°18.4	145°00.2	N02°59.4
13	173°44.3	334°37.4	32.3	70°08.3	21.8	37°43.3	18.3	160°02.7	59.4
14	188°46.8	349°38.0	33.3	85°09.0	21.7	52°45.3	18.1	175°05.3	59.3
15	203°49.2	4°38.7	·· 34.4	100°09.7	·· 21.6	67°47.2	·· 18.0	190°07.9	·· 59.2
16	218°51.7	19°39.4	35.4	115°10.5	21.5	82°49.1	17.8	205°10.5	59.2
17	233°54.1	34°40.0	36.5	130°11.2	21.4	97°51.1	17.7	220°13.1	59.1
18	248°56.6	49°40.7	S11°37.6	145°11.9	N23°21.3	112°53.0	N17°17.5	235°15.7	N02°59.1
19	263°59.1	64°41.3	38.6	160°12.7	21.2	127°54.9	17.4	250°18.3	59.0
20	279°01.5	79°42.0	39.7	175°13.4	21.0	142°56.9	17.3	265°20.9	58.9
21	294°04.0	94°42.7	·· 40.7	190°14.1	·· 20.9	157°58.8	·· 17.1	280°23.4	·· 58.9
22	309°06.5	109°43.3	41.8	205°14.9	20.8	173°00.7	17.0	295°26.0	58.8
23	324°08.9	124°44.0	42.8	220°15.6	20.7	188°02.7	16.8	310°28.6	58.8
Mer.pass.	01:27	ν 0.6′	d 1.1′	m -4.59	ν 0.7′	d 0.1′	m 1.25	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.49

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	339°11.4	139°44.7	S11°43.9	235°16.3	N23°20.6	203°04.6	N17°16.7	325°31.2	N02°58.7
1	354°13.9	154°45.4	44.9	250°17.1	20.5	218°06.5	16.5	340°33.8	58.6
2	9°16.3	169°46.0	46.0	265°17.8	20.4	233°08.5	16.4	355°36.4	58.6
3	24°18.8	184°46.7	·· 47.0	280°18.6	·· 20.2	248°10.4	·· 16.2	10°39.0	·· 58.5
4	39°21.2	199°47.4	48.1	295°19.3	20.1	263°12.3	16.1	25°41.6	58.5
5	54°23.7	214°48.0	49.1	310°20.0	20.0	278°14.3	15.9	40°44.1	58.4
6	69°26.2	229°48.7	S11°50.2	325°20.8	N23°19.9	293°16.2	N17°15.8	55°46.7	N02°58.3
7	84°28.6	244°49.4	51.2	340°21.5	19.8	308°18.1	15.6	70°49.3	58.3
8	99°31.1	259°50.1	52.3	355°22.3	19.7	323°20.1	15.5	85°51.9	58.2
9	114°33.6	274°50.8	·· 53.3	10°23.0	·· 19.5	338°22.0	·· 15.3	100°54.5	·· 58.2
10	129°36.0	289°51.4	54.4	25°23.7	19.4	353°23.9	15.2	115°57.1	58.1
11	144°38.5	304°52.1	55.4	40°24.5	19.3	8°25.9	15.1	130°59.7	58.0
12	159°41.0	319°52.8	S11°56.5	55°25.2	N23°19.2	23°27.8	N17°14.9	146°02.3	N02°58.0
13	174°43.4	334°53.5	57.5	70°26.0	19.1	38°29.7	14.8	161°04.9	57.9
14	189°45.9	349°54.2	58.6	85°26.7	19.0	53°31.7	14.6	176°07.4	57.8
15	204°48.4	4°54.9	11°59.6	100°27.4	·· 18.8	68°33.6	·· 14.5	191°10.0	·· 57.8
16	219°50.8	19°55.5	12°00.7	115°28.2	18.7	83°35.6	14.3	206°12.6	57.7
17	234°53.3	34°56.2	01.7	130°28.9	18.6	98°37.5	14.2	221°15.2	57.7
18	249°55.7	49°56.9	S12°02.7	145°29.7	N23°18.5	113°39.4	N17°14.0	236°17.8	N02°57.6
19	264°58.2	64°57.6	03.8	160°30.4	18.4	128°41.4	13.9	251°20.4	57.5
20	280°00.7	79°58.3	04.8	175°31.1	18.2	143°43.3	13.7	266°23.0	57.5
21	295°03.1	94°59.0	·· 05.9	190°31.9	·· 18.1	158°45.2	·· 13.6	281°25.6	·· 57.4
22	310°05.6	109°59.7	06.9	205°32.6	18.0	173°47.2	13.4	296°28.2	57.4
23	325°08.1	125°00.4	07.9	220°33.4	17.9	188°49.1	13.3	311°30.8	57.3
Mer.pass.	01:23	ν 0.7′	d 1.1′	m -4.61	ν 0.7′	d 0.1′	m 1.25	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.48

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°29.0	56°41.0
Diphda	348°45.7	-17°50.2
Achernar	335°18.8	-57°05.7
Hamal	327°49.5	23°35.4
Polaris	313°10.7	89°22.3
Acamar	315°10.6	-40°11.5
Menkar	314°04.6	4°11.8
Mirfak	308°26.2	49°57.2
Aldebaran	290°38.1	16°33.8
Rigel	281°02.6	-8°10.1
Capella	280°20.0	46°01.3
Bellatrix	278°21.5	6°22.5
Elnath	278°00.2	28°37.8
Alnilam	275°36.4	-1°10.9
Betelgeuse	270°50.7	7°24.8
Canopus	263°52.1	-52°42.2
Sirius	258°25.2	-16°45.0
Adhara	255°05.0	-29°00.3
Procyon	244°49.6	5°09.5
Pollux	243°15.9	27°57.7
Avior	234°14.7	-59°35.5
Suhail	222°45.7	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°46.7	-8°46.4
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°15.0
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.1
Spica	158°21.1	-11°18.0
Alkaid	152°51.2	49°11.0
Hadar	148°34.4	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.7	-60°57.0
Kochab	137°20.3	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.7	26°37.7
Antares	112°14.1	-26°29.5
Atria	107°07.0	-69°04.8
Sabik	102°01.1	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.3	51°29.4
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.1	38°48.7
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.7
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Aug 29 Sat	SHA	Mer.pass
Venus	162°00.6	14:42
Mars	257°28.1	08:21
Jupiter	224°18.7	10:33
Saturn	346°14.0	02:26

Aug 30 Sun	SHA	Mer.pass
Venus	161°16.6	14:41
Mars	256°46.5	08:20
Jupiter	224°05.9	10:29
Saturn	346°16.9	02:22

Aug 31 Mon	SHA	Mer.pass
Venus	160°33.3	14:40
Mars	256°05.0	08:19
Jupiter	223°53.2	10:26
Saturn	346°19.8	02:18

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°43.6	N09°25.4	351°09.4	14.6′	S04°25.0	15.2′	56.5′
1	194°43.8	24.5	5°43.0	14.6′	04°09.8	15.2′	56.5′
2	209°44.0	23.6	20°16.5	14.6′	03°54.6	15.3′	56.6′
3	224°44.2	·· 22.7	34°50.1	14.6′	03°39.3	15.2′	56.6′
4	239°44.3	21.8	49°23.7	14.6′	03°24.1	15.3′	56.6′
5	254°44.5	20.9	63°57.3	14.6′	03°08.8	15.3′	56.6′
6	269°44.7	N09°20.1	78°30.8	14.6′	S02°53.5	15.4′	56.7′
7	284°44.9	19.2	93°04.4	14.5′	02°38.1	15.4′	56.7′
8	299°45.1	18.3	107°38.0	14.5′	02°22.7	15.4′	56.7′
9	314°45.3	·· 17.4	122°11.5	14.5′	02°07.3	15.4′	56.7′
10	329°45.5	16.5	136°45.0	14.5′	01°51.9	15.4′	56.7′
11	344°45.7	15.6	151°18.5	14.5′	01°36.5	15.4′	56.8′
12	359°45.9	N09°14.7	165°52.0	14.5′	S01°21.1	15.5′	56.8′
13	14°46.0	13.8	180°25.5	14.5′	01°05.6	15.5′	56.8′
14	29°46.2	12.9	194°59.0	14.5′	00°50.1	15.5′	56.8′
15	44°46.4	·· 12.0	209°32.5	14.4′	00°34.6	15.5′	56.8′
16	59°46.6	11.2	224°05.9	14.4′	00°19.1	15.5′	56.9′
17	74°46.8	10.3	238°39.3	14.4′	S00°03.6	15.5′	56.9′
18	89°47.0	N09°09.4	253°12.7	14.4′	N00°11.9	15.6′	56.9′
19	104°47.2	08.5	267°46.1	14.4′	00°27.5	15.5′	56.9′
20	119°47.4	07.6	282°19.5	14.3′	00°43.0	15.6′	57.0′
21	134°47.6	·· 06.7	296°52.8	14.3′	00°58.6	15.5′	57.0′
22	149°47.8	05.8	311°26.1	14.3′	01°14.1	15.6′	57.0′
23	164°48.0	04.9	325°59.4	14.3′	01°29.7	15.6′	57.0′
	SD = 15.8′	d = 0.9′		SD = 15.4′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.1	N09°04.0	340°32.6	14.2′	N01°45.3	15.6′	57.0′
1	194°48.3	03.1	355°05.9	14.2′	02°00.9	15.5′	57.1′
2	209°48.5	02.2	9°39.1	14.2′	02°16.4	15.6′	57.1′
3	224°48.7	·· 01.3	24°12.2	14.1′	02°32.0	15.6′	57.1′
4	239°48.9	09°00.4	38°45.4	14.1′	02°47.6	15.6′	57.1′
5	254°49.1	08°59.5	53°18.5	14.1′	03°03.2	15.5′	57.1′
6	269°49.3	N08°58.7	67°51.5	14.0′	N03°18.7	15.6′	57.2′
7	284°49.5	57.8	82°24.6	14.0′	03°34.3	15.6′	57.2′
8	299°49.7	56.9	96°57.6	14.0′	03°49.9	15.5′	57.2′
9	314°49.9	·· 56.0	111°30.5	13.9′	04°05.4	15.6′	57.2′
10	329°50.1	55.1	126°03.5	13.9′	04°21.0	15.5′	57.2′
11	344°50.3	54.2	140°36.3	13.8′	04°36.5	15.5′	57.3′
12	359°50.5	N08°53.3	155°09.2	13.8′	N04°52.0	15.5′	57.3′
13	14°50.6	52.4	169°42.0	13.8′	05°07.5	15.5′	57.3′
14	29°50.8	51.5	184°14.8	13.7′	05°23.0	15.5′	57.3′
15	44°51.0	·· 50.6	198°47.5	13.7′	05°38.5	15.5′	57.3′
16	59°51.2	49.7	213°20.1	13.6′	05°54.0	15.5′	57.4′
17	74°51.4	48.8	227°52.8	13.6′	06°09.5	15.4′	57.4′
18	89°51.6	N08°47.9	242°25.3	13.5′	N06°24.9	15.4′	57.4′
19	104°51.8	47.0	256°57.9	13.5′	06°40.3	15.4′	57.4′
20	119°52.0	46.1	271°30.3	13.4′	06°55.7	15.4′	57.4′
21	134°52.2	·· 45.2	286°02.8	13.4′	07°11.1	15.4′	57.5′
22	149°52.4	44.3	300°35.1	13.3′	07°26.5	15.3′	57.5′
23	164°52.6	43.4	315°07.5	13.3′	07°41.8	15.3′	57.5′
	SD = 15.8′	d = 0.9′		SD = 15.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°52.8	N08°42.5	329°39.7	13.2′	N07°57.1	15.3′	57.5′
1	194°53.0	41.6	344°11.9	13.2′	08°12.4	15.2′	57.5′
2	209°53.2	40.7	358°44.1	13.1′	08°27.6	15.2′	57.6′
3	224°53.4	·· 39.8	13°16.2	13.0′	08°42.8	15.2′	57.6′
4	239°53.6	38.9	27°48.2	13.0′	08°58.0	15.2′	57.6′
5	254°53.8	38.0	42°20.2	12.9′	09°13.2	15.1′	57.6′
6	269°54.0	N08°37.1	56°52.1	12.8′	N09°28.3	15.1′	57.6′
7	284°54.2	36.2	71°23.9	12.8′	09°43.4	15.0′	57.7′
8	299°54.3	35.3	85°55.7	12.7′	09°58.4	15.0′	57.7′
9	314°54.5	·· 34.4	100°27.5	12.7′	10°13.4	15.0′	57.7′
10	329°54.7	33.5	114°59.1	12.6′	10°28.4	14.9′	57.7′
11	344°54.9	32.6	129°30.7	12.5′	10°43.3	14.9′	57.7′
12	359°55.1	N08°31.7	144°02.2	12.4′	N10°58.2	14.9′	57.8′
13	14°55.3	30.8	158°33.7	12.4′	11°13.1	14.8′	57.8′
14	29°55.5	29.9	173°05.0	12.3′	11°27.9	14.7′	57.8′
15	44°55.7	·· 29.0	187°36.3	12.2′	11°42.6	14.7′	57.8′
16	59°55.9	28.1	202°07.6	12.2′	11°57.3	14.7′	57.8′
17	74°56.1	27.2	216°38.7	12.1′	12°12.0	14.6′	57.8′
18	89°56.3	N08°26.3	231°09.8	12.0′	N12°26.6	14.5′	57.9′
19	104°56.5	25.4	245°40.8	11.9′	12°41.1	14.5′	57.9′
20	119°56.7	24.5	260°11.8	11.9′	12°55.6	14.4′	57.9′
21	134°56.9	·· 23.6	274°42.6	11.8′	13°10.0	14.4′	57.9′
22	149°57.1	22.7	289°13.4	11.7′	13°24.4	14.4′	57.9′
23	164°57.3	21.8	303°44.1	11.6′	13°38.8	14.2′	58.0′
	SD = 15.8′	d = 0.9′		SD = 15.7′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:16	03:51	20:06	21:39	////
N 70°	////	02:48	04:06	19:52	21:09	////
68°	01:09	03:11	04:19	19:40	20:47	22:42
66°	01:57	03:29	04:28	19:31	20:30	21:59
64°	02:26	03:43	04:37	19:23	20:16	21:31
62°	02:47	03:54	04:44	19:16	20:05	21:11
60°	03:04	04:04	04:50	19:10	19:55	20:54
N 58°	03:18	04:13	04:55	19:04	19:47	20:41
56°	03:30	04:20	05:00	19:00	19:39	20:29
54°	03:40	04:27	05:05	18:56	19:33	20:20
52°	03:49	04:33	05:08	18:52	19:27	20:11
50°	03:56	04:38	05:12	18:48	19:22	20:03
45°	04:12	04:49	05:19	18:41	19:11	19:48
N 40°	04:25	04:58	05:26	18:35	19:03	19:36
35°	04:34	05:05	05:31	18:30	18:55	19:26
30°	04:43	05:11	05:36	18:25	18:49	19:18
20°	04:55	05:22	05:44	18:17	18:39	19:06
N 10°	05:05	05:30	05:51	18:10	18:32	18:56
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:58	18:19	18:44
20°	05:22	05:48	06:10	17:51	18:13	18:39
30°	05:26	05:54	06:18	17:44	18:08	18:36
35°	05:27	05:56	06:22	17:40	18:05	18:35
40°	05:28	05:59	06:27	17:35	18:02	18:34
45°	05:29	06:03	06:32	17:30	17:59	18:33
S 50°	05:29	06:06	06:39	17:23	17:56	18:33
52°	05:29	06:08	06:42	17:20	17:55	18:34
54°	05:28	06:09	06:45	17:17	17:53	18:34
56°	05:28	06:11	06:49	17:14	17:51	18:34
58°	05:28	06:13	06:53	17:10	17:49	18:35
S 60°	05:27	06:15	06:57	17:05	17:48	18:36

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	19:05	18:30	17:47	06:09	08:20	10:41
N 70°	19:05	18:39	18:08	06:14	08:14	10:22
68°	19:06	18:46	18:24	06:17	08:10	10:08
66°	19:06	18:53	18:38	06:20	08:06	09:56
64°	19:06	18:58	18:49	06:23	08:03	09:47
62°	19:07	19:02	18:58	06:25	08:00	09:39
60°	19:07	19:06	19:07	06:26	07:58	09:32
N 58°	19:07	19:10	19:14	06:28	07:56	09:26
56°	19:07	19:13	19:20	06:30	07:54	09:20
54°	19:07	19:16	19:26	06:31	07:52	09:16
52°	19:07	19:19	19:32	06:32	07:51	09:11
50°	19:08	19:21	19:36	06:33	07:49	09:07
45°	19:08	19:26	19:47	06:35	07:46	08:59
N 40°	19:08	19:31	19:55	06:37	07:44	08:52
35°	19:08	19:35	20:03	06:39	07:42	08:46
30°	19:09	19:38	20:10	06:40	07:40	08:41
20°	19:09	19:44	20:21	06:43	07:36	08:32
N 10°	19:09	19:49	20:31	06:45	07:33	08:24
0°	19:10	19:54	20:41	06:47	07:31	08:16
S 10°	19:10	19:59	20:51	06:49	07:28	08:09
20°	19:11	20:05	21:01	06:51	07:25	08:01
30°	19:11	20:11	21:13	06:53	07:22	07:52
35°	19:11	20:15	21:20	06:54	07:20	07:47
40°	19:12	20:19	21:29	06:56	07:18	07:41
45°	19:12	20:24	21:38	06:58	07:16	07:35
S 50°	19:13	20:30	21:49	07:00	07:13	07:27
52°	19:13	20:32	21:55	07:00	07:11	07:23
54°	19:13	20:35	22:01	07:01	07:10	07:19
56°	19:13	20:39	22:07	07:03	07:08	07:15
58°	19:14	20:42	22:15	07:04	07:06	07:10
S 60°	19:14	20:47	22:23	07:05	07:05	07:04

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 17-19 99-91%
29	01:06	00:57	12:01	00:36	12:58	
30	00:47	00:38	12:01	01:20	13:42	
31	00:29	00:19	12:00	02:05	14:29	

September 01, 02, 03 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	340°10.5	140°01.1	S12°09.0	235°34.1	N23°17.8	203°51.0	N17°13.2	326°33.3	N02°57.2
1	355°13.0	155°01.8	10.0	250°34.8	17.6	218°53.0	13.0	341°35.9	57.2
2	10°15.5	170°02.5	11.1	265°35.6	17.5	233°54.9	12.9	356°38.5	57.1
3	25°17.9	185°03.2	·· 12.1	280°36.3	·· 17.4	248°56.8	·· 12.7	11°41.1	·· 57.0
4	40°20.4	200°03.9	13.1	295°37.1	17.3	263°58.8	12.6	26°43.7	57.0
5	55°22.8	215°04.6	14.2	310°37.8	17.1	279°00.7	12.4	41°46.3	56.9
6	70°25.3	230°05.3	S12°15.2	325°38.6	N23°17.0	294°02.7	N17°12.3	56°48.9	N02°56.9
7	85°27.8	245°06.0	16.3	340°39.3	16.9	309°04.6	12.1	71°51.5	56.8
8	100°30.2	260°06.7	17.3	355°40.0	16.8	324°06.5	12.0	86°54.1	56.7
9	115°32.7	275°07.4	·· 18.3	10°40.8	·· 16.7	339°08.5	·· 11.8	101°56.7	·· 56.7
10	130°35.2	290°08.1	19.4	25°41.5	16.5	354°10.4	11.7	116°59.3	56.6
11	145°37.6	305°08.8	20.4	40°42.3	16.4	9°12.3	11.5	132°01.9	56.5
12	160°40.1	320°09.5	S12°21.4	55°43.0	N23°16.3	24°14.3	N17°11.4	147°04.4	N02°56.5
13	175°42.6	335°10.2	22.5	70°43.8	16.2	39°16.2	11.2	162°07.0	56.4
14	190°45.0	350°10.9	23.5	85°44.5	16.0	54°18.2	11.1	177°09.6	56.4
15	205°47.5	5°11.7	·· 24.5	100°45.3	·· 15.9	69°20.1	·· 11.0	192°12.2	·· 56.3
16	220°50.0	20°12.4	25.6	115°46.0	15.8	84°22.0	10.8	207°14.8	56.2
17	235°52.4	35°13.1	26.6	130°46.8	15.6	99°24.0	10.7	222°17.4	56.2
18	250°54.9	50°13.8	S12°27.6	145°47.5	N23°15.5	114°25.9	N17°10.5	237°20.0	N02°56.1
19	265°57.3	65°14.5	28.6	160°48.2	15.4	129°27.8	10.4	252°22.6	56.0
20	280°59.8	80°15.2	29.7	175°49.0	15.3	144°29.8	10.2	267°25.2	56.0
21	296°02.3	95°16.0	·· 30.7	190°49.7	·· 15.1	159°31.7	·· 10.1	282°27.8	·· 55.9
22	311°04.7	110°16.7	31.7	205°50.5	15.0	174°33.7	09.9	297°30.4	55.9
23	326°07.2	125°17.4	32.8	220°51.2	14.9	189°35.6	09.8	312°33.0	55.8
Mer.pass. 01:19		ν 0.7′	d 1.0′	m -4.62	ν 0.7′	d 0.1′	m 1.24	ν 1.9′	d 0.1′ m -1.80	ν 2.6′	d 0.1′ m 0.48

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	341°09.7	140°18.1	S12°33.8	235°52.0	N23°14.8	204°37.5	N17°09.6	327°35.6	N02°55.7
1	356°12.1	155°18.8	34.8	250°52.7	14.6	219°39.5	09.5	342°38.1	55.7
2	11°14.6	170°19.6	35.8	265°53.5	14.5	234°41.4	09.3	357°40.7	55.6
3	26°17.1	185°20.3	·· 36.9	280°54.2	·· 14.4	249°43.3	·· 09.2	12°43.3	·· 55.5
4	41°19.5	200°21.0	37.9	295°55.0	14.2	264°45.3	09.1	27°45.9	55.5
5	56°22.0	215°21.8	38.9	310°55.7	14.1	279°47.2	08.9	42°48.5	55.4
6	71°24.5	230°22.5	S12°39.9	325°56.5	N23°14.0	294°49.2	N17°08.8	57°51.1	N02°55.4
7	86°26.9	245°23.2	41.0	340°57.2	13.8	309°51.1	08.6	72°53.7	55.3
8	101°29.4	260°23.9	42.0	355°58.0	13.7	324°53.0	08.5	87°56.3	55.2
9	116°31.8	275°24.7	·· 43.0	10°58.7	·· 13.6	339°55.0	·· 08.3	102°58.9	·· 55.2
10	131°34.3	290°25.4	44.0	25°59.5	13.5	354°56.9	08.2	118°01.5	55.1
11	146°36.8	305°26.1	45.0	41°00.2	13.3	9°58.9	08.0	133°04.1	55.0
12	161°39.2	320°26.9	S12°46.1	56°01.0	N23°13.2	25°00.8	N17°07.9	148°06.7	N02°55.0
13	176°41.7	335°27.6	47.1	71°01.7	13.1	40°02.7	07.7	163°09.3	54.9
14	191°44.2	350°28.4	48.1	86°02.5	12.9	55°04.7	07.6	178°11.9	54.8
15	206°46.6	5°29.1	·· 49.1	101°03.2	·· 12.8	70°06.6	·· 07.4	193°14.5	·· 54.8
16	221°49.1	20°29.8	50.1	116°04.0	12.7	85°08.6	07.3	208°17.1	54.7
17	236°51.6	35°30.6	51.1	131°04.7	12.5	100°10.5	07.1	223°19.7	54.7
18	251°54.0	50°31.3	S12°52.2	146°05.5	N23°12.4	115°12.4	N17°07.0	238°22.3	N02°54.6
19	266°56.5	65°32.1	53.2	161°06.2	12.3	130°14.4	06.9	253°24.9	54.5
20	281°58.9	80°32.8	54.2	176°07.0	12.1	145°16.3	06.7	268°27.5	54.5
21	297°01.4	95°33.6	·· 55.2	191°07.7	·· 12.0	160°18.2	·· 06.6	283°30.0	·· 54.4
22	312°03.9	110°34.3	56.2	206°08.5	11.9	175°20.2	06.4	298°32.6	54.3
23	327°06.3	125°35.1	57.2	221°09.2	11.7	190°22.1	06.3	313°35.2	54.3
Mer.pass. 01:15		ν 0.7′	d 1.0′	m -4.63	ν 0.7′	d 0.1′	m 1.24	ν 1.9′	d 0.1′ m -1.81	ν 2.6′	d 0.1′ m 0.47

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	342°08.8	140°35.8	S12°58.2	236°10.0	N23°11.6	205°24.1	N17°06.1	328°37.8	N02°54.2
1	357°11.3	155°36.6	12°59.3	251°10.7	11.5	220°26.0	06.0	343°40.4	54.1
2	12°13.7	170°37.3	13°00.3	266°11.5	11.3	235°28.0	05.8	358°43.0	54.1
3	27°16.2	185°38.1	·· 01.3	281°12.2	·· 11.2	250°29.9	·· 05.7	13°45.6	·· 54.0
4	42°18.7	200°38.8	02.3	296°13.0	11.0	265°31.8	05.5	28°48.2	54.0
5	57°21.1	215°39.6	03.3	311°13.7	10.9	280°33.8	05.4	43°50.8	53.9
6	72°23.6	230°40.4	S13°04.3	326°14.5	N23°10.8	295°35.7	N17°05.2	58°53.4	N02°53.8
7	87°26.1	245°41.1	05.3	341°15.3	10.6	310°37.7	05.1	73°56.0	53.8
8	102°28.5	260°41.9	06.3	356°16.0	10.5	325°39.6	05.0	88°58.6	53.7
9	117°31.0	275°42.6	·· 07.3	11°16.8	·· 10.4	340°41.5	·· 04.8	104°01.2	·· 53.6
10	132°33.4	290°43.4	08.3	26°17.5	10.2	355°43.5	04.7	119°03.8	53.6
11	147°35.9	305°44.2	09.3	41°18.3	10.1	10°45.4	04.5	134°06.4	53.5
12	162°38.4	320°44.9	S13°10.3	56°19.0	N23°09.9	25°47.4	N17°04.4	149°09.0	N02°53.4
13	177°40.8	335°45.7	11.4	71°19.8	09.8	40°49.3	04.2	164°11.6	53.4
14	192°43.3	350°46.5	12.4	86°20.5	09.7	55°51.2	04.1	179°14.2	53.3
15	207°45.8	5°47.2	·· 13.4	101°21.3	·· 09.5	70°53.2	·· 03.9	194°16.8	·· 53.2
16	222°48.2	20°48.0	14.4	116°22.1	09.4	85°55.1	03.8	209°19.4	53.2
17	237°50.7	35°48.8	15.4	131°22.8	09.3	100°57.1	03.6	224°22.0	53.1
18	252°53.2	50°49.5	S13°16.4	146°23.6	N23°09.1	115°59.0	N17°03.5	239°24.6	N02°53.1
19	267°55.6	65°50.3	17.4	161°24.3	09.0	131°00.9	03.3	254°27.2	53.0
20	282°58.1	80°51.1	18.4	176°25.1	08.8	146°02.9	03.2	269°29.8	52.9
21	298°00.6	95°51.9	·· 19.4	191°25.8	·· 08.7	161°04.8	·· 03.1	284°32.4	·· 52.9
22	313°03.0	110°52.6	20.4	206°26.6	08.5	176°06.8	02.9	299°35.0	52.8
23	328°05.5	125°53.4	21.4	221°27.4	08.4	191°08.7	02.8	314°37.6	52.7
Mer.pass. 01:11		ν 0.8′	d 1.0′	m -4.64	ν 0.8′	d 0.1′	m 1.24	ν 1.9′	d 0.1′ m -1.81	ν 2.6′	d 0.1′ m 0.47

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°29.0	56°41.0
Diphda	348°45.6	-17°50.2
Achernar	335°18.8	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°09.1	89°22.3
Acamar	315°10.6	-40°11.5
Menkar	314°04.6	4°11.8
Mirfak	308°26.1	49°57.2
Aldebaran	290°38.1	16°33.8
Rigel	281°02.6	-8°10.1
Capella	280°20.0	46°01.3
Bellatrix	278°21.5	6°22.5
Elnath	278°00.2	28°37.8
Alnilam	275°36.4	-1°10.9
Betelgeuse	270°50.7	7°24.8
Canopus	263°52.0	-52°42.2
Sirius	258°25.2	-16°45.0
Adhara	255°05.0	-29°00.2
Procyon	244°49.6	5°09.5
Pollux	243°15.9	27°57.7
Avior	234°14.7	-59°35.5
Suhail	222°45.7	-43°32.3
Miaplacidus	221°38.9	-69°49.4
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.1
Spica	158°21.1	-11°18.0
Alkaid	152°51.2	49°11.0
Hadar	148°34.4	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.8	19°02.8
Rigil Kent.	139°38.7	-60°56.9
Kochab	137°20.3	74°03.0
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.1	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.1	38°48.7
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.7
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Sep 01 Tue	SHA	Mer.pass
Venus	159°50.6	14:39
Mars	255°23.6	08:17
Jupiter	223°40.5	10:23
Saturn	346°22.8	02:13

Sep 02 Wed	SHA	Mer.pass
Venus	159°08.5	14:38
Mars	254°42.3	08:16
Jupiter	223°27.9	10:20
Saturn	346°25.9	02:09

Sep 03 Thu	SHA	Mer.pass
Venus	158°27.0	14:37
Mars	254°01.2	08:15
Jupiter	223°15.3	10:17
Saturn	346°29.0	02:05

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h

Tue	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°57.5	N08°20.9	318°14.7	11.5′	N13°53.0	14.2′	58.0′
1	194°57.7	20.0	332°45.2	11.4′	14°07.2	14.2′	58.0′
2	209°57.9	19.0	347°15.7	11.4′	14°21.4	14.1′	58.0′
3	224°58.1	·· 18.1	1°46.0	11.3′	14°35.5	14.0′	58.0′
4	239°58.3	17.2	16°16.3	11.2′	14°49.5	13.9′	58.0′
5	254°58.5	16.3	30°46.5	11.1′	15°03.4	13.9′	58.1′
6	269°58.7	N08°15.4	45°16.6	11.0′	N15°17.3	13.8′	58.1′
7	284°58.9	14.5	59°46.6	10.9′	15°31.1	13.7′	58.1′
8	299°59.1	13.6	74°16.5	10.8′	15°44.8	13.7′	58.1′
9	314°59.3	·· 12.7	88°46.4	10.7′	15°58.5	13.6′	58.1′
10	329°59.5	11.8	103°16.1	10.7′	16°12.1	13.5′	58.1′
11	344°59.7	10.9	117°45.7	10.6′	16°25.6	13.4′	58.2′
12	359°59.9	N08°10.0	132°15.3	10.5′	N16°39.0	13.3′	58.2′
13	15°00.1	09.1	146°44.8	10.4′	16°52.3	13.3′	58.2′
14	30°00.3	08.2	161°14.1	10.3′	17°05.6	13.2′	58.2′
15	45°00.5	·· 07.3	175°43.4	10.2′	17°18.8	13.1′	58.2′
16	60°00.7	06.4	190°12.6	10.1′	17°31.9	13.0′	58.2′
17	75°00.9	05.4	204°41.7	10.0′	17°44.9	12.9′	58.3′
18	90°01.1	N08°04.5	219°10.7	9.9′	N17°57.8	12.9′	58.3′
19	105°01.3	03.6	233°39.6	9.8′	18°10.7	12.7′	58.3′
20	120°01.5	02.7	248°08.3	9.7′	18°23.4	12.7′	58.3′
21	135°01.7	·· 01.8	262°37.0	9.6′	18°36.1	12.5′	58.3′
22	150°01.9	00.9	277°05.6	9.5′	18°48.6	12.5′	58.3′
23	165°02.1	00.0	291°34.1	9.4′	19°01.1	12.3′	58.4′
	SD = 15.8′	d = 0.9′		SD = 15.8′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°02.3	N07°59.1	306°02.5	9.3′	N19°13.4	12.3′	58.4′
1	195°02.5	58.2	320°30.8	9.2′	19°25.7	12.2′	58.4′
2	210°02.7	57.3	334°59.0	9.1′	19°37.9	12.0′	58.4′
3	225°02.9	·· 56.3	349°27.0	9.0′	19°49.9	12.0′	58.4′
4	240°03.1	55.4	3°55.0	8.9′	20°01.9	11.8′	58.4′
5	255°03.3	54.5	18°22.9	8.8′	20°13.7	11.8′	58.5′
6	270°03.5	N07°53.6	32°50.7	8.7′	N20°25.5	11.6′	58.5′
7	285°03.7	52.7	47°18.3	8.6′	20°37.1	11.5′	58.5′
8	300°03.9	51.8	61°45.9	8.5′	20°48.6	11.4′	58.5′
9	315°04.1	·· 50.9	76°13.4	8.4′	21°00.0	11.3′	58.5′
10	330°04.3	50.0	90°40.7	8.2′	21°11.3	11.2′	58.5′
11	345°04.5	49.0	105°08.0	8.1′	21°22.5	11.1′	58.5′
12	0°04.7	N07°48.1	119°35.1	8.0′	N21°33.6	10.9′	58.6′
13	15°04.9	47.2	134°02.1	7.9′	21°44.5	10.8′	58.6′
14	30°05.1	46.3	148°29.1	7.8′	21°55.3	10.7′	58.6′
15	45°05.3	·· 45.4	162°55.9	7.7′	22°06.0	10.6′	58.6′
16	60°05.5	44.5	177°22.6	7.6′	22°16.6	10.4′	58.6′
17	75°05.7	43.6	191°49.2	7.5′	22°27.0	10.4′	58.6′
18	90°05.9	N07°42.6	206°15.7	7.4′	N22°37.4	10.1′	58.7′
19	105°06.1	41.7	220°42.1	7.3′	22°47.5	10.1′	58.7′
20	120°06.3	40.8	235°08.4	7.2′	22°57.6	9.9′	58.7′
21	135°06.5	·· 39.9	249°34.6	7.1′	23°07.5	9.8′	58.7′
22	150°06.7	39.0	264°00.7	7.0′	23°17.3	9.7′	58.7′
23	165°06.9	38.1	278°26.7	6.9′	23°27.0	9.5′	58.7′
	SD = 15.8′	d = 0.9′		SD = 15.9′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°07.1	N07°37.2	292°52.6	6.8′	N23°36.5	9.4′	58.7′
1	195°07.3	36.2	307°18.4	6.7′	23°45.9	9.2′	58.7′
2	210°07.5	35.3	321°44.0	6.6′	23°55.1	9.1′	58.8′
3	225°07.7	·· 34.4	336°09.6	6.5′	24°04.2	8.9′	58.8′
4	240°08.0	33.5	350°35.1	6.4′	24°13.1	8.9′	58.8′
5	255°08.2	32.6	5°00.4	6.3′	24°22.0	8.6′	58.8′
6	270°08.4	N07°31.7	19°25.7	6.2′	N24°30.6	8.5′	58.8′
7	285°08.6	30.7	33°50.9	6.1′	24°39.1	8.4′	58.8′
8	300°08.8	29.8	48°15.9	6.0′	24°47.5	8.2′	58.8′
9	315°09.0	·· 28.9	62°40.9	5.9′	24°55.7	8.0′	58.9′
10	330°09.2	28.0	77°05.8	5.8′	25°03.7	7.9′	58.9′
11	345°09.4	27.1	91°30.5	5.7′	25°11.6	7.8′	58.9′
12	0°09.6	N07°26.2	105°55.2	5.6′	N25°19.4	7.6′	58.9′
13	15°09.8	25.2	120°19.8	5.5′	25°27.0	7.4′	58.9′
14	30°10.0	24.3	134°44.3	5.4′	25°34.4	7.2′	58.9′
15	45°10.2	·· 23.4	149°08.7	5.3′	25°41.6	7.1′	58.9′
16	60°10.4	22.5	163°33.0	5.2′	25°48.7	7.0′	58.9′
17	75°10.6	21.6	177°57.2	5.1′	25°55.7	6.8′	59.0′
18	90°10.8	N07°20.6	192°21.3	5.0′	N26°02.5	6.6′	59.0′
19	105°11.0	19.7	206°45.4	4.9′	26°09.1	6.4′	59.0′
20	120°11.2	18.8	221°09.3	4.9′	26°15.5	6.3′	59.0′
21	135°11.4	·· 17.9	235°33.2	4.8′	26°21.8	6.1′	59.0′
22	150°11.6	17.0	249°56.9	4.7′	26°27.9	5.9′	59.0′
23	165°11.8	16.0	264°20.6	4.6′	26°33.8	5.7′	59.0′
	SD = 15.8′	d = 0.9′		SD = 16.0′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:38	04:06	19:50	21:16	////
N 70°	00:10	03:05	04:19	19:37	20:50	23:15
68°	01:40	03:25	04:30	19:27	20:31	22:12
66°	02:16	03:40	04:38	19:19	20:16	21:39
64°	02:40	03:53	04:46	19:12	20:04	21:15
62°	02:59	04:03	04:52	19:06	19:54	20:57
60°	03:14	04:12	04:57	19:01	19:45	20:43
N 58°	03:27	04:20	05:02	18:56	19:38	20:30
56°	03:37	04:27	05:06	18:52	19:31	20:20
54°	03:47	04:33	05:10	18:48	19:25	20:11
52°	03:55	04:38	05:13	18:45	19:20	20:03
50°	04:02	04:43	05:16	18:42	19:15	19:56
45°	04:16	04:53	05:23	18:35	19:06	19:42
N 40°	04:28	05:01	05:29	18:30	18:58	19:31
35°	04:37	05:08	05:33	18:25	18:51	19:22
30°	04:45	05:13	05:38	18:21	18:46	19:14
20°	04:56	05:22	05:45	18:14	18:37	19:03
N 10°	05:05	05:30	05:51	18:08	18:30	18:54
0°	05:11	05:36	05:56	18:03	18:24	18:48
S 10°	05:16	05:41	06:02	17:58	18:19	18:43
20°	05:20	05:46	06:08	17:52	18:14	18:40
30°	05:22	05:50	06:14	17:46	18:10	18:37
35°	05:23	05:53	06:18	17:42	18:07	18:37
40°	05:24	05:55	06:22	17:38	18:05	18:37
45°	05:23	05:57	06:27	17:33	18:03	18:37
S 50°	05:23	06:00	06:32	17:28	18:00	18:38
52°	05:22	06:01	06:35	17:25	17:59	18:38
54°	05:22	06:02	06:38	17:22	17:58	18:39
56°	05:21	06:04	06:41	17:19	17:57	18:40
58°	05:20	06:05	06:44	17:16	17:56	18:41
S 60°	05:18	06:06	06:48	17:12	17:54	18:42

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	16:18	▭	▭	13:53	▭	▭
N 70°	17:17	▭	▭	12:55	▭	▭
68°	17:53	▭	▭	12:22	▭	▭
66°	18:18	17:42	▭	11:58	14:24	▭
64°	18:38	18:23	17:36	11:39	13:45	16:31
62°	18:54	18:51	18:47	11:24	13:18	15:21
60°	19:08	19:12	19:23	11:11	12:57	14:46
N 58°	19:20	19:30	19:49	11:00	12:40	14:20
56°	19:30	19:45	20:09	10:51	12:25	14:00
54°	19:39	19:58	20:26	10:43	12:13	13:43
52°	19:48	20:09	20:41	10:35	12:02	13:29
50°	19:55	20:20	20:54	10:29	11:53	13:17
45°	20:11	20:41	21:21	10:14	11:32	12:51
N 40°	20:24	20:59	21:42	10:03	11:16	12:30
35°	20:35	21:13	21:59	09:53	11:02	12:14
30°	20:45	21:26	22:15	09:44	10:51	11:59
20°	21:02	21:48	22:41	09:29	10:30	11:34
N 10°	21:17	22:07	23:03	09:16	10:13	11:13
0°	21:31	22:26	23:24	09:04	09:57	10:53
S 10°	21:45	22:44	23:45	08:53	09:40	10:33
20°	22:01	23:03	·· ··	08:40	09:23	10:12
30°	22:19	23:26	·· ··	08:25	09:03	09:48
35°	22:29	23:40	·· ··	08:17	08:52	09:34
40°	22:41	23:55	·· ··	08:08	08:39	09:17
45°	22:55	·· ··	00:14	07:56	08:23	08:57
S 50°	23:12	·· ··	00:37	07:43	08:04	08:33
52°	23:21	·· ··	00:49	07:37	07:55	08:21
54°	23:30	·· ··	01:01	07:30	07:45	08:08
56°	23:40	·· ··	01:16	07:23	07:34	07:52
58°	23:52	·· ··	01:34	07:14	07:21	07:34
S 60°	·· ··	00:06	01:55	07:05	07:07	07:12

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 20-22 84-65%
01	00:10	00:00	12:00	02:53	15:18	
02	00:09	00:19	12:00	03:44	16:11	
03	00:29	00:38	11:59	04:39	17:09	

September 04, 05, 06 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°07.9	140°54.2	S13°22.4	236°28.1	N23°08.3	206°10.7	N17°02.6	329°40.2	N02°52.7
1	358°10.4	155°55.0	23.4	251°28.9	08.1	221°12.6	02.5	344°42.8	52.6
2	13°12.9	170°55.8	24.4	266°29.6	08.0	236°14.5	02.3	359°45.4	52.5
3	28°15.3	185°56.6	·· 25.4	281°30.4	·· 07.8	251°16.5	·· 02.2	14°48.0	·· 52.5
4	43°17.8	200°57.3	26.4	296°31.1	07.7	266°18.4	02.0	29°50.6	52.4
5	58°20.3	215°58.1	27.3	311°31.9	07.6	281°20.4	01.9	44°53.2	52.3
6	73°22.7	230°58.9	S13°28.3	326°32.7	N23°07.4	296°22.3	N17°01.7	59°55.8	N02°52.3
7	88°25.2	245°59.7	29.3	341°33.4	07.3	311°24.3	01.6	74°58.4	52.2
8	103°27.7	261°00.5	30.3	356°34.2	07.1	326°26.2	01.4	90°01.0	52.1
9	118°30.1	276°01.3	·· 31.3	11°34.9	·· 07.0	341°28.1	·· 01.3	105°03.6	·· 52.1
10	133°32.6	291°02.1	32.3	26°35.7	06.8	356°30.1	01.1	120°06.2	52.0
11	148°35.1	306°02.9	33.3	41°36.5	06.7	11°32.0	01.0	135°08.8	51.9
12	163°37.5	321°03.7	S13°34.3	56°37.2	N23°06.5	26°34.0	N17°00.9	150°11.4	N02°51.9
13	178°40.0	336°04.5	35.3	71°38.0	06.4	41°35.9	00.7	165°14.0	51.8
14	193°42.4	351°05.3	36.3	86°38.7	06.3	56°37.9	00.6	180°16.6	51.8
15	208°44.9	6°06.1	·· 37.3	101°39.5	·· 06.1	71°39.8	·· 00.4	195°19.2	·· 51.7
16	223°47.4	21°06.9	38.2	116°40.3	06.0	86°41.7	00.3	210°21.8	51.6
17	238°49.8	36°07.7	39.2	131°41.0	05.8	101°43.7	00.1	225°24.4	51.6
18	253°52.3	51°08.5	S13°40.2	146°41.8	N23°05.7	116°45.6	N17°00.0	240°27.0	N02°51.5
19	268°54.8	66°09.3	41.2	161°42.6	05.5	131°47.6	16°59.8	255°29.6	51.4
20	283°57.2	81°10.1	42.2	176°43.3	05.4	146°49.5	59.7	270°32.2	51.4
21	298°59.7	96°10.9	·· 43.2	191°44.1	·· 05.2	161°51.5	·· 59.5	285°34.8	·· 51.3
22	314°02.2	111°11.7	44.2	206°44.8	05.1	176°53.4	59.4	300°37.4	51.2
23	329°04.6	126°12.5	45.1	221°45.6	04.9	191°55.4	59.2	315°40.0	51.2
Mer.pass.	01:07	ν 0.8′	d 1.0′	m -4.65	ν 0.8′	d 0.1′	m 1.23	ν 1.9′	d 0.1′ m -1.81	ν 2.6′	d 0.1′ m 0.46

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°07.1	141°13.3	S13°46.1	236°46.4	N23°04.8	206°57.3	N16°59.1	330°42.6	N02°51.1
1	359°09.5	156°14.1	47.1	251°47.1	04.6	221°59.2	59.0	345°45.2	51.0
2	14°12.0	171°14.9	48.1	266°47.9	04.5	237°01.2	58.8	0°47.8	51.0
3	29°14.5	186°15.8	·· 49.1	281°48.7	·· 04.3	252°03.1	·· 58.7	15°50.4	·· 50.9
4	44°16.9	201°16.6	50.1	296°49.4	04.2	267°05.1	58.5	30°53.0	50.8
5	59°19.4	216°17.4	51.0	311°50.2	04.0	282°07.0	58.4	45°55.6	50.8
6	74°21.9	231°18.2	S13°52.0	326°51.0	N23°03.9	297°09.0	N16°58.2	60°58.2	N02°50.7
7	89°24.3	246°19.0	53.0	341°51.7	03.7	312°10.9	58.1	76°00.8	50.6
8	104°26.8	261°19.9	54.0	356°52.5	03.6	327°12.9	57.9	91°03.4	50.6
9	119°29.3	276°20.7	·· 54.9	11°53.3	·· 03.4	342°14.8	·· 57.8	106°06.0	·· 50.5
10	134°31.7	291°21.5	55.9	26°54.0	03.3	357°16.7	57.6	121°08.6	50.4
11	149°34.2	306°22.3	56.9	41°54.8	03.1	12°18.7	57.5	136°11.2	50.4
12	164°36.7	321°23.1	S13°57.9	56°55.5	N23°03.0	27°20.6	N16°57.3	151°13.8	N02°50.3
13	179°39.1	336°24.0	58.8	71°56.3	02.8	42°22.6	57.2	166°16.4	50.2
14	194°41.6	351°24.8	13°59.8	86°57.1	02.7	57°24.5	57.1	181°19.0	50.2
15	209°44.0	6°25.6	14°00.8	101°57.8	·· 02.5	72°26.5	·· 56.9	196°21.6	·· 50.1
16	224°46.5	21°26.5	01.8	116°58.6	02.4	87°28.4	56.8	211°24.2	50.0
17	239°49.0	36°27.3	02.7	131°59.4	02.2	102°30.4	56.6	226°26.8	50.0
18	254°51.4	51°28.1	S14°03.7	147°00.2	N23°02.1	117°32.3	N16°56.5	241°29.4	N02°49.9
19	269°53.9	66°29.0	04.7	162°00.9	01.9	132°34.3	56.3	256°32.0	49.8
20	284°56.4	81°29.8	05.7	177°01.7	01.8	147°36.2	56.2	271°34.7	49.8
21	299°58.8	96°30.6	·· 06.6	192°02.5	·· 01.6	162°38.2	·· 56.0	286°37.3	·· 49.7
22	315°01.3	111°31.5	07.6	207°03.2	01.5	177°40.1	55.9	301°39.9	49.6
23	330°03.8	126°32.3	08.6	222°04.0	01.3	192°42.0	55.7	316°42.5	49.6
Mer.pass.	01:03	ν 0.8′	d 1.0′	m -4.66	ν 0.8′	d 0.1′	m 1.23	ν 1.9′	d 0.1′ m -1.81	ν 2.6′	d 0.1′ m 0.46

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	345°06.2	141°33.2	S14°09.5	237°04.8	N23°01.1	207°44.0	N16°55.6	331°45.1	N02°49.5
1	0°08.7	156°34.0	10.5	252°05.5	01.0	222°45.9	55.4	346°47.7	49.4
2	15°11.2	171°34.9	11.5	267°06.3	00.8	237°47.9	55.3	1°50.3	49.4
3	30°13.6	186°35.7	·· 12.4	282°07.1	·· 00.7	252°49.8	·· 55.2	16°52.9	·· 49.3
4	45°16.1	201°36.6	13.4	297°07.8	00.5	267°51.8	55.0	31°55.5	49.2
5	60°18.5	216°37.4	14.4	312°08.6	00.4	282°53.7	54.9	46°58.1	49.2
6	75°21.0	231°38.3	S14°15.3	327°09.4	N23°00.2	297°55.7	N16°54.7	62°00.7	N02°49.1
7	90°23.5	246°39.1	16.3	342°10.2	23°00.1	312°57.6	54.6	77°03.3	49.0
8	105°25.9	261°40.0	17.2	357°10.9	22°59.9	327°59.6	54.4	92°05.9	49.0
9	120°28.4	276°40.8	·· 18.2	12°11.7	·· 59.7	343°01.5	·· 54.3	107°08.5	·· 48.9
10	135°30.9	291°41.7	19.2	27°12.5	59.6	358°03.5	54.1	122°11.1	48.8
11	150°33.3	306°42.5	20.1	42°13.2	59.4	13°05.4	54.0	137°13.7	48.8
12	165°35.8	321°43.4	S14°21.1	57°14.0	N22°59.3	28°07.4	N16°53.8	152°16.3	N02°48.7
13	180°38.3	336°44.3	22.0	72°14.8	59.1	43°09.3	53.7	167°18.9	48.6
14	195°40.7	351°45.1	23.0	87°15.6	58.9	58°11.3	53.5	182°21.5	48.6
15	210°43.2	6°46.0	·· 24.0	102°16.3	·· 58.8	73°13.2	·· 53.4	197°24.2	·· 48.5
16	225°45.7	21°46.8	24.9	117°17.1	58.6	88°15.2	53.3	212°26.8	48.4
17	240°48.1	36°47.7	25.9	132°17.9	58.5	103°17.1	53.1	227°29.4	48.4
18	255°50.6	51°48.6	S14°26.8	147°18.6	N22°58.3	118°19.0	N16°53.0	242°32.0	N02°48.3
19	270°53.0	66°49.4	27.8	162°19.4	58.2	133°21.0	52.8	257°34.6	48.2
20	285°55.5	81°50.3	28.7	177°20.2	58.0	148°22.9	52.7	272°37.2	48.2
21	300°58.0	96°51.2	·· 29.7	192°21.0	·· 57.8	163°24.9	·· 52.5	287°39.8	·· 48.1
22	316°00.4	111°52.1	30.6	207°21.7	57.7	178°26.8	52.4	302°42.4	48.0
23	331°02.9	126°52.9	31.6	222°22.5	57.5	193°28.8	52.2	317°45.0	48.0
Mer.pass.	00:59	ν 0.8′	d 1.0′	m -4.68	ν 0.8′	d 0.2′	m 1.23	ν 1.9′	d 0.1′ m -1.81	ν 2.6′	d 0.1′ m 0.45

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°29.0	56°41.0
Diphda	348°45.6	-17°50.2
Achernar	335°18.7	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°07.3	89°22.3
Acamar	315°10.5	-40°11.5
Menkar	314°04.6	4°11.8
Mirfak	308°26.1	49°57.2
Aldebaran	290°38.0	16°33.8
Rigel	281°02.6	-8°10.0
Capella	280°19.9	46°01.3
Bellatrix	278°21.5	6°22.5
Elnath	278°00.2	28°37.8
Alnilam	275°36.4	-1°10.9
Betelgeuse	270°50.7	7°24.8
Canopus	263°52.0	-52°42.2
Sirius	258°25.2	-16°45.0
Adhara	255°05.0	-29°00.2
Procyon	244°49.6	5°09.5
Pollux	243°15.9	27°57.7
Avior	234°14.7	-59°35.5
Suhail	222°45.7	-43°32.2
Miaplacidus	221°38.9	-69°49.4
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.5
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°11.0
Hadar	148°34.5	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.9	19°02.8
Rigil Kent.	139°38.8	-60°56.9
Kochab	137°20.4	74°02.9
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.1	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.1	38°48.7
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.7
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Sep 04 Fri	SHA	Mer.pass
Venus	157°46.3	14:36
Mars	253°20.2	08:14
Jupiter	223°02.7	10:14
Saturn	346°32.2	02:01

Sep 05 Sat	SHA	Mer.pass
Venus	157°06.2	14:34
Mars	252°39.3	08:12
Jupiter	222°50.2	10:11
Saturn	346°35.5	01:57

Sep 06 Sun	SHA	Mer.pass
Venus	156°26.9	14:33
Mars	251°58.5	08:11
Jupiter	222°37.8	10:08
Saturn	346°38.8	01:53

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = +0.1252 sec ΔT = TT-UT1 = +69.0588 sec

2026 September 04 to Sep. 06 UT

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°12.1	N07°15.1	278°44.3	4.5′	N26°39.5	5.6′	59.0′
1	195°12.3	14.2	293°07.8	4.5′	26°45.1	5.4′	59.0′
2	210°12.5	13.3	307°31.3	4.4′	26°50.5	5.3′	59.1′
3	225°12.7	·· 12.4	321°54.6	4.3′	26°55.8	5.0′	59.1′
4	240°12.9	11.4	336°18.0	4.2′	27°00.8	4.9′	59.1′
5	255°13.1	10.5	350°41.2	4.2′	27°05.7	4.7′	59.1′
6	270°13.3	N07°09.6	5°04.4	4.1′	N27°10.4	4.5′	59.1′
7	285°13.5	08.7	19°27.5	4.0′	27°14.9	4.3′	59.1′
8	300°13.7	07.7	33°50.5	4.0′	27°19.2	4.1′	59.1′
9	315°13.9	·· 06.8	48°13.5	3.9′	27°23.3	4.0′	59.1′
10	330°14.1	05.9	62°36.4	3.8′	27°27.3	3.8′	59.1′
11	345°14.3	05.0	76°59.2	3.8′	27°31.1	3.6′	59.2′
12	0°14.5	N07°04.1	91°22.0	3.7′	N27°34.7	3.4′	59.2′
13	15°14.7	03.1	105°44.8	3.7′	27°38.1	3.2′	59.2′
14	30°14.9	02.2	120°07.4	3.6′	27°41.3	3.0′	59.2′
15	45°15.2	·· 01.3	134°30.1	3.6′	27°44.3	2.8′	59.2′
16	60°15.4	07°00.4	148°52.7	3.5′	27°47.1	2.7′	59.2′
17	75°15.6	06°59.4	163°15.2	3.5′	27°49.8	2.4′	59.2′
18	90°15.8	N06°58.5	177°37.7	3.4′	N27°52.2	2.3′	59.2′
19	105°16.0	57.6	192°00.1	3.4′	27°54.5	2.1′	59.2′
20	120°16.2	56.7	206°22.5	3.4′	27°56.6	1.8′	59.2′
21	135°16.4	·· 55.7	220°44.9	3.3′	27°58.4	1.7′	59.3′
22	150°16.6	54.8	235°07.3	3.3′	28°00.1	1.5′	59.3′
23	165°16.8	53.9	249°29.6	3.3′	28°01.6	1.3′	59.3′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°17.0	N06°53.0	263°51.8	3.2′	N28°02.9	1.1′	59.3′
1	195°17.2	52.0	278°14.1	3.2′	28°04.0	0.9′	59.3′
2	210°17.4	51.1	292°36.3	3.2′	28°04.9	0.7′	59.3′
3	225°17.7	·· 50.2	306°58.5	3.2′	28°05.6	0.6′	59.3′
4	240°17.9	49.3	321°20.7	3.2′	28°06.2	0.3′	59.3′
5	255°18.1	48.3	335°42.9	3.2′	28°06.5	0.1′	59.3′
6	270°18.3	N06°47.4	350°05.0	3.1′	N28°06.6	0.1′	59.3′
7	285°18.5	46.5	4°27.2	3.1′	28°06.5	0.2′	59.3′
8	300°18.7	45.5	18°49.3	3.1′	28°06.3	0.5′	59.3′
9	315°18.9	·· 44.6	33°11.4	3.1′	28°05.8	0.7′	59.3′
10	330°19.1	43.7	47°33.5	3.1′	28°05.1	0.8′	59.4′
11	345°19.3	42.8	61°55.7	3.1′	28°04.3	1.1′	59.4′
12	0°19.5	N06°41.8	76°17.8	3.1′	N28°03.2	1.3′	59.4′
13	15°19.7	40.9	90°39.9	3.1′	28°01.9	1.4′	59.4′
14	30°20.0	40.0	105°02.0	3.1′	28°00.5	1.6′	59.4′
15	45°20.2	·· 39.0	119°24.2	3.2′	27°58.9	1.9′	59.4′
16	60°20.4	38.1	133°46.3	3.2′	27°57.0	2.0′	59.4′
17	75°20.6	37.2	148°08.5	3.2′	27°55.0	2.3′	59.4′
18	90°20.8	N06°36.3	162°30.7	3.2′	N27°52.7	2.4′	59.4′
19	105°21.0	35.3	176°52.9	3.2′	27°50.3	2.6′	59.4′
20	120°21.2	34.4	191°15.1	3.3′	27°47.7	2.8′	59.4′
21	135°21.4	·· 33.5	205°37.4	3.3′	27°44.9	3.1′	59.4′
22	150°21.6	32.5	219°59.7	3.3′	27°41.8	3.2′	59.4′
23	165°21.8	31.6	234°22.0	3.3′	27°38.6	3.4′	59.4′
	SD = 15.9′	d = 0.9′	SD = 16.2′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°22.1	N06°30.7	248°44.3	3.4′	N27°35.2	3.6′	59.4′
1	195°22.3	29.7	263°06.7	3.4′	27°31.6	3.7′	59.4′
2	210°22.5	28.8	277°29.1	3.5′	27°27.9	4.0′	59.4′
3	225°22.7	·· 27.9	291°51.6	3.5′	27°23.9	4.2′	59.4′
4	240°22.9	27.0	306°14.1	3.5′	27°19.7	4.4′	59.4′
5	255°23.1	26.0	320°36.6	3.6′	27°15.3	4.5′	59.4′
6	270°23.3	N06°25.1	334°59.2	3.6′	N27°10.8	4.7′	59.5′
7	285°23.5	24.2	349°21.8	3.7′	27°06.1	5.0′	59.5′
8	300°23.7	23.2	3°44.5	3.7′	27°01.1	5.1′	59.5′
9	315°24.0	·· 22.3	18°07.3	3.8′	26°56.0	5.3′	59.5′
10	330°24.2	21.4	32°30.1	3.9′	26°50.7	5.4′	59.5′
11	345°24.4	20.4	46°52.9	3.9′	26°45.3	5.7′	59.5′
12	0°24.6	N06°19.5	61°15.8	4.0′	N26°39.6	5.9′	59.5′
13	15°24.8	18.6	75°38.8	4.0′	26°33.7	6.0′	59.5′
14	30°25.0	17.6	90°01.9	4.1′	26°27.7	6.2′	59.5′
15	45°25.2	·· 16.7	104°25.0	4.2′	26°21.5	6.4′	59.5′
16	60°25.4	15.8	118°48.1	4.2′	26°15.1	6.6′	59.5′
17	75°25.6	14.8	133°11.4	4.3′	26°08.5	6.7′	59.5′
18	90°25.9	N06°13.9	147°34.7	4.4′	N26°01.8	6.9′	59.5′
19	105°26.1	13.0	161°58.1	4.5′	25°54.9	7.1′	59.5′
20	120°26.3	12.0	176°21.5	4.5′	25°47.8	7.3′	59.5′
21	135°26.5	·· 11.1	190°45.1	4.6′	25°40.5	7.4′	59.5′
22	150°26.7	10.2	205°08.7	4.7′	25°33.1	7.6′	59.5′
23	165°26.9	09.2	219°32.4	4.8′	25°25.5	7.8′	59.5′
	SD = 15.9′	d = 0.9′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	////	02:58	04:21	19:33	20:54	////
N 70°	01:17	03:21	04:32	19:23	20:33	22:30
68°	02:03	03:38	04:41	19:14	20:16	21:48
66°	02:32	03:51	04:48	19:07	20:03	21:21
64°	02:53	04:03	04:54	19:01	19:52	21:00
62°	03:10	04:12	05:00	18:56	19:43	20:44
60°	03:24	04:20	05:04	18:52	19:35	20:31
N 58°	03:35	04:27	05:08	18:48	19:29	20:20
56°	03:45	04:33	05:12	18:44	19:23	20:11
54°	03:53	04:38	05:15	18:41	19:18	20:02
52°	04:01	04:43	05:18	18:38	19:13	19:55
50°	04:07	04:48	05:21	18:36	19:09	19:49
45°	04:21	04:57	05:27	18:30	19:00	19:36
N 40°	04:31	05:04	05:31	18:25	18:53	19:25
35°	04:39	05:10	05:36	18:21	18:47	19:17
30°	04:46	05:15	05:39	18:18	18:42	19:10
20°	04:57	05:23	05:45	18:12	18:34	19:00
N 10°	05:05	05:29	05:51	18:07	18:28	18:52
0°	05:10	05:35	05:55	18:02	18:23	18:47
S 10°	05:15	05:39	06:00	17:57	18:18	18:43
20°	05:17	05:43	06:05	17:53	18:15	18:40
30°	05:19	05:47	06:11	17:47	18:11	18:39
35°	05:19	05:48	06:14	17:44	18:09	18:39
40°	05:19	05:50	06:17	17:41	18:08	18:39
45°	05:18	05:52	06:21	17:37	18:06	18:40
S 50°	05:16	05:54	06:26	17:32	18:04	18:42
52°	05:16	05:55	06:28	17:30	18:04	18:43
54°	05:15	05:55	06:31	17:28	18:03	18:44
56°	05:13	05:56	06:33	17:25	18:02	18:45
58°	05:12	05:57	06:36	17:22	18:02	18:47
S 60°	05:10	05:58	06:39	17:19	18:01	18:49

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	21:05	▭	▭	19:36
62°	18:45	19:54	22:07	17:32	18:35	18:33
60°	19:51	20:58	22:41	16:26	17:31	17:58
N 58°	20:25	21:32	23:06	15:52	16:57	17:33
56°	20:51	21:57	23:26	15:26	16:32	17:12
54°	21:11	22:18	23:42	15:06	16:11	16:56
52°	21:28	22:34	23:57	14:49	15:54	16:41
50°	21:43	22:49	·· ··	14:35	15:40	16:28
45°	22:13	23:18	·· ··	14:05	15:10	16:02
N 40°	22:36	23:41	·· ··	13:42	14:47	15:41
35°	22:55	·· ··	00:00	13:23	14:28	15:23
30°	23:12	·· ··	00:16	13:07	14:11	15:08
20°	23:40	·· ··	00:44	12:39	13:43	14:42
N 10°	·· ··	00:04	01:07	12:16	13:19	14:20
0°	·· ··	00:26	01:29	11:54	12:56	13:59
S 10°	·· ··	00:49	01:51	11:32	12:34	13:38
20°	00:08	01:13	02:15	11:08	12:10	13:15
30°	00:35	01:41	02:42	10:40	11:41	12:49
35°	00:51	01:58	02:59	10:24	11:25	12:33
40°	01:09	02:18	03:17	10:05	11:05	12:15
45°	01:31	02:42	03:40	09:43	10:41	11:53
S 50°	02:00	03:12	04:09	09:14	10:11	11:25
52°	02:14	03:27	04:23	08:59	09:56	11:11
54°	02:30	03:45	04:39	08:43	09:38	10:55
56°	02:49	04:06	04:59	08:23	09:17	10:36
58°	03:13	04:33	05:23	07:59	08:49	10:12
S 60°	03:45	05:12	05:54	07:27	08:11	09:41

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 54-31%
04	00:48	00:58	11:59	05:39	18:10	
05	01:08	01:18	11:59	06:41	19:13	
06	01:28	01:38	11:58	07:44	20:15	

September 07, 08, 09 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	346°05.4	141°53.8	S14°32.5	237°23.3	N22°57.3	208°30.7	N16°52.1	332°47.6	N02°47.9
1	1°07.8	156°54.7	33.5	252°24.1	57.2	223°32.7	51.9	347°50.2	47.8
2	16°10.3	171°55.6	34.4	267°24.8	57.0	238°34.6	51.8	2°52.8	47.8
3	31°12.8	186°56.4	·· 35.4	282°25.6	·· 56.9	253°36.6	·· 51.6	17°55.4	·· 47.7
4	46°15.2	201°57.3	36.3	297°26.4	56.7	268°38.5	51.5	32°58.0	47.6
5	61°17.7	216°58.2	37.3	312°27.2	56.5	283°40.5	51.4	48°00.6	47.6
6	76°20.2	231°59.1	S14°38.2	327°27.9	N22°56.4	298°42.4	N16°51.2	63°03.3	N02°47.5
7	91°22.6	247°00.0	39.2	342°28.7	56.2	313°44.4	51.1	78°05.9	47.4
8	106°25.1	262°00.9	40.1	357°29.5	56.1	328°46.3	50.9	93°08.5	47.4
9	121°27.5	277°01.8	·· 41.1	12°30.3	·· 55.9	343°48.3	·· 50.8	108°11.1	·· 47.3
10	136°30.0	292°02.7	42.0	27°31.1	55.7	358°50.2	50.6	123°13.7	47.2
11	151°32.5	307°03.5	43.0	42°31.8	55.6	13°52.2	50.5	138°16.3	47.1
12	166°34.9	322°04.4	S14°43.9	57°32.6	N22°55.4	28°54.1	N16°50.3	153°18.9	N02°47.1
13	181°37.4	337°05.3	44.8	72°33.4	55.2	43°56.1	50.2	168°21.5	47.0
14	196°39.9	352°06.2	45.8	87°34.2	55.1	58°58.0	50.0	183°24.1	46.9
15	211°42.3	7°07.1	·· 46.7	102°34.9	·· 54.9	74°00.0	·· 49.9	198°26.7	·· 46.9
16	226°44.8	22°08.0	47.7	117°35.7	54.7	89°01.9	49.7	213°29.3	46.8
17	241°47.3	37°08.9	48.6	132°36.5	54.6	104°03.9	49.6	228°31.9	46.7
18	256°49.7	52°09.8	S14°49.5	147°37.3	N22°54.4	119°05.8	N16°49.5	243°34.6	N02°46.7
19	271°52.2	67°10.7	50.5	162°38.1	54.2	134°07.8	49.3	258°37.2	46.6
20	286°54.6	82°11.6	51.4	177°38.8	54.1	149°09.7	49.2	273°39.8	46.5
21	301°57.1	97°12.5	·· 52.3	192°39.6	·· 53.9	164°11.7	·· 49.0	288°42.4	·· 46.5
22	316°59.6	112°13.5	53.3	207°40.4	53.7	179°13.6	48.9	303°45.0	46.4
23	332°02.0	127°14.4	54.2	222°41.2	53.6	194°15.6	48.7	318°47.6	46.3
Mer.pass. 00:55		ν 0.9′	d 1.0′	m -4.69	ν 0.8′	d 0.2′	m 1.22	ν 1.9′	d 0.1′ m -1.81	ν 2.6′	d 0.1′ m 0.45

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	347°04.5	142°15.3	S14°55.2	237°42.0	N22°53.4	209°17.5	N16°48.6	333°50.2	N02°46.3
1	2°07.0	157°16.2	56.1	252°42.7	53.2	224°19.5	48.4	348°52.8	46.2
2	17°09.4	172°17.1	57.0	267°43.5	53.1	239°21.4	48.3	3°55.4	46.1
3	32°11.9	187°18.0	·· 58.0	282°44.3	·· 52.9	254°23.4	·· 48.1	18°58.0	·· 46.1
4	47°14.4	202°18.9	58.9	297°45.1	52.7	269°25.4	48.0	34°00.6	46.0
5	62°16.8	217°19.8	14°59.8	312°45.9	52.6	284°27.3	47.9	49°03.3	45.9
6	77°19.3	232°20.8	S15°00.7	327°46.6	N22°52.4	299°29.3	N16°47.7	64°05.9	N02°45.8
7	92°21.8	247°21.7	01.7	342°47.4	52.2	314°31.2	47.6	79°08.5	45.8
8	107°24.2	262°22.6	02.6	357°48.2	52.1	329°33.2	47.4	94°11.1	45.7
9	122°26.7	277°23.5	·· 03.5	12°49.0	·· 51.9	344°35.1	·· 47.3	109°13.7	·· 45.6
10	137°29.1	292°24.5	04.5	27°49.8	51.7	359°37.1	47.1	124°16.3	45.6
11	152°31.6	307°25.4	05.4	42°50.6	51.5	14°39.0	47.0	139°18.9	45.5
12	167°34.1	322°26.3	S15°06.3	57°51.3	N22°51.4	29°41.0	N16°46.8	154°21.5	N02°45.4
13	182°36.5	337°27.2	07.2	72°52.1	51.2	44°42.9	46.7	169°24.1	45.4
14	197°39.0	352°28.2	08.2	87°52.9	51.0	59°44.9	46.5	184°26.8	45.3
15	212°41.5	7°29.1	·· 09.1	102°53.7	·· 50.9	74°46.8	·· 46.4	199°29.4	·· 45.2
16	227°43.9	22°30.0	10.0	117°54.5	50.7	89°48.8	46.2	214°32.0	45.2
17	242°46.4	37°31.0	10.9	132°55.3	50.5	104°50.7	46.1	229°34.6	45.1
18	257°48.9	52°31.9	S15°11.8	147°56.0	N22°50.3	119°52.7	N16°46.0	244°37.2	N02°45.0
19	272°51.3	67°32.9	12.8	162°56.8	50.2	134°54.6	45.8	259°39.8	45.0
20	287°53.8	82°33.8	13.7	177°57.6	50.0	149°56.6	45.7	274°42.4	44.9
21	302°56.3	97°34.7	·· 14.6	192°58.4	·· 49.8	164°58.5	·· 45.5	289°45.0	·· 44.8
22	317°58.7	112°35.7	15.5	207°59.2	49.7	180°00.5	45.4	304°47.6	44.7
23	333°01.2	127°36.6	16.4	223°00.0	49.5	195°02.5	45.2	319°50.3	44.7
Mer.pass. 00:52		ν 0.9′	d 0.9′	m -4.70	ν 0.8′	d 0.2′	m 1.22	ν 2.0′	d 0.1′ m -1.82	ν 2.6′	d 0.1′ m 0.45

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	348°03.6	142°37.6	S15°17.4	238°00.8	N22°49.3	210°04.4	N16°45.1	334°52.9	N02°44.6
1	3°06.1	157°38.5	18.3	253°01.6	49.1	225°06.4	44.9	349°55.5	44.5
2	18°08.6	172°39.5	19.2	268°02.3	49.0	240°08.3	44.8	4°58.1	44.5
3	33°11.0	187°40.4	·· 20.1	283°03.1	·· 48.8	255°10.3	·· 44.6	20°00.7	·· 44.4
4	48°13.5	202°41.4	21.0	298°03.9	48.6	270°12.2	44.5	35°03.3	44.3
5	63°16.0	217°42.3	21.9	313°04.7	48.4	285°14.2	44.4	50°05.9	44.3
6	78°18.4	232°43.3	S15°22.8	328°05.5	N22°48.3	300°16.1	N16°44.2	65°08.5	N02°44.2
7	93°20.9	247°44.3	23.8	343°06.3	48.1	315°18.1	44.1	80°11.2	44.1
8	108°23.4	262°45.2	24.7	358°07.1	47.9	330°20.0	43.9	95°13.8	44.0
9	123°25.8	277°46.2	·· 25.6	13°07.9	·· 47.7	345°22.0	·· 43.8	110°16.4	·· 44.0
10	138°28.3	292°47.1	26.5	28°08.6	47.6	0°23.9	43.6	125°19.0	43.9
11	153°30.7	307°48.1	27.4	43°09.4	47.4	15°25.9	43.5	140°21.6	43.8
12	168°33.2	322°49.1	S15°28.3	58°10.2	N22°47.2	30°27.9	N16°43.3	155°24.2	N02°43.8
13	183°35.7	337°50.0	29.2	73°11.0	47.0	45°29.8	43.2	170°26.8	43.7
14	198°38.1	352°51.0	30.1	88°11.8	46.9	60°31.8	43.0	185°29.4	43.6
15	213°40.6	7°52.0	·· 31.0	103°12.6	·· 46.7	75°33.7	·· 42.9	200°32.1	·· 43.6
16	228°43.1	22°53.0	31.9	118°13.4	46.5	90°35.7	42.8	215°34.7	43.5
17	243°45.5	37°53.9	32.8	133°14.2	46.3	105°37.6	42.6	230°37.3	43.4
18	258°48.0	52°54.9	S15°33.7	148°15.0	N22°46.1	120°39.6	N16°42.5	245°39.9	N02°43.4
19	273°50.5	67°55.9	34.6	163°15.8	46.0	135°41.5	42.3	260°42.5	43.3
20	288°52.9	82°56.9	35.5	178°16.5	45.8	150°43.5	42.2	275°45.1	43.2
21	303°55.4	97°57.8	·· 36.4	193°17.3	·· 45.6	165°45.5	·· 42.0	290°47.7	·· 43.1
22	318°57.9	112°58.8	37.3	208°18.1	45.4	180°47.4	41.9	305°50.4	43.1
23	334°00.3	127°59.8	38.2	223°18.9	45.3	195°49.4	41.7	320°53.0	43.0
Mer.pass. 00:48		ν 0.9′	d 0.9′	m -4.71	ν 0.8′	d 0.2′	m 1.22	ν 2.0′	d 0.1′ m -1.82	ν 2.6′	d 0.1′ m 0.44

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°28.9	56°41.0
Diphda	348°45.6	-17°50.2
Achernar	335°18.7	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°05.7	89°22.3
Acamar	315°10.5	-40°11.5
Menkar	314°04.5	4°11.8
Mirfak	308°26.1	49°57.2
Aldebaran	290°38.0	16°33.8
Rigel	281°02.6	-8°10.0
Capella	280°19.9	46°01.3
Bellatrix	278°21.4	6°22.5
Elnath	278°00.2	28°37.8
Alnilam	275°36.4	-1°10.9
Betelgeuse	270°50.7	7°24.8
Canopus	263°52.0	-52°42.2
Sirius	258°25.2	-16°44.9
Adhara	255°05.0	-29°00.2
Procyon	244°49.6	5°09.5
Pollux	243°15.9	27°57.7
Avior	234°14.7	-59°35.4
Suhail	222°45.7	-43°32.2
Miaplacidus	221°38.8	-69°49.4
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.4
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.6	-57°15.9
Alioth	166°12.2	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°11.0
Hadar	148°34.5	-60°30.3
Menkent	147°56.2	-36°30.2
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.8	-60°56.9
Kochab	137°20.4	74°02.9
Zuben'ubi	136°54.7	-16°09.2
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.1	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.1	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.8
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Sep 07 Mon	SHA	Mer.pass
Venus	155°48.4	14:32
Mars	251°17.9	08:10
Jupiter	222°25.4	10:05
Saturn	346°42.2	01:49

Sep 08 Tue	SHA	Mer.pass
Venus	155°10.8	14:30
Mars	250°37.5	08:09
Jupiter	222°13.0	10:02
Saturn	346°45.7	01:44

Sep 09 Wed	SHA	Mer.pass
Venus	154°33.9	14:29
Mars	249°57.1	08:08
Jupiter	222°00.8	09:58
Saturn	346°49.2	01:40

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°27.1	N06°08.3	233°56.1	4.9′	N25°17.7	8.0′	59.5′
1	195°27.3	07.4	248°20.0	4.9′	25°09.7	8.1′	59.5′
2	210°27.6	06.4	262°43.9	5.0′	25°01.6	8.3′	59.5′
3	225°27.8	·· 05.5	277°08.0	5.1′	24°53.3	8.4′	59.5′
4	240°28.0	04.6	291°32.1	5.2′	24°44.9	8.6′	59.5′
5	255°28.2	03.6	305°56.3	5.3′	24°36.3	8.8′	59.5′
6	270°28.4	N06°02.7	320°20.5	5.4′	N24°27.5	8.9′	59.5′
7	285°28.6	01.7	334°44.9	5.5′	24°18.6	9.1′	59.5′
8	300°28.8	06°00.8	349°09.4	5.6′	24°09.5	9.2′	59.5′
9	315°29.0	05°59.9	3°33.9	5.6′	24°00.3	9.4′	59.5′
10	330°29.3	58.9	17°58.6	5.7′	23°50.9	9.6′	59.5′
11	345°29.5	58.0	32°23.3	5.8′	23°41.3	9.7′	59.4′
12	0°29.7	N05°57.1	46°48.1	5.9′	N23°31.6	9.9′	59.4′
13	15°29.9	56.1	61°13.1	6.0′	23°21.7	10.0′	59.4′
14	30°30.1	55.2	75°38.1	6.1′	23°11.7	10.1′	59.4′
15	45°30.3	·· 54.2	90°03.2	6.2′	23°01.6	10.3′	59.4′
16	60°30.5	53.3	104°28.4	6.3′	22°51.3	10.4′	59.4′
17	75°30.8	52.4	118°53.7	6.4′	22°40.9	10.6′	59.4′
18	90°31.0	N05°51.4	133°19.2	6.5′	N22°30.3	10.7′	59.4′
19	105°31.2	50.5	147°44.7	6.6′	22°19.6	10.9′	59.4′
20	120°31.4	49.6	162°10.3	6.7′	22°08.7	11.0′	59.4′
21	135°31.6	·· 48.6	176°36.0	6.8′	21°57.7	11.1′	59.4′
22	150°31.8	47.7	191°01.8	6.9′	21°46.6	11.2′	59.4′
23	165°32.0	46.7	205°27.7	7.0′	21°35.4	11.4′	59.4′
	SD = 15.9′	d = 0.9′	SD = 16.2′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°32.3	N05°45.8	219°53.7	7.1′	N21°24.0	11.5′	59.4′
1	195°32.5	44.9	234°19.8	7.2′	21°12.5	11.7′	59.4′
2	210°32.7	43.9	248°46.0	7.3′	21°00.8	11.8′	59.4′
3	225°32.9	·· 43.0	263°12.4	7.4′	20°49.0	11.8′	59.4′
4	240°33.1	42.0	277°38.8	7.5′	20°37.2	12.1′	59.4′
5	255°33.3	41.1	292°05.3	7.6′	20°25.1	12.1′	59.3′
6	270°33.5	N05°40.2	306°31.9	7.7′	N20°13.0	12.3′	59.3′
7	285°33.8	39.2	320°58.6	7.8′	20°00.7	12.3′	59.3′
8	300°34.0	38.3	335°25.4	7.9′	19°48.4	12.5′	59.3′
9	315°34.2	·· 37.3	349°52.4	8.0′	19°35.9	12.6′	59.3′
10	330°34.4	36.4	4°19.4	8.1′	19°23.3	12.7′	59.3′
11	345°34.6	35.5	18°46.5	8.2′	19°10.6	12.8′	59.3′
12	0°34.8	N05°34.5	33°13.7	8.3′	N18°57.8	13.0′	59.3′
13	15°35.0	33.6	47°41.0	8.4′	18°44.8	13.0′	59.3′
14	30°35.3	32.6	62°08.5	8.5′	18°31.8	13.1′	59.3′
15	45°35.5	·· 31.7	76°36.0	8.6′	18°18.7	13.3′	59.3′
16	60°35.7	30.8	91°03.6	8.7′	18°05.4	13.3′	59.2′
17	75°35.9	29.8	105°31.3	8.8′	17°52.1	13.4′	59.2′
18	90°36.1	N05°28.9	119°59.1	8.9′	N17°38.7	13.5′	59.2′
19	105°36.3	27.9	134°27.0	9.0′	17°25.2	13.7′	59.2′
20	120°36.6	27.0	148°55.0	9.1′	17°11.5	13.7′	59.2′
21	135°36.8	·· 26.0	163°23.1	9.2′	16°57.8	13.8′	59.2′
22	150°37.0	25.1	177°51.3	9.3′	16°44.0	13.9′	59.2′
23	165°37.2	24.2	192°19.6	9.4′	16°30.1	14.0′	59.2′
	SD = 15.9′	d = 0.9′	SD = 16.2′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°37.4	N05°23.2	206°48.0	9.5′	N16°16.1	14.0′	59.1′
1	195°37.6	22.3	221°16.5	9.6′	16°02.1	14.2′	59.1′
2	210°37.8	21.3	235°45.1	9.7′	15°47.9	14.2′	59.1′
3	225°38.1	·· 20.4	250°13.7	9.8′	15°33.7	14.3′	59.1′
4	240°38.3	19.4	264°42.5	9.9′	15°19.4	14.4′	59.1′
5	255°38.5	18.5	279°11.4	9.9′	15°05.0	14.5′	59.1′
6	270°38.7	N05°17.6	293°40.3	10.0′	N14°50.5	14.5′	59.1′
7	285°38.9	16.6	308°09.3	10.1′	14°36.0	14.6′	59.0′
8	300°39.1	15.7	322°38.4	10.2′	14°21.4	14.7′	59.0′
9	315°39.4	·· 14.7	337°07.7	10.3′	14°06.7	14.8′	59.0′
10	330°39.6	13.8	351°36.9	10.4′	13°51.9	14.8′	59.0′
11	345°39.8	12.8	6°06.3	10.5′	13°37.1	14.9′	59.0′
12	0°40.0	N05°11.9	20°35.8	10.6′	N13°22.2	14.9′	59.0′
13	15°40.2	10.9	35°05.3	10.6′	13°07.3	15.0′	59.0′
14	30°40.4	10.0	49°35.0	10.7′	12°52.3	15.1′	58.9′
15	45°40.7	·· 09.1	64°04.7	10.8′	12°37.2	15.1′	58.9′
16	60°40.9	08.1	78°34.5	10.9′	12°22.1	15.2′	58.9′
17	75°41.1	07.2	93°04.4	11.0′	12°06.9	15.3′	58.9′
18	90°41.3	N05°06.2	107°34.3	11.0′	N11°51.6	15.2′	58.9′
19	105°41.5	05.3	122°04.4	11.1′	11°36.4	15.4′	58.8′
20	120°41.7	04.3	136°34.5	11.2′	11°21.0	15.4′	58.8′
21	135°42.0	·· 03.4	151°04.7	11.3′	11°05.6	15.4′	58.8′
22	150°42.2	02.4	165°34.9	11.3′	10°50.2	15.5′	58.8′
23	165°42.4	01.5	180°05.3	11.4′	10°34.7	15.5′	58.8′
	SD = 15.9′	d = 0.9′	SD = 16.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	00:36	03:16	04:35	19:17	20:35	22:58
N 70°	01:48	03:36	04:44	19:09	20:16	22:00
68°	02:23	03:50	04:51	19:02	20:02	21:27
66°	02:47	04:02	04:58	18:56	19:50	21:04
64°	03:06	04:12	05:03	18:51	19:41	20:46
62°	03:21	04:21	05:07	18:46	19:33	20:32
60°	03:33	04:28	05:11	18:43	19:26	20:20
N 58°	03:43	04:34	05:15	18:39	19:20	20:10
56°	03:52	04:39	05:18	18:36	19:15	20:02
54°	04:00	04:44	05:21	18:34	19:10	19:54
52°	04:06	04:48	05:23	18:31	19:06	19:47
50°	04:12	04:52	05:25	18:29	19:02	19:42
45°	04:25	05:00	05:30	18:24	18:54	19:30
N 40°	04:34	05:07	05:34	18:20	18:48	19:20
35°	04:42	05:12	05:38	18:17	18:43	19:13
30°	04:48	05:17	05:41	18:14	18:38	19:07
20°	04:58	05:24	05:46	18:09	18:31	18:57
N 10°	05:05	05:29	05:50	18:05	18:26	18:51
0°	05:10	05:34	05:54	18:01	18:22	18:46
S 10°	05:13	05:37	05:58	17:57	18:18	18:43
20°	05:15	05:40	06:02	17:53	18:15	18:41
30°	05:15	05:43	06:07	17:49	18:13	18:40
35°	05:15	05:44	06:10	17:46	18:12	18:41
40°	05:14	05:45	06:12	17:43	18:11	18:42
45°	05:13	05:46	06:16	17:40	18:10	18:44
S 50°	05:10	05:47	06:20	17:37	18:09	18:46
52°	05:09	05:48	06:21	17:35	18:09	18:48
54°	05:07	05:48	06:23	17:33	18:08	18:49
56°	05:06	05:48	06:26	17:31	18:08	18:51
58°	05:03	05:49	06:28	17:29	18:08	18:53
S 60°	05:01	05:49	06:31	17:26	18:08	18:56

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▭	▭	00:02	▭	20:42	19:25
N 70°	▭	▭	00:48	▭	19:54	19:07
68°	22:00	·· ··	01:18	20:45	19:23	18:52
66°	23:12	·· ··	01:39	19:33	18:59	18:40
64°	23:48	·· ··	01:57	18:56	18:41	18:30
62°	·· ··	00:14	02:11	18:29	18:25	18:21
60°	·· ··	00:34	02:23	18:08	18:12	18:14
N 58°	·· ··	00:50	02:33	17:51	18:01	18:07
56°	·· ··	01:04	02:42	17:37	17:51	18:01
54°	·· ··	01:16	02:49	17:24	17:43	17:56
52°	·· ··	01:26	02:56	17:13	17:35	17:51
50°	00:09	01:36	03:03	17:03	17:28	17:47
45°	00:34	01:55	03:16	16:42	17:12	17:37
N 40°	00:54	02:11	03:27	16:25	17:00	17:29
35°	01:11	02:25	03:37	16:10	16:49	17:22
30°	01:26	02:36	03:45	15:58	16:40	17:16
20°	01:50	02:56	03:59	15:36	16:23	17:05
N 10°	02:11	03:13	04:11	15:17	16:09	16:56
0°	02:31	03:29	04:23	14:59	15:55	16:47
S 10°	02:51	03:45	04:34	14:41	15:41	16:38
20°	03:12	04:02	04:46	14:22	15:26	16:28
30°	03:36	04:21	05:00	13:59	15:09	16:17
35°	03:50	04:32	05:08	13:46	14:59	16:10
40°	04:06	04:45	05:17	13:31	14:48	16:03
45°	04:25	05:00	05:27	13:12	14:34	15:54
S 50°	04:50	05:18	05:40	12:49	14:17	15:43
52°	05:01	05:27	05:46	12:38	14:09	15:38
54°	05:14	05:37	05:52	12:26	14:00	15:33
56°	05:29	05:47	05:59	12:11	13:50	15:27
58°	05:47	06:00	06:07	11:54	13:39	15:20
S 60°	06:09	06:14	06:16	11:33	13:25	15:12

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 21-6%
07	01:49	01:59	11:58	08:45	21:14	
08	02:09	02:19	11:58	09:42	22:09	
09	02:30	02:40	11:57	10:35	23:00	

September 10, 11, 12 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°02.8	143°00.8	S15°39.1	238°19.7	N22°45.1	210°51.3	N16°41.6	335°55.6	N02°42.9
1	4°05.2	158°01.8	40.0	253°20.5	44.9	225°53.3	41.4	350°58.2	42.9
2	19°07.7	173°02.8	40.9	268°21.3	44.7	240°55.2	41.3	6°00.8	42.8
3	34°10.2	188°03.8	·· 41.8	283°22.1	·· 44.5	255°57.2	·· 41.2	21°03.4	·· 42.7
4	49°12.6	203°04.8	42.7	298°22.9	44.4	270°59.2	41.0	36°06.0	42.6
5	64°15.1	218°05.7	43.6	313°23.7	44.2	286°01.1	40.9	51°08.7	42.6
6	79°17.6	233°06.7	S15°44.5	328°24.5	N22°44.0	301°03.1	N16°40.7	66°11.3	N02°42.5
7	94°20.0	248°07.7	45.4	343°25.3	43.8	316°05.0	40.6	81°13.9	42.4
8	109°22.5	263°08.7	46.3	358°26.1	43.6	331°07.0	40.4	96°16.5	42.4
9	124°25.0	278°09.7	·· 47.2	13°26.9	·· 43.4	346°08.9	·· 40.3	111°19.1	·· 42.3
10	139°27.4	293°10.7	48.1	28°27.7	43.3	1°10.9	40.1	126°21.7	42.2
11	154°29.9	308°11.7	49.0	43°28.5	43.1	16°12.9	40.0	141°24.4	42.2
12	169°32.4	323°12.8	S15°49.8	58°29.2	N22°42.9	31°14.8	N16°39.8	156°27.0	N02°42.1
13	184°34.8	338°13.8	50.7	73°30.0	42.7	46°16.8	39.7	171°29.6	42.0
14	199°37.3	353°14.8	51.6	88°30.8	42.5	61°18.7	39.6	186°32.2	41.9
15	214°39.7	8°15.8	·· 52.5	103°31.6	·· 42.3	76°20.7	·· 39.4	201°34.8	·· 41.9
16	229°42.2	23°16.8	53.4	118°32.4	42.2	91°22.6	39.3	216°37.4	41.8
17	244°44.7	38°17.8	54.3	133°33.2	42.0	106°24.6	39.1	231°40.0	41.7
18	259°47.1	53°18.8	S15°55.2	148°34.0	N22°41.8	121°26.6	N16°39.0	246°42.7	N02°41.7
19	274°49.6	68°19.8	56.0	163°34.8	41.6	136°28.5	38.8	261°45.3	41.6
20	289°52.1	83°20.9	56.9	178°35.6	41.4	151°30.5	38.7	276°47.9	41.5
21	304°54.5	98°21.9	·· 57.8	193°36.4	·· 41.2	166°32.4	·· 38.5	291°50.5	·· 41.5
22	319°57.0	113°22.9	58.7	208°37.2	41.1	181°34.4	38.4	306°53.1	41.4
23	334°59.5	128°23.9	59.6	223°38.0	40.9	196°36.3	38.2	321°55.7	41.3
Mer.pass.	00:44	ν 1.0′	d 0.9′	m -4.72	ν 0.8′	d 0.2′	m 1.21	ν 2.0′	d 0.1′ m -1.82	ν 2.6′	d 0.1′ m 0.44

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°01.9	143°24.9	S16°00.5	238°38.8	N22°40.7	211°38.3	N16°38.1	336°58.4	N02°41.2
1	5°04.4	158°26.0	01.3	253°39.6	40.5	226°40.3	38.0	352°01.0	41.2
2	20°06.8	173°27.0	02.2	268°40.4	40.3	241°42.2	37.8	7°03.6	41.1
3	35°09.3	188°28.0	·· 03.1	283°41.2	·· 40.1	256°44.2	·· 37.7	22°06.2	·· 41.0
4	50°11.8	203°29.1	04.0	298°42.0	39.9	271°46.1	37.5	37°08.8	41.0
5	65°14.2	218°30.1	04.8	313°42.8	39.8	286°48.1	37.4	52°11.4	40.9
6	80°16.7	233°31.1	S16°05.7	328°43.6	N22°39.6	301°50.1	N16°37.2	67°14.1	N02°40.8
7	95°19.2	248°32.2	06.6	343°44.4	39.4	316°52.0	37.1	82°16.7	40.7
8	110°21.6	263°33.2	07.5	358°45.2	39.2	331°54.0	36.9	97°19.3	40.7
9	125°24.1	278°34.3	·· 08.3	13°46.0	·· 39.0	346°55.9	·· 36.8	112°21.9	·· 40.6
10	140°26.6	293°35.3	09.2	28°46.8	38.8	1°57.9	36.7	127°24.5	40.5
11	155°29.0	308°36.3	10.1	43°47.6	38.6	16°59.9	36.5	142°27.2	40.5
12	170°31.5	323°37.4	S16°10.9	58°48.4	N22°38.4	32°01.8	N16°36.4	157°29.8	N02°40.4
13	185°34.0	338°38.4	11.8	73°49.2	38.3	47°03.8	36.2	172°32.4	40.3
14	200°36.4	353°39.5	12.7	88°50.0	38.1	62°05.7	36.1	187°35.0	40.2
15	215°38.9	8°40.5	·· 13.5	103°50.8	·· 37.9	77°07.7	·· 35.9	202°37.6	·· 40.2
16	230°41.3	23°41.6	14.4	118°51.6	37.7	92°09.7	35.8	217°40.2	40.1
17	245°43.8	38°42.7	15.3	133°52.4	37.5	107°11.6	35.6	232°42.9	40.0
18	260°46.3	53°43.7	S16°16.1	148°53.2	N22°37.3	122°13.6	N16°35.5	247°45.5	N02°40.0
19	275°48.7	68°44.8	17.0	163°54.0	37.1	137°15.5	35.3	262°48.1	39.9
20	290°51.2	83°45.8	17.9	178°54.8	36.9	152°17.5	35.2	277°50.7	39.8
21	305°53.7	98°46.9	·· 18.7	193°55.7	·· 36.7	167°19.5	·· 35.1	292°53.3	·· 39.7
22	320°56.1	113°48.0	19.6	208°56.5	36.5	182°21.4	34.9	307°56.0	39.7
23	335°58.6	128°49.0	20.5	223°57.3	36.3	197°23.4	34.8	322°58.6	39.6
Mer.pass.	00:40	ν 1.0′	d 0.9′	m -4.73	ν 0.8′	d 0.2′	m 1.21	ν 2.0′	d 0.1′ m -1.82	ν 2.6′	d 0.1′ m 0.43

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	351°01.1	143°50.1	S16°21.3	238°58.1	N22°36.2	212°25.3	N16°34.6	338°01.2	N02°39.5
1	6°03.5	158°51.2	22.2	253°58.9	36.0	227°27.3	34.5	353°03.8	39.5
2	21°06.0	173°52.2	23.0	268°59.7	35.8	242°29.3	34.3	8°06.4	39.4
3	36°08.4	188°53.3	·· 23.9	284°00.5	·· 35.6	257°31.2	·· 34.2	23°09.0	·· 39.3
4	51°10.9	203°54.4	24.7	299°01.3	35.4	272°33.2	34.0	38°11.7	39.2
5	66°13.4	218°55.5	25.6	314°02.1	35.2	287°35.2	33.9	53°14.3	39.2
6	81°15.8	233°56.5	S16°26.5	329°02.9	N22°35.0	302°37.1	N16°33.8	68°16.9	N02°39.1
7	96°18.3	248°57.6	27.3	344°03.7	34.8	317°39.1	33.6	83°19.5	39.0
8	111°20.8	263°58.7	28.2	359°04.5	34.6	332°41.0	33.5	98°22.1	39.0
9	126°23.2	278°59.8	·· 29.0	14°05.3	·· 34.4	347°43.0	·· 33.3	113°24.8	·· 38.9
10	141°25.7	294°00.9	29.9	29°06.1	34.2	2°45.0	33.2	128°27.4	38.8
11	156°28.2	309°02.0	30.7	44°06.9	34.0	17°46.9	33.0	143°30.0	38.7
12	171°30.6	324°03.0	S16°31.6	59°07.7	N22°33.8	32°48.9	N16°32.9	158°32.6	N02°38.7
13	186°33.1	339°04.1	32.4	74°08.6	33.6	47°50.9	32.7	173°35.2	38.6
14	201°35.6	354°05.2	33.3	89°09.4	33.5	62°52.8	32.6	188°37.9	38.5
15	216°38.0	9°06.3	·· 34.1	104°10.2	·· 33.3	77°54.8	·· 32.5	203°40.5	·· 38.4
16	231°40.5	24°07.4	35.0	119°11.0	33.1	92°56.7	32.3	218°43.1	38.4
17	246°42.9	39°08.5	35.8	134°11.8	32.9	107°58.7	32.2	233°45.7	38.3
18	261°45.4	54°09.6	S16°36.6	149°12.6	N22°32.7	123°00.7	N16°32.0	248°48.3	N02°38.2
19	276°47.9	69°10.7	37.5	164°13.4	32.5	138°02.6	31.9	263°51.0	38.2
20	291°50.3	84°11.8	38.3	179°14.2	32.3	153°04.6	31.7	278°53.6	38.1
21	306°52.8	99°12.9	·· 39.2	194°15.0	·· 32.1	168°06.6	·· 31.6	293°56.2	·· 38.0
22	321°55.3	114°14.0	40.0	209°15.8	31.9	183°08.5	31.4	308°58.8	37.9
23	336°57.7	129°15.1	40.8	224°16.7	31.7	198°10.5	31.3	324°01.4	37.9
Mer.pass.	00:36	ν 1.1′	d 0.9′	m -4.74	ν 0.8′	d 0.2′	m 1.21	ν 2.0′	d 0.1′ m -1.82	ν 2.6′	d 0.1′ m 0.43

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°28.9	56°41.1
Diphda	348°45.6	-17°50.2
Achernar	335°18.7	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°04.4	89°22.3
Acamar	315°10.5	-40°11.5
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.3
Aldebaran	290°38.0	16°33.8
Rigel	281°02.5	-8°10.0
Capella	280°19.8	46°01.3
Bellatrix	278°21.4	6°22.5
Elnath	278°00.1	28°37.8
Alnilam	275°36.4	-1°10.9
Betelgeuse	270°50.6	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.1	-16°44.9
Adhara	255°04.9	-29°00.2
Procyon	244°49.6	5°09.5
Pollux	243°15.8	27°57.7
Avior	234°14.6	-59°35.4
Suhail	222°45.7	-43°32.2
Miaplacidus	221°38.8	-69°49.4
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.4
Denebola	182°23.9	14°25.5
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.7	-57°15.8
Alioth	166°12.2	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°11.0
Hadar	148°34.5	-60°30.3
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.8	-60°56.9
Kochab	137°20.5	74°02.9
Zuben'ubi	136°54.7	-16°09.2
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.2	-69°04.8
Sabik	102°01.2	-15°45.4
Shaula	96°08.4	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.4	51°29.4
Kaus Aust.	83°30.5	-34°22.4
Vega	80°32.1	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.8
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Sep 10 Thu	SHA	Mer.pass
Venus	153°58.0	14:27
Mars	249°16.9	08:06
Jupiter	221°48.5	09:55
Saturn	346°52.8	01:36

Sep 11 Fri	SHA	Mer.pass
Venus	153°23.0	14:25
Mars	248°36.9	08:05
Jupiter	221°36.4	09:52
Saturn	346°56.4	01:32

Sep 12 Sat	SHA	Mer.pass
Venus	152°49.0	14:24
Mars	247°57.0	08:04
Jupiter	221°24.3	09:49
Saturn	347°00.1	01:28

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°42.6	N05°00.5	194°35.7	11.5′	N10°19.2	15.6′	58.8′
1	195°42.8	04°59.6	209°06.2	11.6′	10°03.6	15.6′	58.7′
2	210°43.1	58.6	223°36.8	11.6′	09°48.0	15.7′	58.7′
3	225°43.3	·· 57.7	238°07.4	11.7′	09°32.3	15.7′	58.7′
4	240°43.5	56.8	252°38.1	11.8′	09°16.6	15.7′	58.7′
5	255°43.7	55.8	267°08.8	11.8′	09°00.9	15.8′	58.7′
6	270°43.9	N04°54.9	281°39.7	11.9′	N08°45.1	15.8′	58.6′
7	285°44.1	53.9	296°10.6	12.0′	08°29.3	15.8′	58.6′
8	300°44.4	53.0	310°41.5	12.0′	08°13.5	15.9′	58.6′
9	315°44.6	·· 52.0	325°12.6	12.1′	07°57.6	15.8′	58.6′
10	330°44.8	51.1	339°43.7	12.2′	07°41.8	15.9′	58.6′
11	345°45.0	50.1	354°14.8	12.2′	07°25.9	16.0′	58.5′
12	0°45.2	N04°49.2	8°46.0	12.3′	N07°09.9	15.9′	58.5′
13	15°45.4	48.2	23°17.3	12.3′	06°54.0	16.0′	58.5′
14	30°45.7	47.3	37°48.6	12.4′	06°38.0	16.0′	58.5′
15	45°45.9	·· 46.3	52°20.0	12.4′	06°22.0	16.0′	58.4′
16	60°46.1	45.4	66°51.5	12.5′	06°06.0	16.1′	58.4′
17	75°46.3	44.4	81°23.0	12.6′	05°49.9	16.0′	58.4′
18	90°46.5	N04°43.5	95°54.5	12.6′	N05°33.9	16.1′	58.4′
19	105°46.8	42.5	110°26.1	12.7′	05°17.8	16.1′	58.3′
20	120°47.0	41.6	124°57.8	12.7′	05°01.7	16.1′	58.3′
21	135°47.2	·· 40.6	139°29.5	12.8′	04°45.6	16.1′	58.3′
22	150°47.4	39.7	154°01.2	12.8′	04°29.5	16.1′	58.3′
23	165°47.6	38.7	168°33.0	12.8′	04°13.4	16.1′	58.3′
	SD = 15.9′	d = 0.9′	SD = 16.0′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°47.9	N04°37.8	183°04.9	12.9′	N03°57.3	16.1′	58.2′
1	195°48.1	36.8	197°36.8	12.9′	03°41.2	16.1′	58.2′
2	210°48.3	35.9	212°08.7	13.0′	03°25.1	16.2′	58.2′
3	225°48.5	·· 34.9	226°40.7	13.0′	03°08.9	16.1′	58.2′
4	240°48.7	34.0	241°12.7	13.1′	02°52.8	16.1′	58.1′
5	255°48.9	33.0	255°44.8	13.1′	02°36.7	16.1′	58.1′
6	270°49.2	N04°32.1	270°16.9	13.1′	N02°20.6	16.2′	58.1′
7	285°49.4	31.1	284°49.0	13.2′	02°04.4	16.1′	58.1′
8	300°49.6	30.2	299°21.2	13.2′	01°48.3	16.1′	58.0′
9	315°49.8	·· 29.2	313°53.4	13.2′	01°32.2	16.1′	58.0′
10	330°50.0	28.3	328°25.6	13.3′	01°16.1	16.1′	58.0′
11	345°50.3	27.3	342°57.9	13.3′	01°00.0	16.1′	57.9′
12	0°50.5	N04°26.4	357°30.2	13.3′	N00°43.9	16.0′	57.9′
13	15°50.7	25.4	12°02.6	13.4′	00°27.9	16.1′	57.9′
14	30°50.9	24.5	26°34.9	13.4′	N00°11.8	16.0′	57.9′
15	45°51.1	·· 23.5	41°07.3	13.4′	S00°04.2	16.1′	57.8′
16	60°51.4	22.6	55°39.8	13.5′	00°20.3	16.0′	57.8′
17	75°51.6	21.6	70°12.2	13.5′	00°36.3	16.0′	57.8′
18	90°51.8	N04°20.7	84°44.7	13.5′	S00°52.3	16.0′	57.8′
19	105°52.0	19.7	99°17.2	13.5′	01°08.3	15.9′	57.7′
20	120°52.2	18.7	113°49.8	13.6′	01°24.2	15.9′	57.7′
21	135°52.5	·· 17.8	128°22.3	13.6′	01°40.1	16.0′	57.7′
22	150°52.7	16.8	142°54.9	13.6′	01°56.1	15.8′	57.7′
23	165°52.9	15.9	157°27.5	13.6′	02°11.9	15.9′	57.6′
	SD = 15.9′	d = 1.0′	SD = 15.9′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°53.1	N04°14.9	172°00.1	13.6′	S02°27.8	15.8′	57.6′
1	195°53.3	14.0	186°32.7	13.6′	02°43.6	15.8′	57.6′
2	210°53.6	13.0	201°05.4	13.7′	02°59.4	15.8′	57.5′
3	225°53.8	·· 12.1	215°38.0	13.7′	03°15.2	15.7′	57.5′
4	240°54.0	11.1	230°10.7	13.7′	03°30.9	15.8′	57.5′
5	255°54.2	10.2	244°43.4	13.7′	03°46.7	15.6′	57.5′
6	270°54.4	N04°09.2	259°16.1	13.7′	S04°02.3	15.7′	57.4′
7	285°54.7	08.3	273°48.8	13.7′	04°18.0	15.6′	57.4′
8	300°54.9	07.3	288°21.6	13.7′	04°33.6	15.6′	57.4′
9	315°55.1	·· 06.4	302°54.3	13.7′	04°49.2	15.5′	57.3′
10	330°55.3	05.4	317°27.0	13.8′	05°04.7	15.5′	57.3′
11	345°55.5	04.4	331°59.8	13.8′	05°20.2	15.4′	57.3′
12	0°55.8	N04°03.5	346°32.5	13.8′	S05°35.6	15.4′	57.3′
13	15°56.0	02.5	1°05.3	13.8′	05°51.0	15.4′	57.2′
14	30°56.2	01.6	15°38.1	13.8′	06°06.4	15.3′	57.2′
15	45°56.4	04°00.6	30°10.8	13.8′	06°21.7	15.3′	57.2′
16	60°56.6	03°59.7	44°43.6	13.8′	06°37.0	15.3′	57.1′
17	75°56.9	58.7	59°16.4	13.8′	06°52.3	15.1′	57.1′
18	90°57.1	N03°57.8	73°49.2	13.8′	S07°07.4	15.2′	57.1′
19	105°57.3	56.8	88°21.9	13.8′	07°22.6	15.1′	57.1′
20	120°57.5	55.8	102°54.7	13.8′	07°37.7	15.0′	57.0′
21	135°57.7	·· 54.9	117°27.5	13.8′	07°52.7	15.0′	57.0′
22	150°58.0	53.9	132°00.2	13.8′	08°07.7	15.0′	57.0′
23	165°58.2	53.0	146°33.0	13.8′	08°22.7	14.8′	56.9′
	SD = 15.9′	d = 1.0′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	01:27	03:33	04:49	19:02	20:16	22:16
N 70°	02:12	03:50	04:56	18:55	20:00	21:35
68°	02:41	04:03	05:02	18:49	19:48	21:08
66°	03:01	04:13	05:07	18:44	19:38	20:48
64°	03:18	04:22	05:11	18:40	19:29	20:33
62°	03:31	04:29	05:15	18:37	19:22	20:20
60°	03:42	04:35	05:18	18:33	19:16	20:09
N 58°	03:51	04:41	05:21	18:31	19:11	20:00
56°	03:59	04:46	05:24	18:28	19:06	19:52
54°	04:06	04:50	05:26	18:26	19:02	19:46
52°	04:12	04:54	05:28	18:24	18:58	19:40
50°	04:18	04:57	05:30	18:23	18:55	19:34
45°	04:29	05:04	05:34	18:19	18:48	19:23
N 40°	04:37	05:10	05:37	18:16	18:43	19:15
35°	04:44	05:14	05:40	18:13	18:38	19:08
30°	04:50	05:18	05:42	18:10	18:34	19:03
20°	04:59	05:24	05:47	18:06	18:29	18:54
N 10°	05:05	05:29	05:50	18:03	18:24	18:49
0°	05:09	05:33	05:53	18:00	18:21	18:45
S 10°	05:11	05:36	05:57	17:57	18:18	18:42
20°	05:12	05:38	06:00	17:54	18:16	18:41
30°	05:12	05:39	06:03	17:50	18:14	18:42
35°	05:11	05:40	06:05	17:48	18:14	18:43
40°	05:09	05:41	06:08	17:46	18:13	18:45
45°	05:07	05:41	06:10	17:44	18:13	18:47
S 50°	05:04	05:41	06:13	17:41	18:13	18:51
52°	05:02	05:41	06:15	17:40	18:13	18:52
54°	05:00	05:41	06:16	17:38	18:13	18:55
56°	04:58	05:41	06:18	17:37	18:14	18:57
58°	04:55	05:41	06:20	17:35	18:14	19:00
S 60°	04:52	05:40	06:22	17:33	18:14	19:03

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	03:06	05:29	07:44	18:43	18:08	17:33
N 70°	03:21	05:32	07:37	18:36	18:10	17:43
68°	03:34	05:35	07:31	18:30	18:11	17:51
66°	03:44	05:38	07:27	18:25	18:12	17:58
64°	03:52	05:39	07:23	18:21	18:13	18:04
62°	03:59	05:41	07:20	18:17	18:13	18:09
60°	04:05	05:43	07:17	18:14	18:14	18:14
N 58°	04:11	05:44	07:14	18:11	18:14	18:18
56°	04:15	05:45	07:12	18:09	18:15	18:21
54°	04:20	05:46	07:10	18:06	18:15	18:24
52°	04:23	05:47	07:08	18:04	18:16	18:27
50°	04:27	05:48	07:06	18:02	18:16	18:30
45°	04:34	05:50	07:03	17:58	18:17	18:36
N 40°	04:41	05:51	07:00	17:54	18:18	18:41
35°	04:46	05:53	06:57	17:51	18:18	18:45
30°	04:51	05:54	06:55	17:48	18:19	18:49
20°	04:59	05:56	06:51	17:43	18:20	18:55
N 10°	05:06	05:58	06:48	17:39	18:20	19:01
0°	05:12	05:59	06:45	17:35	18:21	19:06
S 10°	05:19	06:01	06:42	17:31	18:22	19:12
20°	05:26	06:03	06:39	17:26	18:23	19:17
30°	05:34	06:05	06:35	17:21	18:23	19:24
35°	05:38	06:06	06:33	17:18	18:24	19:28
40°	05:44	06:08	06:30	17:15	18:24	19:32
45°	05:49	06:09	06:28	17:11	18:25	19:37
S 50°	05:57	06:11	06:25	17:06	18:26	19:43
52°	06:00	06:12	06:23	17:04	18:26	19:46
54°	06:03	06:13	06:22	17:01	18:26	19:49
56°	06:07	06:14	06:20	16:59	18:27	19:53
58°	06:12	06:15	06:18	16:55	18:27	19:57
S 60°	06:16	06:16	06:16	16:52	18:28	20:01

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 29-1 2-1%
10	02:50	03:01	11:57	11:24	23:47	
11	03:11	03:22	11:57	12:10	–:–	
12	03:32	03:43	11:56	12:56	00:33	

September 13, 14, 15 UT (Sun., Monday., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	352°00.2	144°16.3	S16°41.7	239°17.5	N22°31.5	213°12.5	N16°31.1	339°04.1	N02°37.8
1	7°02.7	159°17.4	42.5	254°18.3	31.3	228°14.4	31.0	354°06.7	37.7
2	22°05.1	174°18.5	43.4	269°19.1	31.1	243°16.4	30.9	9°09.3	37.7
3	37°07.6	189°19.6	·· 44.2	284°19.9	·· 30.9	258°18.3	·· 30.7	24°11.9	·· 37.6
4	52°10.0	204°20.7	45.0	299°20.7	30.7	273°20.3	30.6	39°14.6	37.5
5	67°12.5	219°21.8	45.9	314°21.5	30.5	288°22.3	30.4	54°17.2	37.4
6	82°15.0	234°23.0	S16°46.7	329°22.3	N22°30.3	303°24.2	N16°30.3	69°19.8	N02°37.4
7	97°17.4	249°24.1	47.5	344°23.2	30.1	318°26.2	30.1	84°22.4	37.3
8	112°19.9	264°25.2	48.4	359°24.0	29.9	333°28.2	30.0	99°25.0	37.2
9	127°22.4	279°26.4	·· 49.2	14°24.8	·· 29.7	348°30.1	·· 29.8	114°27.7	·· 37.1
10	142°24.8	294°27.5	50.0	29°25.6	29.5	3°32.1	29.7	129°30.3	37.1
11	157°27.3	309°28.6	50.9	44°26.4	29.3	18°34.1	29.6	144°32.9	37.0
12	172°29.8	324°29.7	S16°51.7	59°27.2	N22°29.1	33°36.0	N16°29.4	159°35.5	N02°36.9
13	187°32.2	339°30.9	52.5	74°28.0	28.9	48°38.0	29.3	174°38.1	36.9
14	202°34.7	354°32.0	53.3	89°28.9	28.7	63°40.0	29.1	189°40.8	36.8
15	217°37.2	9°33.2	·· 54.2	104°29.7	·· 28.5	78°41.9	·· 29.0	204°43.4	·· 36.7
16	232°39.6	24°34.3	55.0	119°30.5	28.3	93°43.9	28.8	219°46.0	36.6
17	247°42.1	39°35.5	55.8	134°31.3	28.1	108°45.9	28.7	234°48.6	36.6
18	262°44.5	54°36.6	S16°56.6	149°32.1	N22°27.9	123°47.8	N16°28.5	249°51.3	N02°36.5
19	277°47.0	69°37.7	57.5	164°32.9	27.7	138°49.8	28.4	264°53.9	36.4
20	292°49.5	84°38.9	58.3	179°33.7	27.5	153°51.8	28.3	279°56.5	36.3
21	307°51.9	99°40.0	·· 59.1	194°34.6	·· 27.3	168°53.7	·· 28.1	294°59.1	·· 36.3
22	322°54.4	114°41.2	16°59.9	209°35.4	27.1	183°55.7	28.0	310°01.7	36.2
23	337°56.9	129°42.4	17°00.7	224°36.2	26.9	198°57.7	27.8	325°04.4	36.1
Mer.pass. 00:32		ν 1.1′	d 0.8′	m -4.75	ν 0.8′	d 0.2′	m 1.20	ν 2.0′	d 0.1′ m -1.83	ν 2.6′	d 0.1′ m 0.42

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	352°59.3	144°43.5	S17°01.6	239°37.0	N22°26.7	213°59.6	N16°27.7	340°07.0	N02°36.1
1	8°01.8	159°44.7	02.4	254°37.8	26.5	229°01.6	27.5	355°09.6	36.0
2	23°04.3	174°45.8	03.2	269°38.7	26.3	244°03.6	27.4	10°12.2	35.9
3	38°06.7	189°47.0	·· 04.0	284°39.5	·· 26.1	259°05.5	·· 27.2	25°14.9	·· 35.8
4	53°09.2	204°48.2	04.8	299°40.3	25.9	274°07.5	27.1	40°17.5	35.8
5	68°11.7	219°49.3	05.6	314°41.1	25.7	289°09.5	27.0	55°20.1	35.7
6	83°14.1	234°50.5	S17°06.4	329°41.9	N22°25.5	304°11.4	N16°26.8	70°22.7	N02°35.6
7	98°16.6	249°51.7	07.3	344°42.7	25.3	319°13.4	26.7	85°25.4	35.5
8	113°19.0	264°52.9	08.1	359°43.6	25.1	334°15.4	26.5	100°28.0	35.5
9	128°21.5	279°54.0	·· 08.9	14°44.4	·· 24.8	349°17.3	·· 26.4	115°30.6	·· 35.4
10	143°24.0	294°55.2	09.7	29°45.2	24.6	4°19.3	26.2	130°33.2	35.3
11	158°26.4	309°56.4	10.5	44°46.0	24.4	19°21.3	26.1	145°35.9	35.3
12	173°28.9	324°57.6	S17°11.3	59°46.9	N22°24.2	34°23.2	N16°26.0	160°38.5	N02°35.2
13	188°31.4	339°58.8	12.1	74°47.7	24.0	49°25.2	25.8	175°41.1	35.1
14	203°33.8	354°59.9	12.9	89°48.5	23.8	64°27.2	25.7	190°43.7	35.0
15	218°36.3	10°01.1	·· 13.7	104°49.3	·· 23.6	79°29.1	·· 25.5	205°46.3	·· 35.0
16	233°38.8	25°02.3	14.5	119°50.1	23.4	94°31.1	25.4	220°49.0	34.9
17	248°41.2	40°03.5	15.3	134°51.0	23.2	109°33.1	25.2	235°51.6	34.8
18	263°43.7	55°04.7	S17°16.1	149°51.8	N22°23.0	124°35.0	N16°25.1	250°54.2	N02°34.7
19	278°46.1	70°05.9	16.9	164°52.6	22.8	139°37.0	24.9	265°56.8	34.7
20	293°48.6	85°07.1	17.7	179°53.4	22.6	154°39.0	24.8	280°59.5	34.6
21	308°51.1	100°08.3	·· 18.5	194°54.3	·· 22.4	169°40.9	·· 24.7	296°02.1	·· 34.5
22	323°53.5	115°09.5	19.3	209°55.1	22.2	184°42.9	24.5	311°04.7	34.4
23	338°56.0	130°10.7	20.1	224°55.9	22.0	199°44.9	24.4	326°07.3	34.4
Mer.pass. 00:28		ν 1.2′	d 0.8′	m -4.76	ν 0.8′	d 0.2′	m 1.20	ν 2.0′	d 0.1′ m -1.83	ν 2.6′	d 0.1′ m 0.42

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	353°58.5	145°11.9	S17°20.9	239°56.7	N22°21.7	214°46.9	N16°24.2	341°10.0	N02°34.3
1	9°00.9	160°13.1	21.7	254°57.5	21.5	229°48.8	24.1	356°12.6	34.2
2	24°03.4	175°14.3	22.5	269°58.4	21.3	244°50.8	23.9	11°15.2	34.1
3	39°05.9	190°15.5	·· 23.3	284°59.2	·· 21.1	259°52.8	·· 23.8	26°17.8	·· 34.1
4	54°08.3	205°16.8	24.1	300°00.0	20.9	274°54.7	23.6	41°20.5	34.0
5	69°10.8	220°18.0	24.9	315°00.8	20.7	289°56.7	23.5	56°23.1	33.9
6	84°13.3	235°19.2	S17°25.7	330°01.7	N22°20.5	304°58.7	N16°23.4	71°25.7	N02°33.9
7	99°15.7	250°20.4	26.5	345°02.5	20.3	320°00.6	23.2	86°28.3	33.8
8	114°18.2	265°21.6	27.2	0°03.3	20.1	335°02.6	23.1	101°31.0	33.7
9	129°20.6	280°22.9	·· 28.0	15°04.2	·· 19.9	350°04.6	·· 22.9	116°33.6	·· 33.6
10	144°23.1	295°24.1	28.8	30°05.0	19.6	5°06.6	22.8	131°36.2	33.6
11	159°25.6	310°25.3	29.6	45°05.8	19.4	20°08.5	22.6	146°38.8	33.5
12	174°28.0	325°26.6	S17°30.4	60°06.6	N22°19.2	35°10.5	N16°22.5	161°41.5	N02°33.4
13	189°30.5	340°27.8	31.2	75°07.5	19.0	50°12.5	22.4	176°44.1	33.3
14	204°33.0	355°29.0	31.9	90°08.3	18.8	65°14.4	22.2	191°46.7	33.3
15	219°35.4	10°30.3	·· 32.7	105°09.1	·· 18.6	80°16.4	·· 22.1	206°49.4	·· 33.2
16	234°37.9	25°31.5	33.5	120°09.9	18.4	95°18.4	21.9	221°52.0	33.1
17	249°40.4	40°32.7	34.3	135°10.8	18.2	110°20.4	21.8	236°54.6	33.0
18	264°42.8	55°34.0	S17°35.1	150°11.6	N22°18.0	125°22.3	N16°21.6	251°57.2	N02°33.0
19	279°45.3	70°35.2	35.8	165°12.4	17.7	140°24.3	21.5	266°59.9	32.9
20	294°47.7	85°36.5	36.6	180°13.3	17.5	155°26.3	21.3	282°02.5	32.8
21	309°50.2	100°37.7	·· 37.4	195°14.1	·· 17.3	170°28.2	·· 21.2	297°05.1	·· 32.7
22	324°52.7	115°39.0	38.2	210°14.9	17.1	185°30.2	21.1	312°07.7	32.7
23	339°55.1	130°40.2	38.9	225°15.8	16.9	200°32.2	20.9	327°10.4	32.6
Mer.pass. 00:24		ν 1.2′	d 0.8′	m -4.77	ν 0.8′	d 0.2′	m 1.19	ν 2.0′	d 0.1′ m -1.83	ν 2.6′	d 0.1′ m 0.42

Stars

	SHA	**Dec**
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°28.9	56°41.1
Diphda	348°45.6	-17°50.2
Achernar	335°18.7	-57°05.8
Hamal	327°49.4	23°35.4
Polaris	313°03.0	89°22.3
Acamar	315°10.5	-40°11.5
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.3
Aldebaran	290°38.0	16°33.8
Rigel	281°02.5	-8°10.0
Capella	280°19.8	46°01.3
Bellatrix	278°21.4	6°22.5
Elnath	278°00.1	28°37.8
Alnilam	275°36.3	-1°10.9
Betelgeuse	270°50.6	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.1	-16°44.9
Adhara	255°04.9	-29°00.2
Procyon	244°49.6	5°09.5
Pollux	243°15.8	27°57.7
Avior	234°14.6	-59°35.4
Suhail	222°45.7	-43°32.2
Miaplacidus	221°38.8	-69°49.4
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.4
Denebola	182°23.9	14°25.4
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.7	-57°15.8
Alioth	166°12.3	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°11.0
Hadar	148°34.5	-60°30.3
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.8	-60°56.9
Kochab	137°20.5	74°02.9
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.2	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.5	-37°07.5
Rasalhague	95°57.2	12°32.6
Eltanin	90°41.5	51°29.4
Kaus Aust.	83°30.6	-34°22.4
Vega	80°32.2	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.8
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.8
Markab	13°28.2	15°21.1

Sep 13 Sun	**SHA**	**Mer.pass**
Venus	152°16.1	14:22
Mars	247°17.3	08:02
Jupiter	221°12.3	09:46
Saturn	347°03.9	01:23

Sep 14 Mon	**SHA**	**Mer.pass**
Venus	151°44.2	14:20
Mars	246°37.7	08:01
Jupiter	221°00.3	09:43
Saturn	347°07.7	01:19

Sep 15 Tue	**SHA**	**Mer.pass**
Venus	151°13.4	14:18
Mars	245°58.3	08:00
Jupiter	220°48.4	09:40
Saturn	347°11.5	01:15

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h | Sun | | Moon | | | | |

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°58.4	N03°52.0	161°05.7	13.7′	S08°37.5	14.9′	56.9′
1	195°58.6	51.1	175°38.5	13.7′	08°52.4	14.7′	56.9′
2	210°58.8	50.1	190°11.2	13.7′	09°07.1	14.8′	56.8′
3	225°59.1	·· 49.2	204°43.9	13.7′	09°21.9	14.6′	56.8′
4	240°59.3	48.2	219°16.7	13.7′	09°36.5	14.6′	56.8′
5	255°59.5	47.2	233°49.4	13.7′	09°51.1	14.6′	56.8′
6	270°59.7	N03°46.3	248°22.1	13.7′	S10°05.7	14.5′	56.7′
7	286°00.0	45.3	262°54.8	13.7′	10°20.2	14.4′	56.7′
8	301°00.2	44.4	277°27.4	13.7′	10°34.6	14.3′	56.7′
9	316°00.4	·· 43.4	292°00.1	13.6′	10°48.9	14.3′	56.6′
10	331°00.6	42.5	306°32.7	13.6′	11°03.2	14.3′	56.6′
11	346°00.8	41.5	321°05.4	13.6′	11°17.5	14.1′	56.6′
12	1°01.1	N03°40.5	335°38.0	13.6′	S11°31.6	14.1′	56.6′
13	16°01.3	39.6	350°10.6	13.6′	11°45.7	14.1′	56.5′
14	31°01.5	38.6	4°43.1	13.6′	11°59.8	13.9′	56.5′
15	46°01.7	·· 37.7	19°15.7	13.5′	12°13.7	13.9′	56.5′
16	61°01.9	36.7	33°48.2	13.5′	12°27.6	13.8′	56.4′
17	76°02.2	35.7	48°20.7	13.5′	12°41.4	13.8′	56.4′
18	91°02.4	N03°34.8	62°53.2	13.5′	S12°55.2	13.7′	56.4′
19	106°02.6	33.8	77°25.7	13.5′	13°08.9	13.6′	56.4′
20	121°02.8	32.9	91°58.2	13.4′	13°22.5	13.5′	56.3′
21	136°03.1	·· 31.9	106°30.6	13.4′	13°36.0	13.5′	56.3′
22	151°03.3	31.0	121°03.0	13.4′	13°49.5	13.4′	56.3′
23	166°03.5	30.0	135°35.4	13.4′	14°02.9	13.3′	56.2′
	SD = 15.9′	d = 1.0′	SD = 15.5′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°03.7	N03°29.0	150°07.7	13.3′	S14°16.2	13.2′	56.2′
1	196°03.9	28.1	164°40.1	13.3′	14°29.4	13.1′	56.2′
2	211°04.2	27.1	179°12.4	13.3′	14°42.5	13.1′	56.2′
3	226°04.4	·· 26.2	193°44.6	13.2′	14°55.6	13.0′	56.1′
4	241°04.6	25.2	208°16.9	13.2′	15°08.6	12.9′	56.1′
5	256°04.8	24.2	222°49.1	13.2′	15°21.5	12.8′	56.1′
6	271°05.1	N03°23.3	237°21.3	13.2′	S15°34.3	12.8′	56.0′
7	286°05.3	22.3	251°53.4	13.1′	15°47.1	12.6′	56.0′
8	301°05.5	21.4	266°25.5	13.1′	15°59.7	12.6′	56.0′
9	316°05.7	·· 20.4	280°57.6	13.1′	16°12.3	12.5′	56.0′
10	331°05.9	19.4	295°29.7	13.0′	16°24.8	12.4′	55.9′
11	346°06.2	18.5	310°01.7	13.0′	16°37.2	12.3′	55.9′
12	1°06.4	N03°17.5	324°33.7	13.0′	S16°49.5	12.3′	55.9′
13	16°06.6	16.6	339°05.7	12.9′	17°01.8	12.1′	55.8′
14	31°06.8	15.6	353°37.6	12.9′	17°13.9	12.0′	55.8′
15	46°07.0	·· 14.6	8°09.5	12.9′	17°25.9	12.0′	55.8′
16	61°07.3	13.7	22°41.3	12.8′	17°37.9	11.9′	55.8′
17	76°07.5	12.7	37°13.2	12.8′	17°49.8	11.7′	55.7′
18	91°07.7	N03°11.8	51°44.9	12.7′	S18°01.5	11.7′	55.7′
19	106°07.9	10.8	66°16.7	12.7′	18°13.2	11.6′	55.7′
20	121°08.2	09.8	80°48.4	12.7′	18°24.8	11.5′	55.7′
21	136°08.4	·· 08.9	95°20.1	12.6′	18°36.3	11.4′	55.6′
22	151°08.6	07.9	109°51.7	12.6′	18°47.7	11.3′	55.6′
23	166°08.8	07.0	124°23.3	12.6′	18°59.0	11.2′	55.6′
	SD = 15.9′	d = 1.0′	SD = 15.3′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°09.0	N03°06.0	138°54.9	12.5′	S19°10.2	11.1′	55.6′
1	196°09.3	05.0	153°26.4	12.5′	19°21.3	11.0′	55.5′
2	211°09.5	04.1	167°57.9	12.4′	19°32.3	11.0′	55.5′
3	226°09.7	·· 03.1	182°29.3	12.4′	19°43.3	10.8′	55.5′
4	241°09.9	02.1	197°00.7	12.4′	19°54.1	10.7′	55.5′
5	256°10.2	01.2	211°32.1	12.3′	20°04.8	10.6′	55.4′
6	271°10.4	N03°00.2	226°03.4	12.3′	S20°15.4	10.5′	55.4′
7	286°10.6	02°59.3	240°34.7	12.2′	20°25.9	10.4′	55.4′
8	301°10.8	58.3	255°05.9	12.2′	20°36.3	10.3′	55.4′
9	316°11.1	·· 57.3	269°37.1	12.2′	20°46.6	10.2′	55.3′
10	331°11.3	56.4	284°08.3	12.1′	20°56.8	10.1′	55.3′
11	346°11.5	55.4	298°39.4	12.1′	21°06.9	10.0′	55.3′
12	1°11.7	N02°54.4	313°10.5	12.0′	S21°16.9	9.9′	55.3′
13	16°11.9	53.5	327°41.5	12.0′	21°26.8	9.7′	55.2′
14	31°12.2	52.5	342°12.5	11.9′	21°36.5	9.7′	55.2′
15	46°12.4	·· 51.6	356°43.4	11.9′	21°46.2	9.6′	55.2′
16	61°12.6	50.6	11°14.3	11.9′	21°55.8	9.4′	55.2′
17	76°12.8	49.6	25°45.2	11.8′	22°05.2	9.3′	55.1′
18	91°13.1	N02°48.7	40°16.0	11.8′	S22°14.5	9.3′	55.1′
19	106°13.3	47.7	54°46.8	11.7′	22°23.8	9.1′	55.1′
20	121°13.5	46.7	69°17.5	11.7′	22°32.9	9.0′	55.1′
21	136°13.7	·· 45.8	83°48.2	11.7′	22°41.9	8.9′	55.1′
22	151°13.9	44.8	98°18.9	11.6′	22°50.8	8.8′	55.0′
23	166°14.2	43.9	112°49.5	11.6′	22°59.6	8.6′	55.0′
	SD = 15.9′	d = 1.0′	SD = 15.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:59	03:50	05:02	18:46	19:58	21:45
N 70°	02:33	04:04	05:08	18:41	19:45	21:13
68°	02:57	04:15	05:13	18:36	19:34	20:51
66°	03:15	04:24	05:17	18:32	19:25	20:33
64°	03:29	04:31	05:20	18:29	19:18	20:20
62°	03:41	04:37	05:23	18:27	19:12	20:08
60°	03:50	04:43	05:25	18:24	19:07	19:59
N 58°	03:59	04:48	05:28	18:22	19:02	19:51
56°	04:06	04:52	05:29	18:20	18:58	19:44
54°	04:12	04:55	05:31	18:19	18:54	19:37
52°	04:18	04:59	05:33	18:17	18:51	19:32
50°	04:23	05:02	05:34	18:16	18:48	19:27
45°	04:33	05:08	05:37	18:13	18:42	19:17
N 40°	04:41	05:13	05:40	18:11	18:38	19:10
35°	04:47	05:17	05:42	18:09	18:34	19:04
30°	04:52	05:20	05:44	18:07	18:31	18:59
20°	04:59	05:25	05:47	18:04	18:26	18:51
N 10°	05:04	05:29	05:50	18:01	18:22	18:47
0°	05:08	05:32	05:52	17:59	18:20	18:44
S 10°	05:09	05:34	05:55	17:57	18:18	18:42
20°	05:10	05:35	05:57	17:54	18:16	18:42
30°	05:08	05:36	06:00	17:52	18:16	18:44
35°	05:07	05:36	06:01	17:51	18:16	18:45
40°	05:04	05:36	06:03	17:49	18:16	18:48
45°	05:01	05:35	06:05	17:47	18:17	18:51
S 50°	04:57	05:35	06:07	17:45	18:18	18:55
52°	04:55	05:34	06:08	17:44	18:18	18:57
54°	04:52	05:34	06:09	17:44	18:19	19:00
56°	04:50	05:33	06:10	17:42	18:19	19:03
58°	04:46	05:32	06:11	17:41	18:20	19:06
S 60°	04:43	05:31	06:12	17:40	18:21	19:10

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	10:04	13:12	▬	16:49	15:18	▬
N 70°	09:44	12:10	▬	17:12	16:22	▬
68°	09:29	11:35	14:42	17:29	16:58	15:30
66°	09:16	11:11	13:21	17:43	17:24	16:52
64°	09:06	10:52	12:44	17:55	17:44	17:30
62°	08:57	10:36	12:18	18:05	18:01	17:56
60°	08:50	10:23	11:58	18:14	18:15	18:17
N 58°	08:43	10:12	11:42	18:21	18:27	18:35
56°	08:37	10:03	11:28	18:28	18:37	18:49
54°	08:32	09:54	11:16	18:34	18:46	19:02
52°	08:28	09:47	11:05	18:40	18:54	19:13
50°	08:24	09:40	10:56	18:45	19:02	19:23
45°	08:15	09:26	10:36	18:56	19:18	19:44
N 40°	08:07	09:14	10:20	19:05	19:31	20:01
35°	08:01	09:04	10:06	19:12	19:42	20:15
30°	07:55	08:55	09:55	19:19	19:52	20:28
20°	07:46	08:40	09:35	19:31	20:09	20:49
N 10°	07:37	08:27	09:18	19:42	20:24	21:08
0°	07:30	08:15	09:02	19:51	20:37	21:25
S 10°	07:22	08:03	08:46	20:01	20:52	21:43
20°	07:14	07:51	08:29	20:12	21:07	22:02
30°	07:05	07:36	08:10	20:24	21:24	22:23
35°	07:00	07:28	07:59	20:31	21:34	22:36
40°	06:54	07:19	07:46	20:39	21:46	22:51
45°	06:47	07:08	07:31	20:49	21:59	23:09
S 50°	06:39	06:54	07:13	21:00	22:16	23:31
52°	06:35	06:48	07:05	21:06	22:24	23:42
54°	06:31	06:42	06:55	21:12	22:33	23:54
56°	06:26	06:34	06:44	21:18	22:43	·· ··
58°	06:21	06:26	06:32	21:26	22:55	·· ··
S 60°	06:16	06:16	06:18	21:34	23:08	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 2-4 4-16%
13	03:54	04:04	11:56	13:41	01:18	
14	04:15	04:26	11:56	14:26	02:03	
15	04:36	04:47	11:55	15:14	02:50	

September 16, 17, 18 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	354°57.6	145°41.5	S17°39.7	240°16.6	N22°16.7	215°34.2	N16°20.8	342°13.0	N02°32.5
1	10°00.1	160°42.8	40.5	255°17.4	16.5	230°36.1	20.6	357°15.6	32.5
2	25°02.5	175°44.0	41.3	270°18.3	16.2	245°38.1	20.5	12°18.2	32.4
3	40°05.0	190°45.3	·· 42.0	285°19.1	·· 16.0	260°40.1	·· 20.3	27°20.9	·· 32.3
4	55°07.5	205°46.6	42.8	300°19.9	15.8	275°42.0	20.2	42°23.5	32.2
5	70°09.9	220°47.8	43.6	315°20.7	15.6	290°44.0	20.1	57°26.1	32.2
6	85°12.4	235°49.1	S17°44.3	330°21.6	N22°15.4	305°46.0	N16°19.9	72°28.8	N02°32.1
7	100°14.9	250°50.4	45.1	345°22.4	15.2	320°48.0	19.8	87°31.4	32.0
8	115°17.3	265°51.6	45.9	0°23.2	15.0	335°49.9	19.6	102°34.0	31.9
9	130°19.8	280°52.9	·· 46.6	15°24.1	·· 14.7	350°51.9	·· 19.5	117°36.6	·· 31.9
10	145°22.2	295°54.2	47.4	30°24.9	14.5	5°53.9	19.3	132°39.3	31.8
11	160°24.7	310°55.5	48.1	45°25.7	14.3	20°55.9	19.2	147°41.9	31.7
12	175°27.2	325°56.8	S17°48.9	60°26.6	N22°14.1	35°57.8	N16°19.1	162°44.5	N02°31.6
13	190°29.6	340°58.0	49.7	75°27.4	13.9	50°59.8	18.9	177°47.1	31.6
14	205°32.1	355°59.3	50.4	90°28.2	13.7	66°01.8	18.8	192°49.8	31.5
15	220°34.6	11°00.6	·· 51.2	105°29.1	·· 13.4	81°03.8	·· 18.6	207°52.4	·· 31.4
16	235°37.0	26°01.9	51.9	120°29.9	13.2	96°05.7	18.5	222°55.0	31.3
17	250°39.5	41°03.2	52.7	135°30.8	13.0	111°07.7	18.3	237°57.7	31.3
18	265°42.0	56°04.5	S17°53.4	150°31.6	N22°12.8	126°09.7	N16°18.2	253°00.3	N02°31.2
19	280°44.4	71°05.8	54.2	165°32.4	12.6	141°11.7	18.0	268°02.9	31.1
20	295°46.9	86°07.1	55.0	180°33.3	12.3	156°13.6	17.9	283°05.5	31.0
21	310°49.4	101°08.4	·· 55.7	195°34.1	·· 12.1	171°15.6	·· 17.8	298°08.2	·· 31.0
22	325°51.8	116°09.7	56.5	210°34.9	11.9	186°17.6	17.6	313°10.8	30.9
23	340°54.3	131°11.0	57.2	225°35.8	11.7	201°19.6	17.5	328°13.4	30.8
Mer.pass. 00:20		ν 1.3′	d 0.8′	m -4.78	ν 0.8′	d 0.2′	m 1.19	ν 2.0′	d 0.1′ m -1.83	ν 2.6′	d 0.1′ m 0.41

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°56.7	146°12.3	S17°58.0	240°36.6	N22°11.5	216°21.5	N16°17.3	343°16.1	N02°30.7
1	10°59.2	161°13.7	58.7	255°37.4	11.2	231°23.5	17.2	358°18.7	30.7
2	26°01.7	176°15.0	17°59.4	270°38.3	11.0	246°25.5	17.0	13°21.3	30.6
3	41°04.1	191°16.3	18°00.2	285°39.1	·· 10.8	261°27.5	·· 16.9	28°23.9	·· 30.5
4	56°06.6	206°17.6	00.9	300°40.0	10.6	276°29.4	16.8	43°26.6	30.4
5	71°09.1	221°18.9	01.7	315°40.8	10.4	291°31.4	16.6	58°29.2	30.4
6	86°11.5	236°20.2	S18°02.4	330°41.6	N22°10.1	306°33.4	N16°16.5	73°31.8	N02°30.3
7	101°14.0	251°21.6	03.2	345°42.5	09.9	321°35.4	16.3	88°34.5	30.2
8	116°16.5	266°22.9	03.9	0°43.3	09.7	336°37.3	16.2	103°37.1	30.1
9	131°18.9	281°24.2	·· 04.6	15°44.2	·· 09.5	351°39.3	·· 16.0	118°39.7	·· 30.1
10	146°21.4	296°25.6	05.4	30°45.0	09.3	6°41.3	15.9	133°42.3	30.0
11	161°23.9	311°26.9	06.1	45°45.8	09.0	21°43.3	15.8	148°45.0	29.9
12	176°26.3	326°28.2	S18°06.9	60°46.7	N22°08.8	36°45.2	N16°15.6	163°47.6	N02°29.8
13	191°28.8	341°29.6	07.6	75°47.5	08.6	51°47.2	15.5	178°50.2	29.8
14	206°31.2	356°30.9	08.3	90°48.4	08.4	66°49.2	15.3	193°52.9	29.7
15	221°33.7	11°32.3	·· 09.1	105°49.2	·· 08.2	81°51.2	·· 15.2	208°55.5	·· 29.6
16	236°36.2	26°33.6	09.8	120°50.0	07.9	96°53.1	15.0	223°58.1	29.5
17	251°38.6	41°35.0	10.5	135°50.9	07.7	111°55.1	14.9	239°00.7	29.5
18	266°41.1	56°36.3	S18°11.2	150°51.7	N22°07.5	126°57.1	N16°14.8	254°03.4	N02°29.4
19	281°43.6	71°37.7	12.0	165°52.6	07.3	141°59.1	14.6	269°06.0	29.3
20	296°46.0	86°39.0	12.7	180°53.4	07.0	157°01.1	14.5	284°08.6	29.2
21	311°48.5	101°40.4	·· 13.4	195°54.3	·· 06.8	172°03.0	·· 14.3	299°11.3	·· 29.2
22	326°51.0	116°41.8	14.2	210°55.1	06.6	187°05.0	14.2	314°13.9	29.1
23	341°53.4	131°43.1	14.9	225°55.9	06.4	202°07.0	14.0	329°16.5	29.0
Mer.pass. 00:16		ν 1.3′	d 0.7′	m -4.78	ν 0.8′	d 0.2′	m 1.18	ν 2.0′	d 0.1′ m -1.83	ν 2.6′	d 0.1′ m 0.41

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°55.9	146°44.5	S18°15.6	240°56.8	N22°06.1	217°09.0	N16°13.9	344°19.2	N02°28.9
1	11°58.3	161°45.9	16.3	255°57.6	05.9	232°10.9	13.8	359°21.8	28.9
2	27°00.8	176°47.2	17.0	270°58.5	05.7	247°12.9	13.6	14°24.4	28.8
3	42°03.3	191°48.6	·· 17.8	285°59.3	·· 05.5	262°14.9	·· 13.5	29°27.0	·· 28.7
4	57°05.7	206°50.0	18.5	301°00.2	05.2	277°16.9	13.3	44°29.7	28.6
5	72°08.2	221°51.3	19.2	316°01.0	05.0	292°18.9	13.2	59°32.3	28.6
6	87°10.7	236°52.7	S18°19.9	331°01.9	N22°04.8	307°20.8	N16°13.0	74°34.9	N02°28.5
7	102°13.1	251°54.1	20.6	346°02.7	04.6	322°22.8	12.9	89°37.6	28.4
8	117°15.6	266°55.5	21.3	1°03.6	04.3	337°24.8	12.8	104°40.2	28.3
9	132°18.1	281°56.9	·· 22.1	16°04.4	·· 04.1	352°26.8	·· 12.6	119°42.8	·· 28.3
10	147°20.5	296°58.3	22.8	31°05.2	03.9	7°28.8	12.5	134°45.5	28.2
11	162°23.0	311°59.7	23.5	46°06.1	03.7	22°30.7	12.3	149°48.1	28.1
12	177°25.5	327°01.1	S18°24.2	61°06.9	N22°03.4	37°32.7	N16°12.2	164°50.7	N02°28.0
13	192°27.9	342°02.5	24.9	76°07.8	03.2	52°34.7	12.0	179°53.4	28.0
14	207°30.4	357°03.9	25.6	91°08.6	03.0	67°36.7	11.9	194°56.0	27.9
15	222°32.8	12°05.3	·· 26.3	106°09.5	·· 02.7	82°38.7	·· 11.8	209°58.6	·· 27.8
16	237°35.3	27°06.7	27.0	121°10.3	02.5	97°40.6	11.6	225°01.3	27.7
17	252°37.8	42°08.1	27.7	136°11.2	02.3	112°42.6	11.5	240°03.9	27.7
18	267°40.2	57°09.5	S18°28.4	151°12.0	N22°02.1	127°44.6	N16°11.3	255°06.5	N02°27.6
19	282°42.7	72°10.9	29.1	166°12.9	01.8	142°46.6	11.2	270°09.1	27.5
20	297°45.2	87°12.3	29.8	181°13.7	01.6	157°48.6	11.0	285°11.8	27.4
21	312°47.6	102°13.7	·· 30.5	196°14.6	·· 01.4	172°50.5	·· 10.9	300°14.4	·· 27.4
22	327°50.1	117°15.1	31.2	211°15.4	01.1	187°52.5	10.8	315°17.0	27.3
23	342°52.6	132°16.6	31.9	226°16.3	00.9	202°54.5	10.6	330°19.7	27.2
Mer.pass. 00:12		ν 1.4′	d 0.7′	m -4.79	ν 0.8′	d 0.2′	m 1.18	ν 2.0′	d 0.1′ m -1.84	ν 2.6′	d 0.1′ m 0.40

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.4	-42°09.4
Schedar	349°28.9	56°41.1
Diphda	348°45.6	-17°50.2
Achernar	335°18.6	-57°05.8
Hamal	327°49.3	23°35.4
Polaris	313°01.5	89°22.3
Acamar	315°10.4	-40°11.5
Menkar	314°04.5	4°11.8
Mirfak	308°26.0	49°57.3
Aldebaran	290°37.9	16°33.8
Rigel	281°02.5	-8°10.0
Capella	280°19.8	46°01.3
Bellatrix	278°21.4	6°22.5
Elnath	278°00.1	28°37.8
Alnilam	275°36.3	-1°10.9
Betelgeuse	270°50.6	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.1	-16°44.9
Adhara	255°04.9	-29°00.2
Procyon	244°49.5	5°09.5
Pollux	243°15.8	27°57.7
Avior	234°14.6	-59°35.4
Suhail	222°45.6	-43°32.2
Miaplacidus	221°38.8	-69°49.4
Alphard	217°46.7	-8°46.3
Regulus	207°33.3	11°50.3
Dubhe	193°40.0	61°36.4
Denebola	182°23.9	14°25.4
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.7	-57°15.8
Alioth	166°12.3	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.5	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.8	-60°56.9
Kochab	137°20.6	74°02.9
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.2	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.5	-37°07.5
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.5	51°29.4
Kaus Aust.	83°30.6	-34°22.4
Vega	80°32.2	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.1	-56°39.0
Deneb	49°24.5	45°22.8
Enif	33°37.1	10°00.0
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.1

Sep 16 Wed	SHA	Mer.pass
Venus	150°43.9	14:16
Mars	245°19.0	07:58
Jupiter	220°36.6	09:36
Saturn	347°15.4	01:11

Sep 17 Thu	SHA	Mer.pass
Venus	150°15.6	14:14
Mars	244°39.9	07:57
Jupiter	220°24.8	09:33
Saturn	347°19.3	01:07

Sep 18 Fri	SHA	Mer.pass
Venus	149°48.6	14:12
Mars	244°00.9	07:56
Jupiter	220°13.1	09:30
Saturn	347°23.3	01:03

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°14.4	N02°42.9	127°20.1	11.5′	S23°08.2	8.6′	55.0′
1	196°14.6	41.9	141°50.6	11.5′	23°16.8	8.4′	55.0′
2	211°14.8	41.0	156°21.1	11.4′	23°25.2	8.3′	55.0′
3	226°15.1	·· 40.0	170°51.6	11.4′	23°33.5	8.2′	54.9′
4	241°15.3	39.0	185°22.0	11.4′	23°41.7	8.1′	54.9′
5	256°15.5	38.1	199°52.3	11.3′	23°49.8	8.0′	54.9′
6	271°15.7	N02°37.1	214°22.7	11.3′	S23°57.8	7.9′	54.9′
7	286°16.0	36.1	228°52.9	11.2′	24°05.7	7.7′	54.9′
8	301°16.2	35.2	243°23.2	11.2′	24°13.4	7.6′	54.8′
9	316°16.4	·· 34.2	257°53.4	11.2′	24°21.0	7.5′	54.8′
10	331°16.6	33.3	272°23.6	11.1′	24°28.5	7.4′	54.8′
11	346°16.8	32.3	286°53.7	11.1′	24°35.9	7.2′	54.8′
12	1°17.1	N02°31.3	301°23.8	11.0′	S24°43.1	7.2′	54.8′
13	16°17.3	30.4	315°53.8	11.0′	24°50.3	7.0′	54.7′
14	31°17.5	29.4	330°23.8	11.0′	24°57.3	6.9′	54.7′
15	46°17.7	·· 28.4	344°53.8	10.9′	25°04.2	6.7′	54.7′
16	61°18.0	27.5	359°23.7	10.9′	25°10.9	6.7′	54.7′
17	76°18.2	26.5	13°53.6	10.9′	25°17.6	6.5′	54.7′
18	91°18.4	N02°25.5	28°23.5	10.8′	S25°24.1	6.4′	54.7′
19	106°18.6	24.6	42°53.3	10.8′	25°30.5	6.2′	54.6′
20	121°18.9	23.6	57°23.1	10.7′	25°36.7	6.2′	54.6′
21	136°19.1	·· 22.6	71°52.8	10.7′	25°42.9	6.0′	54.6′
22	151°19.3	21.7	86°22.5	10.7′	25°48.9	5.9′	54.6′
23	166°19.5	20.7	100°52.2	10.6′	25°54.8	5.8′	54.6′
	SD = 15.9′	d = 1.0′	SD = 15.0′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°19.7	N02°19.7	115°21.9	10.6′	S26°00.6	5.6′	54.6′
1	196°20.0	18.8	129°51.5	10.6′	26°06.2	5.5′	54.5′
2	211°20.2	17.8	144°21.1	10.5′	26°11.7	5.4′	54.5′
3	226°20.4	·· 16.8	158°50.6	10.5′	26°17.1	5.3′	54.5′
4	241°20.6	15.9	173°20.1	10.5′	26°22.4	5.1′	54.5′
5	256°20.9	14.9	187°49.6	10.5′	26°27.5	5.0′	54.5′
6	271°21.1	N02°13.9	202°19.1	10.4′	S26°32.5	4.8′	54.5′
7	286°21.3	13.0	216°48.5	10.4′	26°37.3	4.8′	54.5′
8	301°21.5	12.0	231°17.9	10.4′	26°42.1	4.6′	54.5′
9	316°21.8	·· 11.0	245°47.3	10.3′	26°46.7	4.5′	54.4′
10	331°22.0	10.1	260°16.6	10.3′	26°51.2	4.3′	54.4′
11	346°22.2	09.1	274°45.9	10.3′	26°55.5	4.2′	54.4′
12	1°22.4	N02°08.1	289°15.2	10.3′	S26°59.7	4.1′	54.4′
13	16°22.6	07.2	303°44.5	10.2′	27°03.8	4.0′	54.4′
14	31°22.9	06.2	318°13.7	10.2′	27°07.8	3.8′	54.4′
15	46°23.1	·· 05.2	332°42.9	10.2′	27°11.6	3.7′	54.4′
16	61°23.3	04.3	347°12.1	10.2′	27°15.3	3.5′	54.4′
17	76°23.5	03.3	1°41.3	10.1′	27°18.8	3.4′	54.3′
18	91°23.8	N02°02.3	16°10.4	10.1′	S27°22.2	3.3′	54.3′
19	106°24.0	01.4	30°39.6	10.1′	27°25.5	3.2′	54.3′
20	121°24.2	02°00.4	45°08.7	10.1′	27°28.7	3.0′	54.3′
21	136°24.4	01°59.4	59°37.8	10.1′	27°31.7	2.9′	54.3′
22	151°24.7	58.5	74°06.8	10.1′	27°34.6	2.7′	54.3′
23	166°24.9	57.5	88°35.9	10.0′	27°37.3	2.6′	54.3′
	SD = 15.9′	d = 1.0′	SD = 14.9′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°25.1	N01°56.5	103°04.9	10.0′	S27°39.9	2.5′	54.3′
1	196°25.3	55.6	117°34.0	10.0′	27°42.4	2.4′	54.3′
2	211°25.5	54.6	132°03.0	10.0′	27°44.8	2.2′	54.3′
3	226°25.8	·· 53.6	146°32.0	10.0′	27°47.0	2.1′	54.3′
4	241°26.0	52.7	161°01.0	10.0′	27°49.1	1.9′	54.3′
5	256°26.2	51.7	175°29.9	10.0′	27°51.0	1.8′	54.2′
6	271°26.4	N01°50.7	189°58.9	10.0′	S27°52.8	1.7′	54.2′
7	286°26.7	49.8	204°27.9	9.9′	27°54.5	1.5′	54.2′
8	301°26.9	48.8	218°56.8	9.9′	27°56.0	1.4′	54.2′
9	316°27.1	·· 47.8	233°25.7	9.9′	27°57.4	1.3′	54.2′
10	331°27.3	46.9	247°54.7	9.9′	27°58.7	1.1′	54.2′
11	346°27.6	45.9	262°23.6	9.9′	27°59.8	1.0′	54.2′
12	1°27.8	N01°44.9	276°52.5	9.9′	S28°00.8	0.9′	54.2′
13	16°28.0	44.0	291°21.4	9.9′	28°01.7	0.7′	54.2′
14	31°28.2	43.0	305°50.4	9.9′	28°02.4	0.6′	54.2′
15	46°28.5	·· 42.0	320°19.3	9.9′	28°03.0	0.4′	54.2′
16	61°28.7	41.1	334°48.2	9.9′	28°03.4	0.3′	54.2′
17	76°28.9	40.1	349°17.1	9.9′	28°03.7	0.2′	54.2′
18	91°29.1	N01°39.1	3°46.0	9.9′	S28°03.9	0.1′	54.2′
19	106°29.3	38.1	18°14.9	9.9′	28°04.0	0.1′	54.2′
20	121°29.6	37.2	32°43.9	9.9′	28°03.9	0.3′	54.2′
21	136°29.8	·· 36.2	47°12.8	9.9′	28°03.6	0.3′	54.2′
22	151°30.0	35.2	61°41.7	9.9′	28°03.3	0.5′	54.2′
23	166°30.2	34.3	76°10.6	9.9′	28°02.8	0.7′	54.2′
	SD = 15.9′	d = 1.0′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:24	04:05	05:16	18:30	19:40	21:19
N 70°	02:51	04:17	05:20	18:27	19:29	20:53
68°	03:11	04:26	05:23	18:23	19:20	20:34
66°	03:27	04:34	05:26	18:21	19:13	20:19
64°	03:40	04:40	05:29	18:19	19:07	20:07
62°	03:50	04:46	05:31	18:17	19:02	19:57
60°	03:59	04:50	05:32	18:15	18:57	19:48
N 58°	04:06	04:54	05:34	18:14	18:53	19:41
56°	04:13	04:58	05:35	18:12	18:50	19:35
54°	04:18	05:01	05:37	18:11	18:47	19:29
52°	04:23	05:04	05:38	18:10	18:44	19:24
50°	04:28	05:06	05:39	18:09	18:42	19:20
45°	04:37	05:11	05:41	18:07	18:37	19:11
N 40°	04:44	05:16	05:43	18:06	18:33	19:05
35°	04:49	05:19	05:44	18:04	18:29	18:59
30°	04:54	05:22	05:46	18:03	18:27	18:55
20°	05:00	05:26	05:48	18:01	18:23	18:49
N 10°	05:04	05:29	05:50	17:59	18:20	18:45
0°	05:07	05:31	05:51	17:58	18:18	18:42
S 10°	05:07	05:32	05:53	17:56	18:17	18:42
20°	05:07	05:32	05:54	17:55	18:17	18:43
30°	05:04	05:32	05:56	17:54	18:17	18:45
35°	05:02	05:32	05:57	17:53	18:18	18:47
40°	04:59	05:31	05:58	17:52	18:19	18:50
45°	04:56	05:30	05:59	17:51	18:20	18:54
S 50°	04:50	05:28	06:00	17:50	18:22	19:00
52°	04:48	05:27	06:01	17:49	18:23	19:02
54°	04:45	05:26	06:01	17:49	18:24	19:06
56°	04:41	05:25	06:02	17:48	18:25	19:09
58°	04:38	05:24	06:03	17:48	18:27	19:13
S 60°	04:33	05:22	06:03	17:47	18:28	19:18

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	14:58	▬	▬	16:58	▬	▬
62°	14:05	15:57	▬	17:51	17:44	▬
60°	13:33	15:03	16:13	18:24	18:39	19:16
N 58°	13:09	14:30	15:36	18:48	19:12	19:53
56°	12:50	14:06	15:09	19:07	19:36	20:20
54°	12:34	13:47	14:48	19:24	19:55	20:41
52°	12:21	13:31	14:31	19:38	20:12	20:58
50°	12:09	13:17	14:16	19:50	20:26	21:13
45°	11:44	12:48	13:46	20:16	20:55	21:43
N 40°	11:24	12:26	13:22	20:36	21:18	22:07
35°	11:08	12:07	13:03	20:53	21:36	22:26
30°	10:54	11:52	12:46	21:08	21:53	22:43
20°	10:30	11:25	12:18	21:33	22:20	23:10
N 10°	10:10	11:02	11:54	21:54	22:43	23:35
0°	09:51	10:41	11:32	22:15	23:05	23:57
S 10°	09:32	10:19	11:10	22:35	23:27	·· ··
20°	09:11	09:57	10:46	22:57	23:51	·· ··
30°	08:48	09:31	10:18	23:22	·· ··	00:18
35°	08:34	09:15	10:02	23:37	·· ··	00:35
40°	08:19	08:57	09:42	23:54	·· ··	00:53
45°	08:00	08:36	09:19	·· ··	00:15	01:16
S 50°	07:37	08:09	08:50	·· ··	00:42	01:46
52°	07:26	07:55	08:35	·· ··	00:55	02:00
54°	07:14	07:40	08:18	·· ··	01:10	02:17
56°	06:59	07:22	07:58	00:07	01:27	02:37
58°	06:43	07:01	07:33	00:23	01:48	03:02
S 60°	06:23	06:33	06:58	00:43	02:16	03:37

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 5-7 24-42%
16	04:58	05:08	11:55	16:03	03:38	
17	05:19	05:30	11:55	16:53	04:28	
18	05:40	05:51	11:54	17:44	05:19	

September 19, 20, 21 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	357°55.0	147°18.0	S18°32.6	241°17.1	N22°00.7	217°56.5	N16°10.5	345°22.3	N02°27.1
1	12°57.5	162°19.4	33.3	256°18.0	00.5	232°58.5	10.3	0°24.9	27.1
2	28°00.0	177°20.9	34.0	271°18.8	00.2	248°00.4	10.2	15°27.6	27.0
3	43°02.4	192°22.3	·· 34.7	286°19.7	22°00.0	263°02.4	·· 10.1	30°30.2	·· 26.9
4	58°04.9	207°23.7	35.4	301°20.5	21°59.8	278°04.4	09.9	45°32.8	26.8
5	73°07.3	222°25.2	36.1	316°21.4	59.5	293°06.4	09.8	60°35.5	26.8
6	88°09.8	237°26.6	S18°36.8	331°22.2	N21°59.3	308°08.4	N16°09.6	75°38.1	N02°26.7
7	103°12.3	252°28.0	37.5	346°23.1	59.1	323°10.3	09.5	90°40.7	26.6
8	118°14.7	267°29.5	38.2	1°23.9	58.8	338°12.3	09.3	105°43.4	26.5
9	133°17.2	282°30.9	·· 38.9	16°24.8	·· 58.6	353°14.3	·· 09.2	120°46.0	·· 26.5
10	148°19.7	297°32.4	39.5	31°25.7	58.4	8°16.3	09.1	135°48.6	26.4
11	163°22.1	312°33.8	40.2	46°26.5	58.1	23°18.3	08.9	150°51.3	26.3
12	178°24.6	327°35.3	S18°40.9	61°27.4	N21°57.9	38°20.3	N16°08.8	165°53.9	N02°26.2
13	193°27.1	342°36.7	41.6	76°28.2	57.7	53°22.2	08.6	180°56.5	26.2
14	208°29.5	357°38.2	42.3	91°29.1	57.4	68°24.2	08.5	195°59.2	26.1
15	223°32.0	12°39.7	·· 43.0	106°29.9	·· 57.2	83°26.2	·· 08.3	211°01.8	·· 26.0
16	238°34.5	27°41.1	43.6	121°30.8	57.0	98°28.2	08.2	226°04.4	25.9
17	253°36.9	42°42.6	44.3	136°31.6	56.7	113°30.2	08.1	241°07.1	25.9
18	268°39.4	57°44.1	S18°45.0	151°32.5	N21°56.5	128°32.2	N16°07.9	256°09.7	N02°25.8
19	283°41.8	72°45.5	45.7	166°33.3	56.3	143°34.1	07.8	271°12.3	25.7
20	298°44.3	87°47.0	46.3	181°34.2	56.0	158°36.1	07.6	286°15.0	25.6
21	313°46.8	102°48.5	·· 47.0	196°35.1	·· 55.8	173°38.1	·· 07.5	301°17.6	·· 25.5
22	328°49.2	117°50.0	47.7	211°35.9	55.6	188°40.1	07.4	316°20.2	25.5
23	343°51.7	132°51.5	48.4	226°36.8	55.3	203°42.1	07.2	331°22.9	25.4
Mer.pass. 00:08		ν 1.4′	d 0.7′	m -4.80	ν 0.9′	d 0.2′	m 1.17	ν 2.0′	d 0.1′ m -1.84	ν 2.6′	d 0.1′ m 0.40

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	358°54.2	147°52.9	S18°49.0	241°37.6	N21°55.1	218°44.1	N16°07.1	346°25.5	N02°25.3
1	13°56.6	162°54.4	49.7	256°38.5	54.9	233°46.0	06.9	1°28.1	25.2
2	28°59.1	177°55.9	50.4	271°39.3	54.6	248°48.0	06.8	16°30.8	25.2
3	44°01.6	192°57.4	·· 51.0	286°40.2	·· 54.4	263°50.0	·· 06.6	31°33.4	·· 25.1
4	59°04.0	207°58.9	51.7	301°41.1	54.2	278°52.0	06.5	46°36.0	25.0
5	74°06.5	223°00.4	52.4	316°41.9	53.9	293°54.0	06.4	61°38.7	24.9
6	89°08.9	238°01.9	S18°53.0	331°42.8	N21°53.7	308°56.0	N16°06.2	76°41.3	N02°24.9
7	104°11.4	253°03.4	53.7	346°43.6	53.5	323°58.0	06.1	91°43.9	24.8
8	119°13.9	268°04.9	54.3	1°44.5	53.2	338°59.9	05.9	106°46.6	24.7
9	134°16.3	283°06.4	·· 55.0	16°45.4	·· 53.0	354°01.9	·· 05.8	121°49.2	·· 24.6
10	149°18.8	298°07.9	55.7	31°46.2	52.7	9°03.9	05.7	136°51.8	24.6
11	164°21.3	313°09.4	56.3	46°47.1	52.5	24°05.9	05.5	151°54.5	24.5
12	179°23.7	328°11.0	S18°57.0	61°47.9	N21°52.3	39°07.9	N16°05.4	166°57.1	N02°24.4
13	194°26.2	343°12.5	57.6	76°48.8	52.0	54°09.9	05.2	181°59.7	24.3
14	209°28.7	358°14.0	58.3	91°49.7	51.8	69°11.9	05.1	197°02.4	24.3
15	224°31.1	13°15.5	·· 58.9	106°50.5	·· 51.6	84°13.8	·· 04.9	212°05.0	·· 24.2
16	239°33.6	28°17.1	18°59.6	121°51.4	51.3	99°15.8	04.8	227°07.6	24.1
17	254°36.1	43°18.6	19°00.2	136°52.3	51.1	114°17.8	04.7	242°10.3	24.0
18	269°38.5	58°20.1	S19°00.9	151°53.1	N21°50.8	129°19.8	N16°04.5	257°12.9	N02°24.0
19	284°41.0	73°21.7	01.5	166°54.0	50.6	144°21.8	04.4	272°15.5	23.9
20	299°43.4	88°23.2	02.2	181°54.8	50.4	159°23.8	04.2	287°18.2	23.8
21	314°45.9	103°24.7	·· 02.8	196°55.7	·· 50.1	174°25.8	·· 04.1	302°20.8	·· 23.7
22	329°48.4	118°26.3	03.5	211°56.6	49.9	189°27.7	04.0	317°23.4	23.6
23	344°50.8	133°27.8	04.1	226°57.4	49.7	204°29.7	03.8	332°26.1	23.6
Mer.pass. 00:04		ν 1.5′	d 0.7′	m -4.80	ν 0.9′	d 0.2′	m 1.17	ν 2.0′	d 0.1′ m -1.84	ν 2.6′	d 0.1′ m 0.40

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	359°53.3	148°29.4	S19°04.8	241°58.3	N21°49.4	219°31.7	N16°03.7	347°28.7	N02°23.5
1	14°55.8	163°30.9	05.4	256°59.2	49.2	234°33.7	03.5	2°31.3	23.4
2	29°58.2	178°32.5	06.0	272°00.0	48.9	249°35.7	03.4	17°34.0	23.3
3	45°00.7	193°34.0	·· 06.7	287°00.9	·· 48.7	264°37.7	·· 03.3	32°36.6	·· 23.3
4	60°03.2	208°35.6	07.3	302°01.8	48.4	279°39.7	03.1	47°39.2	23.2
5	75°05.6	223°37.2	07.9	317°02.6	48.2	294°41.7	03.0	62°41.9	23.1
6	90°08.1	238°38.7	S19°08.6	332°03.5	N21°48.0	309°43.6	N16°02.8	77°44.5	N02°23.0
7	105°10.6	253°40.3	09.2	347°04.4	47.7	324°45.6	02.7	92°47.1	23.0
8	120°13.0	268°41.9	09.8	2°05.2	47.5	339°47.6	02.5	107°49.8	22.9
9	135°15.5	283°43.4	·· 10.5	17°06.1	·· 47.2	354°49.6	·· 02.4	122°52.4	·· 22.8
10	150°17.9	298°45.0	11.1	32°07.0	47.0	9°51.6	02.3	137°55.0	22.7
11	165°20.4	313°46.6	11.7	47°07.8	46.8	24°53.6	02.1	152°57.7	22.7
12	180°22.9	328°48.2	S19°12.4	62°08.7	N21°46.5	39°55.6	N16°02.0	168°00.3	N02°22.6
13	195°25.3	343°49.8	13.0	77°09.6	46.3	54°57.6	01.8	183°03.0	22.5
14	210°27.8	358°51.3	13.6	92°10.4	46.0	69°59.6	01.7	198°05.6	22.4
15	225°30.3	13°52.9	·· 14.2	107°11.3	·· 45.8	85°01.5	·· 01.6	213°08.2	·· 22.3
16	240°32.7	28°54.5	14.8	122°12.2	45.5	100°03.5	01.4	228°10.9	22.3
17	255°35.2	43°56.1	15.5	137°13.0	45.3	115°05.5	01.3	243°13.5	22.2
18	270°37.7	58°57.7	S19°16.1	152°13.9	N21°45.1	130°07.5	N16°01.1	258°16.1	N02°22.1
19	285°40.1	73°59.3	16.7	167°14.8	44.8	145°09.5	01.0	273°18.8	22.0
20	300°42.6	89°00.9	17.3	182°15.6	44.6	160°11.5	00.9	288°21.4	22.0
21	315°45.0	104°02.5	·· 17.9	197°16.5	·· 44.3	175°13.5	·· 00.7	303°24.0	·· 21.9
22	330°47.5	119°04.1	18.6	212°17.4	44.1	190°15.5	00.6	318°26.7	21.8
23	345°50.0	134°05.7	19.2	227°18.3	43.8	205°17.5	00.4	333°29.3	21.7
Mer.pass. 23:57		ν 1.6′	d 0.6′	m -4.81	ν 0.9′	d 0.2′	m 1.16	ν 2.0′	d 0.1′ m -1.84	ν 2.6′	d 0.1′ m 0.39

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.4
Ankaa	353°05.3	-42°09.4
Schedar	349°28.9	56°41.1
Diphda	348°45.6	-17°50.2
Achernar	335°18.6	-57°05.8
Hamal	327°49.3	23°35.4
Polaris	313°00.0	89°22.4
Acamar	315°10.4	-40°11.5
Menkar	314°04.5	4°11.8
Mirfak	308°25.9	49°57.3
Aldebaran	290°37.9	16°33.8
Rigel	281°02.5	-8°10.0
Capella	280°19.7	46°01.3
Bellatrix	278°21.3	6°22.5
Elnath	278°00.1	28°37.8
Alnilam	275°36.3	-1°10.9
Betelgeuse	270°50.6	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.1	-16°44.9
Adhara	255°04.9	-29°00.2
Procyon	244°49.5	5°09.5
Pollux	243°15.8	27°57.7
Avior	234°14.6	-59°35.4
Suhail	222°45.6	-43°32.2
Miaplacidus	221°38.7	-69°49.4
Alphard	217°46.6	-8°46.3
Regulus	207°33.2	11°50.3
Dubhe	193°39.9	61°36.4
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.7	-57°15.8
Alioth	166°12.3	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.5	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.8	-60°56.9
Kochab	137°20.6	74°02.9
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.7	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.3	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.5	-37°07.5
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.5	51°29.4
Kaus Aust.	83°30.6	-34°22.4
Vega	80°32.2	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.2	-56°39.0
Deneb	49°24.5	45°22.8
Enif	33°37.1	10°00.1
Al Na'ir	27°30.7	-46°49.8
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.1

Sep 19 Sat	SHA	Mer.pass
Venus	149°23.0	14:09
Mars	243°22.1	07:54
Jupiter	220°01.5	09:27
Saturn	347°27.3	00:58

Sep 20 Sun	SHA	Mer.pass
Venus	148°58.8	14:07
Mars	242°43.5	07:53
Jupiter	219°49.9	09:24
Saturn	347°31.3	00:54

Sep 21 Mon	SHA	Mer.pass
Venus	148°36.1	14:05
Mars	242°05.0	07:52
Jupiter	219°38.4	09:21
Saturn	347°35.4	00:50

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	181°30.5	N01°33.3	90°39.6	10.0′	S28°02.1	0.7′	54.2′
1	196°30.7	32.3	105°08.5	10.0′	28°01.4	0.9′	54.2′
2	211°30.9	31.4	119°37.5	10.0′	28°00.5	1.1′	54.2′
3	226°31.1	·· 30.4	134°06.5	10.0′	27°59.4	1.2′	54.2′
4	241°31.4	29.4	148°35.5	10.0′	27°58.2	1.3′	54.2′
5	256°31.6	28.5	163°04.5	10.0′	27°56.9	1.4′	54.2′
6	271°31.8	N01°27.5	177°33.5	10.0′	S27°55.5	1.6′	54.2′
7	286°32.0	26.5	192°02.5	10.0′	27°53.9	1.7′	54.2′
8	301°32.2	25.6	206°31.5	10.1′	27°52.2	1.9′	54.2′
9	316°32.5	·· 24.6	221°00.6	10.1′	27°50.3	2.0′	54.2′
10	331°32.7	23.6	235°29.6	10.1′	27°48.3	2.1′	54.2′
11	346°32.9	22.6	249°58.7	10.1′	27°46.2	2.2′	54.2′
12	1°33.1	N01°21.7	264°27.8	10.1′	S27°44.0	2.4′	54.2′
13	16°33.4	20.7	278°57.0	10.1′	27°41.6	2.6′	54.2′
14	31°33.6	19.7	293°26.1	10.2′	27°39.0	2.6′	54.2′
15	46°33.8	·· 18.8	307°55.3	10.2′	27°36.4	2.8′	54.2′
16	61°34.0	17.8	322°24.5	10.2′	27°33.6	2.9′	54.2′
17	76°34.3	16.8	336°53.7	10.2′	27°30.7	3.1′	54.2′
18	91°34.5	N01°15.9	351°22.9	10.3′	S27°27.6	3.1′	54.2′
19	106°34.7	14.9	5°52.2	10.3′	27°24.5	3.4′	54.2′
20	121°34.9	13.9	20°21.5	10.3′	27°21.1	3.4′	54.2′
21	136°35.1	·· 12.9	34°50.8	10.3′	27°17.7	3.6′	54.2′
22	151°35.4	12.0	49°20.1	10.4′	27°14.1	3.7′	54.2′
23	166°35.6	11.0	63°49.5	10.4′	27°10.4	3.8′	54.2′
	SD = 15.9′	d = 1.0′		SD = 14.8′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°35.8	N01°10.0	78°18.9	10.4′	S27°06.6	4.0′	54.2′
1	196°36.0	09.1	92°48.3	10.5′	27°02.6	4.1′	54.2′
2	211°36.3	08.1	107°17.8	10.5′	26°58.5	4.2′	54.3′
3	226°36.5	·· 07.1	121°47.3	10.5′	26°54.3	4.4′	54.3′
4	241°36.7	06.2	136°16.8	10.6′	26°49.9	4.5′	54.3′
5	256°36.9	05.2	150°46.4	10.6′	26°45.4	4.6′	54.3′
6	271°37.1	N01°04.2	165°15.9	10.6′	S26°40.8	4.7′	54.3′
7	286°37.4	03.2	179°45.6	10.7′	26°36.1	4.9′	54.3′
8	301°37.6	02.3	194°15.2	10.7′	26°31.2	5.0′	54.3′
9	316°37.8	·· 01.3	208°44.9	10.7′	26°26.2	5.1′	54.3′
10	331°38.0	01°00.3	223°14.6	10.8′	26°21.1	5.2′	54.3′
11	346°38.3	00°59.4	237°44.4	10.8′	26°15.9	5.4′	54.3′
12	1°38.5	N00°58.4	252°14.2	10.8′	S26°10.5	5.5′	54.3′
13	16°38.7	57.4	266°44.0	10.9′	26°05.0	5.6′	54.3′
14	31°38.9	56.4	281°13.9	10.9′	25°59.4	5.8′	54.4′
15	46°39.1	·· 55.5	295°43.8	11.0′	25°53.6	5.8′	54.4′
16	61°39.4	54.5	310°13.8	11.0′	25°47.8	6.0′	54.4′
17	76°39.6	53.5	324°43.8	11.0′	25°41.8	6.1′	54.4′
18	91°39.8	N00°52.6	339°13.8	11.1′	S25°35.7	6.3′	54.4′
19	106°40.0	51.6	353°43.9	11.1′	25°29.4	6.3′	54.4′
20	121°40.3	50.6	8°14.0	11.2′	25°23.1	6.5′	54.4′
21	136°40.5	·· 49.7	22°44.1	11.2′	25°16.6	6.6′	54.4′
22	151°40.7	48.7	37°14.3	11.2′	25°10.0	6.7′	54.4′
23	166°40.9	47.7	51°44.6	11.3′	25°03.3	6.8′	54.5′
	SD = 15.9′	d = 1.0′		SD = 14.8′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°41.1	N00°46.7	66°14.8	11.3′	S24°56.5	7.0′	54.5′
1	196°41.4	45.8	80°45.2	11.4′	24°49.5	7.1′	54.5′
2	211°41.6	44.8	95°15.5	11.4′	24°42.4	7.2′	54.5′
3	226°41.8	·· 43.8	109°45.9	11.5′	24°35.2	7.3′	54.5′
4	241°42.0	42.9	124°16.4	11.5′	24°27.9	7.4′	54.5′
5	256°42.3	41.9	138°46.9	11.5′	24°20.5	7.5′	54.5′
6	271°42.5	N00°40.9	153°17.4	11.6′	S24°13.0	7.7′	54.6′
7	286°42.7	39.9	167°48.0	11.6′	24°05.3	7.7′	54.6′
8	301°42.9	39.0	182°18.6	11.7′	23°57.6	7.9′	54.6′
9	316°43.1	·· 38.0	196°49.3	11.7′	23°49.7	8.0′	54.6′
10	331°43.4	37.0	211°20.0	11.8′	23°41.7	8.1′	54.6′
11	346°43.6	36.1	225°50.8	11.8′	23°33.6	8.3′	54.6′
12	1°43.8	N00°35.1	240°21.6	11.8′	S23°25.3	8.3′	54.6′
13	16°44.0	34.1	254°52.4	11.9′	23°17.0	8.4′	54.7′
14	31°44.3	33.1	269°23.3	11.9′	23°08.6	8.6′	54.7′
15	46°44.5	·· 32.2	283°54.2	12.0′	23°00.0	8.7′	54.7′
16	61°44.7	31.2	298°25.2	12.0′	22°51.3	8.7′	54.7′
17	76°44.9	30.2	312°56.3	12.1′	22°42.6	8.9′	54.7′
18	91°45.1	N00°29.3	327°27.3	12.1′	S22°33.7	9.0′	54.7′
19	106°45.4	28.3	341°58.5	12.2′	22°24.7	9.1′	54.8′
20	121°45.6	27.3	356°29.6	12.2′	22°15.6	9.2′	54.8′
21	136°45.8	·· 26.3	11°00.8	12.3′	22°06.4	9.3′	54.8′
22	151°46.0	25.4	25°32.1	12.3′	21°57.1	9.4′	54.8′
23	166°46.3	24.4	40°03.4	12.3′	21°47.7	9.5′	54.8′
	SD = 15.9′	d = 1.0′		SD = 14.9′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:45	04:20	05:29	18:15	19:24	20:57
N 70°	03:08	04:30	05:32	18:13	19:14	20:35
68°	03:25	04:37	05:34	18:11	19:07	20:18
66°	03:39	04:44	05:36	18:09	19:01	20:05
64°	03:50	04:49	05:37	18:08	18:56	19:55
62°	03:59	04:54	05:38	18:07	18:51	19:46
60°	04:07	04:58	05:39	18:06	18:48	19:38
N 58°	04:13	05:01	05:40	18:05	18:44	19:32
56°	04:19	05:04	05:41	18:04	18:42	19:26
54°	04:24	05:06	05:42	18:04	18:39	19:21
52°	04:29	05:09	05:43	18:03	18:37	19:17
50°	04:33	05:11	05:43	18:03	18:35	19:13
45°	04:41	05:15	05:45	18:02	18:31	19:05
N 40°	04:47	05:19	05:46	18:01	18:28	18:59
35°	04:52	05:21	05:46	18:00	18:25	18:55
30°	04:55	05:23	05:47	17:59	18:23	18:51
20°	05:01	05:26	05:48	17:58	18:20	18:46
N 10°	05:04	05:28	05:49	17:57	18:18	18:43
0°	05:06	05:30	05:50	17:57	18:17	18:41
S 10°	05:06	05:30	05:51	17:56	18:17	18:41
20°	05:04	05:30	05:52	17:56	18:18	18:43
30°	05:01	05:28	05:52	17:55	18:19	18:47
35°	04:58	05:27	05:52	17:55	18:20	18:50
40°	04:54	05:26	05:53	17:55	18:22	18:53
45°	04:50	05:24	05:53	17:55	18:24	18:58
S 50°	04:44	05:21	05:53	17:54	18:27	19:04
52°	04:41	05:20	05:54	17:54	18:28	19:08
54°	04:37	05:19	05:54	17:54	18:29	19:11
56°	04:33	05:17	05:54	17:54	18:31	19:15
58°	04:29	05:15	05:54	17:54	18:33	19:20
S 60°	04:24	05:13	05:54	17:54	18:35	19:25

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	18:47	▬	▬	21:56
64°	▬	18:42	18:06	▬	20:19	22:36
62°	17:50	17:42	17:37	19:26	21:18	23:04
60°	16:52	17:08	17:15	20:23	21:51	23:25
N 58°	16:19	16:44	16:57	20:56	22:16	23:42
56°	15:54	16:24	16:42	21:21	22:35	23:56
54°	15:34	16:07	16:29	21:40	22:52	·· ··
52°	15:18	15:53	16:18	21:57	23:05	·· ··
50°	15:03	15:40	16:08	22:11	23:18	·· ··
45°	14:34	15:14	15:46	22:40	23:43	·· ··
N 40°	14:12	14:54	15:29	23:02	·· ··	00:03
35°	13:53	14:36	15:14	23:21	·· ··	00:19
30°	13:36	14:22	15:02	23:37	·· ··	00:34
20°	13:09	13:56	14:40	·· ··	00:03	00:58
N 10°	12:45	13:34	14:21	·· ··	00:27	01:18
0°	12:23	13:14	14:03	·· ··	00:48	01:38
S 10°	12:01	12:53	13:45	00:19	01:09	01:57
20°	11:38	12:31	13:26	00:43	01:32	02:18
30°	11:10	12:06	13:04	01:11	01:59	02:41
35°	10:54	11:51	12:51	01:27	02:14	02:55
40°	10:35	11:33	12:35	01:46	02:32	03:11
45°	10:12	11:12	12:17	02:10	02:54	03:30
S 50°	09:42	10:45	11:55	02:39	03:21	03:53
52°	09:28	10:32	11:44	02:54	03:35	04:05
54°	09:11	10:17	11:32	03:11	03:50	04:17
56°	08:51	09:59	11:17	03:31	04:08	04:32
58°	08:25	09:37	11:01	03:57	04:30	04:49
S 60°	07:50	09:09	10:40	04:32	04:59	05:10

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 51-70%
19	06:02	06:13	11:54	18:36	06:10	
20	06:23	06:34	11:53	19:26	07:01	
21	06:45	06:55	11:53	20:14	07:50	

September 22, 23, 24 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	0°52.4	149°07.4	S19°19.8	242°19.1	N21°43.6	220°19.4	N16°00.3	348°31.9	N02°21.7
1	15°54.9	164°09.0	20.4	257°20.0	43.4	235°21.4	00.2	3°34.6	21.6
2	30°57.4	179°10.6	21.0	272°20.9	43.1	250°23.4	16°00.0	18°37.2	21.5
3	45°59.8	194°12.2	·· 21.6	287°21.7	·· 42.9	265°25.4	15°59.9	33°39.9	·· 21.4
4	61°02.3	209°13.8	22.2	302°22.6	42.6	280°27.4	59.7	48°42.5	21.4
5	76°04.8	224°15.5	22.8	317°23.5	42.4	295°29.4	59.6	63°45.1	21.3
6	91°07.2	239°17.1	S19°23.4	332°24.4	N21°42.1	310°31.4	N15°59.5	78°47.8	N02°21.2
7	106°09.7	254°18.7	24.0	347°25.2	41.9	325°33.4	59.3	93°50.4	21.1
8	121°12.2	269°20.4	24.6	2°26.1	41.6	340°35.4	59.2	108°53.0	21.0
9	136°14.6	284°22.0	·· 25.2	17°27.0	·· 41.4	355°37.4	·· 59.0	123°55.7	·· 21.0
10	151°17.1	299°23.7	25.8	32°27.9	41.1	10°39.4	58.9	138°58.3	20.9
11	166°19.5	314°25.3	26.4	47°28.7	40.9	25°41.4	58.7	154°00.9	20.8
12	181°22.0	329°27.0	S19°27.0	62°29.6	N21°40.6	40°43.3	N15°58.6	169°03.6	N02°20.7
13	196°24.5	344°28.6	27.6	77°30.5	40.4	55°45.3	58.5	184°06.2	20.7
14	211°26.9	359°30.3	28.2	92°31.4	40.2	70°47.3	58.3	199°08.9	20.6
15	226°29.4	14°31.9	·· 28.8	107°32.2	·· 39.9	85°49.3	·· 58.2	214°11.5	·· 20.5
16	241°31.9	29°33.6	29.4	122°33.1	39.7	100°51.3	58.0	229°14.1	20.4
17	256°34.3	44°35.2	30.0	137°34.0	39.4	115°53.3	57.9	244°16.8	20.4
18	271°36.8	59°36.9	S19°30.6	152°34.9	N21°39.2	130°55.3	N15°57.8	259°19.4	N02°20.3
19	286°39.3	74°38.6	31.2	167°35.7	38.9	145°57.3	57.6	274°22.0	20.2
20	301°41.7	89°40.2	31.7	182°36.6	38.7	160°59.3	57.5	289°24.7	20.1
21	316°44.2	104°41.9	·· 32.3	197°37.5	·· 38.4	176°01.3	·· 57.3	304°27.3	·· 20.0
22	331°46.7	119°43.6	32.9	212°38.4	38.2	191°03.3	57.2	319°30.0	20.0
23	346°49.1	134°45.3	33.5	227°39.2	37.9	206°05.3	57.1	334°32.6	19.9
Mer.pass. 23:53		ν 1.6′	d 0.6′	m -4.81	ν 0.9′	d 0.2′	m 1.16	ν 2.0′	d 0.1′ m -1.85	ν 2.6′	d 0.1′ m 0.39

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	1°51.6	149°47.0	S19°34.1	242°40.1	N21°37.7	221°07.3	N15°56.9	349°35.2	N02°19.8
1	16°54.0	164°48.7	34.7	257°41.0	37.4	236°09.3	56.8	4°37.9	19.7
2	31°56.5	179°50.3	35.2	272°41.9	37.2	251°11.2	56.6	19°40.5	19.7
3	46°59.0	194°52.0	·· 35.8	287°42.8	·· 36.9	266°13.2	·· 56.5	34°43.1	·· 19.6
4	62°01.4	209°53.7	36.4	302°43.6	36.7	281°15.2	56.4	49°45.8	19.5
5	77°03.9	224°55.4	37.0	317°44.5	36.4	296°17.2	56.2	64°48.4	19.4
6	92°06.4	239°57.1	S19°37.5	332°45.4	N21°36.2	311°19.2	N15°56.1	79°51.1	N02°19.4
7	107°08.8	254°58.8	38.1	347°46.3	35.9	326°21.2	55.9	94°53.7	19.3
8	122°11.3	270°00.5	38.7	2°47.2	35.7	341°23.2	55.8	109°56.3	19.2
9	137°13.8	285°02.2	·· 39.2	17°48.0	·· 35.4	356°25.2	·· 55.7	124°59.0	·· 19.1
10	152°16.2	300°04.0	39.8	32°48.9	35.2	11°27.2	55.5	140°01.6	19.0
11	167°18.7	315°05.7	40.4	47°49.8	34.9	26°29.2	55.4	155°04.2	19.0
12	182°21.1	330°07.4	S19°40.9	62°50.7	N21°34.7	41°31.2	N15°55.2	170°06.9	N02°18.9
13	197°23.6	345°09.1	41.5	77°51.6	34.4	56°33.2	55.1	185°09.5	18.8
14	212°26.1	0°10.8	42.1	92°52.4	34.2	71°35.2	55.0	200°12.2	18.7
15	227°28.5	15°12.6	·· 42.6	107°53.3	·· 33.9	86°37.2	·· 54.8	215°14.8	·· 18.7
16	242°31.0	30°14.3	43.2	122°54.2	33.7	101°39.2	54.7	230°17.4	18.6
17	257°33.5	45°16.0	43.8	137°55.1	33.4	116°41.2	54.5	245°20.1	18.5
18	272°35.9	60°17.8	S19°44.3	152°56.0	N21°33.1	131°43.2	N15°54.4	260°22.7	N02°18.4
19	287°38.4	75°19.5	44.9	167°56.9	32.9	146°45.2	54.3	275°25.3	18.4
20	302°40.9	90°21.3	45.4	182°57.7	32.6	161°47.2	54.1	290°28.0	18.3
21	317°43.3	105°23.0	·· 46.0	197°58.6	·· 32.4	176°49.2	·· 54.0	305°30.6	·· 18.2
22	332°45.8	120°24.7	46.5	212°59.5	32.1	191°51.1	53.9	320°33.3	18.1
23	347°48.3	135°26.5	47.1	228°00.4	31.9	206°53.1	53.7	335°35.9	18.0
Mer.pass. 23:49		ν 1.7′	d 0.6′	m -4.81	ν 0.9′	d 0.2′	m 1.15	ν 2.0′	d 0.1′ m -1.85	ν 2.6′	d 0.1′ m 0.38

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	2°50.7	150°28.3	S19°47.6	243°01.3	N21°31.6	221°55.1	N15°53.6	350°38.5	N02°18.0
1	17°53.2	165°30.0	48.2	258°02.2	31.4	236°57.1	53.4	5°41.2	17.9
2	32°55.6	180°31.8	48.7	273°03.1	31.1	251°59.1	53.3	20°43.8	17.8
3	47°58.1	195°33.5	·· 49.3	288°03.9	·· 30.9	267°01.1	·· 53.2	35°46.4	·· 17.7
4	63°00.6	210°35.3	49.8	303°04.8	30.6	282°03.1	53.0	50°49.1	17.7
5	78°03.0	225°37.1	50.3	318°05.7	30.4	297°05.1	52.9	65°51.7	17.6
6	93°05.5	240°38.8	S19°50.9	333°06.6	N21°30.1	312°07.1	N15°52.7	80°54.4	N02°17.5
7	108°08.0	255°40.6	51.4	348°07.5	29.8	327°09.1	52.6	95°57.0	17.4
8	123°10.4	270°42.4	52.0	3°08.4	29.6	342°11.1	52.5	110°59.6	17.4
9	138°12.9	285°44.2	·· 52.5	18°09.3	·· 29.3	357°13.1	·· 52.3	126°02.3	·· 17.3
10	153°15.4	300°46.0	53.0	33°10.1	29.1	12°15.1	52.2	141°04.9	17.2
11	168°17.8	315°47.8	53.6	48°11.0	28.8	27°17.1	52.0	156°07.6	17.1
12	183°20.3	330°49.5	S19°54.1	63°11.9	N21°28.6	42°19.1	N15°51.9	171°10.2	N02°17.0
13	198°22.8	345°51.3	54.6	78°12.8	28.3	57°21.1	51.8	186°12.8	17.0
14	213°25.2	0°53.1	55.2	93°13.7	28.0	72°23.1	51.6	201°15.5	16.9
15	228°27.7	15°54.9	·· 55.7	108°14.6	·· 27.8	87°25.1	·· 51.5	216°18.1	·· 16.8
16	243°30.1	30°56.7	56.2	123°15.5	27.5	102°27.1	51.3	231°20.8	16.7
17	258°32.6	45°58.6	56.7	138°16.4	27.3	117°29.1	51.2	246°23.4	16.7
18	273°35.1	61°00.4	S19°57.3	153°17.3	N21°27.0	132°31.1	N15°51.1	261°26.0	N02°16.6
19	288°37.5	76°02.2	57.8	168°18.2	26.8	147°33.1	50.9	276°28.7	16.5
20	303°40.0	91°04.0	58.3	183°19.0	26.5	162°35.1	50.8	291°31.3	16.4
21	318°42.5	106°05.8	·· 58.8	198°19.9	·· 26.2	177°37.1	·· 50.6	306°33.9	·· 16.3
22	333°44.9	121°07.6	59.3	213°20.8	26.0	192°39.1	50.5	321°36.6	16.3
23	348°47.4	136°09.5	59.9	228°21.7	25.7	207°41.1	50.4	336°39.2	16.2
Mer.pass. 23:45		ν 1.8′	d 0.5′	m -4.81	ν 0.9′	d 0.3′	m 1.15	ν 2.0′	d 0.1′ m -1.85	ν 2.6′	d 0.1′ m 0.38

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.9	56°41.1
Diphda	348°45.6	-17°50.2
Achernar	335°18.6	-57°05.8
Hamal	327°49.3	23°35.4
Polaris	312°58.7	89°22.4
Acamar	315°10.4	-40°11.5
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.3
Aldebaran	290°37.9	16°33.8
Rigel	281°02.4	-8°10.0
Capella	280°19.7	46°01.3
Bellatrix	278°21.3	6°22.5
Elnath	278°00.0	28°37.8
Alnilam	275°36.3	-1°10.9
Betelgeuse	270°50.6	7°24.8
Canopus	263°51.8	-52°42.2
Sirius	258°25.1	-16°44.9
Adhara	255°04.8	-29°00.2
Procyon	244°49.5	5°09.5
Pollux	243°15.7	27°57.6
Avior	234°14.5	-59°35.4
Suhail	222°45.6	-43°32.2
Miaplacidus	221°38.7	-69°49.4
Alphard	217°46.6	-8°46.3
Regulus	207°33.2	11°50.2
Dubhe	193°39.9	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.9
Gacrux	171°50.7	-57°15.8
Alioth	166°12.3	55°49.0
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.5	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.9
Kochab	137°20.7	74°02.9
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.7
Antares	112°14.2	-26°29.5
Atria	107°07.3	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.5	-37°07.5
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.5	51°29.4
Kaus Aust.	83°30.6	-34°22.4
Vega	80°32.2	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.5
Peacock	53°03.2	-56°39.0
Deneb	49°24.6	45°22.8
Enif	33°37.1	10°00.1
Al Na'ir	27°30.7	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.1

Sep 22 Tue	SHA	Mer.pass
Venus	148°14.9	14:02
Mars	241°26.7	07:50
Jupiter	219°27.0	09:17
Saturn	347°39.5	00:46

Sep 23 Wed	SHA	Mer.pass
Venus	147°55.4	13:59
Mars	240°48.5	07:49
Jupiter	219°15.7	09:14
Saturn	347°43.6	00:42

Sep 24 Thu	SHA	Mer.pass
Venus	147°37.5	13:56
Mars	240°10.6	07:47
Jupiter	219°04.4	09:11
Saturn	347°47.8	00:37

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°46.5	N00°23.4	54°34.7	12.4′	S21°38.2	9.7′	54.9′
1	196°46.7	22.4	69°06.1	12.4′	21°28.5	9.7′	54.9′
2	211°46.9	21.5	83°37.6	12.5′	21°18.8	9.8′	54.9′
3	226°47.1	·· 20.5	98°09.1	12.5′	21°09.0	9.9′	54.9′
4	241°47.4	19.5	112°40.6	12.6′	20°59.1	10.1′	54.9′
5	256°47.6	18.6	127°12.1	12.6′	20°49.0	10.1′	55.0′
6	271°47.8	N00°17.6	141°43.8	12.7′	S20°38.9	10.2′	55.0′
7	286°48.0	16.6	156°15.4	12.7′	20°28.7	10.4′	55.0′
8	301°48.2	15.6	170°47.1	12.7′	20°18.3	10.4′	55.0′
9	316°48.5	·· 14.7	185°18.9	12.8′	20°07.9	10.5′	55.0′
10	331°48.7	13.7	199°50.6	12.8′	19°57.4	10.6′	55.1′
11	346°48.9	12.7	214°22.5	12.9′	19°46.8	10.7′	55.1′
12	1°49.1	N00°11.8	228°54.3	12.9′	S19°36.1	10.8′	55.1′
13	16°49.3	10.8	243°26.2	13.0′	19°25.3	10.9′	55.1′
14	31°49.6	09.8	257°58.2	13.0′	19°14.4	11.0′	55.1′
15	46°49.8	·· 08.8	272°30.2	13.0′	19°03.4	11.1′	55.2′
16	61°50.0	07.9	287°02.2	13.1′	18°52.3	11.2′	55.2′
17	76°50.2	06.9	301°34.3	13.1′	18°41.1	11.3′	55.2′
18	91°50.5	N00°05.9	316°06.4	13.2′	S18°29.8	11.4′	55.2′
19	106°50.7	04.9	330°38.6	13.2′	18°18.4	11.4′	55.3′
20	121°50.9	04.0	345°10.8	13.2′	18°07.0	11.6′	55.3′
21	136°51.1	·· 03.0	359°43.0	13.3′	17°55.4	11.6′	55.3′
22	151°51.3	02.0	14°15.3	13.3′	17°43.8	11.7′	55.3′
23	166°51.6	01.1	28°47.6	13.3′	17°32.1	11.8′	55.3′
	SD = 15.9′	d = 1.0′	SD = 15.0′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°51.8	N00°00.1	43°19.9	13.4′	S17°20.3	11.9′	55.4′
1	196°52.0	S00°00.9	57°52.3	13.4′	17°08.4	12.0′	55.4′
2	211°52.2	01.9	72°24.7	13.5′	16°56.4	12.0′	55.4′
3	226°52.4	·· 02.8	86°57.2	13.5′	16°44.4	12.2′	55.4′
4	241°52.7	03.8	101°29.7	13.5′	16°32.2	12.2′	55.5′
5	256°52.9	04.8	116°02.2	13.6′	16°20.0	12.3′	55.5′
6	271°53.1	S00°05.8	130°34.7	13.6′	S16°07.7	12.4′	55.5′
7	286°53.3	06.7	145°07.3	13.6′	15°55.3	12.5′	55.5′
8	301°53.5	07.7	159°39.9	13.7′	15°42.8	12.5′	55.6′
9	316°53.8	·· 08.7	174°12.6	13.7′	15°30.3	12.7′	55.6′
10	331°54.0	09.6	188°45.3	13.7′	15°17.6	12.7′	55.6′
11	346°54.2	10.6	203°18.0	13.7′	15°04.9	12.7′	55.6′
12	1°54.4	S00°11.6	217°50.7	13.8′	S14°52.2	12.9′	55.7′
13	16°54.6	12.6	232°23.5	13.8′	14°39.3	12.9′	55.7′
14	31°54.9	13.5	246°56.3	13.8′	14°26.4	13.0′	55.7′
15	46°55.1	·· 14.5	261°29.2	13.9′	14°13.4	13.1′	55.7′
16	61°55.3	15.5	276°02.0	13.9′	14°00.3	13.2′	55.8′
17	76°55.5	16.5	290°34.9	13.9′	13°47.1	13.2′	55.8′
18	91°55.7	S00°17.4	305°07.8	13.9′	S13°33.9	13.3′	55.8′
19	106°56.0	18.4	319°40.8	14.0′	13°20.6	13.4′	55.8′
20	121°56.2	19.4	334°13.7	14.0′	13°07.2	13.4′	55.9′
21	136°56.4	·· 20.3	348°46.7	14.0′	12°53.8	13.5′	55.9′
22	151°56.6	21.3	3°19.7	14.0′	12°40.3	13.6′	55.9′
23	166°56.8	22.3	17°52.7	14.1′	12°26.7	13.6′	55.9′
	SD = 15.9′	d = 1.0′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°57.1	S00°23.3	32°25.8	14.1′	S12°13.1	13.7′	56.0′
1	196°57.3	24.2	46°58.9	14.1′	11°59.4	13.8′	56.0′
2	211°57.5	25.2	61°32.0	14.1′	11°45.6	13.8′	56.0′
3	226°57.7	·· 26.2	76°05.1	14.1′	11°31.8	13.9′	56.1′
4	241°57.9	27.2	90°38.2	14.1′	11°17.9	14.0′	56.1′
5	256°58.1	28.1	105°11.3	14.2′	11°03.9	14.0′	56.1′
6	271°58.4	S00°29.1	119°44.5	14.2′	S10°49.9	14.1′	56.1′
7	286°58.6	30.1	134°17.7	14.2′	10°35.8	14.1′	56.2′
8	301°58.8	31.0	148°50.9	14.2′	10°21.7	14.2′	56.2′
9	316°59.0	·· 32.0	163°24.1	14.2′	10°07.5	14.3′	56.2′
10	331°59.2	33.0	177°57.3	14.2′	09°53.2	14.3′	56.2′
11	346°59.5	34.0	192°30.5	14.2′	09°38.9	14.4′	56.3′
12	1°59.7	S00°34.9	207°03.8	14.3′	S09°24.5	14.4′	56.3′
13	16°59.9	35.9	221°37.0	14.3′	09°10.1	14.5′	56.3′
14	32°00.1	36.9	236°10.3	14.3′	08°55.6	14.5′	56.4′
15	47°00.3	·· 37.9	250°43.6	14.3′	08°41.1	14.6′	56.4′
16	62°00.6	38.8	265°16.9	14.3′	08°26.5	14.6′	56.4′
17	77°00.8	39.8	279°50.1	14.3′	08°11.9	14.7′	56.4′
18	92°01.0	S00°40.8	294°23.4	14.3′	S07°57.2	14.7′	56.5′
19	107°01.2	41.8	308°56.7	14.3′	07°42.5	14.8′	56.5′
20	122°01.4	42.7	323°30.0	14.3′	07°27.7	14.9′	56.5′
21	137°01.6	·· 43.7	338°03.3	14.3′	07°12.8	14.8′	56.5′
22	152°01.9	44.7	352°36.6	14.3′	06°58.0	14.9′	56.6′
23	167°02.1	45.6	7°09.9	14.3′	06°43.1	15.0′	56.6′
	SD = 15.9′	d = 1.0′	SD = 15.3′				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	03:04	04:34	05:43	17:59	19:07	20:36
N 70°	03:24	04:42	05:44	17:59	19:00	20:17
68°	03:38	04:48	05:44	17:58	18:54	20:03
66°	03:50	04:54	05:45	17:58	18:49	19:52
64°	04:00	04:58	05:46	17:57	18:45	19:43
62°	04:08	05:02	05:46	17:57	18:41	19:35
60°	04:15	05:05	05:46	17:57	18:38	19:28
N 58°	04:21	05:08	05:47	17:57	18:36	19:22
56°	04:26	05:10	05:47	17:57	18:34	19:18
54°	04:30	05:12	05:47	17:56	18:32	19:13
52°	04:34	05:14	05:48	17:56	18:30	19:10
50°	04:37	05:15	05:48	17:56	18:28	19:06
45°	04:44	05:19	05:48	17:56	18:25	18:59
N 40°	04:50	05:21	05:48	17:56	18:23	18:54
35°	04:54	05:23	05:49	17:56	18:21	18:50
30°	04:57	05:25	05:49	17:55	18:19	18:47
20°	05:01	05:27	05:49	17:55	18:17	18:43
N 10°	05:04	05:28	05:49	17:55	18:16	18:41
0°	05:04	05:28	05:49	17:56	18:16	18:40
S 10°	05:04	05:28	05:49	17:56	18:17	18:41
20°	05:01	05:27	05:49	17:56	18:18	18:44
30°	04:57	05:25	05:48	17:57	18:21	18:49
35°	04:53	05:23	05:48	17:57	18:22	18:52
40°	04:49	05:21	05:48	17:58	18:25	18:56
45°	04:44	05:18	05:47	17:58	18:27	19:02
S 50°	04:37	05:15	05:47	17:59	18:31	19:09
52°	04:33	05:13	05:47	17:59	18:33	19:13
54°	04:29	05:11	05:46	18:00	18:35	19:17
56°	04:25	05:09	05:46	18:00	18:37	19:22
58°	04:20	05:06	05:46	18:00	18:40	19:27
S 60°	04:14	05:04	05:45	18:01	18:43	19:33

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	18:51	18:06	▬	▬	01:08
N 70°	19:21	18:27	17:54	23:01	·· ··	01:30
68°	18:40	18:08	17:45	23:41	·· ··	01:47
66°	18:12	17:52	17:37	·· ··	00:08	02:01
64°	17:50	17:39	17:30	·· ··	00:28	02:12
62°	17:33	17:29	17:25	·· ··	00:45	02:22
60°	17:18	17:19	17:19	·· ··	00:58	02:30
N 58°	17:06	17:11	17:15	·· ··	01:10	02:37
56°	16:55	17:04	17:11	·· ··	01:20	02:43
54°	16:45	16:57	17:07	00:09	01:29	02:49
52°	16:37	16:52	17:04	00:20	01:37	02:54
50°	16:29	16:46	17:01	00:30	01:44	02:59
45°	16:13	16:35	16:54	00:50	01:59	03:08
N 40°	15:59	16:25	16:49	01:06	02:11	03:16
35°	15:48	16:17	16:44	01:20	02:21	03:23
30°	15:37	16:10	16:40	01:32	02:31	03:29
20°	15:20	15:57	16:33	01:52	02:46	03:40
N 10°	15:05	15:46	16:26	02:10	03:00	03:49
0°	14:50	15:36	16:20	02:26	03:12	03:57
S 10°	14:36	15:25	16:14	02:42	03:25	04:05
20°	14:20	15:14	16:07	02:59	03:38	04:14
30°	14:02	15:01	16:00	03:19	03:53	04:24
35°	13:52	14:53	15:55	03:30	04:02	04:30
40°	13:40	14:45	15:50	03:43	04:11	04:36
45°	13:25	14:35	15:45	03:59	04:23	04:43
S 50°	13:08	14:23	15:38	04:18	04:37	04:52
52°	13:00	14:17	15:35	04:26	04:43	04:56
54°	12:50	14:11	15:31	04:36	04:50	05:01
56°	12:40	14:04	15:27	04:47	04:58	05:06
58°	12:28	13:56	15:23	05:00	05:07	05:11
S 60°	12:14	13:46	15:18	05:15	05:17	05:17

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 78-92%
22	07:06	07:17	11:53	21:01	08:38	
23	07:27	07:38	11:52	21:46	09:24	
24	07:48	07:59	11:52	22:30	10:08	

September 25, 26, 27 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	3°49.9	151°11.3	S20°00.4	243°22.6	N21°25.5	222°43.1	N15°50.2	351°41.9	N02°16.1
1	18°52.3	166°13.1	00.9	258°23.5	25.2	237°45.1	50.1	6°44.5	16.0
2	33°54.8	181°15.0	01.4	273°24.4	25.0	252°47.1	50.0	21°47.1	16.0
3	48°57.2	196°16.8	·· 01.9	288°25.3	·· 24.7	267°49.1	·· 49.8	36°49.8	·· 15.9
4	63°59.7	211°18.6	02.4	303°26.2	24.4	282°51.1	49.7	51°52.4	15.8
5	79°02.2	226°20.5	02.9	318°27.1	24.2	297°53.1	49.5	66°55.1	15.7
6	94°04.6	241°22.3	S20°03.4	333°28.0	N21°23.9	312°55.1	N15°49.4	81°57.7	N02°15.6
7	109°07.1	256°24.2	03.9	348°28.9	23.7	327°57.1	49.3	97°00.3	15.6
8	124°09.6	271°26.0	04.4	3°29.8	23.4	342°59.1	49.1	112°03.0	15.5
9	139°12.0	286°27.9	·· 04.9	18°30.6	·· 23.1	358°01.1	·· 49.0	127°05.6	·· 15.4
10	154°14.5	301°29.7	05.4	33°31.5	22.9	13°03.1	48.8	142°08.3	15.3
11	169°17.0	316°31.6	05.9	48°32.4	22.6	28°05.1	48.7	157°10.9	15.3
12	184°19.4	331°33.5	S20°06.4	63°33.3	N21°22.4	43°07.1	N15°48.6	172°13.5	N02°15.2
13	199°21.9	346°35.3	06.9	78°34.2	22.1	58°09.1	48.4	187°16.2	15.1
14	214°24.4	1°37.2	07.4	93°35.1	21.8	73°11.1	48.3	202°18.8	15.0
15	229°26.8	16°39.1	·· 07.9	108°36.0	·· 21.6	88°13.1	·· 48.2	217°21.5	·· 15.0
16	244°29.3	31°41.0	08.4	123°36.9	21.3	103°15.1	48.0	232°24.1	14.9
17	259°31.7	46°42.9	08.9	138°37.8	21.0	118°17.1	47.9	247°26.7	14.8
18	274°34.2	61°44.7	S20°09.4	153°38.7	N21°20.8	133°19.1	N15°47.7	262°29.4	N02°14.7
19	289°36.7	76°46.6	09.9	168°39.6	20.5	148°21.1	47.6	277°32.0	14.6
20	304°39.1	91°48.5	10.4	183°40.5	20.3	163°23.1	47.5	292°34.7	14.6
21	319°41.6	106°50.4	·· 10.9	198°41.4	·· 20.0	178°25.1	·· 47.3	307°37.3	·· 14.5
22	334°44.1	121°52.3	11.3	213°42.3	19.7	193°27.1	47.2	322°39.9	14.4
23	349°46.5	136°54.2	11.8	228°43.2	19.5	208°29.1	47.0	337°42.6	14.3
Mer.pass. 23:41		ν 1.8′ d 0.5′	m -4.82	ν 0.9′ d 0.3′	m 1.14	ν 2.0′ d 0.1′	m -1.86	ν 2.6′ d 0.1′	m 0.38

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	4°49.0	151°56.1	S20°12.3	243°44.1	N21°19.2	223°31.1	N15°46.9	352°45.2	N02°14.3
1	19°51.5	166°58.0	12.8	258°45.0	18.9	238°33.2	46.8	7°47.9	14.2
2	34°53.9	182°00.0	13.3	273°45.9	18.7	253°35.2	46.6	22°50.5	14.1
3	49°56.4	197°01.9	·· 13.7	288°46.8	·· 18.4	268°37.2	·· 46.5	37°53.1	·· 14.0
4	64°58.8	212°03.8	14.2	303°47.7	18.2	283°39.2	46.4	52°55.8	13.9
5	80°01.3	227°05.7	14.7	318°48.6	17.9	298°41.2	46.2	67°58.4	13.9
6	95°03.8	242°07.6	S20°15.2	333°49.5	N21°17.6	313°43.2	N15°46.1	83°01.1	N02°13.8
7	110°06.2	257°09.6	15.6	348°50.4	17.4	328°45.2	45.9	98°03.7	13.7
8	125°08.7	272°11.5	16.1	3°51.3	17.1	343°47.2	45.8	113°06.3	13.6
9	140°11.2	287°13.4	·· 16.6	18°52.2	·· 16.8	358°49.2	·· 45.7	128°09.0	·· 13.6
10	155°13.6	302°15.4	17.0	33°53.1	16.6	13°51.2	45.5	143°11.6	13.5
11	170°16.1	317°17.3	17.5	48°54.0	16.3	28°53.2	45.4	158°14.3	13.4
12	185°18.6	332°19.2	S20°17.9	63°54.9	N21°16.0	43°55.2	N15°45.3	173°16.9	N02°13.3
13	200°21.0	347°21.2	18.4	78°55.8	15.8	58°57.2	45.1	188°19.6	13.2
14	215°23.5	2°23.1	18.9	93°56.7	15.5	73°59.2	45.0	203°22.2	13.2
15	230°26.0	17°25.1	·· 19.3	108°57.6	·· 15.2	89°01.2	·· 44.8	218°24.8	·· 13.1
16	245°28.4	32°27.1	19.8	123°58.5	15.0	104°03.2	44.7	233°27.5	13.0
17	260°30.9	47°29.0	20.2	138°59.4	14.7	119°05.2	44.6	248°30.1	12.9
18	275°33.3	62°31.0	S20°20.7	154°00.3	N21°14.4	134°07.2	N15°44.4	263°32.8	N02°12.9
19	290°35.8	77°33.0	21.1	169°01.2	14.2	149°09.2	44.3	278°35.4	12.8
20	305°38.3	92°34.9	21.6	184°02.1	13.9	164°11.2	44.2	293°38.0	12.7
21	320°40.7	107°36.9	·· 22.0	199°03.1	·· 13.6	179°13.3	·· 44.0	308°40.7	·· 12.6
22	335°43.2	122°38.9	22.5	214°04.0	13.4	194°15.3	43.9	323°43.3	12.5
23	350°45.7	137°40.9	22.9	229°04.9	13.1	209°17.3	43.7	338°46.0	12.5
Mer.pass. 23:37		ν 1.9′ d 0.5′	m -4.81	ν 0.9′ d 0.3′	m 1.14	ν 2.0′ d 0.1′	m -1.86	ν 2.6′ d 0.1′	m 0.37

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°48.1	152°42.8	S20°23.4	244°05.8	N21°12.8	224°19.3	N15°43.6	353°48.6	N02°12.4
1	20°50.6	167°44.8	23.8	259°06.7	12.6	239°21.3	43.5	8°51.2	12.3
2	35°53.1	182°46.8	24.3	274°07.6	12.3	254°23.3	43.3	23°53.9	12.2
3	50°55.5	197°48.8	·· 24.7	289°08.5	·· 12.0	269°25.3	·· 43.2	38°56.5	·· 12.2
4	65°58.0	212°50.8	25.1	304°09.4	11.8	284°27.3	43.1	53°59.2	12.1
5	81°00.4	227°52.8	25.6	319°10.3	11.5	299°29.3	42.9	69°01.8	12.0
6	96°02.9	242°54.8	S20°26.0	334°11.2	N21°11.2	314°31.3	N15°42.8	84°04.5	N02°11.9
7	111°05.4	257°56.8	26.4	349°12.1	11.0	329°33.3	42.6	99°07.1	11.8
8	126°07.8	272°58.8	26.9	4°13.0	10.7	344°35.3	42.5	114°09.7	11.8
9	141°10.3	288°00.8	·· 27.3	19°13.9	·· 10.4	359°37.3	·· 42.4	129°12.4	·· 11.7
10	156°12.8	303°02.9	27.7	34°14.8	10.2	14°39.3	42.2	144°15.0	11.6
11	171°15.2	318°04.9	28.2	49°15.8	09.9	29°41.4	42.1	159°17.7	11.5
12	186°17.7	333°06.9	S20°28.6	64°16.7	N21°09.6	44°43.4	N15°42.0	174°20.3	N02°11.5
13	201°20.2	348°08.9	29.0	79°17.6	09.4	59°45.4	41.8	189°22.9	11.4
14	216°22.6	3°11.0	29.4	94°18.5	09.1	74°47.4	41.7	204°25.6	11.3
15	231°25.1	18°13.0	·· 29.8	109°19.4	·· 08.8	89°49.4	·· 41.5	219°28.2	·· 11.2
16	246°27.6	33°15.0	30.3	124°20.3	08.5	104°51.4	41.4	234°30.9	11.1
17	261°30.0	48°17.1	30.7	139°21.2	08.3	119°53.4	41.3	249°33.5	11.1
18	276°32.5	63°19.1	S20°31.1	154°22.1	N21°08.0	134°55.4	N15°41.1	264°36.2	N02°11.0
19	291°34.9	78°21.2	31.5	169°23.0	07.7	149°57.4	41.0	279°38.8	10.9
20	306°37.4	93°23.2	31.9	184°24.0	07.5	164°59.4	40.9	294°41.4	10.8
21	321°39.9	108°25.3	·· 32.3	199°24.9	·· 07.2	180°01.4	·· 40.7	309°44.1	·· 10.8
22	336°42.3	123°27.3	32.7	214°25.8	06.9	195°03.5	40.6	324°46.7	10.7
23	351°44.8	138°29.4	33.1	229°26.7	06.6	210°05.5	40.4	339°49.4	10.6
Mer.pass. 23:33		ν 2.0′ d 0.4′	m -4.81	ν 0.9′ d 0.3′	m 1.13	ν 2.0′ d 0.1′	m -1.86	ν 2.6′ d 0.1′	m 0.37

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.9	56°41.1
Diphda	348°45.6	-17°50.2
Achernar	335°18.6	-57°05.8
Hamal	327°49.3	23°35.4
Polaris	312°57.6	89°22.4
Acamar	315°10.4	-40°11.5
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.3
Aldebaran	290°37.9	16°33.8
Rigel	281°02.4	-8°10.0
Capella	280°19.7	46°01.4
Bellatrix	278°21.3	6°22.5
Elnath	278°00.0	28°37.8
Alnilam	275°36.2	-1°10.9
Betelgeuse	270°50.5	7°24.8
Canopus	263°51.8	-52°42.2
Sirius	258°25.0	-16°44.9
Adhara	255°04.8	-29°00.2
Procyon	244°49.5	5°09.5
Pollux	243°15.7	27°57.6
Avior	234°14.5	-59°35.4
Suhail	222°45.6	-43°32.2
Miaplacidus	221°38.7	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.2	11°50.2
Dubhe	193°39.9	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.4
Acrux	172°59.2	-63°14.8
Gacrux	171°50.7	-57°15.8
Alioth	166°12.3	55°48.9
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.6	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.9
Kochab	137°20.7	74°02.9
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.7
Antares	112°14.3	-26°29.5
Atria	107°07.4	-69°04.7
Sabik	102°01.2	-15°45.4
Shaula	96°08.5	-37°07.5
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.6	51°29.4
Kaus Aust.	83°30.6	-34°22.4
Vega	80°32.2	38°48.8
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.2	-56°39.0
Deneb	49°24.6	45°22.8
Enif	33°37.2	10°00.1
Al Na'ir	27°30.7	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Sep 25 Fri	SHA	Mer.pass
Venus	147°21.4	13:54
Mars	239°32.8	07:46
Jupiter	218°53.2	09:08
Saturn	347°52.0	00:33

Sep 26 Sat	SHA	Mer.pass
Venus	147°07.1	13:50
Mars	238°55.1	07:45
Jupiter	218°42.2	09:05
Saturn	347°56.2	00:29

Sep 27 Sun	SHA	Mer.pass
Venus	146°54.7	13:47
Mars	238°17.6	07:43
Jupiter	218°31.1	09:02
Saturn	348°00.5	00:25

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°02.3	S00°46.6	21°43.2	14.3′	S06°28.1	15.0′	56.6′
1	197°02.5	47.6	36°16.5	14.3′	06°13.1	15.1′	56.7′
2	212°02.7	48.6	50°49.8	14.3′	05°58.0	15.0′	56.7′
3	227°02.9	·· 49.5	65°23.1	14.3′	05°43.0	15.2′	56.7′
4	242°03.2	50.5	79°56.4	14.3′	05°27.8	15.1′	56.7′
5	257°03.4	51.5	94°29.7	14.3′	05°12.7	15.2′	56.8′
6	272°03.6	S00°52.5	109°03.0	14.3′	S04°57.5	15.3′	56.8′
7	287°03.8	53.4	123°36.3	14.3′	04°42.2	15.3′	56.8′
8	302°04.0	54.4	138°09.6	14.3′	04°26.9	15.3′	56.8′
9	317°04.3	·· 55.4	152°42.8	14.2′	04°11.6	15.3′	56.9′
10	332°04.5	56.3	167°16.1	14.2′	03°56.3	15.4′	56.9′
11	347°04.7	57.3	181°49.3	14.2′	03°40.9	15.4′	56.9′
12	2°04.9	S00°58.3	196°22.5	14.2′	S03°25.5	15.4′	57.0′
13	17°05.1	00°59.3	210°55.7	14.2′	03°10.1	15.5′	57.0′
14	32°05.3	01°00.2	225°28.9	14.2′	02°54.6	15.5′	57.0′
15	47°05.6	·· 01.2	240°02.1	14.2′	02°39.1	15.5′	57.0′
16	62°05.8	02.2	254°35.3	14.1′	02°23.6	15.5′	57.1′
17	77°06.0	03.2	269°08.4	14.1′	02°08.1	15.6′	57.1′
18	92°06.2	S01°04.1	283°41.5	14.1′	S01°52.5	15.6′	57.1′
19	107°06.4	05.1	298°14.6	14.1′	01°36.9	15.6′	57.1′
20	122°06.6	06.1	312°47.7	14.1′	01°21.3	15.7′	57.2′
21	137°06.9	·· 07.1	327°20.8	14.0′	01°05.6	15.6′	57.2′
22	152°07.1	08.0	341°53.8	14.0′	00°50.0	15.7′	57.2′
23	167°07.3	09.0	356°26.8	14.0′	00°34.3	15.7′	57.3′
	SD = 15.9′	d = 1.0′	SD = 15.4′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°07.5	S01°10.0	10°59.8	14.0′	S00°18.6	15.7′	57.3′
1	197°07.7	10.9	25°32.8	13.9′	S00°02.9	15.7′	57.3′
2	212°07.9	11.9	40°05.7	13.9′	N00°12.8	15.7′	57.3′
3	227°08.1	·· 12.9	54°38.6	13.9′	00°28.5	15.8′	57.4′
4	242°08.4	13.9	69°11.5	13.8′	00°44.3	15.7′	57.4′
5	257°08.6	14.8	83°44.3	13.8′	01°00.0	15.8′	57.4′
6	272°08.8	S01°15.8	98°17.2	13.8′	N01°15.8	15.8′	57.4′
7	287°09.0	16.8	112°49.9	13.7′	01°31.6	15.8′	57.5′
8	302°09.2	17.8	127°22.7	13.7′	01°47.4	15.8′	57.5′
9	317°09.4	·· 18.7	141°55.4	13.7′	02°03.2	15.8′	57.5′
10	332°09.7	19.7	156°28.0	13.6′	02°19.0	15.8′	57.5′
11	347°09.9	20.7	171°00.7	13.6′	02°34.8	15.8′	57.6′
12	2°10.1	S01°21.6	185°33.3	13.6′	N02°50.6	15.8′	57.6′
13	17°10.3	22.6	200°05.8	13.5′	03°06.4	15.8′	57.6′
14	32°10.5	23.6	214°38.3	13.5′	03°22.2	15.8′	57.6′
15	47°10.7	·· 24.6	229°10.8	13.4′	03°38.0	15.8′	57.7′
16	62°10.9	25.5	243°43.2	13.4′	03°53.8	15.8′	57.7′
17	77°11.2	26.5	258°15.6	13.3′	04°09.6	15.7′	57.7′
18	92°11.4	S01°27.5	272°47.9	13.3′	N04°25.3	15.8′	57.7′
19	107°11.6	28.5	287°20.2	13.2′	04°41.1	15.8′	57.8′
20	122°11.8	29.4	301°52.5	13.2′	04°56.9	15.8′	57.8′
21	137°12.0	·· 30.4	316°24.7	13.1′	05°12.7	15.7′	57.8′
22	152°12.2	31.4	330°56.8	13.1′	05°28.4	15.7′	57.8′
23	167°12.4	32.3	345°28.9	13.0′	05°44.1	15.8′	57.9′
	SD = 15.9′	d = 1.0′	SD = 15.6′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°12.7	S01°33.3	0°00.9	13.0′	N05°59.9	15.7′	57.9′
1	197°12.9	34.3	14°32.9	12.9′	06°15.6	15.7′	57.9′
2	212°13.1	35.3	29°04.8	12.9′	06°31.3	15.6′	57.9′
3	227°13.3	·· 36.2	43°36.7	12.8′	06°46.9	15.7′	58.0′
4	242°13.5	37.2	58°08.5	12.8′	07°02.6	15.6′	58.0′
5	257°13.7	38.2	72°40.3	12.7′	07°18.2	15.6′	58.0′
6	272°13.9	S01°39.2	87°11.9	12.6′	N07°33.8	15.6′	58.0′
7	287°14.2	40.1	101°43.6	12.6′	07°49.4	15.6′	58.1′
8	302°14.4	41.1	116°15.1	12.5′	08°05.0	15.5′	58.1′
9	317°14.6	·· 42.1	130°46.6	12.4′	08°20.5	15.5′	58.1′
10	332°14.8	43.0	145°18.1	12.4′	08°36.0	15.5′	58.1′
11	347°15.0	44.0	159°49.5	12.3′	08°51.5	15.4′	58.1′
12	2°15.2	S01°45.0	174°20.8	12.2′	N09°06.9	15.4′	58.2′
13	17°15.4	46.0	188°52.0	12.2′	09°22.3	15.4′	58.2′
14	32°15.6	46.9	203°23.2	12.1′	09°37.7	15.3′	58.2′
15	47°15.9	·· 47.9	217°54.3	12.0′	09°53.0	15.3′	58.2′
16	62°16.1	48.9	232°25.3	12.0′	10°08.3	15.3′	58.3′
17	77°16.3	49.9	246°56.3	11.9′	10°23.6	15.2′	58.3′
18	92°16.5	S01°50.8	261°27.2	11.8′	N10°38.8	15.2′	58.3′
19	107°16.7	51.8	275°58.0	11.7′	10°54.0	15.1′	58.3′
20	122°16.9	52.8	290°28.7	11.7′	11°09.1	15.1′	58.3′
21	137°17.1	·· 53.7	304°59.4	11.6′	11°24.2	15.0′	58.4′
22	152°17.3	54.7	319°30.0	11.5′	11°39.2	15.0′	58.4′
23	167°17.6	55.7	334°00.5	11.4′	11°54.2	15.0′	58.4′
	SD = 15.9′	d = 1.0′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:22	04:48	05:56	17:44	18:51	20:17
N 70°	03:38	04:55	05:56	17:45	18:46	20:01
68°	03:51	04:59	05:55	17:46	18:41	19:49
66°	04:01	05:03	05:55	17:46	18:37	19:39
64°	04:10	05:07	05:54	17:47	18:34	19:31
62°	04:17	05:10	05:54	17:47	18:31	19:24
60°	04:22	05:12	05:54	17:48	18:29	19:18
N 58°	04:28	05:14	05:53	17:48	18:27	19:13
56°	04:32	05:16	05:53	17:49	18:26	19:09
54°	04:36	05:17	05:53	17:49	18:24	19:05
52°	04:39	05:19	05:52	17:49	18:23	19:02
50°	04:42	05:20	05:52	17:49	18:22	18:59
45°	04:48	05:22	05:52	17:50	18:19	18:53
N 40°	04:53	05:24	05:51	17:51	18:18	18:49
35°	04:56	05:26	05:51	17:51	18:16	18:46
30°	04:59	05:27	05:50	17:52	18:16	18:43
20°	05:02	05:28	05:50	17:53	18:15	18:40
N 10°	05:04	05:28	05:49	17:54	18:15	18:39
0°	05:03	05:27	05:48	17:55	18:15	18:39
S 10°	05:02	05:26	05:47	17:56	18:17	18:41
20°	04:58	05:24	05:46	17:57	18:19	18:45
30°	04:53	05:21	05:45	17:58	18:22	18:50
35°	04:49	05:19	05:44	17:59	18:25	18:54
40°	04:44	05:16	05:43	18:00	18:28	18:59
45°	04:38	05:12	05:42	18:02	18:31	19:06
S 50°	04:30	05:08	05:40	18:03	18:36	19:14
52°	04:26	05:06	05:40	18:04	18:38	19:18
54°	04:21	05:03	05:39	18:05	18:40	19:23
56°	04:16	05:01	05:38	18:06	18:43	19:28
58°	04:10	04:58	05:37	18:07	18:46	19:34
S 60°	04:04	04:54	05:36	18:08	18:50	19:41

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	17:31	16:57	16:18	03:27	05:39	07:56
N 70°	17:28	17:02	16:34	03:36	05:38	07:44
68°	17:26	17:07	16:46	03:43	05:36	07:34
66°	17:24	17:11	16:56	03:49	05:35	07:25
64°	17:22	17:14	17:05	03:53	05:34	07:19
62°	17:21	17:17	17:13	03:58	05:34	07:13
60°	17:19	17:19	17:19	04:01	05:33	07:08
N 58°	17:18	17:21	17:25	04:04	05:32	07:03
56°	17:17	17:23	17:30	04:07	05:32	06:59
54°	17:16	17:25	17:35	04:10	05:31	06:56
52°	17:15	17:27	17:39	04:12	05:31	06:52
50°	17:15	17:28	17:43	04:14	05:31	06:49
45°	17:13	17:31	17:52	04:18	05:30	06:43
N 40°	17:11	17:34	17:59	04:22	05:29	06:38
35°	17:10	17:37	18:05	04:25	05:28	06:33
30°	17:09	17:39	18:10	04:28	05:28	06:29
20°	17:07	17:43	18:20	04:33	05:27	06:23
N 10°	17:06	17:46	18:28	04:37	05:26	06:17
0°	17:04	17:49	18:36	04:41	05:25	06:11
S 10°	17:03	17:52	18:44	04:45	05:24	06:05
20°	17:01	17:56	18:53	04:49	05:24	06:00
30°	16:59	18:00	19:02	04:53	05:23	05:53
35°	16:58	18:02	19:08	04:56	05:22	05:49
40°	16:57	18:05	19:15	04:59	05:21	05:45
45°	16:55	18:08	19:23	05:02	05:21	05:40
S 50°	16:54	18:11	19:32	05:06	05:20	05:34
52°	16:53	18:13	19:36	05:08	05:19	05:31
54°	16:52	18:15	19:41	05:10	05:19	05:28
56°	16:51	18:17	19:46	05:12	05:18	05:25
58°	16:50	18:19	19:52	05:15	05:18	05:21
S 60°	16:49	18:22	19:59	05:17	05:17	05:17

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 97-100%
25	08:09	08:20	11:52	23:15	10:52	
26	08:30	08:40	11:51	–:–	11:37	
27	08:51	09:01	11:51	00:00	12:23	

September 28, 29, 30 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°47.3	153°31.5	S20°33.5	244°27.6	N21°06.4	225°07.5	N15°40.3	354°52.0	N02°10.5
1	21°49.7	168°33.5	34.0	259°28.5	06.1	240°09.5	40.2	9°54.6	10.4
2	36°52.2	183°35.6	34.4	274°29.4	05.8	255°11.5	40.0	24°57.3	10.4
3	51°54.7	198°37.7	·· 34.8	289°30.3	·· 05.6	270°13.5	·· 39.9	39°59.9	·· 10.3
4	66°57.1	213°39.8	35.2	304°31.3	05.3	285°15.5	39.8	55°02.6	10.2
5	81°59.6	228°41.9	35.6	319°32.2	05.0	300°17.5	39.6	70°05.2	10.1
6	97°02.0	243°43.9	S20°35.9	334°33.1	N21°04.7	315°19.5	N15°39.5	85°07.9	N02°10.1
7	112°04.5	258°46.0	36.3	349°34.0	04.5	330°21.6	39.4	100°10.5	10.0
8	127°07.0	273°48.1	36.7	4°34.9	04.2	345°23.6	39.2	115°13.1	09.9
9	142°09.4	288°50.2	·· 37.1	19°35.8	·· 03.9	0°25.6	·· 39.1	130°15.8	·· 09.8
10	157°11.9	303°52.3	37.5	34°36.8	03.7	15°27.6	38.9	145°18.4	09.7
11	172°14.4	318°54.4	37.9	49°37.7	03.4	30°29.6	38.8	160°21.1	09.7
12	187°16.8	333°56.5	S20°38.3	64°38.6	N21°03.1	45°31.6	N15°38.7	175°23.7	N02°09.6
13	202°19.3	348°58.6	38.7	79°39.5	02.8	60°33.6	38.5	190°26.4	09.5
14	217°21.8	4°00.8	39.1	94°40.4	02.6	75°35.6	38.4	205°29.0	09.4
15	232°24.2	19°02.9	·· 39.4	109°41.3	·· 02.3	90°37.6	·· 38.3	220°31.6	·· 09.4
16	247°26.7	34°05.0	39.8	124°42.3	02.0	105°39.7	38.1	235°34.3	09.3
17	262°29.2	49°07.1	40.2	139°43.2	01.7	120°41.7	38.0	250°36.9	09.2
18	277°31.6	64°09.2	S20°40.6	154°44.1	N21°01.5	135°43.7	N15°37.9	265°39.6	N02°09.1
19	292°34.1	79°11.4	40.9	169°45.0	01.2	150°45.7	37.7	280°42.2	09.0
20	307°36.5	94°13.5	41.3	184°45.9	00.9	165°47.7	37.6	295°44.8	09.0
21	322°39.0	109°15.7	·· 41.7	199°46.9	·· 00.6	180°49.7	·· 37.4	310°47.5	·· 08.9
22	337°41.5	124°17.8	42.1	214°47.8	00.4	195°51.7	37.3	325°50.1	08.8
23	352°43.9	139°19.9	42.4	229°48.7	00.1	210°53.8	37.2	340°52.8	08.7
Mer.pass. 23:29		ν 2.1′	d 0.4′	m -4.81	ν 0.9′	d 0.3′	m 1.13	ν 2.0′	d 0.1′ m -1.86	ν 2.6′	d 0.1′ m 0.36

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	7°46.4	154°22.1	S20°42.8	244°49.6	N20°59.8	225°55.8	N15°37.0	355°55.4	N02°08.7
1	22°48.9	169°24.2	43.2	259°50.5	59.5	240°57.8	36.9	10°58.1	08.6
2	37°51.3	184°26.4	43.5	274°51.5	59.3	255°59.8	36.8	26°00.7	08.5
3	52°53.8	199°28.6	·· 43.9	289°52.4	·· 59.0	271°01.8	·· 36.6	41°03.3	·· 08.4
4	67°56.3	214°30.7	44.2	304°53.3	58.7	286°03.8	36.5	56°06.0	08.3
5	82°58.7	229°32.9	44.6	319°54.2	58.4	301°05.8	36.4	71°08.6	08.3
6	98°01.2	244°35.1	S20°45.0	334°55.1	N20°58.1	316°07.9	N15°36.2	86°11.3	N02°08.2
7	113°03.7	259°37.2	45.3	349°56.1	57.9	331°09.9	36.1	101°13.9	08.1
8	128°06.1	274°39.4	45.7	4°57.0	57.6	346°11.9	35.9	116°16.6	08.0
9	143°08.6	289°41.6	·· 46.0	19°57.9	·· 57.3	1°13.9	·· 35.8	131°19.2	·· 08.0
10	158°11.0	304°43.8	46.4	34°58.8	57.0	16°15.9	35.7	146°21.8	07.9
11	173°13.5	319°46.0	46.7	49°59.8	56.8	31°17.9	35.5	161°24.5	07.8
12	188°16.0	334°48.2	S20°47.1	65°00.7	N20°56.5	46°19.9	N15°35.4	176°27.1	N02°07.7
13	203°18.4	349°50.4	47.4	80°01.6	56.2	61°22.0	35.3	191°29.8	07.6
14	218°20.9	4°52.6	47.7	95°02.5	55.9	76°24.0	35.1	206°32.4	07.6
15	233°23.4	19°54.8	·· 48.1	110°03.5	·· 55.6	91°26.0	·· 35.0	221°35.1	·· 07.5
16	248°25.8	34°57.0	48.4	125°04.4	55.4	106°28.0	34.9	236°37.7	07.4
17	263°28.3	49°59.2	48.8	140°05.3	55.1	121°30.0	34.7	251°40.3	07.3
18	278°30.8	65°01.4	S20°49.1	155°06.2	N20°54.8	136°32.0	N15°34.6	266°43.0	N02°07.3
19	293°33.2	80°03.6	49.4	170°07.2	54.5	151°34.1	34.5	281°45.6	07.2
20	308°35.7	95°05.8	49.8	185°08.1	54.3	166°36.1	34.3	296°48.3	07.1
21	323°38.1	110°08.0	·· 50.1	200°09.0	·· 54.0	181°38.1	·· 34.2	311°50.9	·· 07.0
22	338°40.6	125°10.3	50.4	215°09.9	53.7	196°40.1	34.0	326°53.6	06.9
23	353°43.1	140°12.5	50.7	230°10.9	53.4	211°42.1	33.9	341°56.2	06.9
Mer.pass. 23:25		ν 2.2′	d 0.4′	m -4.80	ν 0.9′	d 0.3′	m 1.12	ν 2.0′	d 0.1′ m -1.87	ν 2.6′	d 0.1′ m 0.36

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°45.5	155°14.7	S20°51.1	245°11.8	N20°53.1	226°44.1	N15°33.8	356°58.9	N02°06.8
1	23°48.0	170°17.0	51.4	260°12.7	52.9	241°46.2	33.6	12°01.5	06.7
2	38°50.5	185°19.2	51.7	275°13.6	52.6	256°48.2	33.5	27°04.1	06.6
3	53°52.9	200°21.5	·· 52.0	290°14.6	·· 52.3	271°50.2	·· 33.4	42°06.8	·· 06.6
4	68°55.4	215°23.7	52.3	305°15.5	52.0	286°52.2	33.2	57°09.4	06.5
5	83°57.9	230°26.0	52.7	320°16.4	51.7	301°54.2	33.1	72°12.1	06.4
6	99°00.3	245°28.2	S20°53.0	335°17.4	N20°51.5	316°56.2	N15°33.0	87°14.7	N02°06.3
7	114°02.8	260°30.5	53.3	350°18.3	51.2	331°58.3	32.8	102°17.4	06.2
8	129°05.3	275°32.7	53.6	5°19.2	50.9	347°00.3	32.7	117°20.0	06.2
9	144°07.7	290°35.0	·· 53.9	20°20.2	·· 50.6	2°02.3	·· 32.6	132°22.6	·· 06.1
10	159°10.2	305°37.3	54.2	35°21.1	50.3	17°04.3	32.4	147°25.3	06.0
11	174°12.6	320°39.6	54.5	50°22.0	50.0	32°06.3	32.3	162°27.9	05.9
12	189°15.1	335°41.8	S20°54.8	65°22.9	N20°49.8	47°08.4	N15°32.2	177°30.6	N02°05.9
13	204°17.6	350°44.1	55.1	80°23.9	49.5	62°10.4	32.0	192°33.2	05.8
14	219°20.0	5°46.4	55.4	95°24.8	49.2	77°12.4	31.9	207°35.9	05.7
15	234°22.5	20°48.7	·· 55.7	110°25.7	·· 48.9	92°14.4	·· 31.7	222°38.5	·· 05.6
16	249°25.0	35°51.0	56.0	125°26.7	48.6	107°16.4	31.6	237°41.1	05.5
17	264°27.4	50°53.3	56.3	140°27.6	48.4	122°18.5	31.5	252°43.8	05.5
18	279°29.9	65°55.6	S20°56.6	155°28.5	N20°48.1	137°20.5	N15°31.3	267°46.4	N02°05.4
19	294°32.4	80°57.9	56.9	170°29.5	47.8	152°22.5	31.2	282°49.1	05.3
20	309°34.8	96°00.2	57.2	185°30.4	47.5	167°24.5	31.1	297°51.7	05.2
21	324°37.3	111°02.5	·· 57.5	200°31.3	·· 47.2	182°26.5	·· 30.9	312°54.4	·· 05.2
22	339°39.8	126°04.8	57.8	215°32.3	46.9	197°28.6	30.8	327°57.0	05.1
23	354°42.2	141°07.1	58.0	230°33.2	46.7	212°30.6	30.7	342°59.7	05.0
Mer.pass. 23:21		ν 2.2′	d 0.3′	m -4.79	ν 0.9′	d 0.3′	m 1.12	ν 2.0′	d 0.1′ m -1.87	ν 2.6′	d 0.1′ m 0.35

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.9	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.6	-57°05.8
Hamal	327°49.3	23°35.4
Polaris	312°56.4	89°22.4
Acamar	315°10.4	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.9	49°57.3
Aldebaran	290°37.8	16°33.8
Rigel	281°02.4	-8°10.0
Capella	280°19.7	46°01.4
Bellatrix	278°21.3	6°22.5
Elnath	278°00.0	28°37.8
Alnilam	275°36.2	-1°10.9
Betelgeuse	270°50.5	7°24.8
Canopus	263°51.8	-52°42.2
Sirius	258°25.0	-16°44.9
Adhara	255°04.8	-29°00.2
Procyon	244°49.5	5°09.5
Pollux	243°15.7	27°57.6
Avior	234°14.5	-59°35.4
Suhail	222°45.6	-43°32.2
Miaplacidus	221°38.6	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.2	11°50.2
Dubhe	193°39.9	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.7	-57°15.8
Alioth	166°12.3	55°48.9
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.6	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.9
Kochab	137°20.7	74°02.8
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.4	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.5	-37°07.5
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.6	51°29.4
Kaus Aust.	83°30.6	-34°22.4
Vega	80°32.3	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.2	-56°39.0
Deneb	49°24.6	45°22.8
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Sep 28 Mon	SHA	Mer.pass
Venus	146°44.2	13:44
Mars	237°40.3	07:42
Jupiter	218°20.2	08:58
Saturn	348°04.7	00:20

Sep 29 Tue	SHA	Mer.pass
Venus	146°35.7	13:41
Mars	237°03.2	07:40
Jupiter	218°09.4	08:55
Saturn	348°09.0	00:16

Sep 30 Wed	SHA	Mer.pass
Venus	146°29.2	13:37
Mars	236°26.2	07:39
Jupiter	217°58.6	08:52
Saturn	348°13.3	00:12

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°17.8	S01°56.7	348°30.9	11.3′	N12°09.2	14.8′	58.4′
1	197°18.0	57.6	3°01.3	11.3′	12°24.0	14.9′	58.4′
2	212°18.2	58.6	17°31.5	11.2′	12°38.9	14.8′	58.5′
3	227°18.4	01°59.6	32°01.7	11.1′	12°53.7	14.7′	58.5′
4	242°18.6	02°00.5	46°31.8	11.0′	13°08.4	14.6′	58.5′
5	257°18.8	01.5	61°01.8	10.9′	13°23.0	14.6′	58.5′
6	272°19.0	S02°02.5	75°31.8	10.8′	N13°37.6	14.6′	58.5′
7	287°19.2	03.5	90°01.6	10.8′	13°52.2	14.4′	58.5′
8	302°19.5	04.4	104°31.4	10.7′	14°06.6	14.4′	58.6′
9	317°19.7	·· 05.4	119°01.0	10.6′	14°21.0	14.4′	58.6′
10	332°19.9	06.4	133°30.6	10.5′	14°35.4	14.2′	58.6′
11	347°20.1	07.4	148°00.1	10.4′	14°49.6	14.2′	58.6′
12	2°20.3	S02°08.3	162°29.5	10.3′	N15°03.8	14.2′	58.6′
13	17°20.5	09.3	176°58.8	10.2′	15°18.0	14.0′	58.7′
14	32°20.7	10.3	191°28.1	10.1′	15°32.0	14.0′	58.7′
15	47°20.9	·· 11.2	205°57.2	10.0′	15°46.0	13.9′	58.7′
16	62°21.1	12.2	220°26.2	9.9′	15°59.9	13.8′	58.7′
17	77°21.4	13.2	234°55.2	9.8′	16°13.7	13.7′	58.7′
18	92°21.6	S02°14.2	249°24.0	9.8′	N16°27.4	13.7′	58.7′
19	107°21.8	15.1	263°52.8	9.7′	16°41.1	13.5′	58.7′
20	122°22.0	16.1	278°21.4	9.6′	16°54.6	13.5′	58.8′
21	137°22.2	·· 17.1	292°50.0	9.5′	17°08.1	13.4′	58.8′
22	152°22.4	18.0	307°18.5	9.4′	17°21.5	13.3′	58.8′
23	167°22.6	19.0	321°46.8	9.3′	17°34.8	13.2′	58.8′
	SD = 16.0′	d = 1.0′		SD = 15.9′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°22.8	S02°20.0	336°15.1	9.2′	N17°48.0	13.1′	58.8′
1	197°23.0	21.0	350°43.3	9.1′	18°01.1	13.0′	58.8′
2	212°23.2	21.9	5°11.3	9.0′	18°14.1	13.0′	58.9′
3	227°23.4	·· 22.9	19°39.3	8.9′	18°27.1	12.8′	58.9′
4	242°23.7	23.9	34°07.2	8.8′	18°39.9	12.7′	58.9′
5	257°23.9	24.8	48°34.9	8.7′	18°52.6	12.6′	58.9′
6	272°24.1	S02°25.8	63°02.6	8.6′	N19°05.2	12.5′	58.9′
7	287°24.3	26.8	77°30.2	8.5′	19°17.7	12.4′	58.9′
8	302°24.5	27.8	91°57.6	8.4′	19°30.1	12.3′	58.9′
9	317°24.7	·· 28.7	106°25.0	8.3′	19°42.4	12.2′	58.9′
10	332°24.9	29.7	120°52.3	8.2′	19°54.6	12.1′	59.0′
11	347°25.1	30.7	135°19.4	8.1′	20°06.7	11.9′	59.0′
12	2°25.3	S02°31.6	149°46.5	8.0′	N20°18.6	11.9′	59.0′
13	17°25.5	32.6	164°13.4	7.9′	20°30.5	11.7′	59.0′
14	32°25.7	33.6	178°40.3	7.7′	20°42.2	11.6′	59.0′
15	47°25.9	·· 34.6	193°07.0	7.6′	20°53.8	11.5′	59.0′
16	62°26.2	35.5	207°33.7	7.5′	21°05.3	11.4′	59.0′
17	77°26.4	36.5	222°00.2	7.4′	21°16.7	11.2′	59.0′
18	92°26.6	S02°37.5	236°26.6	7.3′	N21°27.9	11.1′	59.0′
19	107°26.8	38.4	250°53.0	7.2′	21°39.0	11.0′	59.1′
20	122°27.0	39.4	265°19.2	7.1′	21°50.0	10.9′	59.1′
21	137°27.2	·· 40.4	279°45.4	7.0′	22°00.9	10.7′	59.1′
22	152°27.4	41.4	294°11.4	6.9′	22°11.6	10.6′	59.1′
23	167°27.6	42.3	308°37.3	6.8′	22°22.2	10.5′	59.1′
	SD = 16.0′	d = 1.0′		SD = 16.0′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°27.8	S02°43.3	323°03.1	6.7′	N22°32.7	10.3′	59.1′
1	197°28.0	44.3	337°28.9	6.6′	22°43.0	10.2′	59.1′
2	212°28.2	45.2	351°54.5	6.5′	22°53.2	10.0′	59.1′
3	227°28.4	·· 46.2	6°20.0	6.4′	23°03.2	9.9′	59.1′
4	242°28.6	47.2	20°45.5	6.3′	23°13.1	9.8′	59.1′
5	257°28.8	48.1	35°10.8	6.2′	23°22.9	9.6′	59.1′
6	272°29.0	S02°49.1	49°36.0	6.1′	N23°32.5	9.5′	59.2′
7	287°29.3	50.1	64°01.2	6.0′	23°42.0	9.3′	59.2′
8	302°29.5	51.1	78°26.2	5.9′	23°51.3	9.2′	59.2′
9	317°29.7	·· 52.0	92°51.2	5.9′	24°00.5	9.0′	59.2′
10	332°29.9	53.0	107°16.0	5.8′	24°09.5	8.9′	59.2′
11	347°30.1	54.0	121°40.8	5.7′	24°18.4	8.7′	59.2′
12	2°30.3	S02°54.9	136°05.4	5.6′	N24°27.1	8.5′	59.2′
13	17°30.5	55.9	150°30.0	5.5′	24°35.6	8.4′	59.2′
14	32°30.7	56.9	164°54.5	5.4′	24°44.0	8.3′	59.2′
15	47°30.9	·· 57.8	179°18.9	5.3′	24°52.3	8.1′	59.2′
16	62°31.1	58.8	193°43.2	5.2′	25°00.4	7.9′	59.2′
17	77°31.3	02°59.8	208°07.4	5.1′	25°08.3	7.7′	59.2′
18	92°31.5	S03°00.8	222°31.5	5.0′	N25°16.0	7.6′	59.2′
19	107°31.7	01.7	236°55.6	5.0′	25°23.6	7.5′	59.2′
20	122°31.9	02.7	251°19.5	4.9′	25°31.1	7.2′	59.2′
21	137°32.1	·· 03.7	265°43.4	4.8′	25°38.3	7.1′	59.2′
22	152°32.3	04.6	280°07.2	4.7′	25°45.4	6.9′	59.3′
23	167°32.5	05.6	294°30.9	4.6′	25°52.3	6.8′	59.3′
	SD = 16.0′	d = 1.0′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:38	05:02	06:10	17:29	18:36	19:58
N 70°	03:52	05:07	06:07	17:31	18:32	19:45
68°	04:03	05:10	06:06	17:33	18:28	19:35
66°	04:12	05:13	06:04	17:35	18:26	19:26
64°	04:19	05:15	06:03	17:36	18:23	19:20
62°	04:25	05:17	06:02	17:38	18:22	19:14
60°	04:30	05:19	06:01	17:39	18:20	19:09
N 58°	04:34	05:21	06:00	17:40	18:19	19:05
56°	04:38	05:22	05:59	17:41	18:18	19:01
54°	04:42	05:23	05:58	17:41	18:17	18:58
52°	04:44	05:24	05:57	17:42	18:16	18:55
50°	04:47	05:25	05:57	17:43	18:15	18:53
45°	04:52	05:26	05:55	17:44	18:14	18:48
N 40°	04:56	05:27	05:54	17:46	18:13	18:44
35°	04:59	05:28	05:53	17:47	18:12	18:41
30°	05:01	05:28	05:52	17:48	18:12	18:40
20°	05:03	05:28	05:50	17:50	18:12	18:37
N 10°	05:03	05:28	05:49	17:52	18:13	18:37
0°	05:02	05:26	05:47	17:54	18:14	18:38
S 10°	05:00	05:24	05:45	17:55	18:16	18:41
20°	04:56	05:21	05:43	17:58	18:20	18:45
30°	04:49	05:17	05:41	18:00	18:24	18:52
35°	04:45	05:14	05:40	18:02	18:27	18:57
40°	04:39	05:11	05:38	18:03	18:31	19:03
45°	04:32	05:07	05:36	18:05	18:35	19:10
S 50°	04:23	05:01	05:34	18:08	18:40	19:19
52°	04:18	04:59	05:33	18:09	18:43	19:24
54°	04:13	04:56	05:31	18:10	18:46	19:29
56°	04:07	04:53	05:30	18:12	18:49	19:35
58°	04:01	04:49	05:29	18:13	18:53	19:42
S 60°	03:53	04:45	05:27	18:15	18:57	19:49

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	15:18	▭	▭	10:41	▭	▭
N 70°	15:53	▭	▭	10:07	▭	▭
68°	16:19	15:27	▭	09:43	12:25	▭
66°	16:39	16:12	▭	09:24	11:41	▭
64°	16:56	16:43	16:18	09:10	11:12	13:37
62°	17:09	17:06	17:03	08:57	10:50	12:52
60°	17:21	17:24	17:33	08:47	10:33	12:23
N 58°	17:31	17:40	17:56	08:38	10:18	12:01
56°	17:40	17:53	18:14	08:30	10:05	11:43
54°	17:47	18:05	18:30	08:23	09:55	11:27
52°	17:55	18:15	18:44	08:17	09:45	11:14
50°	18:01	18:24	18:56	08:11	09:36	11:02
45°	18:15	18:44	19:21	07:59	09:18	10:39
N 40°	18:26	19:00	19:41	07:49	09:04	10:19
35°	18:36	19:13	19:57	07:41	08:51	10:03
30°	18:45	19:25	20:12	07:33	08:40	09:50
20°	19:00	19:45	20:37	07:21	08:22	09:26
N 10°	19:13	20:03	20:58	07:10	08:06	09:06
0°	19:26	20:20	21:19	06:59	07:51	08:47
S 10°	19:39	20:37	21:39	06:49	07:36	08:29
20°	19:52	20:55	22:01	06:38	07:21	08:09
30°	20:08	21:17	22:26	06:26	07:03	07:46
35°	20:17	21:29	22:41	06:18	06:52	07:32
40°	20:28	21:43	22:59	06:10	06:40	07:17
45°	20:40	22:01	23:20	06:01	06:26	06:59
S 50°	20:56	22:22	23:47	05:50	06:09	06:36
52°	21:03	22:32	·· ··	05:44	06:02	06:25
54°	21:11	22:44	·· ··	05:39	05:53	06:13
56°	21:20	22:57	·· ··	05:32	05:43	05:59
58°	21:30	23:13	·· ··	05:25	05:32	05:43
S 60°	21:42	23:31	·· ··	05:17	05:19	05:23

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 17-19 98-87%
28	09:11	09:21	11:51	00:48	13:13	
29	09:31	09:41	11:50	01:38	14:06	
30	09:51	10:01	11:50	02:34	15:03	

October 01, 02, 03 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°44.7	156°09.5	S20°58.3	245°34.1	N20°46.4	227°32.6	N15°30.5	358°02.3	N02°04.9
1	24°47.1	171°11.8	58.6	260°35.1	46.1	242°34.6	30.4	13°04.9	04.8
2	39°49.6	186°14.1	58.9	275°36.0	45.8	257°36.6	30.3	28°07.6	04.8
3	54°52.1	201°16.4	·· 59.2	290°37.0	·· 45.5	272°38.7	·· 30.1	43°10.2	·· 04.7
4	69°54.5	216°18.8	59.4	305°37.9	45.2	287°40.7	30.0	58°12.9	04.6
5	84°57.0	231°21.1	20°59.7	320°38.8	45.0	302°42.7	29.9	73°15.5	04.5
6	99°59.5	246°23.5	S21°00.0	335°39.8	N20°44.7	317°44.7	N15°29.7	88°18.2	N02°04.5
7	115°01.9	261°25.8	00.2	350°40.7	44.4	332°46.7	29.6	103°20.8	04.4
8	130°04.4	276°28.2	00.5	5°41.6	44.1	347°48.8	29.5	118°23.4	04.3
9	145°06.9	291°30.5	·· 00.8	20°42.6	·· 43.8	2°50.8	·· 29.3	133°26.1	·· 04.2
10	160°09.3	306°32.9	01.0	35°43.5	43.5	17°52.8	29.2	148°28.7	04.1
11	175°11.8	321°35.2	01.3	50°44.4	43.2	32°54.8	29.1	163°31.4	04.1
12	190°14.3	336°37.6	S21°01.6	65°45.4	N20°43.0	47°56.9	N15°28.9	178°34.0	N02°04.0
13	205°16.7	351°40.0	01.8	80°46.3	42.7	62°58.9	28.8	193°36.7	03.9
14	220°19.2	6°42.4	02.1	95°47.3	42.4	78°00.9	28.7	208°39.3	03.8
15	235°21.6	21°44.7	·· 02.3	110°48.2	·· 42.1	93°02.9	·· 28.5	223°42.0	·· 03.8
16	250°24.1	36°47.1	02.6	125°49.1	41.8	108°05.0	28.4	238°44.6	03.7
17	265°26.6	51°49.5	02.8	140°50.1	41.5	123°07.0	28.3	253°47.2	03.6
18	280°29.0	66°51.9	S21°03.1	155°51.0	N20°41.2	138°09.0	N15°28.1	268°49.9	N02°03.5
19	295°31.5	81°54.3	03.3	170°52.0	41.0	153°11.0	28.0	283°52.5	03.5
20	310°34.0	96°56.7	03.6	185°52.9	40.7	168°13.0	27.9	298°55.2	03.4
21	325°36.4	111°59.1	·· 03.8	200°53.8	·· 40.4	183°15.1	·· 27.7	313°57.8	·· 03.3
22	340°38.9	127°01.5	04.0	215°54.8	40.1	198°17.1	27.6	329°00.5	03.2
23	355°41.4	142°03.9	04.3	230°55.7	39.8	213°19.1	27.5	344°03.1	03.1
Mer.pass. 23:17		ν 2.3′	d 0.3′	m -4.78	ν 0.9′	d 0.3′	m 1.11	ν 2.0′	d 0.1′ m -1.87	ν 2.6′	d 0.1′ m 0.35

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°43.8	157°06.3	S21°04.5	245°56.7	N20°39.5	228°21.1	N15°27.3	359°05.8	N02°03.1
1	25°46.3	172°08.7	04.8	260°57.6	39.2	243°23.2	27.2	14°08.4	03.0
2	40°48.7	187°11.1	05.0	275°58.6	38.9	258°25.2	27.0	29°11.0	02.9
3	55°51.2	202°13.6	·· 05.2	290°59.5	·· 38.7	273°27.2	·· 26.9	44°13.7	·· 02.8
4	70°53.7	217°16.0	05.5	306°00.4	38.4	288°29.2	26.8	59°16.3	02.8
5	85°56.1	232°18.4	05.7	321°01.4	38.1	303°31.3	26.6	74°19.0	02.7
6	100°58.6	247°20.8	S21°05.9	336°02.3	N20°37.8	318°33.3	N15°26.5	89°21.6	N02°02.6
7	116°01.1	262°23.3	06.1	351°03.3	37.5	333°35.3	26.4	104°24.3	02.5
8	131°03.5	277°25.7	06.4	6°04.2	37.2	348°37.3	26.2	119°26.9	02.4
9	146°06.0	292°28.2	·· 06.6	21°05.2	·· 36.9	3°39.4	·· 26.1	134°29.5	·· 02.4
10	161°08.5	307°30.6	06.8	36°06.1	36.6	18°41.4	26.0	149°32.2	02.3
11	176°10.9	322°33.1	07.0	51°07.1	36.3	33°43.4	25.8	164°34.8	02.2
12	191°13.4	337°35.5	S21°07.2	66°08.0	N20°36.1	48°45.5	N15°25.7	179°37.5	N02°02.1
13	206°15.9	352°38.0	07.4	81°09.0	35.8	63°47.5	25.6	194°40.1	02.1
14	221°18.3	7°40.4	07.6	96°09.9	35.5	78°49.5	25.4	209°42.8	02.0
15	236°20.8	22°42.9	·· 07.9	111°10.8	·· 35.2	93°51.5	·· 25.3	224°45.4	·· 01.9
16	251°23.2	37°45.4	08.1	126°11.8	34.9	108°53.6	25.2	239°48.1	01.8
17	266°25.7	52°47.9	08.3	141°12.7	34.6	123°55.6	25.0	254°50.7	01.7
18	281°28.2	67°50.3	S21°08.5	156°13.7	N20°34.3	138°57.6	N15°24.9	269°53.3	N02°01.7
19	296°30.6	82°52.8	08.7	171°14.6	34.0	153°59.6	24.8	284°56.0	01.6
20	311°33.1	97°55.3	08.9	186°15.6	33.7	169°01.7	24.6	299°58.6	01.5
21	326°35.6	112°57.8	·· 09.1	201°16.5	·· 33.4	184°03.7	·· 24.5	315°01.3	·· 01.4
22	341°38.0	128°00.3	09.3	216°17.5	33.2	199°05.7	24.4	330°03.9	01.4
23	356°40.5	143°02.8	09.4	231°18.4	32.9	214°07.8	24.3	345°06.6	01.3
Mer.pass. 23:13		ν 2.4′	d 0.2′	m -4.77	ν 0.9′	d 0.3′	m 1.10	ν 2.0′	d 0.1′ m -1.88	ν 2.6′	d 0.1′ m 0.34

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	11°43.0	158°05.3	S21°09.6	246°19.4	N20°32.6	229°09.8	N15°24.1	0°09.2	N02°01.2
1	26°45.4	173°07.8	09.8	261°20.3	32.3	244°11.8	24.0	15°11.9	01.1
2	41°47.9	188°10.3	10.0	276°21.3	32.0	259°13.8	23.9	30°14.5	01.0
3	56°50.4	203°12.8	·· 10.2	291°22.2	·· 31.7	274°15.9	·· 23.7	45°17.1	·· 01.0
4	71°52.8	218°15.3	10.4	306°23.2	31.4	289°17.9	23.6	60°19.8	00.9
5	86°55.3	233°17.9	10.6	321°24.1	31.1	304°19.9	23.5	75°22.4	00.8
6	101°57.7	248°20.4	S21°10.7	336°25.1	N20°30.8	319°22.0	N15°23.3	90°25.1	N02°00.7
7	117°00.2	263°22.9	10.9	351°26.0	30.5	334°24.0	23.2	105°27.7	00.7
8	132°02.7	278°25.4	11.1	6°27.0	30.2	349°26.0	23.1	120°30.4	00.6
9	147°05.1	293°28.0	·· 11.3	21°27.9	·· 29.9	4°28.0	·· 22.9	135°33.0	·· 00.5
10	162°07.6	308°30.5	11.4	36°28.9	29.7	19°30.1	22.8	150°35.7	00.4
11	177°10.1	323°33.1	11.6	51°29.8	29.4	34°32.1	22.7	165°38.3	00.3
12	192°12.5	338°35.6	S21°11.8	66°30.8	N20°29.1	49°34.1	N15°22.5	180°40.9	N02°00.3
13	207°15.0	353°38.1	11.9	81°31.8	28.8	64°36.2	22.4	195°43.6	00.2
14	222°17.5	8°40.7	12.1	96°32.7	28.5	79°38.2	22.3	210°46.2	00.1
15	237°19.9	23°43.3	·· 12.3	111°33.7	·· 28.2	94°40.2	·· 22.1	225°48.9	·· 00.0
16	252°22.4	38°45.8	12.4	126°34.6	27.9	109°42.3	22.0	240°51.5	02°00.0
17	267°24.9	53°48.4	12.6	141°35.6	27.6	124°44.3	21.9	255°54.2	01°59.9
18	282°27.3	68°51.0	S21°12.7	156°36.5	N20°27.3	139°46.3	N15°21.7	270°56.8	N01°59.8
19	297°29.8	83°53.5	12.9	171°37.5	27.0	154°48.3	21.6	285°59.5	59.7
20	312°32.2	98°56.1	13.0	186°38.4	26.7	169°50.4	21.5	301°02.1	59.6
21	327°34.7	113°58.7	·· 13.2	201°39.4	·· 26.4	184°52.4	·· 21.3	316°04.8	·· 59.6
22	342°37.2	129°01.3	13.3	216°40.4	26.1	199°54.4	21.2	331°07.4	59.5
23	357°39.6	144°03.9	13.5	231°41.3	25.8	214°56.5	21.1	346°10.0	59.4
Mer.pass. 23:09		ν 2.5′	d 0.2′	m -4.76	ν 1.0′	d 0.3′	m 1.10	ν 2.0′	d 0.1′ m -1.88	ν 2.6′	d 0.1′ m 0.33

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.8	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.6	-57°05.9
Hamal	327°49.3	23°35.5
Polaris	312°54.9	89°22.4
Acamar	315°10.4	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.8	49°57.3
Aldebaran	290°37.8	16°33.8
Rigel	281°02.4	-8°10.0
Capella	280°19.6	46°01.4
Bellatrix	278°21.3	6°22.5
Elnath	278°00.0	28°37.8
Alnilam	275°36.2	-1°10.9
Betelgeuse	270°50.5	7°24.8
Canopus	263°51.7	-52°42.2
Sirius	258°25.0	-16°44.9
Adhara	255°04.8	-29°00.2
Procyon	244°49.4	5°09.5
Pollux	243°15.7	27°57.6
Avior	234°14.4	-59°35.4
Suhail	222°45.5	-43°32.2
Miaplacidus	221°38.6	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.2	11°50.2
Dubhe	193°39.9	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.5	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.6	-57°15.7
Alioth	166°12.3	55°48.9
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.6	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°20.8	74°02.8
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.4	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.5	-37°07.4
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.6	51°29.4
Kaus Aust.	83°30.7	-34°22.4
Vega	80°32.3	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.2	-56°39.0
Deneb	49°24.6	45°22.8
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Oct 01 Thu	SHA	Mer.pass
Venus	146°24.8	13:33
Mars	235°49.5	07:37
Jupiter	217°47.9	08:49
Saturn	348°17.6	00:08

Oct 02 Fri	SHA	Mer.pass
Venus	146°22.5	13:29
Mars	235°12.9	07:36
Jupiter	217°37.3	08:45
Saturn	348°21.9	00:04

Oct 03 Sat	SHA	Mer.pass
Venus	146°22.3	13:25
Mars	234°36.4	07:34
Jupiter	217°26.8	08:42
Saturn	348°26.3	23:55

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°32.7	S03°06.6	308°54.6	4.6′	N25°59.1	6.5′	59.3′
1	197°32.9	07.5	323°18.1	4.5′	26°05.6	6.4′	59.3′
2	212°33.1	08.5	337°41.6	4.4′	26°12.0	6.3′	59.3′
3	227°33.3	·· 09.5	352°05.0	4.3′	26°18.3	6.0′	59.3′
4	242°33.5	10.5	6°28.4	4.3′	26°24.3	5.9′	59.3′
5	257°33.7	11.4	20°51.7	4.2′	26°30.2	5.7′	59.3′
6	272°34.0	S03°12.4	35°14.9	4.1′	N26°35.9	5.5′	59.3′
7	287°34.2	13.4	49°38.0	4.1′	26°41.4	5.3′	59.3′
8	302°34.4	14.3	64°01.1	4.0′	26°46.7	5.2′	59.3′
9	317°34.6	·· 15.3	78°24.1	4.0′	26°51.9	4.9′	59.3′
10	332°34.8	16.3	92°47.1	3.9′	26°56.8	4.8′	59.3′
11	347°35.0	17.2	107°10.0	3.9′	27°01.6	4.6′	59.3′
12	2°35.2	S03°18.2	121°32.9	3.8′	N27°06.2	4.4′	59.3′
13	17°35.4	19.2	135°55.7	3.7′	27°10.6	4.3′	59.3′
14	32°35.6	20.1	150°18.4	3.7′	27°14.9	4.0′	59.3′
15	47°35.8	·· 21.1	164°41.1	3.7′	27°18.9	3.8′	59.3′
16	62°36.0	22.1	179°03.8	3.6′	27°22.7	3.7′	59.3′
17	77°36.2	23.0	193°26.4	3.6′	27°26.4	3.5′	59.3′
18	92°36.4	S03°24.0	207°48.9	3.5′	N27°29.9	3.3′	59.3′
19	107°36.6	25.0	222°11.5	3.5′	27°33.2	3.1′	59.3′
20	122°36.8	26.0	236°33.9	3.5′	27°36.3	2.9′	59.3′
21	137°37.0	·· 26.9	250°56.4	3.4′	27°39.2	2.7′	59.3′
22	152°37.2	27.9	265°18.8	3.4′	27°41.9	2.5′	59.3′
23	167°37.4	28.9	279°41.2	3.4′	27°44.4	2.3′	59.3′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°37.6	S03°29.8	294°03.6	3.3′	N27°46.7	2.1′	59.3′
1	197°37.8	30.8	308°25.9	3.3′	27°48.8	2.0′	59.3′
2	212°38.0	31.8	322°48.3	3.3′	27°50.8	1.7′	59.3′
3	227°38.2	·· 32.7	337°10.6	3.3′	27°52.5	1.6′	59.3′
4	242°38.4	33.7	351°32.8	3.3′	27°54.1	1.3′	59.3′
5	257°38.6	34.7	5°55.1	3.3′	27°55.4	1.2′	59.3′
6	272°38.8	S03°35.6	20°17.4	3.2′	N27°56.6	1.0′	59.3′
7	287°39.0	36.6	34°39.6	3.2′	27°57.6	0.7′	59.3′
8	302°39.2	37.6	49°01.9	3.2′	27°58.3	0.6′	59.3′
9	317°39.4	·· 38.5	63°24.1	3.2′	27°58.9	0.4′	59.3′
10	332°39.6	39.5	77°46.3	3.2′	27°59.3	0.2′	59.3′
11	347°39.8	40.5	92°08.6	3.2′	27°59.5	0.0′	59.3′
12	2°40.0	S03°41.4	106°30.8	3.2′	N27°59.5	0.3′	59.3′
13	17°40.2	42.4	120°53.0	3.3′	27°59.2	0.4′	59.3′
14	32°40.4	43.4	135°15.3	3.3′	27°58.8	0.6′	59.3′
15	47°40.6	·· 44.3	149°37.6	3.3′	27°58.2	0.7′	59.3′
16	62°40.8	45.3	163°59.8	3.3′	27°57.5	1.0′	59.3′
17	77°41.0	46.3	178°22.1	3.3′	27°56.5	1.2′	59.3′
18	92°41.2	S03°47.2	192°44.5	3.3′	N27°55.3	1.4′	59.3′
19	107°41.4	48.2	207°06.8	3.4′	27°53.9	1.5′	59.3′
20	122°41.6	49.2	221°29.1	3.4′	27°52.4	1.8′	59.3′
21	137°41.8	·· 50.1	235°51.5	3.4′	27°50.6	2.0′	59.3′
22	152°42.0	51.1	250°13.9	3.4′	27°48.6	2.1′	59.2′
23	167°42.1	52.1	264°36.4	3.5′	27°46.5	2.3′	59.2′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°42.3	S03°53.0	278°58.9	3.5′	N27°44.2	2.6′	59.2′
1	197°42.5	54.0	293°21.4	3.6′	27°41.6	2.7′	59.2′
2	212°42.7	55.0	307°43.9	3.6′	27°38.9	2.9′	59.2′
3	227°42.9	·· 55.9	322°06.5	3.6′	27°36.0	3.1′	59.2′
4	242°43.1	56.9	336°29.2	3.7′	27°32.9	3.3′	59.2′
5	257°43.3	57.9	350°51.9	3.7′	27°29.6	3.4′	59.2′
6	272°43.5	S03°58.8	5°14.6	3.8′	N27°26.2	3.7′	59.2′
7	287°43.7	03°59.8	19°37.4	3.8′	27°22.5	3.8′	59.2′
8	302°43.9	04°00.8	34°00.2	3.9′	27°18.7	4.1′	59.2′
9	317°44.1	·· 01.7	48°23.1	3.9′	27°14.6	4.2′	59.2′
10	332°44.3	02.7	62°46.1	4.0′	27°10.4	4.4′	59.2′
11	347°44.5	03.7	77°09.1	4.1′	27°06.0	4.6′	59.2′
12	2°44.7	S04°04.6	91°32.1	4.1′	N27°01.4	4.7′	59.2′
13	17°44.9	05.6	105°55.3	4.2′	26°56.7	5.0′	59.2′
14	32°45.1	06.6	120°18.4	4.3′	26°51.7	5.1′	59.2′
15	47°45.3	·· 07.5	134°41.7	4.3′	26°46.6	5.3′	59.2′
16	62°45.5	08.5	149°05.0	4.4′	26°41.3	5.5′	59.2′
17	77°45.7	09.5	163°28.4	4.5′	26°35.8	5.6′	59.1′
18	92°45.9	S04°10.4	177°51.9	4.5′	N26°30.2	5.8′	59.1′
19	107°46.1	11.4	192°15.4	4.6′	26°24.4	6.0′	59.1′
20	122°46.3	12.4	206°39.1	4.7′	26°18.4	6.2′	59.1′
21	137°46.4	·· 13.3	221°02.7	4.8′	26°12.2	6.4′	59.1′
22	152°46.6	14.3	235°26.5	4.9′	26°05.8	6.5′	59.1′
23	167°46.8	15.2	249°50.4	4.9′	25°59.3	6.7′	59.1′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:54	05:16	06:23	17:13	18:20	19:41
N 70°	04:06	05:19	06:19	17:17	18:18	19:30
68°	04:15	05:21	06:16	17:21	18:16	19:21
66°	04:22	05:23	06:14	17:23	18:14	19:14
64°	04:28	05:24	06:11	17:26	18:13	19:08
62°	04:33	05:25	06:09	17:28	18:12	19:04
60°	04:38	05:26	06:08	17:30	18:11	18:59
N 58°	04:41	05:27	06:06	17:31	18:10	18:56
56°	04:44	05:28	06:05	17:33	18:10	18:53
54°	04:47	05:28	06:04	17:34	18:09	18:50
52°	04:50	05:29	06:02	17:35	18:09	18:48
50°	04:52	05:29	06:01	17:36	18:09	18:46
45°	04:56	05:30	05:59	17:39	18:08	18:42
N 40°	04:59	05:30	05:57	17:41	18:08	18:39
35°	05:01	05:30	05:55	17:43	18:08	18:37
30°	05:02	05:30	05:54	17:44	18:08	18:36
20°	05:04	05:29	05:51	17:47	18:09	18:35
N 10°	05:03	05:28	05:49	17:50	18:11	18:35
0°	05:01	05:25	05:46	17:53	18:13	18:37
S 10°	04:58	05:22	05:44	17:55	18:16	18:41
20°	04:53	05:19	05:41	17:58	18:20	18:46
30°	04:45	05:13	05:37	18:02	18:26	18:54
35°	04:40	05:10	05:35	18:04	18:29	18:59
40°	04:34	05:06	05:33	18:06	18:34	19:06
45°	04:26	05:01	05:30	18:09	18:39	19:14
S 50°	04:16	04:55	05:27	18:13	18:45	19:24
52°	04:11	04:52	05:26	18:14	18:48	19:29
54°	04:05	04:48	05:24	18:16	18:52	19:35
56°	03:59	04:44	05:22	18:18	18:56	19:42
58°	03:51	04:40	05:20	18:20	19:00	19:49
S 60°	03:43	04:35	05:18	18:22	19:05	19:58

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	▭	▭	▭	▭
62°	17:02	17:39	19:42	15:01	16:36	16:43
60°	17:54	18:48	20:22	14:09	15:27	16:03
N 58°	18:26	19:23	20:49	13:37	14:52	15:35
56°	18:50	19:49	21:11	13:13	14:26	15:13
54°	19:10	20:09	21:28	12:54	14:05	14:55
52°	19:26	20:26	21:43	12:38	13:48	14:40
50°	19:40	20:41	21:56	12:24	13:34	14:27
45°	20:09	21:11	22:23	11:56	13:04	13:59
N 40°	20:32	21:34	22:44	11:33	12:41	13:38
35°	20:51	21:53	23:02	11:15	12:21	13:20
30°	21:07	22:09	23:17	10:59	12:05	13:04
20°	21:34	22:37	23:42	10:32	11:37	12:37
N 10°	21:58	23:01	·· ··	10:09	11:13	12:14
0°	22:20	23:23	·· ··	09:48	10:50	11:53
S 10°	22:42	23:45	·· ··	09:26	10:28	11:31
20°	23:06	·· ··	00:09	09:03	10:04	11:08
30°	23:34	·· ··	00:37	08:37	09:36	10:41
35°	23:51	·· ··	00:53	08:21	09:19	10:25
40°	·· ··	00:10	01:13	08:03	08:59	10:06
45°	·· ··	00:34	01:36	07:41	08:36	09:43
S 50°	·· ··	01:04	02:05	07:13	08:06	09:14
52°	00:00	01:19	02:20	07:00	07:51	09:00
54°	00:15	01:36	02:37	06:44	07:33	08:43
56°	00:33	01:57	02:57	06:26	07:12	08:24
58°	00:55	02:23	03:22	06:04	06:46	07:59
S 60°	01:23	03:00	03:56	05:35	06:09	07:25

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 20-22 78-57%
01	10:11	10:21	11:50	03:33	16:04	
02	10:30	10:40	11:49	04:35	17:07	
03	10:49	10:59	11:49	05:38	18:09	

October 04, 05, 06 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	12°42.1	159°06.5	S21°13.6	246°42.3	N20°25.5	229°58.5	N15°20.9	1°12.7	N01°59.3
1	27°44.6	174°09.1	13.8	261°43.2	25.2	245°00.5	20.8	16°15.3	59.3
2	42°47.0	189°11.7	13.9	276°44.2	25.0	260°02.6	20.7	31°18.0	59.2
3	57°49.5	204°14.3	·· 14.0	291°45.1	·· 24.7	275°04.6	·· 20.5	46°20.6	·· 59.1
4	72°52.0	219°16.9	14.2	306°46.1	24.4	290°06.6	20.4	61°23.3	59.0
5	87°54.4	234°19.5	14.3	321°47.1	24.1	305°08.7	20.3	76°25.9	59.0
6	102°56.9	249°22.1	S21°14.4	336°48.0	N20°23.8	320°10.7	N15°20.1	91°28.6	N01°58.9
7	117°59.4	264°24.7	14.6	351°49.0	23.5	335°12.7	20.0	106°31.2	58.8
8	133°01.8	279°27.3	14.7	6°49.9	23.2	350°14.8	19.9	121°33.8	58.7
9	148°04.3	294°30.0	·· 14.8	21°50.9	·· 22.9	5°16.8	·· 19.8	136°36.5	·· 58.6
10	163°06.7	309°32.6	14.9	36°51.9	22.6	20°18.8	19.6	151°39.1	58.6
11	178°09.2	324°35.2	15.0	51°52.8	22.3	35°20.9	19.5	166°41.8	58.5
12	193°11.7	339°37.9	S21°15.2	66°53.8	N20°22.0	50°22.9	N15°19.4	181°44.4	N01°58.4
13	208°14.1	354°40.5	15.3	81°54.7	21.7	65°24.9	19.2	196°47.1	58.3
14	223°16.6	9°43.2	15.4	96°55.7	21.4	80°27.0	19.1	211°49.7	58.3
15	238°19.1	24°45.8	·· 15.5	111°56.7	·· 21.1	95°29.0	·· 19.0	226°52.4	·· 58.2
16	253°21.5	39°48.5	15.6	126°57.6	20.8	110°31.0	18.8	241°55.0	58.1
17	268°24.0	54°51.1	15.7	141°58.6	20.5	125°33.1	18.7	256°57.6	58.0
18	283°26.5	69°53.8	S21°15.8	156°59.6	N20°20.2	140°35.1	N15°18.6	272°00.3	N01°57.9
19	298°28.9	84°56.4	15.9	172°00.5	19.9	155°37.1	18.4	287°02.9	57.9
20	313°31.4	99°59.1	16.0	187°01.5	19.6	170°39.2	18.3	302°05.6	57.8
21	328°33.8	115°01.8	·· 16.1	202°02.4	·· 19.3	185°41.2	·· 18.2	317°08.2	·· 57.7
22	343°36.3	130°04.5	16.2	217°03.4	19.0	200°43.3	18.0	332°10.9	57.6
23	358°38.8	145°07.1	16.3	232°04.4	18.7	215°45.3	17.9	347°13.5	57.6
Mer.pass.	23:05	ν 2.6′	d 0.1′	m -4.74	ν 1.0′	d 0.3′	m 1.09	ν 2.0′	d 0.1′ m -1.88	ν 2.6′	d 0.1′ m 0.33

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°41.2	160°09.8	S21°16.4	247°05.3	N20°18.4	230°47.3	N15°17.8	2°16.2	N01°57.5
1	28°43.7	175°12.5	16.5	262°06.3	18.1	245°49.4	17.7	17°18.8	57.4
2	43°46.2	190°15.2	16.6	277°07.3	17.8	260°51.4	17.5	32°21.5	57.3
3	58°48.6	205°17.9	·· 16.7	292°08.2	·· 17.5	275°53.4	·· 17.4	47°24.1	·· 57.3
4	73°51.1	220°20.6	16.8	307°09.2	17.2	290°55.5	17.3	62°26.7	57.2
5	88°53.6	235°23.3	16.8	322°10.2	16.9	305°57.5	17.1	77°29.4	57.1
6	103°56.0	250°26.0	S21°16.9	337°11.1	N20°16.6	320°59.5	N15°17.0	92°32.0	N01°57.0
7	118°58.5	265°28.7	17.0	352°12.1	16.3	336°01.6	16.9	107°34.7	56.9
8	134°01.0	280°31.4	17.1	7°13.1	16.0	351°03.6	16.7	122°37.3	56.9
9	149°03.4	295°34.2	·· 17.1	22°14.0	·· 15.7	6°05.7	·· 16.6	137°40.0	·· 56.8
10	164°05.9	310°36.9	17.2	37°15.0	15.4	21°07.7	16.5	152°42.6	56.7
11	179°08.3	325°39.6	17.3	52°16.0	15.1	36°09.7	16.3	167°45.3	56.6
12	194°10.8	340°42.3	S21°17.3	67°16.9	N20°14.8	51°11.8	N15°16.2	182°47.9	N01°56.6
13	209°13.3	355°45.1	17.4	82°17.9	14.5	66°13.8	16.1	197°50.5	56.5
14	224°15.7	10°47.8	17.5	97°18.9	14.2	81°15.8	16.0	212°53.2	56.4
15	239°18.2	25°50.6	·· 17.5	112°19.9	·· 13.9	96°17.9	·· 15.8	227°55.8	·· 56.3
16	254°20.7	40°53.3	17.6	127°20.8	13.6	111°19.9	15.7	242°58.5	56.3
17	269°23.1	55°56.1	17.6	142°21.8	13.3	126°22.0	15.6	258°01.1	56.2
18	284°25.6	70°58.8	S21°17.7	157°22.8	N20°13.0	141°24.0	N15°15.4	273°03.8	N01°56.1
19	299°28.1	86°01.6	17.8	172°23.7	12.7	156°26.0	15.3	288°06.4	56.0
20	314°30.5	101°04.3	17.8	187°24.7	12.4	171°28.1	15.2	303°09.1	55.9
21	329°33.0	116°07.1	·· 17.9	202°25.7	·· 12.1	186°30.1	·· 15.0	318°11.7	·· 55.9
22	344°35.5	131°09.9	17.9	217°26.7	11.8	201°32.2	14.9	333°14.3	55.8
23	359°37.9	146°12.6	17.9	232°27.6	11.5	216°34.2	14.8	348°17.0	55.7
Mer.pass.	23:01	ν 2.7′	d 0.1′	m -4.72	ν 1.0′	d 0.3′	m 1.08	ν 2.0′	d 0.1′ m -1.89	ν 2.6′	d 0.1′ m 0.33

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°40.4	161°15.4	S21°18.0	247°28.6	N20°11.2	231°36.2	N15°14.7	3°19.6	N01°55.6
1	29°42.8	176°18.2	18.0	262°29.6	10.9	246°38.3	14.5	18°22.3	55.6
2	44°45.3	191°21.0	18.1	277°30.5	10.6	261°40.3	14.4	33°24.9	55.5
3	59°47.8	206°23.8	·· 18.1	292°31.5	·· 10.3	276°42.4	·· 14.3	48°27.6	·· 55.4
4	74°50.2	221°26.6	18.1	307°32.5	10.0	291°44.4	14.1	63°30.2	55.3
5	89°52.7	236°29.3	18.1	322°33.5	09.7	306°46.4	14.0	78°32.9	55.2
6	104°55.2	251°32.1	S21°18.2	337°34.4	N20°09.4	321°48.5	N15°13.9	93°35.5	N01°55.2
7	119°57.6	266°35.0	18.2	352°35.4	09.1	336°50.5	13.7	108°38.2	55.1
8	135°00.1	281°37.8	18.2	7°36.4	08.8	351°52.6	13.6	123°40.8	55.0
9	150°02.6	296°40.6	·· 18.2	22°37.4	·· 08.5	6°54.6	·· 13.5	138°43.4	·· 54.9
10	165°05.0	311°43.4	18.3	37°38.3	08.2	21°56.6	13.4	153°46.1	54.9
11	180°07.5	326°46.2	18.3	52°39.3	07.9	36°58.7	13.2	168°48.7	54.8
12	195°10.0	341°49.0	S21°18.3	67°40.3	N20°07.6	52°00.7	N15°13.1	183°51.4	N01°54.7
13	210°12.4	356°51.9	18.3	82°41.3	07.3	67°02.8	13.0	198°54.0	54.6
14	225°14.9	11°54.7	18.3	97°42.2	07.0	82°04.8	12.8	213°56.7	54.6
15	240°17.3	26°57.5	·· 18.3	112°43.2	·· 06.7	97°06.9	·· 12.7	228°59.3	·· 54.5
16	255°19.8	42°00.4	18.3	127°44.2	06.4	112°08.9	12.6	244°02.0	54.4
17	270°22.3	57°03.2	18.3	142°45.2	06.1	127°10.9	12.4	259°04.6	54.3
18	285°24.7	72°06.0	S21°18.3	157°46.2	N20°05.8	142°13.0	N15°12.3	274°07.2	N01°54.2
19	300°27.2	87°08.9	18.3	172°47.1	05.5	157°15.0	12.2	289°09.9	54.2
20	315°29.7	102°11.7	18.3	187°48.1	05.2	172°17.1	12.1	304°12.5	54.1
21	330°32.1	117°14.6	·· 18.3	202°49.1	·· 04.9	187°19.1	·· 11.9	319°15.2	·· 54.0
22	345°34.6	132°17.5	18.3	217°50.1	04.6	202°21.2	11.8	334°17.8	53.9
23	0°37.1	147°20.3	18.3	232°51.1	04.3	217°23.2	11.7	349°20.5	53.9
Mer.pass.	22:58	ν 2.8′	d 0.0′	m -4.69	ν 1.0′	d 0.3′	m 1.08	ν 2.0′	d 0.1′ m -1.89	ν 2.6′	d 0.1′ m 0.33

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.8	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.3	23°35.5
Polaris	312°53.6	89°22.4
Acamar	315°10.3	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.8	49°57.3
Aldebaran	290°37.8	16°33.9
Rigel	281°02.4	-8°10.0
Capella	280°19.6	46°01.4
Bellatrix	278°21.2	6°22.5
Elnath	277°59.9	28°37.8
Alnilam	275°36.2	-1°10.9
Betelgeuse	270°50.5	7°24.8
Canopus	263°51.7	-52°42.2
Sirius	258°25.0	-16°44.9
Adhara	255°04.8	-29°00.2
Procyon	244°49.4	5°09.5
Pollux	243°15.6	27°57.6
Avior	234°14.4	-59°35.4
Suhail	222°45.5	-43°32.2
Miaplacidus	221°38.5	-69°49.3
Alphard	217°46.6	-8°46.3
Regulus	207°33.2	11°50.2
Dubhe	193°39.9	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.6	-57°15.7
Alioth	166°12.3	55°48.9
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.9
Hadar	148°34.6	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°20.8	74°02.8
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.4	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.6	51°29.4
Kaus Aust.	83°30.7	-34°22.4
Vega	80°32.3	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.2	-56°39.0
Deneb	49°24.6	45°22.8
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Oct 04 Sun	SHA	Mer.pass
Venus	146°24.4	13:21
Mars	234°00.2	07:33
Jupiter	217°16.4	08:39
Saturn	348°30.6	23:51

Oct 05 Mon	SHA	Mer.pass
Venus	146°28.6	13:17
Mars	233°24.1	07:31
Jupiter	217°06.1	08:36
Saturn	348°34.9	23:47

Oct 06 Tue	SHA	Mer.pass
Venus	146°35.0	13:13
Mars	232°48.2	07:30
Jupiter	216°55.9	08:32
Saturn	348°39.3	23:43

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°47.0	S04°16.2	264°14.3	5.0′	N25°52.6	6.8′	59.1′
1	197°47.2	17.2	278°38.3	5.1′	25°45.8	7.0′	59.1′
2	212°47.4	18.1	293°02.4	5.2′	25°38.8	7.2′	59.1′
3	227°47.6	·· 19.1	307°26.6	5.3′	25°31.6	7.4′	59.1′
4	242°47.8	20.1	321°50.9	5.4′	25°24.2	7.5′	59.1′
5	257°48.0	21.0	336°15.2	5.4′	25°16.7	7.7′	59.1′
6	272°48.2	S04°22.0	350°39.7	5.5′	N25°09.0	7.8′	59.1′
7	287°48.4	23.0	5°04.2	5.6′	25°01.2	8.0′	59.0′
8	302°48.6	23.9	19°28.9	5.7′	24°53.2	8.1′	59.0′
9	317°48.8	·· 24.9	33°53.6	5.8′	24°45.1	8.3′	59.0′
10	332°49.0	25.9	48°18.4	5.9′	24°36.8	8.5′	59.0′
11	347°49.1	26.8	62°43.3	6.0′	24°28.3	8.6′	59.0′
12	2°49.3	S04°27.8	77°08.3	6.1′	N24°19.7	8.7′	59.0′
13	17°49.5	28.7	91°33.4	6.2′	24°11.0	8.9′	59.0′
14	32°49.7	29.7	105°58.6	6.3′	24°02.1	9.1′	59.0′
15	47°49.9	·· 30.7	120°23.9	6.4′	23°53.0	9.2′	59.0′
16	62°50.1	31.6	134°49.3	6.5′	23°43.8	9.3′	59.0′
17	77°50.3	32.6	149°14.8	6.6′	23°34.5	9.5′	59.0′
18	92°50.5	S04°33.6	163°40.3	6.7′	N23°25.0	9.6′	58.9′
19	107°50.7	34.5	178°06.0	6.8′	23°15.4	9.8′	58.9′
20	122°50.9	35.5	192°31.8	6.9′	23°05.6	9.9′	58.9′
21	137°51.0	·· 36.4	206°57.7	7.0′	22°55.7	10.0′	58.9′
22	152°51.2	37.4	221°23.7	7.1′	22°45.7	10.2′	58.9′
23	167°51.4	38.4	235°49.8	7.2′	22°35.5	10.3′	58.9′
	SD = 16.0′	d = 1.0′	SD = 16.1′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°51.6	S04°39.3	250°15.9	7.3′	N22°25.2	10.5′	58.9′
1	197°51.8	40.3	264°42.2	7.4′	22°14.7	10.5′	58.9′
2	212°52.0	41.3	279°08.6	7.5′	22°04.2	10.7′	58.9′
3	227°52.2	·· 42.2	293°35.1	7.6′	21°53.5	10.8′	58.9′
4	242°52.4	43.2	308°01.7	7.7′	21°42.7	11.0′	58.8′
5	257°52.6	44.1	322°28.4	7.8′	21°31.7	11.1′	58.8′
6	272°52.8	S04°45.1	336°55.2	7.9′	N21°20.6	11.2′	58.8′
7	287°52.9	46.1	351°22.1	8.0′	21°09.4	11.3′	58.8′
8	302°53.1	47.0	5°49.1	8.1′	20°58.1	11.4′	58.8′
9	317°53.3	·· 48.0	20°16.2	8.2′	20°46.7	11.5′	58.8′
10	332°53.5	49.0	34°43.4	8.3′	20°35.2	11.7′	58.8′
11	347°53.7	49.9	49°10.7	8.4′	20°23.5	11.8′	58.8′
12	2°53.9	S04°50.9	63°38.1	8.5′	N20°11.7	11.9′	58.8′
13	17°54.1	51.8	78°05.6	8.6′	19°59.8	12.0′	58.7′
14	32°54.3	52.8	92°33.2	8.7′	19°47.8	12.1′	58.7′
15	47°54.4	·· 53.8	107°00.9	8.8′	19°35.7	12.2′	58.7′
16	62°54.6	54.7	121°28.7	8.9′	19°23.5	12.3′	58.7′
17	77°54.8	55.7	135°56.6	9.0′	19°11.2	12.4′	58.7′
18	92°55.0	S04°56.6	150°24.6	9.1′	N18°58.8	12.5′	58.7′
19	107°55.2	57.6	164°52.7	9.2′	18°46.3	12.6′	58.7′
20	122°55.4	58.6	179°20.9	9.3′	18°33.7	12.8′	58.7′
21	137°55.6	04°59.5	193°49.2	9.4′	18°20.9	12.8′	58.6′
22	152°55.7	05°00.5	208°17.6	9.5′	18°08.1	12.9′	58.6′
23	167°55.9	01.4	222°46.0	9.6′	17°55.2	13.0′	58.6′
	SD = 16.0′	d = 1.0′	SD = 16.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°56.1	S05°02.4	237°14.6	9.7′	N17°42.2	13.1′	58.6′
1	197°56.3	03.4	251°43.3	9.8′	17°29.1	13.1′	58.6′
2	212°56.5	04.3	266°12.1	9.9′	17°16.0	13.3′	58.6′
3	227°56.7	·· 05.3	280°40.9	10.0′	17°02.7	13.4′	58.6′
4	242°56.9	06.2	295°09.9	10.0′	16°49.3	13.4′	58.6′
5	257°57.0	07.2	309°38.9	10.1′	16°35.9	13.5′	58.5′
6	272°57.2	S05°08.2	324°08.1	10.2′	N16°22.4	13.6′	58.5′
7	287°57.4	09.1	338°37.3	10.3′	16°08.8	13.7′	58.5′
8	302°57.6	10.1	353°06.6	10.4′	15°55.1	13.8′	58.5′
9	317°57.8	·· 11.0	7°36.0	10.5′	15°41.3	13.8′	58.5′
10	332°58.0	12.0	22°05.5	10.6′	15°27.5	14.0′	58.5′
11	347°58.1	13.0	36°35.1	10.7′	15°13.5	13.9′	58.5′
12	2°58.3	S05°13.9	51°04.7	10.8′	N14°59.6	14.1′	58.4′
13	17°58.5	14.9	65°34.5	10.8′	14°45.5	14.1′	58.4′
14	32°58.7	15.8	80°04.3	10.9′	14°31.4	14.2′	58.4′
15	47°58.9	·· 16.8	94°34.2	11.0′	14°17.2	14.3′	58.4′
16	62°59.1	17.7	109°04.2	11.1′	14°02.9	14.3′	58.4′
17	77°59.2	18.7	123°34.3	11.2′	13°48.6	14.4′	58.4′
18	92°59.4	S05°19.7	138°04.5	11.2′	N13°34.2	14.5′	58.4′
19	107°59.6	20.6	152°34.7	11.3′	13°19.7	14.5′	58.3′
20	122°59.8	21.6	167°05.0	11.4′	13°05.2	14.6′	58.3′
21	138°00.0	·· 22.5	181°35.4	11.5′	12°50.6	14.6′	58.3′
22	153°00.1	23.5	196°05.9	11.5′	12°36.0	14.7′	58.3′
23	168°00.3	24.5	210°36.5	11.6′	12°21.3	14.8′	58.3′
	SD = 16.0′	d = 1.0′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:09	05:29	06:37	16:58	18:05	19:25
N 70°	04:18	05:30	06:31	17:04	18:04	19:16
68°	04:26	05:31	06:27	17:08	18:03	19:08
66°	04:32	05:32	06:23	17:12	18:03	19:02
64°	04:37	05:33	06:20	17:15	18:03	18:58
62°	04:41	05:33	06:17	17:18	18:02	18:54
60°	04:45	05:33	06:15	17:21	18:02	18:50
N 58°	04:48	05:34	06:13	17:23	18:02	18:47
56°	04:51	05:34	06:11	17:25	18:02	18:45
54°	04:53	05:34	06:09	17:27	18:02	18:43
52°	04:55	05:34	06:07	17:28	18:02	18:41
50°	04:56	05:34	06:06	17:30	18:02	18:39
45°	05:00	05:34	06:03	17:33	18:03	18:36
N 40°	05:02	05:33	06:00	17:36	18:03	18:34
35°	05:03	05:32	05:58	17:39	18:04	18:33
30°	05:04	05:32	05:56	17:41	18:05	18:32
20°	05:04	05:30	05:52	17:45	18:07	18:32
N 10°	05:03	05:27	05:48	17:48	18:09	18:34
0°	05:00	05:24	05:45	17:52	18:12	18:36
S 10°	04:56	05:21	05:42	17:55	18:16	18:41
20°	04:50	05:16	05:38	17:59	18:21	18:47
30°	04:41	05:10	05:34	18:04	18:28	18:56
35°	04:36	05:06	05:31	18:06	18:32	19:02
40°	04:29	05:01	05:28	18:09	18:37	19:09
45°	04:20	04:55	05:25	18:13	18:43	19:18
S 50°	04:08	04:48	05:21	18:17	18:50	19:30
52°	04:03	04:44	05:19	18:19	18:54	19:35
54°	03:57	04:41	05:17	18:21	18:58	19:42
56°	03:50	04:36	05:14	18:24	19:02	19:49
58°	03:42	04:31	05:12	18:27	19:07	19:57
S 60°	03:32	04:26	05:09	18:30	19:13	20:07

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▭	▭	▭	▭	▭	17:57
N 70°	▭	21:53	·· ··	▭	18:34	17:32
68°	▭	22:37	·· ··	▭	17:49	17:13
66°	20:25	23:05	·· ··	18:05	17:19	16:58
64°	21:16	23:27	·· ··	17:13	16:56	16:45
62°	21:47	23:44	·· ··	16:41	16:38	16:35
60°	22:11	23:58	·· ··	16:17	16:23	16:25
N 58°	22:29	·· ··	00:10	15:58	16:10	16:17
56°	22:45	·· ··	00:21	15:42	15:59	16:10
54°	22:58	·· ··	00:30	15:28	15:49	16:03
52°	23:10	·· ··	00:38	15:16	15:40	15:57
50°	23:20	·· ··	00:45	15:05	15:32	15:52
45°	23:41	·· ··	01:01	14:42	15:15	15:41
N 40°	23:59	·· ··	01:13	14:24	15:01	15:31
35°	·· ··	00:13	01:24	14:08	14:49	15:23
30°	·· ··	00:26	01:33	13:55	14:38	15:15
20°	·· ··	00:47	01:49	13:32	14:20	15:02
N 10°	00:04	01:06	02:03	13:12	14:04	14:51
0°	00:25	01:23	02:16	12:53	13:49	14:40
S 10°	00:45	01:40	02:29	12:34	13:34	14:30
20°	01:07	01:58	02:43	12:13	13:17	14:18
30°	01:32	02:19	02:59	11:50	12:58	14:05
35°	01:47	02:31	03:08	11:36	12:47	13:57
40°	02:04	02:45	03:18	11:19	12:34	13:48
45°	02:24	03:01	03:30	11:00	12:19	13:38
S 50°	02:50	03:22	03:45	10:35	12:00	13:25
52°	03:02	03:31	03:51	10:23	11:51	13:19
54°	03:16	03:42	03:59	10:10	11:41	13:12
56°	03:33	03:54	04:07	09:54	11:30	13:05
58°	03:52	04:08	04:16	09:35	11:17	12:57
S 60°	04:16	04:24	04:27	09:11	11:01	12:47

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 23-25 45-24%
04	11:08	11:17	11:49	06:39	19:08	
05	11:26	11:36	11:48	07:36	20:03	
06	11:44	11:53	11:48	08:29	20:53	

October 07, 08, 09 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	15°39.5	162°23.2	S21°18.3	247°52.0	N20°04.0	232°25.2	N15°11.5	4°23.1	N01°53.8
1	30°42.0	177°26.1	18.3	262°53.0	03.7	247°27.3	11.4	19°25.8	53.7
2	45°44.4	192°28.9	18.3	277°54.0	03.4	262°29.3	11.3	34°28.4	53.6
3	60°46.9	207°31.8	·· 18.2	292°55.0	·· 03.0	277°31.4	·· 11.2	49°31.0	·· 53.6
4	75°49.4	222°34.7	18.2	307°56.0	02.7	292°33.4	11.0	64°33.7	53.5
5	90°51.8	237°37.6	18.2	322°56.9	02.4	307°35.5	10.9	79°36.3	53.4
6	105°54.3	252°40.5	S21°18.2	337°57.9	N20°02.1	322°37.5	N15°10.8	94°39.0	N01°53.3
7	120°56.8	267°43.4	18.1	352°58.9	01.8	337°39.6	10.6	109°41.6	53.3
8	135°59.2	282°46.3	18.1	7°59.9	01.5	352°41.6	10.5	124°44.3	53.2
9	151°01.7	297°49.2	·· 18.1	23°00.9	·· 01.2	7°43.6	·· 10.4	139°46.9	·· 53.1
10	166°04.2	312°52.1	18.0	38°01.9	00.9	22°45.7	10.3	154°49.6	53.0
11	181°06.6	327°55.0	18.0	53°02.8	00.6	37°47.7	10.1	169°52.2	52.9
12	196°09.1	342°57.9	S21°18.0	68°03.8	N20°00.3	52°49.8	N15°10.0	184°54.8	N01°52.9
13	211°11.6	358°00.8	17.9	83°04.8	20°00.0	67°51.8	09.9	199°57.5	52.8
14	226°14.0	13°03.8	17.9	98°05.8	19°59.7	82°53.9	09.7	215°00.1	52.7
15	241°16.5	28°06.7	·· 17.8	113°06.8	·· 59.4	97°55.9	·· 09.6	230°02.8	·· 52.6
16	256°18.9	43°09.6	17.8	128°07.8	59.1	112°58.0	09.5	245°05.4	52.6
17	271°21.4	58°12.6	17.7	143°08.8	58.8	128°00.0	09.4	260°08.1	52.5
18	286°23.9	73°15.5	S21°17.7	158°09.7	N19°58.5	143°02.1	N15°09.2	275°10.7	N01°52.4
19	301°26.3	88°18.4	17.6	173°10.7	58.2	158°04.1	09.1	290°13.4	52.3
20	316°28.8	103°21.4	17.6	188°11.7	57.8	173°06.2	09.0	305°16.0	52.3
21	331°31.3	118°24.3	·· 17.5	203°12.7	·· 57.5	188°08.2	·· 08.8	320°18.7	·· 52.2
22	346°33.7	133°27.3	17.4	218°13.7	57.2	203°10.3	08.7	335°21.3	52.1
23	1°36.2	148°30.2	17.4	233°14.7	56.9	218°12.3	08.6	350°23.9	52.0
Mer.pass. 22:54		ν 2.9′ d 0.0′	m -4.67	ν 1.0′	d 0.3′ m 1.07	ν 2.0′	d 0.1′ m -1.89	ν 2.6′	d 0.1′ m 0.34

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°38.7	163°33.2	S21°17.3	248°15.7	N19°56.6	233°14.3	N15°08.5	5°26.6	N01°52.0
1	31°41.1	178°36.2	17.2	263°16.7	56.3	248°16.4	08.3	20°29.2	51.9
2	46°43.6	193°39.1	17.1	278°17.6	56.0	263°18.4	08.2	35°31.9	51.8
3	61°46.0	208°42.1	·· 17.1	293°18.6	·· 55.7	278°20.5	·· 08.1	50°34.5	·· 51.7
4	76°48.5	223°45.1	17.0	308°19.6	55.4	293°22.5	07.9	65°37.2	51.6
5	91°51.0	238°48.1	16.9	323°20.6	55.1	308°24.6	07.8	80°39.8	51.6
6	106°53.4	253°51.0	S21°16.8	338°21.6	N19°54.8	323°26.6	N15°07.7	95°42.5	N01°51.5
7	121°55.9	268°54.0	16.8	353°22.6	54.5	338°28.7	07.6	110°45.1	51.4
8	136°58.4	283°57.0	16.7	8°23.6	54.2	353°30.7	07.4	125°47.7	51.3
9	152°00.8	299°00.0	·· 16.6	23°24.6	·· 53.8	8°32.8	·· 07.3	140°50.4	·· 51.3
10	167°03.3	314°03.0	16.5	38°25.6	53.5	23°34.8	07.2	155°53.0	51.2
11	182°05.8	329°06.0	16.4	53°26.6	53.2	38°36.9	07.1	170°55.7	51.1
12	197°08.2	344°09.0	S21°16.3	68°27.6	N19°52.9	53°38.9	N15°06.9	185°58.3	N01°51.0
13	212°10.7	359°12.0	16.2	83°28.6	52.6	68°41.0	06.8	201°01.0	51.0
14	227°13.2	14°15.0	16.1	98°29.5	52.3	83°43.0	06.7	216°03.6	50.9
15	242°15.6	29°18.0	·· 16.0	113°30.5	·· 52.0	98°45.1	·· 06.5	231°06.3	·· 50.8
16	257°18.1	44°21.1	15.9	128°31.5	51.7	113°47.1	06.4	246°08.9	50.7
17	272°20.5	59°24.1	15.8	143°32.5	51.4	128°49.2	06.3	261°11.5	50.7
18	287°23.0	74°27.1	S21°15.7	158°33.5	N19°51.1	143°51.2	N15°06.2	276°14.2	N01°50.6
19	302°25.5	89°30.2	15.6	173°34.5	50.8	158°53.3	06.0	291°16.8	50.5
20	317°27.9	104°33.2	15.4	188°35.5	50.4	173°55.3	05.9	306°19.5	50.4
21	332°30.4	119°36.2	·· 15.3	203°36.5	·· 50.1	188°57.4	·· 05.8	321°22.1	·· 50.4
22	347°32.9	134°39.3	15.2	218°37.5	49.8	203°59.5	05.7	336°24.8	50.3
23	2°35.3	149°42.3	15.1	233°38.5	49.5	219°01.5	05.5	351°27.4	50.2
Mer.pass. 22:50		ν 3.0′ d 0.1′	m -4.64	ν 1.0′	d 0.3′ m 1.06	ν 2.0′	d 0.1′ m -1.90	ν 2.6′	d 0.1′ m 0.34

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°37.8	164°45.4	S21°15.0	248°39.5	N19°49.2	234°03.6	N15°05.4	6°30.1	N01°50.1
1	32°40.3	179°48.4	14.8	263°40.5	48.9	249°05.6	05.3	21°32.7	50.0
2	47°42.7	194°51.5	14.7	278°41.5	48.6	264°07.7	05.1	36°35.3	50.0
3	62°45.2	209°54.5	·· 14.6	293°42.5	·· 48.3	279°09.7	·· 05.0	51°38.0	·· 49.9
4	77°47.6	224°57.6	14.4	308°43.5	48.0	294°11.8	04.9	66°40.6	49.8
5	92°50.1	240°00.7	14.3	323°44.5	47.6	309°13.8	04.8	81°43.3	49.7
6	107°52.6	255°03.7	S21°14.2	338°45.5	N19°47.3	324°15.9	N15°04.6	96°45.9	N01°49.7
7	122°55.0	270°06.8	14.0	353°46.5	47.0	339°17.9	04.5	111°48.6	49.6
8	137°57.5	285°09.9	13.9	8°47.5	46.7	354°20.0	04.4	126°51.2	49.5
9	153°00.0	300°13.0	·· 13.7	23°48.5	·· 46.4	9°22.0	·· 04.3	141°53.8	·· 49.4
10	168°02.4	315°16.1	13.6	38°49.5	46.1	24°24.1	04.1	156°56.5	49.4
11	183°04.9	330°19.2	13.4	53°50.5	45.8	39°26.1	04.0	171°59.1	49.3
12	198°07.4	345°22.3	S21°13.3	68°51.5	N19°45.5	54°28.2	N15°03.9	187°01.8	N01°49.2
13	213°09.8	0°25.4	13.1	83°52.5	45.2	69°30.2	03.8	202°04.4	49.1
14	228°12.3	15°28.5	13.0	98°53.5	44.8	84°32.3	03.6	217°07.1	49.1
15	243°14.8	30°31.6	·· 12.8	113°54.5	·· 44.5	99°34.4	·· 03.5	232°09.7	·· 49.0
16	258°17.2	45°34.7	12.6	128°55.5	44.2	114°36.4	03.4	247°12.4	48.9
17	273°19.7	60°37.8	12.5	143°56.5	43.9	129°38.5	03.2	262°15.0	48.8
18	288°22.1	75°40.9	S21°12.3	158°57.5	N19°43.6	144°40.5	N15°03.1	277°17.6	N01°48.8
19	303°24.6	90°44.0	12.1	173°58.5	43.3	159°42.6	03.0	292°20.3	48.7
20	318°27.1	105°47.1	12.0	188°59.5	43.0	174°44.6	02.9	307°22.9	48.6
21	333°29.5	120°50.3	·· 11.8	204°00.5	·· 42.7	189°46.7	·· 02.7	322°25.6	·· 48.5
22	348°32.0	135°53.4	11.6	219°01.5	42.3	204°48.7	02.6	337°28.2	48.5
23	3°34.5	150°56.5	11.4	234°02.5	42.0	219°50.8	02.5	352°30.9	48.4
Mer.pass. 22:46		ν 3.1′ d 0.1′	m -4.60	ν 1.0′	d 0.3′ m 1.06	ν 2.1′	d 0.1′ m -1.90	ν 2.6′	d 0.1′ m 0.35

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.8	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.2	23°35.5
Polaris	312°52.7	89°22.4
Acamar	315°10.3	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.8	49°57.3
Aldebaran	290°37.8	16°33.9
Rigel	281°02.3	-8°10.0
Capella	280°19.6	46°01.4
Bellatrix	278°21.2	6°22.5
Elnath	277°59.9	28°37.8
Alnilam	275°36.2	-1°10.9
Betelgeuse	270°50.4	7°24.8
Canopus	263°51.7	-52°42.2
Sirius	258°24.9	-16°44.9
Adhara	255°04.7	-29°00.2
Procyon	244°49.4	5°09.5
Pollux	243°15.6	27°57.6
Avior	234°14.4	-59°35.4
Suhail	222°45.5	-43°32.2
Miaplacidus	221°38.5	-69°49.3
Alphard	217°46.5	-8°46.3
Regulus	207°33.2	11°50.2
Dubhe	193°39.8	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.6	-57°15.7
Alioth	166°12.3	55°48.9
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.8
Hadar	148°34.6	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°20.9	74°02.8
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.5	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.3	12°32.6
Eltanin	90°41.7	51°29.4
Kaus Aust.	83°30.7	-34°22.4
Vega	80°32.3	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.3	-56°39.1
Deneb	49°24.6	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Oct 07 Wed	SHA	Mer.pass
Venus	146°43.7	13:08
Mars	232°12.5	07:28
Jupiter	216°45.7	08:29
Saturn	348°43.6	23:38

Oct 08 Thu	SHA	Mer.pass
Venus	146°54.5	13:03
Mars	231°37.0	07:26
Jupiter	216°35.7	08:26
Saturn	348°47.9	23:34

Oct 09 Fri	SHA	Mer.pass
Venus	147°07.6	12:58
Mars	231°01.7	07:25
Jupiter	216°25.8	08:23
Saturn	348°52.3	23:30

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°00.5	S05°25.4	225°07.1	11.7′	N12°06.5	14.8′	58.3′
1	198°00.7	26.4	239°37.8	11.8′	11°51.7	14.8′	58.2′
2	213°00.9	27.3	254°08.6	11.8′	11°36.9	14.9′	58.2′
3	228°01.0	·· 28.3	268°39.4	11.9′	11°22.0	15.0′	58.2′
4	243°01.2	29.2	283°10.3	12.0′	11°07.0	15.0′	58.2′
5	258°01.4	30.2	297°41.3	12.0′	10°52.0	15.0′	58.2′
6	273°01.6	S05°31.1	312°12.3	12.1′	N10°37.0	15.1′	58.2′
7	288°01.8	32.1	326°43.4	12.2′	10°21.9	15.2′	58.1′
8	303°01.9	33.1	341°14.6	12.2′	10°06.7	15.2′	58.1′
9	318°02.1	·· 34.0	355°45.9	12.3′	09°51.5	15.2′	58.1′
10	333°02.3	35.0	10°17.2	12.4′	09°36.3	15.2′	58.1′
11	348°02.5	35.9	24°48.5	12.4′	09°21.1	15.3′	58.1′
12	3°02.7	S05°36.9	39°20.0	12.5′	N09°05.8	15.3′	58.1′
13	18°02.8	37.8	53°51.5	12.5′	08°50.5	15.4′	58.0′
14	33°03.0	38.8	68°23.0	12.6′	08°35.1	15.4′	58.0′
15	48°03.2	·· 39.8	82°54.6	12.7′	08°19.7	15.4′	58.0′
16	63°03.4	40.7	97°26.3	12.7′	08°04.3	15.5′	58.0′
17	78°03.6	41.7	111°58.0	12.8′	07°48.8	15.5′	58.0′
18	93°03.7	S05°42.6	126°29.8	12.8′	N07°33.3	15.5′	58.0′
19	108°03.9	43.6	141°01.6	12.9′	07°17.8	15.5′	57.9′
20	123°04.1	44.5	155°33.5	12.9′	07°02.3	15.6′	57.9′
21	138°04.3	·· 45.5	170°05.4	13.0′	06°46.7	15.5′	57.9′
22	153°04.4	46.4	184°37.4	13.0′	06°31.2	15.6′	57.9′
23	168°04.6	47.4	199°09.4	13.1′	06°15.6	15.7′	57.9′
	SD = 16.0′	d = 1.0′	SD = 15.9′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°04.8	S05°48.3	213°41.5	13.1′	N05°59.9	15.6′	57.9′
1	198°05.0	49.3	228°13.6	13.2′	05°44.3	15.7′	57.8′
2	213°05.2	50.3	242°45.8	13.2′	05°28.6	15.7′	57.8′
3	228°05.3	·· 51.2	257°18.0	13.3′	05°12.9	15.6′	57.8′
4	243°05.5	52.2	271°50.2	13.3′	04°57.3	15.7′	57.8′
5	258°05.7	53.1	286°22.5	13.3′	04°41.6	15.8′	57.8′
6	273°05.9	S05°54.1	300°54.9	13.4′	N04°25.8	15.7′	57.7′
7	288°06.0	55.0	315°27.2	13.4′	04°10.1	15.7′	57.7′
8	303°06.2	56.0	329°59.6	13.4′	03°54.4	15.8′	57.7′
9	318°06.4	·· 56.9	344°32.1	13.5′	03°38.6	15.7′	57.7′
10	333°06.6	57.9	359°04.6	13.5′	03°22.9	15.8′	57.7′
11	348°06.7	58.8	13°37.1	13.5′	03°07.1	15.7′	57.6′
12	3°06.9	S05°59.8	28°09.6	13.6′	N02°51.4	15.8′	57.6′
13	18°07.1	06°00.7	42°42.2	13.6′	02°35.6	15.8′	57.6′
14	33°07.3	01.7	57°14.8	13.6′	02°19.8	15.7′	57.6′
15	48°07.4	·· 02.6	71°47.5	13.7′	02°04.1	15.8′	57.6′
16	63°07.6	03.6	86°20.1	13.7′	01°48.3	15.8′	57.5′
17	78°07.8	04.6	100°52.8	13.7′	01°32.5	15.7′	57.5′
18	93°07.9	S06°05.5	115°25.6	13.7′	N01°16.8	15.8′	57.5′
19	108°08.1	06.5	129°58.3	13.8′	01°01.0	15.7′	57.5′
20	123°08.3	07.4	144°31.1	13.8′	00°45.3	15.8′	57.5′
21	138°08.5	·· 08.4	159°03.9	13.8′	00°29.5	15.7′	57.4′
22	153°08.6	09.3	173°36.7	13.8′	N00°13.8	15.7′	57.4′
23	168°08.8	10.3	188°09.5	13.9′	S00°01.9	15.8′	57.4′
	SD = 16.0′	d = 1.0′	SD = 15.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°09.0	S06°11.2	202°42.4	13.9′	S00°17.7	15.7′	57.4′
1	198°09.2	12.2	217°15.3	13.9′	00°33.4	15.6′	57.4′
2	213°09.3	13.1	231°48.2	13.9′	00°49.0	15.7′	57.3′
3	228°09.5	·· 14.1	246°21.1	13.9′	01°04.7	15.7′	57.3′
4	243°09.7	15.0	260°54.0	13.9′	01°20.4	15.6′	57.3′
5	258°09.8	16.0	275°26.9	14.0′	01°36.0	15.6′	57.3′
6	273°10.0	S06°16.9	289°59.9	14.0′	S01°51.6	15.6′	57.3′
7	288°10.2	17.9	304°32.9	14.0′	02°07.2	15.6′	57.2′
8	303°10.3	18.8	319°05.8	14.0′	02°22.8	15.6′	57.2′
9	318°10.5	·· 19.8	333°38.8	14.0′	02°38.4	15.5′	57.2′
10	333°10.7	20.7	348°11.8	14.0′	02°53.9	15.5′	57.2′
11	348°10.9	21.7	2°44.8	14.0′	03°09.4	15.5′	57.1′
12	3°11.0	S06°22.6	17°17.8	14.0′	S03°24.9	15.5′	57.1′
13	18°11.2	23.6	31°50.8	14.0′	03°40.4	15.4′	57.1′
14	33°11.4	24.5	46°23.8	14.0′	03°55.8	15.4′	57.1′
15	48°11.5	·· 25.5	60°56.9	14.0′	04°11.2	15.4′	57.1′
16	63°11.7	26.4	75°29.9	14.0′	04°26.6	15.3′	57.0′
17	78°11.9	27.4	90°02.9	14.0′	04°41.9	15.3′	57.0′
18	93°12.0	S06°28.3	104°35.9	14.0′	S04°57.2	15.3′	57.0′
19	108°12.2	29.3	119°08.9	14.0′	05°12.5	15.3′	57.0′
20	123°12.4	30.2	133°42.0	14.0′	05°27.8	15.2′	56.9′
21	138°12.5	·· 31.2	148°15.0	14.0′	05°43.0	15.1′	56.9′
22	153°12.7	32.1	162°48.0	14.0′	05°58.1	15.2′	56.9′
23	168°12.9	33.0	177°21.0	14.0′	06°13.3	15.1′	56.9′
	SD = 16.0′	d = 1.0′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:23	05:43	06:51	16:42	17:50	19:09
N 70°	04:31	05:42	06:44	16:50	17:51	19:01
68°	04:37	05:42	06:38	16:56	17:51	18:56
66°	04:42	05:42	06:33	17:01	17:52	18:51
64°	04:46	05:41	06:29	17:05	17:52	18:47
62°	04:49	05:41	06:25	17:09	17:53	18:44
60°	04:52	05:40	06:22	17:12	17:53	18:41
N 58°	04:55	05:40	06:19	17:15	17:54	18:39
56°	04:57	05:40	06:17	17:17	17:54	18:37
54°	04:58	05:39	06:15	17:19	17:55	18:36
52°	05:00	05:39	06:13	17:22	17:55	18:34
50°	05:01	05:38	06:11	17:24	17:56	18:33
45°	05:03	05:37	06:07	17:28	17:57	18:31
N 40°	05:05	05:36	06:03	17:31	17:58	18:30
35°	05:05	05:35	06:00	17:34	18:00	18:29
30°	05:06	05:33	05:57	17:37	18:01	18:29
20°	05:05	05:31	05:53	17:42	18:04	18:30
N 10°	05:03	05:27	05:48	17:47	18:08	18:32
0°	04:59	05:23	05:44	17:51	18:12	18:36
S 10°	04:54	05:19	05:40	17:55	18:16	18:41
20°	04:47	05:13	05:35	18:00	18:22	18:48
30°	04:38	05:06	05:30	18:05	18:30	18:58
35°	04:31	05:01	05:27	18:09	18:34	19:05
40°	04:23	04:56	05:23	18:12	18:40	19:13
45°	04:14	04:49	05:19	18:17	18:47	19:22
S 50°	04:01	04:41	05:14	18:22	18:55	19:35
52°	03:55	04:37	05:12	18:24	18:59	19:41
54°	03:48	04:33	05:09	18:27	19:04	19:48
56°	03:41	04:28	05:06	18:30	19:09	19:56
58°	03:32	04:23	05:03	18:33	19:14	20:05
S 60°	03:21	04:16	05:00	18:37	19:21	20:16

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	00:19	02:46	05:00	17:10	16:34	16:01
N 70°	00:41	02:54	04:57	16:59	16:32	16:07
68°	00:58	03:00	04:55	16:50	16:31	16:12
66°	01:11	03:05	04:53	16:43	16:29	16:16
64°	01:22	03:10	04:52	16:36	16:28	16:20
62°	01:32	03:13	04:51	16:31	16:27	16:23
60°	01:40	03:17	04:50	16:26	16:26	16:26
N 58°	01:47	03:19	04:49	16:22	16:25	16:29
56°	01:53	03:22	04:48	16:18	16:25	16:31
54°	01:59	03:24	04:47	16:14	16:24	16:33
52°	02:04	03:26	04:47	16:11	16:23	16:35
50°	02:08	03:28	04:46	16:08	16:23	16:36
45°	02:18	03:32	04:45	16:02	16:21	16:40
N 40°	02:26	03:36	04:44	15:57	16:20	16:43
35°	02:32	03:38	04:43	15:52	16:19	16:46
30°	02:38	03:41	04:42	15:48	16:19	16:48
20°	02:49	03:45	04:40	15:41	16:17	16:52
N 10°	02:58	03:49	04:39	15:35	16:16	16:56
0°	03:06	03:53	04:38	15:29	16:15	16:59
S 10°	03:15	03:57	04:37	15:23	16:13	17:03
20°	03:23	04:00	04:36	15:16	16:12	17:06
30°	03:33	04:05	04:35	15:09	16:10	17:11
35°	03:39	04:07	04:34	15:04	16:09	17:13
40°	03:46	04:10	04:33	14:59	16:08	17:16
45°	03:53	04:13	04:32	14:54	16:07	17:19
S 50°	04:02	04:17	04:31	14:47	16:06	17:23
52°	04:07	04:19	04:31	14:43	16:05	17:24
54°	04:11	04:21	04:30	14:40	16:04	17:26
56°	04:16	04:23	04:29	14:36	16:03	17:29
58°	04:22	04:26	04:29	14:31	16:02	17:31
S 60°	04:28	04:28	04:28	14:26	16:01	17:34

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 26-28 15-3%
07	12:02	12:11	11:48	09:18	21:41	
08	12:19	12:28	11:48	10:04	22:26	
09	12:36	12:44	11:47	10:49	23:11	



October 10, 11, 12 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	18°36.9	165°59.7	S21°11.2	249°03.5	N19°41.7	234°52.9	N15°02.4	7°33.5	N01°48.3
1	33°39.4	181°02.8	11.1	264°04.5	41.4	249°54.9	02.2	22°36.2	48.2
2	48°41.9	196°06.0	10.9	279°05.5	41.1	264°57.0	02.1	37°38.8	48.2
3	63°44.3	211°09.1	·· 10.7	294°06.5	·· 40.8	279°59.0	·· 02.0	52°41.4	·· 48.1
4	78°46.8	226°12.3	10.5	309°07.5	40.5	295°01.1	01.9	67°44.1	48.0
5	93°49.2	241°15.4	10.3	324°08.5	40.2	310°03.1	01.7	82°46.7	47.9
6	108°51.7	256°18.6	S21°10.1	339°09.5	N19°39.8	325°05.2	N15°01.6	97°49.4	N01°47.8
7	123°54.2	271°21.8	09.9	354°10.6	39.5	340°07.3	01.5	112°52.0	47.8
8	138°56.6	286°24.9	09.7	9°11.6	39.2	355°09.3	01.4	127°54.7	47.7
9	153°59.1	301°28.1	·· 09.5	24°12.6	·· 38.9	10°11.4	·· 01.2	142°57.3	·· 47.6
10	169°01.6	316°31.3	09.3	39°13.6	38.6	25°13.4	01.1	157°59.9	47.5
11	184°04.0	331°34.4	09.1	54°14.6	38.3	40°15.5	01.0	173°02.6	47.5
12	199°06.5	346°37.6	S21°08.9	69°15.6	N19°38.0	55°17.6	N15°00.9	188°05.2	N01°47.4
13	214°09.0	1°40.8	08.6	84°16.6	37.6	70°19.6	00.7	203°07.9	47.3
14	229°11.4	16°44.0	08.4	99°17.6	37.3	85°21.7	00.6	218°10.5	47.2
15	244°13.9	31°47.2	·· 08.2	114°18.6	·· 37.0	100°23.7	·· 00.5	233°13.2	·· 47.2
16	259°16.4	46°50.4	08.0	129°19.6	36.7	115°25.8	00.4	248°15.8	47.1
17	274°18.8	61°53.6	07.8	144°20.6	36.4	130°27.8	00.2	263°18.5	47.0
18	289°21.3	76°56.8	S21°07.5	159°21.7	N19°36.1	145°29.9	N15°00.1	278°21.1	N01°46.9
19	304°23.7	92°00.0	07.3	174°22.7	35.7	160°32.0	15°00.0	293°23.7	46.9
20	319°26.2	107°03.2	07.1	189°23.7	35.4	175°34.0	14°59.9	308°26.4	46.8
21	334°28.7	122°06.4	·· 06.8	204°24.7	·· 35.1	190°36.1	·· 59.7	323°29.0	·· 46.7
22	349°31.1	137°09.6	06.6	219°25.7	34.8	205°38.1	59.6	338°31.7	46.6
23	4°33.6	152°12.9	06.4	234°26.7	34.5	220°40.2	59.5	353°34.3	46.6
Mer.pass.	22:42	ν 3.1′	d 0.2′	m -4.57	ν 1.0′	d 0.3′	m 1.05	ν 2.1′	d 0.1′ m -1.90	ν 2.6′	d 0.1′ m 0.36

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	19°36.1	167°16.1	S21°06.1	249°27.7	N19°34.2	235°42.3	N14°59.4	8°37.0	N01°46.5
1	34°38.5	182°19.3	05.9	264°28.7	33.9	250°44.3	59.2	23°39.6	46.4
2	49°41.0	197°22.5	05.6	279°29.8	33.5	265°46.4	59.1	38°42.2	46.3
3	64°43.5	212°25.8	·· 05.4	294°30.8	·· 33.2	280°48.5	·· 59.0	53°44.9	·· 46.3
4	79°45.9	227°29.0	05.1	309°31.8	32.9	295°50.5	58.9	68°47.5	46.2
5	94°48.4	242°32.3	04.9	324°32.8	32.6	310°52.6	58.7	83°50.2	46.1
6	109°50.9	257°35.5	S21°04.6	339°33.8	N19°32.3	325°54.6	N14°58.6	98°52.8	N01°46.0
7	124°53.3	272°38.8	04.4	354°34.8	32.0	340°56.7	58.5	113°55.5	46.0
8	139°55.8	287°42.0	04.1	9°35.8	31.6	355°58.8	58.4	128°58.1	45.9
9	154°58.2	302°45.3	·· 03.8	24°36.9	·· 31.3	11°00.8	·· 58.2	144°00.7	·· 45.8
10	170°00.7	317°48.5	03.6	39°37.9	31.0	26°02.9	58.1	159°03.4	45.7
11	185°03.2	332°51.8	03.3	54°38.9	30.7	41°04.9	58.0	174°06.0	45.7
12	200°05.6	347°55.1	S21°03.0	69°39.9	N19°30.4	56°07.0	N14°57.9	189°08.7	N01°45.6
13	215°08.1	2°58.3	02.8	84°40.9	30.1	71°09.1	57.7	204°11.3	45.5
14	230°10.6	18°01.6	02.5	99°41.9	29.7	86°11.1	57.6	219°14.0	45.4
15	245°13.0	33°04.9	·· 02.2	114°43.0	·· 29.4	101°13.2	·· 57.5	234°16.6	·· 45.4
16	260°15.5	48°08.2	01.9	129°44.0	29.1	116°15.3	57.4	249°19.2	45.3
17	275°18.0	63°11.4	01.6	144°45.0	28.8	131°17.3	57.2	264°21.9	45.2
18	290°20.4	78°14.7	S21°01.3	159°46.0	N19°28.5	146°19.4	N14°57.1	279°24.5	N01°45.1
19	305°22.9	93°18.0	01.1	174°47.0	28.1	161°21.5	57.0	294°27.2	45.1
20	320°25.3	108°21.3	00.8	189°48.1	27.8	176°23.5	56.9	309°29.8	45.0
21	335°27.8	123°24.6	·· 00.5	204°49.1	·· 27.5	191°25.6	·· 56.8	324°32.5	·· 44.9
22	350°30.3	138°27.9	21°00.2	219°50.1	27.2	206°27.7	56.6	339°35.1	44.8
23	5°32.7	153°31.2	20°59.9	234°51.1	26.9	221°29.7	56.5	354°37.7	44.8
Mer.pass.	22:38	ν 3.2′	d 0.2′	m -4.52	ν 1.0′	d 0.3′	m 1.04	ν 2.1′	d 0.1′ m -1.91	ν 2.6′	d 0.1′ m 0.36

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	20°35.2	168°34.5	S20°59.6	249°52.1	N19°26.6	236°31.8	N14°56.4	9°40.4	N01°44.7
1	35°37.7	183°37.8	59.3	264°53.2	26.2	251°33.8	56.3	24°43.0	44.6
2	50°40.1	198°41.1	59.0	279°54.2	25.9	266°35.9	56.1	39°45.7	44.5
3	65°42.6	213°44.5	·· 58.7	294°55.2	·· 25.6	281°38.0	·· 56.0	54°48.3	·· 44.5
4	80°45.1	228°47.8	58.3	309°56.2	25.3	296°40.0	55.9	69°51.0	44.4
5	95°47.5	243°51.1	58.0	324°57.2	25.0	311°42.1	55.8	84°53.6	44.3
6	110°50.0	258°54.4	S20°57.7	339°58.3	N19°24.6	326°44.2	N14°55.6	99°56.2	N01°44.2
7	125°52.5	273°57.8	57.4	354°59.3	24.3	341°46.2	55.5	114°58.9	44.2
8	140°54.9	289°01.1	57.1	10°00.3	24.0	356°48.3	55.4	130°01.5	44.1
9	155°57.4	304°04.4	·· 56.7	25°01.3	·· 23.7	11°50.4	·· 55.3	145°04.2	·· 44.0
10	170°59.8	319°07.8	56.4	40°02.4	23.4	26°52.4	55.1	160°06.8	43.9
11	186°02.3	334°11.1	56.1	55°03.4	23.0	41°54.5	55.0	175°09.5	43.9
12	201°04.8	349°14.5	S20°55.8	70°04.4	N19°22.7	56°56.6	N14°54.9	190°12.1	N01°43.8
13	216°07.2	4°17.8	55.4	85°05.4	22.4	71°58.6	54.8	205°14.7	43.7
14	231°09.7	19°21.2	55.1	100°06.5	22.1	87°00.7	54.7	220°17.4	43.7
15	246°12.2	34°24.5	·· 54.7	115°07.5	·· 21.8	102°02.8	·· 54.5	235°20.0	·· 43.6
16	261°14.6	49°27.9	54.4	130°08.5	21.5	117°04.8	54.4	250°22.7	43.5
17	276°17.1	64°31.2	54.1	145°09.5	21.1	132°06.9	54.3	265°25.3	43.4
18	291°19.6	79°34.6	S20°53.7	160°10.6	N19°20.8	147°09.0	N14°54.2	280°28.0	N01°43.4
19	306°22.0	94°38.0	53.4	175°11.6	20.5	162°11.1	54.0	295°30.6	43.3
20	321°24.5	109°41.4	53.0	190°12.6	20.2	177°13.1	53.9	310°33.2	43.2
21	336°27.0	124°44.7	·· 52.7	205°13.7	·· 19.8	192°15.2	·· 53.8	325°35.9	·· 43.1
22	351°29.4	139°48.1	52.3	220°14.7	19.5	207°17.3	53.7	340°38.5	43.1
23	6°31.9	154°51.5	51.9	235°15.7	19.2	222°19.3	53.6	355°41.2	43.0
Mer.pass.	22:34	ν 3.3′	d 0.3′	m -4.48	ν 1.0′	d 0.3′	m 1.03	ν 2.1′	d 0.1′ m -1.91	ν 2.6′	d 0.1′ m 0.37

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.8	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.2	23°35.5
Polaris	312°51.8	89°22.5
Acamar	315°10.3	-40°11.6
Menkar	314°04.4	4°11.8
Mirfak	308°25.8	49°57.3
Aldebaran	290°37.8	16°33.9
Rigel	281°02.3	-8°10.0
Capella	280°19.5	46°01.4
Bellatrix	278°21.2	6°22.5
Elnath	277°59.9	28°37.8
Alnilam	275°36.1	-1°10.9
Betelgeuse	270°50.4	7°24.8
Canopus	263°51.6	-52°42.2
Sirius	258°24.9	-16°44.9
Adhara	255°04.7	-29°00.2
Procyon	244°49.4	5°09.5
Pollux	243°15.6	27°57.6
Avior	234°14.3	-59°35.4
Suhail	222°45.5	-43°32.2
Miaplacidus	221°38.4	-69°49.3
Alphard	217°46.5	-8°46.3
Regulus	207°33.1	11°50.2
Dubhe	193°39.8	61°36.3
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.6	-57°15.7
Alioth	166°12.3	55°48.9
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.8
Hadar	148°34.6	-60°30.2
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°20.9	74°02.8
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.5	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.7	51°29.4
Kaus Aust.	83°30.7	-34°22.4
Vega	80°32.3	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.3	-56°39.1
Deneb	49°24.7	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.7
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Oct 10 Sat	SHA	Mer.pass
Venus	147°22.8	12:53
Mars	230°26.6	07:23
Jupiter	216°15.9	08:19
Saturn	348°56.6	23:26

Oct 11 Sun	SHA	Mer.pass
Venus	147°40.0	12:48
Mars	229°51.7	07:22
Jupiter	216°06.2	08:16
Saturn	349°00.9	23:21

Oct 12 Mon	SHA	Mer.pass
Venus	147°59.3	12:43
Mars	229°16.9	07:20
Jupiter	215°56.6	08:13
Saturn	349°05.2	23:17

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°13.1	S06°34.0	191°54.0	14.0′	S06°28.4	15.0′	56.9′
1	198°13.2	34.9	206°27.0	14.0′	06°43.4	15.0′	56.8′
2	213°13.4	35.9	221°00.0	14.0′	06°58.4	15.0′	56.8′
3	228°13.6	·· 36.8	235°33.0	14.0′	07°13.4	14.9′	56.8′
4	243°13.7	37.8	250°05.9	14.0′	07°28.3	14.9′	56.8′
5	258°13.9	38.7	264°38.9	13.9′	07°43.2	14.8′	56.7′
6	273°14.0	S06°39.7	279°11.8	13.9′	S07°58.0	14.8′	56.7′
7	288°14.2	40.6	293°44.8	13.9′	08°12.8	14.8′	56.7′
8	303°14.4	41.6	308°17.7	13.9′	08°27.6	14.7′	56.7′
9	318°14.5	·· 42.5	322°50.6	13.9′	08°42.3	14.6′	56.7′
10	333°14.7	43.5	337°23.5	13.9′	08°56.9	14.6′	56.6′
11	348°14.9	44.4	351°56.4	13.9′	09°11.5	14.5′	56.6′
12	3°15.0	S06°45.4	6°29.2	13.8′	S09°26.0	14.5′	56.6′
13	18°15.2	46.3	21°02.1	13.8′	09°40.5	14.5′	56.6′
14	33°15.4	47.2	35°34.9	13.8′	09°55.0	14.3′	56.5′
15	48°15.5	·· 48.2	50°07.7	13.8′	10°09.3	14.4′	56.5′
16	63°15.7	49.1	64°40.5	13.8′	10°23.7	14.2′	56.5′
17	78°15.9	50.1	79°13.2	13.7′	10°37.9	14.2′	56.5′
18	93°16.0	S06°51.0	93°46.0	13.7′	S10°52.1	14.2′	56.4′
19	108°16.2	52.0	108°18.7	13.7′	11°06.3	14.0′	56.4′
20	123°16.4	52.9	122°51.4	13.7′	11°20.3	14.1′	56.4′
21	138°16.5	·· 53.9	137°24.1	13.6′	11°34.4	13.9′	56.4′
22	153°16.7	54.8	151°56.7	13.6′	11°48.3	13.9′	56.4′
23	168°16.8	55.7	166°29.3	13.6′	12°02.2	13.8′	56.3′
	SD = 16.0′	d = 0.9′	SD = 15.5′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°17.0	S06°56.7	181°01.9	13.6′	S12°16.0	13.8′	56.3′
1	198°17.2	57.6	195°34.5	13.5′	12°29.8	13.7′	56.3′
2	213°17.3	58.6	210°07.0	13.5′	12°43.5	13.6′	56.3′
3	228°17.5	06°59.5	224°39.5	13.5′	12°57.1	13.6′	56.2′
4	243°17.7	07°00.5	239°12.0	13.4′	13°10.7	13.5′	56.2′
5	258°17.8	01.4	253°44.5	13.4′	13°24.2	13.4′	56.2′
6	273°18.0	S07°02.3	268°16.9	13.4′	S13°37.6	13.4′	56.2′
7	288°18.1	03.3	282°49.3	13.4′	13°51.0	13.2′	56.1′
8	303°18.3	04.2	297°21.6	13.3′	14°04.2	13.2′	56.1′
9	318°18.5	·· 05.2	311°53.9	13.3′	14°17.4	13.2′	56.1′
10	333°18.6	06.1	326°26.2	13.3′	14°30.6	13.0′	56.1′
11	348°18.8	07.1	340°58.5	13.2′	14°43.6	13.0′	56.1′
12	3°18.9	S07°08.0	355°30.7	13.2′	S14°56.6	12.9′	56.0′
13	18°19.1	08.9	10°02.9	13.1′	15°09.5	12.8′	56.0′
14	33°19.3	09.9	24°35.0	13.1′	15°22.3	12.7′	56.0′
15	48°19.4	·· 10.8	39°07.1	13.1′	15°35.0	12.7′	56.0′
16	63°19.6	11.8	53°39.2	13.0′	15°47.7	12.6′	55.9′
17	78°19.7	12.7	68°11.2	13.0′	16°00.3	12.5′	55.9′
18	93°19.9	S07°13.7	82°43.2	13.0′	S16°12.8	12.4′	55.9′
19	108°20.0	14.6	97°15.2	12.9′	16°25.2	12.3′	55.9′
20	123°20.2	15.5	111°47.1	12.9′	16°37.5	12.2′	55.8′
21	138°20.4	·· 16.5	126°19.0	12.8′	16°49.7	12.2′	55.8′
22	153°20.5	17.4	140°50.9	12.8′	17°01.9	12.1′	55.8′
23	168°20.7	18.4	155°22.7	12.8′	17°14.0	11.9′	55.8′
	SD = 16.0′	d = 0.9′	SD = 15.4′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°20.8	S07°19.3	169°54.4	12.7′	S17°25.9	11.9′	55.8′
1	198°21.0	20.2	184°26.1	12.7′	17°37.8	11.8′	55.7′
2	213°21.2	21.2	198°57.8	12.6′	17°49.6	11.7′	55.7′
3	228°21.3	·· 22.1	213°29.5	12.6′	18°01.3	11.7′	55.7′
4	243°21.5	23.0	228°01.1	12.6′	18°13.0	11.5′	55.7′
5	258°21.6	24.0	242°32.6	12.5′	18°24.5	11.4′	55.6′
6	273°21.8	S07°24.9	257°04.1	12.5′	S18°35.9	11.3′	55.6′
7	288°21.9	25.9	271°35.6	12.4′	18°47.2	11.3′	55.6′
8	303°22.1	26.8	286°07.0	12.4′	18°58.5	11.1′	55.6′
9	318°22.2	·· 27.7	300°38.4	12.3′	19°09.6	11.1′	55.6′
10	333°22.4	28.7	315°09.8	12.3′	19°20.7	10.9′	55.5′
11	348°22.6	29.6	329°41.1	12.3′	19°31.6	10.9′	55.5′
12	3°22.7	S07°30.6	344°12.3	12.2′	S19°42.5	10.7′	55.5′
13	18°22.9	31.5	358°43.5	12.2′	19°53.2	10.7′	55.5′
14	33°23.0	32.4	13°14.7	12.1′	20°03.9	10.5′	55.4′
15	48°23.2	·· 33.4	27°45.8	12.1′	20°14.4	10.5′	55.4′
16	63°23.3	34.3	42°16.9	12.0′	20°24.9	10.3′	55.4′
17	78°23.5	35.2	56°47.9	12.0′	20°35.2	10.3′	55.4′
18	93°23.6	S07°36.2	71°18.9	11.9′	S20°45.5	10.1′	55.4′
19	108°23.8	37.1	85°49.8	11.9′	20°55.6	10.0′	55.3′
20	123°23.9	38.1	100°20.7	11.9′	21°05.6	10.0′	55.3′
21	138°24.1	·· 39.0	114°51.6	11.8′	21°15.6	9.8′	55.3′
22	153°24.2	39.9	129°22.4	11.8′	21°25.4	9.7′	55.3′
23	168°24.4	40.9	143°53.2	11.7′	21°35.1	9.6′	55.3′
	SD = 16.0′	d = 0.9′	SD = 15.2′				

Lat.	**Twilight**		**Sunrise**	**Sunset**	**Twilight**	
	Naut.	Civil			Civil	Naut.
N 72°	04:37	05:56	07:05	16:27	17:35	18:53
N 70°	04:43	05:54	06:56	16:36	17:37	18:48
68°	04:48	05:52	06:49	16:43	17:39	18:43
66°	04:52	05:51	06:43	16:49	17:41	18:40
64°	04:55	05:50	06:38	16:54	17:42	18:37
62°	04:57	05:49	06:33	16:59	17:43	18:35
60°	04:59	05:48	06:29	17:03	17:45	18:33
N 58°	05:01	05:47	06:26	17:06	17:46	18:31
56°	05:03	05:46	06:23	17:10	17:47	18:30
54°	05:04	05:45	06:20	17:12	17:48	18:29
52°	05:05	05:44	06:18	17:15	17:49	18:28
50°	05:06	05:43	06:15	17:17	17:50	18:27
45°	05:07	05:41	06:10	17:22	17:52	18:26
N 40°	05:08	05:39	06:06	17:27	17:54	18:25
35°	05:08	05:37	06:03	17:30	17:56	18:25
30°	05:07	05:35	05:59	17:34	17:58	18:26
20°	05:06	05:31	05:54	17:40	18:02	18:27
N 10°	05:03	05:27	05:48	17:45	18:06	18:31
0°	04:58	05:23	05:43	17:50	18:11	18:35
S 10°	04:53	05:17	05:38	17:55	18:16	18:41
20°	04:45	05:11	05:33	18:01	18:23	18:49
30°	04:34	05:02	05:27	18:07	18:32	19:00
35°	04:27	04:57	05:23	18:11	18:37	19:07
40°	04:18	04:51	05:19	18:16	18:43	19:16
45°	04:08	04:44	05:14	18:21	18:51	19:27
S 50°	03:54	04:34	05:08	18:27	19:00	19:41
52°	03:48	04:30	05:05	18:30	19:05	19:48
54°	03:40	04:25	05:02	18:33	19:10	19:55
56°	03:32	04:20	04:59	18:36	19:15	20:04
58°	03:22	04:14	04:55	18:40	19:22	20:14
S 60°	03:10	04:07	04:51	18:44	19:29	20:26

Lat.	**Moonrise**			**Moonset**		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	07:13	09:46	▬	15:23	14:26	▬
N 70°	07:00	09:13	12:50	15:39	15:01	13:03
68°	06:49	08:49	11:10	15:52	15:27	14:43
66°	06:41	08:31	10:32	16:03	15:46	15:23
64°	06:33	08:17	10:05	16:12	16:02	15:50
62°	06:27	08:04	09:45	16:19	16:16	16:12
60°	06:22	07:54	09:28	16:26	16:27	16:29
N 58°	06:17	07:45	09:14	16:32	16:37	16:44
56°	06:13	07:37	09:03	16:37	16:46	16:56
54°	06:09	07:31	08:52	16:42	16:53	17:07
52°	06:06	07:24	08:43	16:47	17:00	17:17
50°	06:03	07:19	08:35	16:51	17:07	17:26
45°	05:56	07:07	08:17	16:59	17:20	17:45
N 40°	05:50	06:57	08:03	17:06	17:31	18:00
35°	05:46	06:49	07:51	17:13	17:41	18:13
30°	05:42	06:41	07:41	17:18	17:50	18:24
20°	05:34	06:29	07:23	17:28	18:04	18:44
N 10°	05:28	06:18	07:08	17:36	18:17	19:01
0°	05:23	06:08	06:54	17:44	18:30	19:17
S 10°	05:17	05:57	06:40	17:52	18:42	19:33
20°	05:11	05:47	06:25	18:00	18:55	19:50
30°	05:04	05:35	06:08	18:10	19:10	20:10
35°	05:00	05:28	05:58	18:16	19:19	20:22
40°	04:56	05:20	05:46	18:22	19:29	20:35
45°	04:51	05:11	05:33	18:30	19:41	20:51
S 50°	04:45	05:00	05:17	18:39	19:55	21:11
52°	04:42	04:55	05:10	18:43	20:02	21:20
54°	04:39	04:49	05:02	18:48	20:10	21:31
56°	04:36	04:43	04:52	18:53	20:18	21:43
58°	04:32	04:36	04:42	18:59	20:28	21:57
S 60°	04:28	04:29	04:30	19:06	20:39	22:13

Day	**Sun**			**Moon**		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-2%
10	12:52	13:00	11:47	11:33	23:56	
11	13:08	13:16	11:47	12:19	–:–	
12	13:23	13:31	11:46	13:05	00:42	

October 13, 14, 15 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	21°34.3	169°54.9	S20°51.6	250°16.7	N19°18.9	237°21.4	N14°53.4	10°43.8	N01°42.9
1	36°36.8	184°58.3	51.2	265°17.8	18.6	252°23.5	53.3	25°46.5	42.8
2	51°39.3	200°01.7	50.8	280°18.8	18.2	267°25.5	53.2	40°49.1	42.8
3	66°41.7	215°05.1	·· 50.5	295°19.8	·· 17.9	282°27.6	·· 53.1	55°51.7	·· 42.7
4	81°44.2	230°08.5	50.1	310°20.9	17.6	297°29.7	52.9	70°54.4	42.6
5	96°46.7	245°11.9	49.7	325°21.9	17.3	312°31.7	52.8	85°57.0	42.5
6	111°49.1	260°15.3	S20°49.4	340°22.9	N19°17.0	327°33.8	N14°52.7	100°59.7	N01°42.5
7	126°51.6	275°18.7	49.0	355°24.0	16.6	342°35.9	52.6	116°02.3	42.4
8	141°54.1	290°22.1	48.6	10°25.0	16.3	357°38.0	52.5	131°04.9	42.3
9	156°56.5	305°25.5	·· 48.2	25°26.0	·· 16.0	12°40.0	·· 52.3	146°07.6	·· 42.2
10	171°59.0	320°28.9	47.8	40°27.1	15.7	27°42.1	52.2	161°10.2	42.2
11	187°01.4	335°32.3	47.4	55°28.1	15.4	42°44.2	52.1	176°12.9	42.1
12	202°03.9	350°35.8	S20°47.0	70°29.1	N19°15.0	57°46.2	N14°52.0	191°15.5	N01°42.0
13	217°06.4	5°39.2	46.6	85°30.2	14.7	72°48.3	51.8	206°18.2	41.9
14	232°08.8	20°42.6	46.2	100°31.2	14.4	87°50.4	51.7	221°20.8	41.9
15	247°11.3	35°46.1	·· 45.8	115°32.2	·· 14.1	102°52.5	·· 51.6	236°23.4	·· 41.8
16	262°13.8	50°49.5	45.4	130°33.3	13.7	117°54.5	51.5	251°26.1	41.7
17	277°16.2	65°52.9	45.0	145°34.3	13.4	132°56.6	51.4	266°28.7	41.7
18	292°18.7	80°56.4	S20°44.6	160°35.3	N19°13.1	147°58.7	N14°51.2	281°31.4	N01°41.6
19	307°21.2	95°59.8	44.2	175°36.4	12.8	163°00.8	51.1	296°34.0	41.5
20	322°23.6	111°03.3	43.8	190°37.4	12.5	178°02.8	51.0	311°36.6	41.4
21	337°26.1	126°06.7	·· 43.4	205°38.4	·· 12.1	193°04.9	·· 50.9	326°39.3	·· 41.4
22	352°28.6	141°10.2	43.0	220°39.5	11.8	208°07.0	50.8	341°41.9	41.3
23	7°31.0	156°13.6	42.5	235°40.5	11.5	223°09.0	50.6	356°44.6	41.2
Mer.pass.	22:30	ν 3.4′	d 0.4′	m -4.43	ν 1.0′	d 0.3′	m 1.03	ν 2.1′	d 0.1′ m -1.92	ν 2.6′	d 0.1′ m 0.37

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	22°33.5	171°17.1	S20°42.1	250°41.6	N19°11.2	238°11.1	N14°50.5	11°47.2	N01°41.1
1	37°35.9	186°20.6	41.7	265°42.6	10.8	253°13.2	50.4	26°49.9	41.1
2	52°38.4	201°24.0	41.3	280°43.6	10.5	268°15.3	50.3	41°52.5	41.0
3	67°40.9	216°27.5	·· 40.8	295°44.7	·· 10.2	283°17.3	·· 50.1	56°55.1	·· 40.9
4	82°43.3	231°31.0	40.4	310°45.7	09.9	298°19.4	50.0	71°57.8	40.8
5	97°45.8	246°34.4	40.0	325°46.7	09.5	313°21.5	49.9	87°00.4	40.8
6	112°48.3	261°37.9	S20°39.5	340°47.8	N19°09.2	328°23.6	N14°49.8	102°03.1	N01°40.7
7	127°50.7	276°41.4	39.1	355°48.8	08.9	343°25.6	49.7	117°05.7	40.6
8	142°53.2	291°44.9	38.7	10°49.9	08.6	358°27.7	49.5	132°08.3	40.6
9	157°55.7	306°48.4	·· 38.2	25°50.9	·· 08.3	13°29.8	·· 49.4	147°11.0	·· 40.5
10	172°58.1	321°51.9	37.8	40°52.0	07.9	28°31.9	49.3	162°13.6	40.4
11	188°00.6	336°55.3	37.3	55°53.0	07.6	43°34.0	49.2	177°16.3	40.3
12	203°03.1	351°58.8	S20°36.9	70°54.0	N19°07.3	58°36.0	N14°49.1	192°18.9	N01°40.3
13	218°05.5	7°02.3	36.4	85°55.1	07.0	73°38.1	48.9	207°21.5	40.2
14	233°08.0	22°05.8	35.9	100°56.1	06.6	88°40.2	48.8	222°24.2	40.1
15	248°10.4	37°09.3	·· 35.5	115°57.2	·· 06.3	103°42.3	·· 48.7	237°26.8	·· 40.0
16	263°12.9	52°12.9	35.0	130°58.2	06.0	118°44.3	48.6	252°29.5	40.0
17	278°15.4	67°16.4	34.5	145°59.2	05.7	133°46.4	48.5	267°32.1	39.9
18	293°17.8	82°19.9	S20°34.1	161°00.3	N19°05.3	148°48.5	N14°48.3	282°34.7	N01°39.8
19	308°20.3	97°23.4	33.6	176°01.3	05.0	163°50.6	48.2	297°37.4	39.7
20	323°22.8	112°26.9	33.1	191°02.4	04.7	178°52.6	48.1	312°40.0	39.7
21	338°25.2	127°30.4	·· 32.7	206°03.4	·· 04.4	193°54.7	·· 48.0	327°42.7	·· 39.6
22	353°27.7	142°34.0	32.2	221°04.5	04.0	208°56.8	47.9	342°45.3	39.5
23	8°30.2	157°37.5	31.7	236°05.5	03.7	223°58.9	47.7	357°48.0	39.5
Mer.pass.	22:26	ν 3.5′	d 0.4′	m -4.37	ν 1.0′	d 0.3′	m 1.02	ν 2.1′	d 0.1′ m -1.92	ν 2.6′	d 0.1′ m 0.38

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	23°32.6	172°41.0	S20°31.2	251°06.6	N19°03.4	239°01.0	N14°47.6	12°50.6	N01°39.4
1	38°35.1	187°44.5	30.7	266°07.6	03.1	254°03.0	47.5	27°53.2	39.3
2	53°37.5	202°48.1	30.2	281°08.7	02.7	269°05.1	47.4	42°55.9	39.2
3	68°40.0	217°51.6	·· 29.7	296°09.7	·· 02.4	284°07.2	·· 47.3	57°58.5	·· 39.2
4	83°42.5	232°55.1	29.3	311°10.8	02.1	299°09.3	47.1	73°01.2	39.1
5	98°44.9	247°58.7	28.8	326°11.8	01.8	314°11.4	47.0	88°03.8	39.0
6	113°47.4	263°02.2	S20°28.3	341°12.8	N19°01.4	329°13.4	N14°46.9	103°06.4	N01°38.9
7	128°49.9	278°05.8	27.8	356°13.9	01.1	344°15.5	46.8	118°09.1	38.9
8	143°52.3	293°09.3	27.3	11°14.9	00.8	359°17.6	46.7	133°11.7	38.8
9	158°54.8	308°12.9	·· 26.7	26°16.0	·· 00.5	14°19.7	·· 46.5	148°14.4	·· 38.7
10	173°57.3	323°16.4	26.2	41°17.0	19°00.1	29°21.8	46.4	163°17.0	38.7
11	188°59.7	338°20.0	25.7	56°18.1	18°59.8	44°23.8	46.3	178°19.6	38.6
12	204°02.2	353°23.6	S20°25.2	71°19.1	N18°59.5	59°25.9	N14°46.2	193°22.3	N01°38.5
13	219°04.7	8°27.1	24.7	86°20.2	59.1	74°28.0	46.1	208°24.9	38.4
14	234°07.1	23°30.7	24.2	101°21.2	58.8	89°30.1	45.9	223°27.6	38.4
15	249°09.6	38°34.3	·· 23.7	116°22.3	·· 58.5	104°32.2	·· 45.8	238°30.2	·· 38.3
16	264°12.0	53°37.8	23.1	131°23.4	58.2	119°34.2	45.7	253°32.8	38.2
17	279°14.5	68°41.4	22.6	146°24.4	57.8	134°36.3	45.6	268°35.5	38.1
18	294°17.0	83°45.0	S20°22.1	161°25.5	N18°57.5	149°38.4	N14°45.5	283°38.1	N01°38.1
19	309°19.4	98°48.6	21.5	176°26.5	57.2	164°40.5	45.4	298°40.8	38.0
20	324°21.9	113°52.1	21.0	191°27.6	56.9	179°42.6	45.2	313°43.4	37.9
21	339°24.4	128°55.7	·· 20.5	206°28.6	·· 56.5	194°44.7	·· 45.1	328°46.0	·· 37.9
22	354°26.8	143°59.3	19.9	221°29.7	56.2	209°46.7	45.0	343°48.7	37.8
23	9°29.3	159°02.9	19.4	236°30.7	55.9	224°48.8	44.9	358°51.3	37.7
Mer.pass.	22:22	ν 3.5′	d 0.5′	m -4.31	ν 1.0′	d 0.3′	m 1.01	ν 2.1′	d 0.1′ m -1.92	ν 2.6′	d 0.1′ m 0.38

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.8	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.2	23°35.5
Polaris	312°50.6	89°22.5
Acamar	315°10.3	-40°11.6
Menkar	314°04.3	4°11.8
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.7	16°33.9
Rigel	281°02.3	-8°10.1
Capella	280°19.5	46°01.4
Bellatrix	278°21.2	6°22.5
Elnath	277°59.9	28°37.8
Alnilam	275°36.1	-1°10.9
Betelgeuse	270°50.4	7°24.8
Canopus	263°51.6	-52°42.2
Sirius	258°24.9	-16°45.0
Adhara	255°04.7	-29°00.2
Procyon	244°49.3	5°09.5
Pollux	243°15.6	27°57.6
Avior	234°14.3	-59°35.4
Suhail	222°45.4	-43°32.2
Miaplacidus	221°38.4	-69°49.3
Alphard	217°46.5	-8°46.3
Regulus	207°33.1	11°50.2
Dubhe	193°39.8	61°36.2
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.6	-57°15.7
Alioth	166°12.3	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.4	49°10.8
Hadar	148°34.6	-60°30.1
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°20.9	74°02.8
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.6	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.7	51°29.4
Kaus Aust.	83°30.7	-34°22.4
Vega	80°32.3	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.3	-56°39.1
Deneb	49°24.7	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.8
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Oct 13 Tue	SHA	Mer.pass
Venus	148°20.5	12:37
Mars	228°42.4	07:18
Jupiter	215°47.1	08:09
Saturn	349°09.5	23:13

Oct 14 Wed	SHA	Mer.pass
Venus	148°43.6	12:32
Mars	228°08.1	07:17
Jupiter	215°37.6	08:06
Saturn	349°13.7	23:09

Oct 15 Thu	SHA	Mer.pass
Venus	149°08.4	12:26
Mars	227°33.9	07:15
Jupiter	215°28.3	08:03
Saturn	349°18.0	23:05

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°24.5	S07°41.8	158°23.9	11.7′	S21°44.7	9.5′	55.2′
1	198°24.7	42.7	172°54.6	11.6′	21°54.2	9.4′	55.2′
2	213°24.9	43.7	187°25.2	11.6′	22°03.6	9.3′	55.2′
3	228°25.0	·· 44.6	201°55.8	11.5′	22°12.9	9.1′	55.2′
4	243°25.2	45.5	216°26.3	11.5′	22°22.0	9.1′	55.1′
5	258°25.3	46.5	230°56.8	11.5′	22°31.1	8.9′	55.1′
6	273°25.5	S07°47.4	245°27.3	11.4′	S22°40.0	8.8′	55.1′
7	288°25.6	48.3	259°57.7	11.4′	22°48.8	8.7′	55.1′
8	303°25.8	49.3	274°28.0	11.3′	22°57.5	8.6′	55.1′
9	318°25.9	·· 50.2	288°58.4	11.3′	23°06.1	8.5′	55.1′
10	333°26.1	51.1	303°28.6	11.2′	23°14.6	8.4′	55.0′
11	348°26.2	52.1	317°58.9	11.2′	23°23.0	8.2′	55.0′
12	3°26.4	S07°53.0	332°29.1	11.2′	S23°31.2	8.2′	55.0′
13	18°26.5	53.9	346°59.2	11.1′	23°39.4	8.0′	55.0′
14	33°26.7	54.9	1°29.3	11.1′	23°47.4	7.9′	55.0′
15	48°26.8	·· 55.8	15°59.4	11.0′	23°55.3	7.7′	54.9′
16	63°26.9	56.7	30°29.4	11.0′	24°03.0	7.7′	54.9′
17	78°27.1	57.7	44°59.4	10.9′	24°10.7	7.5′	54.9′
18	93°27.2	S07°58.6	59°29.4	10.9′	S24°18.2	7.4′	54.9′
19	108°27.4	07°59.5	73°59.3	10.9′	24°25.6	7.3′	54.9′
20	123°27.5	08°00.5	88°29.1	10.8′	24°32.9	7.2′	54.8′
21	138°27.7	·· 01.4	102°59.0	10.8′	24°40.1	7.0′	54.8′
22	153°27.8	02.3	117°28.8	10.8′	24°47.1	6.9′	54.8′
23	168°28.0	03.3	131°58.5	10.7′	24°54.0	6.8′	54.8′
	SD = 16.0′	d = 0.9′	SD = 15.1′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°28.1	S08°04.2	146°28.2	10.7′	S25°00.8	6.7′	54.8′
1	198°28.3	05.1	160°57.9	10.6′	25°07.5	6.6′	54.8′
2	213°28.4	06.0	175°27.6	10.6′	25°14.1	6.4′	54.7′
3	228°28.6	·· 07.0	189°57.2	10.6′	25°20.5	6.3′	54.7′
4	243°28.7	07.9	204°26.7	10.5′	25°26.8	6.1′	54.7′
5	258°28.9	08.8	218°56.3	10.5′	25°32.9	6.1′	54.7′
6	273°29.0	S08°09.8	233°25.8	10.5′	S25°39.0	5.9′	54.7′
7	288°29.1	10.7	247°55.2	10.4′	25°44.9	5.8′	54.7′
8	303°29.3	11.6	262°24.7	10.4′	25°50.7	5.6′	54.6′
9	318°29.4	·· 12.6	276°54.1	10.4′	25°56.3	5.5′	54.6′
10	333°29.6	13.5	291°23.5	10.3′	26°01.8	5.4′	54.6′
11	348°29.7	14.4	305°52.8	10.3′	26°07.2	5.3′	54.6′
12	3°29.9	S08°15.3	320°22.1	10.3′	S26°12.5	5.1′	54.6′
13	18°30.0	16.3	334°51.4	10.3′	26°17.6	5.0′	54.6′
14	33°30.2	17.2	349°20.7	10.2′	26°22.6	4.9′	54.6′
15	48°30.3	·· 18.1	3°49.9	10.2′	26°27.5	4.8′	54.5′
16	63°30.4	19.1	18°19.1	10.2′	26°32.3	4.6′	54.5′
17	78°30.6	20.0	32°48.3	10.2′	26°36.9	4.4′	54.5′
18	93°30.7	S08°20.9	47°17.5	10.1′	S26°41.3	4.4′	54.5′
19	108°30.9	21.8	61°46.6	10.1′	26°45.7	4.2′	54.5′
20	123°31.0	22.8	76°15.7	10.1′	26°49.9	4.1′	54.5′
21	138°31.2	·· 23.7	90°44.8	10.1′	26°54.0	3.9′	54.5′
22	153°31.3	24.6	105°13.9	10.1′	26°57.9	3.8′	54.4′
23	168°31.4	25.5	119°42.9	10.0′	27°01.7	3.7′	54.4′
	SD = 16.0′	d = 0.9′	SD = 14.9′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°31.6	S08°26.5	134°12.0	10.0′	S27°05.4	3.6′	54.4′
1	198°31.7	27.4	148°41.0	10.0′	27°09.0	3.4′	54.4′
2	213°31.9	28.3	163°10.0	10.0′	27°12.4	3.3′	54.4′
3	228°32.0	·· 29.2	177°39.0	10.0′	27°15.7	3.1′	54.4′
4	243°32.1	30.2	192°07.9	10.0′	27°18.8	3.0′	54.4′
5	258°32.3	31.1	206°36.9	9.9′	27°21.8	2.9′	54.4′
6	273°32.4	S08°32.0	221°05.8	9.9′	S27°24.7	2.7′	54.3′
7	288°32.6	32.9	235°34.8	9.9′	27°27.4	2.6′	54.3′
8	303°32.7	33.9	250°03.7	9.9′	27°30.0	2.5′	54.3′
9	318°32.8	·· 34.8	264°32.6	9.9′	27°32.5	2.3′	54.3′
10	333°33.0	35.7	279°01.5	9.9′	27°34.8	2.2′	54.3′
11	348°33.1	36.6	293°30.4	9.9′	27°37.0	2.1′	54.3′
12	3°33.3	S08°37.6	307°59.2	9.9′	S27°39.1	1.9′	54.3′
13	18°33.4	38.5	322°28.1	9.9′	27°41.0	1.8′	54.3′
14	33°33.5	39.4	336°57.0	9.9′	27°42.8	1.6′	54.3′
15	48°33.7	·· 40.3	351°25.9	9.9′	27°44.4	1.5′	54.3′
16	63°33.8	41.3	5°54.7	9.9′	27°45.9	1.4′	54.3′
17	78°33.9	42.2	20°23.6	9.9′	27°47.3	1.3′	54.2′
18	93°34.1	S08°43.1	34°52.5	9.9′	S27°48.6	1.1′	54.2′
19	108°34.2	44.0	49°21.3	9.9′	27°49.7	0.9′	54.2′
20	123°34.4	44.9	63°50.2	9.9′	27°50.6	0.9′	54.2′
21	138°34.5	·· 45.9	78°19.1	9.9′	27°51.5	0.7′	54.2′
22	153°34.6	46.8	92°47.9	9.9′	27°52.2	0.5′	54.2′
23	168°34.8	47.7	107°16.8	9.9′	27°52.7	0.4′	54.2′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	04:51	06:09	07:19	16:11	17:21	18:39
N 70°	04:55	06:06	07:09	16:22	17:24	18:35
68°	04:58	06:03	07:00	16:31	17:27	18:31
66°	05:01	06:00	06:53	16:38	17:30	18:29
64°	05:03	05:58	06:47	16:44	17:32	18:27
62°	05:05	05:56	06:41	16:49	17:34	18:25
60°	05:06	05:55	06:37	16:54	17:36	18:24
N 58°	05:08	05:53	06:33	16:58	17:38	18:23
56°	05:08	05:52	06:29	17:02	17:39	18:22
54°	05:09	05:50	06:26	17:05	17:41	18:22
52°	05:10	05:49	06:23	17:08	17:42	18:21
50°	05:10	05:48	06:20	17:11	17:44	18:21
45°	05:11	05:45	06:14	17:17	17:47	18:21
N 40°	05:11	05:42	06:09	17:22	17:49	18:21
35°	05:10	05:40	06:05	17:27	17:52	18:21
30°	05:09	05:37	06:01	17:30	17:54	18:22
20°	05:07	05:32	05:54	17:37	17:59	18:25
N 10°	05:03	05:27	05:48	17:43	18:05	18:29
0°	04:58	05:22	05:43	17:49	18:10	18:34
S 10°	04:51	05:16	05:37	17:55	18:17	18:41
20°	04:42	05:08	05:31	18:02	18:24	18:50
30°	04:30	04:59	05:23	18:09	18:34	19:02
35°	04:23	04:53	05:19	18:14	18:40	19:10
40°	04:13	04:46	05:14	18:19	18:47	19:20
45°	04:02	04:38	05:08	18:25	18:55	19:31
S 50°	03:47	04:28	05:01	18:32	19:05	19:47
52°	03:40	04:23	04:58	18:35	19:10	19:54
54°	03:32	04:18	04:55	18:38	19:16	20:02
56°	03:22	04:12	04:51	18:42	19:22	20:12
58°	03:11	04:05	04:47	18:47	19:29	20:23
S 60°	02:59	03:57	04:42	18:52	19:37	20:36

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	13:22	▬	▬	14:14	▬	▬
64°	12:05	▬	▬	15:31	▬	▬
62°	11:29	13:18	15:07	16:08	16:04	16:02
60°	11:04	12:36	13:56	16:34	16:46	17:13
N 58°	10:43	12:08	13:21	16:55	17:14	17:48
56°	10:27	11:46	12:55	17:12	17:36	18:14
54°	10:13	11:29	12:35	17:27	17:55	18:34
52°	10:00	11:13	12:18	17:40	18:10	18:51
50°	09:50	11:00	12:04	17:51	18:23	19:06
45°	09:27	10:33	11:34	18:14	18:51	19:36
N 40°	09:09	10:12	11:11	18:33	19:13	19:59
35°	08:54	09:55	10:52	18:49	19:31	20:18
30°	08:41	09:40	10:36	19:03	19:46	20:34
20°	08:19	09:14	10:08	19:26	20:12	21:02
N 10°	08:00	08:52	09:45	19:47	20:35	21:26
0°	07:42	08:32	09:23	20:06	20:56	21:48
S 10°	07:24	08:12	09:01	20:25	21:18	22:10
20°	07:06	07:50	08:38	20:46	21:41	22:34
30°	06:44	07:25	08:11	21:09	22:07	23:02
35°	06:32	07:10	07:55	21:24	22:23	23:18
40°	06:17	06:53	07:36	21:40	22:41	23:37
45°	06:00	06:33	07:14	21:59	23:03	·· ··
S 50°	05:39	06:08	06:45	22:24	23:31	·· ··
52°	05:29	05:55	06:31	22:36	23:45	·· ··
54°	05:18	05:41	06:15	22:49	·· ··	00:01
56°	05:06	05:25	05:56	23:05	·· ··	00:20
58°	04:51	05:06	05:32	23:24	·· ··	00:44
S 60°	04:34	04:42	05:01	23:48	·· ··	01:15

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 6-18%
13	13:38	13:45	11:46	13:54	01:29	
14	13:53	13:59	11:46	14:44	02:19	
15	14:06	14:13	11:46	15:36	03:10	

October 16, 17, 18 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	24°31.8	174°06.5	S20°18.9	251°31.8	N18°55.6	239°50.9	N14°44.8	13°53.9	N01°37.6
1	39°34.2	189°10.1	18.3	266°32.8	55.2	254°53.0	44.6	28°56.6	37.6
2	54°36.7	204°13.7	17.8	281°33.9	54.9	269°55.1	44.5	43°59.2	37.5
3	69°39.2	219°17.3	·· 17.2	296°34.9	·· 54.6	284°57.2	·· 44.4	59°01.9	·· 37.4
4	84°41.6	234°20.9	16.7	311°36.0	54.2	299°59.2	44.3	74°04.5	37.4
5	99°44.1	249°24.5	16.1	326°37.1	53.9	315°01.3	44.2	89°07.1	37.3
6	114°46.5	264°28.1	S20°15.5	341°38.1	N18°53.6	330°03.4	N14°44.1	104°09.8	N01°37.2
7	129°49.0	279°31.7	15.0	356°39.2	53.3	345°05.5	43.9	119°12.4	37.1
8	144°51.5	294°35.3	14.4	11°40.2	52.9	0°07.6	43.8	134°15.1	37.1
9	159°53.9	309°38.9	·· 13.9	26°41.3	·· 52.6	15°09.7	·· 43.7	149°17.7	·· 37.0
10	174°56.4	324°42.6	13.3	41°42.3	52.3	30°11.7	43.6	164°20.3	36.9
11	189°58.9	339°46.2	12.7	56°43.4	52.0	45°13.8	43.5	179°23.0	36.9
12	205°01.3	354°49.8	S20°12.1	71°44.5	N18°51.6	60°15.9	N14°43.3	194°25.6	N01°36.8
13	220°03.8	9°53.4	11.6	86°45.5	51.3	75°18.0	43.2	209°28.3	36.7
14	235°06.3	24°57.0	11.0	101°46.6	51.0	90°20.1	43.1	224°30.9	36.6
15	250°08.7	40°00.7	·· 10.4	116°47.6	·· 50.6	105°22.2	·· 43.0	239°33.5	·· 36.6
16	265°11.2	55°04.3	09.8	131°48.7	50.3	120°24.3	42.9	254°36.2	36.5
17	280°13.7	70°07.9	09.2	146°49.8	50.0	135°26.3	42.8	269°38.8	36.4
18	295°16.1	85°11.6	S20°08.6	161°50.8	N18°49.7	150°28.4	N14°42.6	284°41.4	N01°36.4
19	310°18.6	100°15.2	08.1	176°51.9	49.3	165°30.5	42.5	299°44.1	36.3
20	325°21.0	115°18.8	07.5	191°52.9	49.0	180°32.6	42.4	314°46.7	36.2
21	340°23.5	130°22.5	·· 06.9	206°54.0	·· 48.7	195°34.7	·· 42.3	329°49.4	·· 36.1
22	355°26.0	145°26.1	06.3	221°55.1	48.3	210°36.8	42.2	344°52.0	36.1
23	10°28.4	160°29.8	05.7	236°56.1	48.0	225°38.9	42.0	359°54.6	36.0
Mer.pass. 22:18		ν 3.6′	d 0.5′	ν 1.1′	d 0.3′	ν 2.1′	d 0.1′	ν 2.6′	d 0.1′
		m -4.25		m 1.00		m -1.93		m 0.39	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	25°30.9	175°33.4	S20°05.1	251°57.2	N18°47.7	240°41.0	N14°41.9	14°57.3	N01°35.9
1	40°33.4	190°37.1	04.5	266°58.3	47.4	255°43.0	41.8	29°59.9	35.8
2	55°35.8	205°40.7	03.9	281°59.3	47.0	270°45.1	41.7	45°02.6	35.8
3	70°38.3	220°44.4	·· 03.2	297°00.4	·· 46.7	285°47.2	·· 41.6	60°05.2	·· 35.7
4	85°40.8	235°48.0	02.6	312°01.5	46.4	300°49.3	41.5	75°07.8	35.6
5	100°43.2	250°51.7	02.0	327°02.5	46.0	315°51.4	41.3	90°10.5	35.6
6	115°45.7	265°55.3	S20°01.4	342°03.6	N18°45.7	330°53.5	N14°41.2	105°13.1	N01°35.5
7	130°48.1	280°59.0	00.8	357°04.6	45.4	345°55.6	41.1	120°15.7	35.4
8	145°50.6	296°02.7	20°00.2	12°05.7	45.0	0°57.7	41.0	135°18.4	35.4
9	160°53.1	311°06.3	19°59.5	27°06.8	·· 44.7	15°59.8	·· 40.9	150°21.0	·· 35.3
10	175°55.5	326°10.0	58.9	42°07.8	44.4	31°01.8	40.8	165°23.7	35.2
11	190°58.0	341°13.7	58.3	57°08.9	44.1	46°03.9	40.6	180°26.3	35.1
12	206°00.5	356°17.3	S19°57.7	72°10.0	N18°43.7	61°06.0	N14°40.5	195°28.9	N01°35.1
13	221°02.9	11°21.0	57.0	87°11.0	43.4	76°08.1	40.4	210°31.6	35.0
14	236°05.4	26°24.7	56.4	102°12.1	43.1	91°10.2	40.3	225°34.2	34.9
15	251°07.9	41°28.4	·· 55.7	117°13.2	·· 42.7	106°12.3	·· 40.2	240°36.8	·· 34.9
16	266°10.3	56°32.1	55.1	132°14.3	42.4	121°14.4	40.1	255°39.5	34.8
17	281°12.8	71°35.7	54.5	147°15.3	42.1	136°16.5	39.9	270°42.1	34.7
18	296°15.3	86°39.4	S19°53.8	162°16.4	N18°41.7	151°18.6	N14°39.8	285°44.8	N01°34.6
19	311°17.7	101°43.1	53.2	177°17.5	41.4	166°20.7	39.7	300°47.4	34.6
20	326°20.2	116°46.8	52.5	192°18.5	41.1	181°22.8	39.6	315°50.0	34.5
21	341°22.6	131°50.5	·· 51.9	207°19.6	·· 40.8	196°24.9	·· 39.5	330°52.7	·· 34.4
22	356°25.1	146°54.2	51.2	222°20.7	40.4	211°26.9	39.4	345°55.3	34.4
23	11°27.6	161°57.9	50.6	237°21.7	40.1	226°29.0	39.3	0°57.9	34.3
Mer.pass. 22:14		ν 3.6′	d 0.6′	ν 1.1′	d 0.3′	ν 2.1′	d 0.1′	ν 2.6′	d 0.1′
		m -4.18		m 1.00		m -1.93		m 0.39	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	26°30.0	177°01.6	S19°49.9	252°22.8	N18°39.8	241°31.1	N14°39.1	16°00.6	N01°34.2
1	41°32.5	192°05.3	49.2	267°23.9	39.4	256°33.2	39.0	31°03.2	34.1
2	56°35.0	207°09.0	48.6	282°25.0	39.1	271°35.3	38.9	46°05.9	34.1
3	71°37.4	222°12.7	·· 47.9	297°26.0	·· 38.8	286°37.4	·· 38.8	61°08.5	·· 34.0
4	86°39.9	237°16.4	47.2	312°27.1	38.4	301°39.5	38.7	76°11.1	33.9
5	101°42.4	252°20.1	46.6	327°28.2	38.1	316°41.6	38.6	91°13.8	33.9
6	116°44.8	267°23.8	S19°45.9	342°29.3	N18°37.8	331°43.7	N14°38.4	106°16.4	N01°33.8
7	131°47.3	282°27.5	45.2	357°30.3	37.4	346°45.8	38.3	121°19.0	33.7
8	146°49.8	297°31.2	44.5	12°31.4	37.1	1°47.9	38.2	136°21.7	33.7
9	161°52.2	312°34.9	·· 43.8	27°32.5	·· 36.8	16°50.0	·· 38.1	151°24.3	·· 33.6
10	176°54.7	327°38.6	43.2	42°33.6	36.4	31°52.1	38.0	166°26.9	33.5
11	191°57.1	342°42.3	42.5	57°34.6	36.1	46°54.2	37.9	181°29.6	33.4
12	206°59.6	357°46.1	S19°41.8	72°35.7	N18°35.8	61°56.3	N14°37.8	196°32.2	N01°33.4
13	222°02.1	12°49.8	41.1	87°36.8	35.5	76°58.4	37.6	211°34.9	33.3
14	237°04.5	27°53.5	40.4	102°37.9	35.1	92°00.4	37.5	226°37.5	33.2
15	252°07.0	42°57.2	·· 39.7	117°38.9	·· 34.8	107°02.5	·· 37.4	241°40.1	·· 33.2
16	267°09.5	58°00.9	39.0	132°40.0	34.5	122°04.6	37.3	256°42.8	33.1
17	282°11.9	73°04.7	38.3	147°41.1	34.1	137°06.7	37.2	271°45.4	33.0
18	297°14.4	88°08.4	S19°37.6	162°42.2	N18°33.8	152°08.8	N14°37.1	286°48.0	N01°32.9
19	312°16.9	103°12.1	36.9	177°43.2	33.5	167°10.9	36.9	301°50.7	32.9
20	327°19.3	118°15.9	36.2	192°44.3	33.1	182°13.0	36.8	316°53.3	32.8
21	342°21.8	133°19.6	·· 35.5	207°45.4	·· 32.8	197°15.1	·· 36.7	331°55.9	·· 32.7
22	357°24.3	148°23.3	34.8	222°46.5	32.5	212°17.2	36.6	346°58.6	32.7
23	12°26.7	163°27.0	34.1	237°47.6	32.1	227°19.3	36.5	2°01.2	32.6
Mer.pass. 22:10		ν 3.7′	d 0.7′	ν 1.1′	d 0.3′	ν 2.1′	d 0.1′	ν 2.6′	d 0.1′
		m -4.11		m 0.99		m -1.94		m 0.40	

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.5
Schedar	349°28.8	56°41.2
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.2	23°35.5
Polaris	312°49.6	89°22.5
Acamar	315°10.3	-40°11.6
Menkar	314°04.3	4°11.8
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.7	16°33.9
Rigel	281°02.3	-8°10.1
Capella	280°19.5	46°01.4
Bellatrix	278°21.1	6°22.5
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°10.9
Betelgeuse	270°50.4	7°24.8
Canopus	263°51.6	-52°42.2
Sirius	258°24.9	-16°45.0
Adhara	255°04.7	-29°00.2
Procyon	244°49.3	5°09.4
Pollux	243°15.5	27°57.6
Avior	234°14.3	-59°35.4
Suhail	222°45.4	-43°32.2
Miaplacidus	221°38.3	-69°49.3
Alphard	217°46.5	-8°46.4
Regulus	207°33.1	11°50.2
Dubhe	193°39.8	61°36.2
Denebola	182°23.8	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°59.2	-63°14.8
Gacrux	171°50.6	-57°15.7
Alioth	166°12.3	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.4	49°10.8
Hadar	148°34.6	-60°30.1
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.7
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°20.9	74°02.7
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.6	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.7	51°29.4
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.4	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.3	-56°39.1
Deneb	49°24.7	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.6	-29°28.8
Scheat	13°43.5	28°13.9
Markab	13°28.2	15°21.2

Oct 16 Fri	SHA	Mer.pass
Venus	149°34.7	12:21
Mars	227°00.0	07:13
Jupiter	215°19.1	07:59
Saturn	349°22.2	23:00

Oct 17 Sat	SHA	Mer.pass
Venus	150°02.5	12:15
Mars	226°26.3	07:12
Jupiter	215°10.1	07:56
Saturn	349°26.4	22:56

Oct 18 Sun	SHA	Mer.pass
Venus	150°31.5	12:09
Mars	225°52.8	07:10
Jupiter	215°01.1	07:53
Saturn	349°30.5	22:52

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	183°34.9	S08°48.6	121°45.7	9.9′	S27°53.1	0.3′	54.2′
1	198°35.0	49.5	136°14.6	9.9′	27°53.4	0.2′	54.2′
2	213°35.2	50.5	150°43.5	9.9′	27°53.6	0.0′	54.2′
3	228°35.3	·· 51.4	165°12.4	9.9′	27°53.6	0.1′	54.2′
4	243°35.4	52.3	179°41.3	9.9′	27°53.5	0.3′	54.2′
5	258°35.6	53.2	194°10.2	9.9′	27°53.2	0.4′	54.2′
6	273°35.7	S08°54.1	208°39.2	10.0′	S27°52.8	0.5′	54.2′
7	288°35.8	55.1	223°08.1	10.0′	27°52.3	0.6′	54.2′
8	303°36.0	56.0	237°37.1	10.0′	27°51.7	0.8′	54.1′
9	318°36.1	·· 56.9	252°06.0	10.0′	27°50.9	1.0′	54.1′
10	333°36.2	57.8	266°35.0	10.0′	27°49.9	1.0′	54.1′
11	348°36.4	58.7	281°04.1	10.0′	27°48.9	1.2′	54.1′
12	3°36.5	S08°59.7	295°33.1	10.1′	S27°47.7	1.3′	54.1′
13	18°36.6	09°00.6	310°02.1	10.1′	27°46.4	1.5′	54.1′
14	33°36.8	01.5	324°31.2	10.1′	27°44.9	1.6′	54.1′
15	48°36.9	·· 02.4	339°00.3	10.1′	27°43.3	1.7′	54.1′
16	63°37.0	03.3	353°29.4	10.1′	27°41.6	1.9′	54.1′
17	78°37.2	04.2	7°58.5	10.2′	27°39.7	2.0′	54.1′
18	93°37.3	S09°05.2	22°27.7	10.2′	S27°37.7	2.1′	54.1′
19	108°37.4	06.1	36°56.9	10.2′	27°35.6	2.3′	54.1′
20	123°37.5	07.0	51°26.1	10.2′	27°33.3	2.4′	54.1′
21	138°37.7	·· 07.9	65°55.3	10.3′	27°30.9	2.5′	54.1′
22	153°37.8	08.8	80°24.6	10.3′	27°28.4	2.7′	54.1′
23	168°37.9	09.7	94°53.9	10.3′	27°25.7	2.8′	54.1′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°38.1	S09°10.7	109°23.2	10.4′	S27°22.9	2.9′	54.1′
1	198°38.2	11.6	123°52.6	10.4′	27°20.0	3.0′	54.1′
2	213°38.3	12.5	138°21.9	10.4′	27°17.0	3.2′	54.1′
3	228°38.5	·· 13.4	152°51.4	10.4′	27°13.8	3.3′	54.1′
4	243°38.6	14.3	167°20.8	10.5′	27°10.5	3.4′	54.1′
5	258°38.7	15.2	181°50.3	10.5′	27°07.1	3.6′	54.1′
6	273°38.8	S09°16.2	196°19.8	10.5′	S27°03.5	3.7′	54.1′
7	288°39.0	17.1	210°49.3	10.6′	26°59.8	3.8′	54.1′
8	303°39.1	18.0	225°18.9	10.6′	26°56.0	3.9′	54.1′
9	318°39.2	·· 18.9	239°48.5	10.7′	26°52.1	4.1′	54.1′
10	333°39.3	19.8	254°18.2	10.7′	26°48.0	4.2′	54.1′
11	348°39.5	20.7	268°47.9	10.7′	26°43.8	4.3′	54.1′
12	3°39.6	S09°21.6	283°17.6	10.8′	S26°39.5	4.5′	54.1′
13	18°39.7	22.5	297°47.4	10.8′	26°35.0	4.6′	54.1′
14	33°39.9	23.5	312°17.2	10.8′	26°30.4	4.7′	54.2′
15	48°40.0	·· 24.4	326°47.0	10.9′	26°25.7	4.8′	54.2′
16	63°40.1	25.3	341°16.9	10.9′	26°20.9	4.9′	54.2′
17	78°40.2	26.2	355°46.9	11.0′	26°16.0	5.1′	54.2′
18	93°40.4	S09°27.1	10°16.8	11.0′	S26°10.9	5.2′	54.2′
19	108°40.5	28.0	24°46.8	11.1′	26°05.7	5.3′	54.2′
20	123°40.6	28.9	39°16.9	11.1′	26°00.4	5.4′	54.2′
21	138°40.7	·· 29.8	53°47.0	11.1′	25°55.0	5.6′	54.2′
22	153°40.9	30.7	68°17.1	11.2′	25°49.4	5.7′	54.2′
23	168°41.0	31.7	82°47.3	11.2′	25°43.7	5.8′	54.2′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°41.1	S09°32.6	97°17.5	11.3′	S25°37.9	5.9′	54.2′
1	198°41.2	33.5	111°47.8	11.3′	25°32.0	6.0′	54.2′
2	213°41.3	34.4	126°18.1	11.4′	25°26.0	6.2′	54.2′
3	228°41.5	·· 35.3	140°48.5	11.4′	25°19.8	6.2′	54.2′
4	243°41.6	36.2	155°18.9	11.5′	25°13.6	6.4′	54.2′
5	258°41.7	37.1	169°49.3	11.5′	25°07.2	6.5′	54.3′
6	273°41.8	S09°38.0	184°19.8	11.5′	S25°00.7	6.7′	54.3′
7	288°42.0	38.9	198°50.4	11.6′	24°54.0	6.7′	54.3′
8	303°42.1	39.8	213°21.0	11.6′	24°47.3	6.8′	54.3′
9	318°42.2	·· 40.7	227°51.6	11.7′	24°40.5	7.0′	54.3′
10	333°42.3	41.6	242°22.3	11.7′	24°33.5	7.1′	54.3′
11	348°42.4	42.6	256°53.0	11.8′	24°26.4	7.2′	54.3′
12	3°42.6	S09°43.5	271°23.8	11.8′	S24°19.2	7.3′	54.3′
13	18°42.7	44.4	285°54.7	11.9′	24°11.9	7.4′	54.3′
14	33°42.8	45.3	300°25.5	11.9′	24°04.5	7.5′	54.3′
15	48°42.9	·· 46.2	314°56.5	12.0′	23°57.0	7.7′	54.4′
16	63°43.0	47.1	329°27.4	12.0′	23°49.3	7.7′	54.4′
17	78°43.2	48.0	343°58.5	12.1′	23°41.6	7.9′	54.4′
18	93°43.3	S09°48.9	358°29.5	12.1′	S23°33.7	7.9′	54.4′
19	108°43.4	49.8	13°00.6	12.2′	23°25.8	8.1′	54.4′
20	123°43.5	50.7	27°31.8	12.2′	23°17.7	8.2′	54.4′
21	138°43.6	·· 51.6	42°03.0	12.3′	23°09.5	8.3′	54.4′
22	153°43.7	52.5	56°34.3	12.3′	23°01.2	8.3′	54.4′
23	168°43.9	53.4	71°05.6	12.4′	22°52.9	8.5′	54.5′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:04	06:22	07:34	15:55	17:06	18:24
N 70°	05:07	06:17	07:21	16:08	17:11	18:22
68°	05:09	06:13	07:11	16:18	17:16	18:20
66°	05:11	06:10	07:03	16:27	17:19	18:18
64°	05:12	06:07	06:56	16:34	17:23	18:17
62°	05:13	06:04	06:50	16:40	17:25	18:16
60°	05:13	06:02	06:44	16:45	17:28	18:16
N 58°	05:14	05:59	06:39	16:50	17:30	18:15
56°	05:14	05:57	06:35	16:54	17:32	18:15
54°	05:15	05:56	06:32	16:58	17:34	18:15
52°	05:15	05:54	06:28	17:02	17:36	18:15
50°	05:15	05:52	06:25	17:05	17:38	18:15
45°	05:14	05:48	06:18	17:12	17:42	18:16
N 40°	05:14	05:45	06:12	17:18	17:45	18:16
35°	05:13	05:42	06:08	17:23	17:48	18:18
30°	05:11	05:39	06:03	17:27	17:51	18:19
20°	05:07	05:33	05:55	17:35	17:57	18:23
N 10°	05:03	05:27	05:49	17:42	18:03	18:28
0°	04:57	05:21	05:42	17:49	18:10	18:34
S 10°	04:49	05:14	05:35	17:55	18:17	18:42
20°	04:40	05:06	05:28	18:03	18:25	18:52
30°	04:27	04:55	05:20	18:11	18:36	19:05
35°	04:18	04:49	05:15	18:16	18:42	19:13
40°	04:08	04:42	05:10	18:22	18:50	19:23
45°	03:56	04:33	05:03	18:29	18:59	19:36
S 50°	03:40	04:21	04:55	18:36	19:11	19:52
52°	03:32	04:16	04:52	18:40	19:16	20:00
54°	03:23	04:10	04:48	18:44	19:22	20:09
56°	03:13	04:03	04:43	18:49	19:29	20:20
58°	03:01	03:56	04:38	18:54	19:37	20:32
S 60°	02:47	03:47	04:33	19:00	19:46	20:47

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	17:28	▬	▬	18:56
64°	▬	▬	16:23	▬	▬	20:00
62°	15:55	15:52	15:48	17:01	18:50	20:34
60°	14:48	15:12	15:23	18:08	19:29	20:59
N 58°	14:13	14:45	15:03	18:43	19:56	21:19
56°	13:48	14:23	14:46	19:08	20:17	21:35
54°	13:28	14:05	14:31	19:28	20:35	21:49
52°	13:11	13:50	14:19	19:45	20:50	22:01
50°	12:56	13:37	14:08	20:00	21:03	22:12
45°	12:27	13:10	13:45	20:29	21:29	22:34
N 40°	12:04	12:48	13:26	20:52	21:50	22:52
35°	11:44	12:31	13:11	21:11	22:07	23:07
30°	11:28	12:15	12:57	21:27	22:22	23:19
20°	11:00	11:49	12:34	21:54	22:48	23:41
N 10°	10:37	11:26	12:14	22:18	23:09	·· ··
0°	10:15	11:05	11:55	22:39	23:29	·· ··
S 10°	09:52	10:44	11:36	23:01	23:49	·· ··
20°	09:29	10:22	11:15	23:24	·· ··	00:11
30°	09:01	09:55	10:52	23:51	·· ··	00:36
35°	08:45	09:40	10:38	·· ··	00:07	00:50
40°	08:26	09:22	10:22	·· ··	00:26	01:07
45°	08:03	09:00	10:02	00:00	00:48	01:27
S 50°	07:33	08:32	09:38	00:30	01:16	01:52
52°	07:19	08:18	09:27	00:44	01:30	02:04
54°	07:02	08:02	09:13	01:01	01:46	02:18
56°	06:41	07:44	08:58	01:21	02:05	02:34
58°	06:16	07:21	08:39	01:47	02:28	02:53
S 60°	05:41	06:50	08:16	02:22	02:59	03:16

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 6-8 26-44%
16	14:20	14:26	11:46	16:27	04:01	
17	14:32	14:38	11:45	17:17	04:52	
18	14:44	14:50	11:45	18:06	05:42	

October 19, 20, 21 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	27°29.2	178°30.8	S19°33.4	252°48.6	N18°31.8	242°21.4	N14°36.4	17°03.9	N01°32.5
1	42°31.6	193°34.5	32.6	267°49.7	31.5	257°23.5	36.3	32°06.5	32.5
2	57°34.1	208°38.3	31.9	282°50.8	31.1	272°25.6	36.1	47°09.1	32.4
3	72°36.6	223°42.0	·· 31.2	297°51.9	·· 30.8	287°27.7	·· 36.0	62°11.8	·· 32.3
4	87°39.0	238°45.7	30.5	312°53.0	30.5	302°29.8	35.9	77°14.4	32.2
5	102°41.5	253°49.5	29.8	327°54.1	30.1	317°31.9	35.8	92°17.0	32.2
6	117°44.0	268°53.2	S19°29.0	342°55.1	N18°29.8	332°34.0	N14°35.7	107°19.7	N01°32.1
7	132°46.4	283°57.0	28.3	357°56.2	29.5	347°36.1	35.6	122°22.3	32.0
8	147°48.9	299°00.7	27.6	12°57.3	29.1	2°38.2	35.5	137°24.9	32.0
9	162°51.4	314°04.5	·· 26.8	27°58.4	·· 28.8	17°40.3	·· 35.3	152°27.6	·· 31.9
10	177°53.8	329°08.2	26.1	42°59.5	28.5	32°42.4	35.2	167°30.2	31.8
11	192°56.3	344°12.0	25.4	58°00.6	28.1	47°44.5	35.1	182°32.8	31.8
12	207°58.7	359°15.7	S19°24.6	73°01.6	N18°27.8	62°46.6	N14°35.0	197°35.5	N01°31.7
13	223°01.2	14°19.5	23.9	88°02.7	27.5	77°48.7	34.9	212°38.1	31.6
14	238°03.7	29°23.2	23.1	103°03.8	27.1	92°50.8	34.8	227°40.8	31.6
15	253°06.1	44°27.0	·· 22.4	118°04.9	·· 26.8	107°52.9	·· 34.7	242°43.4	·· 31.5
16	268°08.6	59°30.7	21.6	133°06.0	26.5	122°55.0	34.6	257°46.0	31.4
17	283°11.1	74°34.5	20.9	148°07.1	26.1	137°57.1	34.4	272°48.7	31.3
18	298°13.5	89°38.3	S19°20.1	163°08.2	N18°25.8	152°59.2	N14°34.3	287°51.3	N01°31.3
19	313°16.0	104°42.0	19.4	178°09.2	25.5	168°01.3	34.2	302°53.9	31.2
20	328°18.5	119°45.8	18.6	193°10.3	25.1	183°03.4	34.1	317°56.6	31.1
21	343°20.9	134°49.6	·· 17.9	208°11.4	·· 24.8	198°05.5	·· 34.0	332°59.2	·· 31.1
22	358°23.4	149°53.3	17.1	223°12.5	24.5	213°07.6	33.9	348°01.8	31.0
23	13°25.9	164°57.1	16.3	238°13.6	24.1	228°09.7	33.8	3°04.5	30.9
Mer.pass. 22:06		ν 3.7′	d 0.7′	m -4.14	ν 1.1′	d 0.3′	m 0.98	ν 2.1′	d 0.1′ m -1.94	ν 2.6′	d 0.1′ m 0.40

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	28°28.3	180°00.9	S19°15.6	253°14.7	N18°23.8	243°11.8	N14°33.6	18°07.1	N01°30.9
1	43°30.8	195°04.6	14.8	268°15.8	23.5	258°13.9	33.5	33°09.7	30.8
2	58°33.2	210°08.4	14.0	283°16.9	23.1	273°16.0	33.4	48°12.4	30.7
3	73°35.7	225°12.2	·· 13.2	298°18.0	·· 22.8	288°18.1	·· 33.3	63°15.0	·· 30.7
4	88°38.2	240°15.9	12.5	313°19.0	22.5	303°20.2	33.2	78°17.6	30.6
5	103°40.6	255°19.7	11.7	328°20.1	22.1	318°22.3	33.1	93°20.3	30.5
6	118°43.1	270°23.5	S19°10.9	343°21.2	N18°21.8	333°24.4	N14°33.0	108°22.9	N01°30.4
7	133°45.6	285°27.3	10.1	358°22.3	21.5	348°26.5	32.9	123°25.5	30.4
8	148°48.0	300°31.0	09.3	13°23.4	21.1	3°28.6	32.7	138°28.2	30.3
9	163°50.5	315°34.8	·· 08.6	28°24.5	·· 20.8	18°30.7	·· 32.6	153°30.8	·· 30.2
10	178°53.0	330°38.6	07.8	43°25.6	20.5	33°32.8	32.5	168°33.4	30.2
11	193°55.4	345°42.4	07.0	58°26.7	20.1	48°35.0	32.4	183°36.1	30.1
12	208°57.9	0°46.1	S19°06.2	73°27.8	N18°19.8	63°37.1	N14°32.3	198°38.7	N01°30.0
13	224°00.4	15°49.9	05.4	88°28.9	19.5	78°39.2	32.2	213°41.3	30.0
14	239°02.8	30°53.7	04.6	103°30.0	19.1	93°41.3	32.1	228°44.0	29.9
15	254°05.3	45°57.5	·· 03.8	118°31.1	·· 18.8	108°43.4	·· 32.0	243°46.6	·· 29.8
16	269°07.7	61°01.3	03.0	133°32.2	18.5	123°45.5	31.9	258°49.2	29.8
17	284°10.2	76°05.0	02.2	148°33.3	18.1	138°47.6	31.7	273°51.9	29.7
18	299°12.7	91°08.8	S19°01.4	163°34.3	N18°17.8	153°49.7	N14°31.6	288°54.5	N01°29.6
19	314°15.1	106°12.6	19°00.6	178°35.4	17.4	168°51.8	31.5	303°57.1	29.6
20	329°17.6	121°16.4	18°59.8	193°36.5	17.1	183°53.9	31.4	318°59.8	29.5
21	344°20.1	136°20.2	·· 59.0	208°37.6	·· 16.8	198°56.0	·· 31.3	334°02.4	·· 29.4
22	359°22.5	151°24.0	58.2	223°38.7	16.4	213°58.1	31.2	349°05.0	29.4
23	14°25.0	166°27.8	57.4	238°39.8	16.1	229°00.2	31.1	4°07.7	29.3
Mer.pass. 22:02		ν 3.8′	d 0.8′	m -4.23	ν 1.1′	d 0.3′	m 0.97	ν 2.1′	d 0.1′ m -1.95	ν 2.6′	d 0.1′ m 0.41

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	29°27.5	181°31.6	S18°56.5	253°40.9	N18°15.8	244°02.3	N14°31.0	19°10.3	N01°29.2
1	44°29.9	196°35.3	55.7	268°42.0	15.4	259°04.4	30.8	34°12.9	29.1
2	59°32.4	211°39.1	54.9	283°43.1	15.1	274°06.5	30.7	49°15.6	29.1
3	74°34.8	226°42.9	·· 54.1	298°44.2	·· 14.8	289°08.7	·· 30.6	64°18.2	·· 29.0
4	89°37.3	241°46.7	53.3	313°45.3	14.4	304°10.8	30.5	79°20.8	28.9
5	104°39.8	256°50.5	52.4	328°46.4	14.1	319°12.9	30.4	94°23.5	28.9
6	119°42.2	271°54.3	S18°51.6	343°47.5	N18°13.8	334°15.0	N14°30.3	109°26.1	N01°28.8
7	134°44.7	286°58.1	50.8	358°48.6	13.4	349°17.1	30.2	124°28.7	28.7
8	149°47.2	302°01.9	49.9	13°49.7	13.1	4°19.2	30.1	139°31.4	28.7
9	164°49.6	317°05.7	·· 49.1	28°50.8	·· 12.8	19°21.3	·· 30.0	154°34.0	·· 28.6
10	179°52.1	332°09.5	48.3	43°51.9	12.4	34°23.4	29.8	169°36.6	28.5
11	194°54.6	347°13.3	47.4	58°53.0	12.1	49°25.5	29.7	184°39.3	28.5
12	209°57.0	2°17.1	S18°46.6	73°54.1	N18°11.7	64°27.6	N14°29.6	199°41.9	N01°28.4
13	224°59.5	17°20.9	45.8	88°55.2	11.4	79°29.7	29.5	214°44.5	28.3
14	240°02.0	32°24.7	44.9	103°56.3	11.1	94°31.9	29.4	229°47.2	28.3
15	255°04.4	47°28.5	·· 44.1	118°57.4	·· 10.7	109°34.0	·· 29.3	244°49.8	·· 28.2
16	270°06.9	62°32.3	43.2	133°58.5	10.4	124°36.1	29.2	259°52.4	28.1
17	285°09.3	77°36.1	42.4	148°59.6	10.1	139°38.2	29.1	274°55.1	28.1
18	300°11.8	92°39.9	S18°41.5	164°00.8	N18°09.7	154°40.3	N14°29.0	289°57.7	N01°28.0
19	315°14.3	107°43.7	40.7	179°01.9	09.4	169°42.4	28.9	305°00.3	27.9
20	330°16.7	122°47.5	39.8	194°03.0	09.1	184°44.5	28.7	320°02.9	27.9
21	345°19.2	137°51.3	·· 39.0	209°04.1	·· 08.7	199°46.6	·· 28.6	335°05.6	·· 27.8
22	0°21.7	152°55.1	38.1	224°05.2	08.4	214°48.7	28.5	350°08.2	27.7
23	15°24.1	167°58.9	37.3	239°06.3	08.0	229°50.9	28.4	5°10.8	27.7
Mer.pass. 21:59		ν 3.8′	d 0.8′	m -4.26	ν 1.1′	d 0.3′	m 0.96	ν 2.1′	d 0.1′ m -1.95	ν 2.6′	d 0.1′ m 0.41

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.2	23°35.5
Polaris	312°48.7	89°22.5
Acamar	315°10.3	-40°11.6
Menkar	314°04.3	4°11.8
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.7	16°33.9
Rigel	281°02.3	-8°10.1
Capella	280°19.4	46°01.4
Bellatrix	278°21.1	6°22.5
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.0
Betelgeuse	270°50.3	7°24.8
Canopus	263°51.5	-52°42.2
Sirius	258°24.8	-16°45.0
Adhara	255°04.6	-29°00.2
Procyon	244°49.3	5°09.4
Pollux	243°15.5	27°57.6
Avior	234°14.2	-59°35.4
Suhail	222°45.4	-43°32.2
Miaplacidus	221°38.3	-69°49.3
Alphard	217°46.5	-8°46.4
Regulus	207°33.1	11°50.2
Dubhe	193°39.7	61°36.2
Denebola	182°23.7	14°25.4
Gienah	175°42.4	-17°41.3
Acrux	172°59.1	-63°14.7
Gacrux	171°50.6	-57°15.7
Alioth	166°12.2	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.8
Hadar	148°34.6	-60°30.1
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°21.0	74°02.7
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.6	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.8	51°29.4
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.4	38°48.8
Nunki	75°46.0	-26°15.8
Altair	61°58.5	8°56.5
Peacock	53°03.4	-56°39.1
Deneb	49°24.7	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.8	-46°49.9
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.5	28°14.0
Markab	13°28.2	15°21.2

Oct 19 Mon	SHA	Mer.pass
Venus	151°01.6	12:03
Mars	225°19.5	07:08
Jupiter	214°52.2	07:49
Saturn	349°34.7	22:48

Oct 20 Tue	SHA	Mer.pass
Venus	151°32.5	11:57
Mars	224°46.4	07:07
Jupiter	214°43.5	07:46
Saturn	349°38.8	22:44

Oct 21 Wed	SHA	Mer.pass
Venus	152°04.1	11:51
Mars	224°13.5	07:05
Jupiter	214°34.9	07:43
Saturn	349°42.8	22:39

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°44.0	S09°54.3	85°36.9	12.4′	S22°44.4	8.6′	54.5′
1	198°44.1	55.2	100°08.3	12.5′	22°35.8	8.8′	54.5′
2	213°44.2	56.1	114°39.8	12.5′	22°27.0	8.8′	54.5′
3	228°44.3	·· 57.0	129°11.3	12.5′	22°18.2	8.9′	54.5′
4	243°44.4	57.9	143°42.8	12.6′	22°09.3	9.0′	54.5′
5	258°44.6	58.8	158°14.4	12.6′	22°00.3	9.1′	54.6′
6	273°44.7	S09°59.7	172°46.1	12.7′	S21°51.2	9.2′	54.6′
7	288°44.8	10°00.6	187°17.7	12.7′	21°42.0	9.4′	54.6′
8	303°44.9	01.5	201°49.5	12.8′	21°32.6	9.4′	54.6′
9	318°45.0	·· 02.4	216°21.3	12.8′	21°23.2	9.5′	54.6′
10	333°45.1	03.3	230°53.1	12.9′	21°13.7	9.6′	54.6′
11	348°45.3	04.2	245°25.0	12.9′	21°04.1	9.7′	54.7′
12	3°45.4	S10°05.1	259°56.9	13.0′	S20°54.4	9.8′	54.7′
13	18°45.5	06.1	274°28.8	13.0′	20°44.6	9.9′	54.7′
14	33°45.6	07.0	289°00.8	13.0′	20°34.7	10.0′	54.7′
15	48°45.7	·· 07.9	303°32.9	13.1′	20°24.7	10.1′	54.7′
16	63°45.8	08.8	318°05.0	13.1′	20°14.6	10.2′	54.7′
17	78°45.9	09.6	332°37.1	13.2′	20°04.4	10.3′	54.8′
18	93°46.0	S10°10.5	347°09.3	13.2′	S19°54.1	10.4′	54.8′
19	108°46.2	11.4	1°41.5	13.3′	19°43.7	10.5′	54.8′
20	123°46.3	12.3	16°13.8	13.3′	19°33.2	10.5′	54.8′
21	138°46.4	·· 13.2	30°46.1	13.3′	19°22.7	10.7′	54.8′
22	153°46.5	14.1	45°18.4	13.4′	19°12.0	10.7′	54.9′
23	168°46.6	15.0	59°50.8	13.4′	19°01.3	10.9′	54.9′
	SD = 16.0′	d = 0.9′	SD = 14.9′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°46.7	S10°15.9	74°23.3	13.5′	S18°50.4	10.9′	54.9′
1	198°46.8	16.8	88°55.7	13.5′	18°39.5	11.0′	54.9′
2	213°46.9	17.7	103°28.2	13.5′	18°28.5	11.1′	55.0′
3	228°47.0	·· 18.6	118°00.8	13.6′	18°17.4	11.2′	55.0′
4	243°47.2	19.5	132°33.4	13.6′	18°06.2	11.3′	55.0′
5	258°47.3	20.4	147°06.0	13.7′	17°54.9	11.3′	55.0′
6	273°47.4	S10°21.3	161°38.7	13.7′	S17°43.6	11.5′	55.0′
7	288°47.5	22.2	176°11.4	13.7′	17°32.1	11.5′	55.1′
8	303°47.6	23.1	190°44.1	13.8′	17°20.6	11.6′	55.1′
9	318°47.7	·· 24.0	205°16.9	13.8′	17°09.0	11.7′	55.1′
10	333°47.8	24.9	219°49.7	13.8′	16°57.3	11.8′	55.1′
11	348°47.9	25.8	234°22.5	13.9′	16°45.5	11.8′	55.2′
12	3°48.0	S10°26.7	248°55.4	13.9′	S16°33.7	12.0′	55.2′
13	18°48.1	27.6	263°28.3	13.9′	16°21.7	12.0′	55.2′
14	33°48.2	28.5	278°01.2	14.0′	16°09.7	12.1′	55.2′
15	48°48.3	·· 29.4	292°34.2	14.0′	15°57.6	12.2′	55.3′
16	63°48.4	30.3	307°07.2	14.0′	15°45.4	12.2′	55.3′
17	78°48.6	31.2	321°40.2	14.1′	15°33.2	12.3′	55.3′
18	93°48.7	S10°32.0	336°13.3	14.1′	S15°20.9	12.4′	55.3′
19	108°48.8	32.9	350°46.3	14.1′	15°08.5	12.5′	55.4′
20	123°48.9	33.8	5°19.5	14.1′	14°56.0	12.6′	55.4′
21	138°49.0	·· 34.7	19°52.6	14.2′	14°43.4	12.6′	55.4′
22	153°49.1	35.6	34°25.8	14.2′	14°30.8	12.7′	55.4′
23	168°49.2	36.5	48°59.0	14.2′	14°18.1	12.8′	55.5′
	SD = 16.1′	d = 0.9′	SD = 15.0′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°49.3	S10°37.4	63°32.2	14.2′	S14°05.3	12.8′	55.5′
1	198°49.4	38.3	78°05.4	14.3′	13°52.5	13.0′	55.5′
2	213°49.5	39.2	92°38.7	14.3′	13°39.5	13.0′	55.6′
3	228°49.6	·· 40.1	107°12.0	14.3′	13°26.5	13.0′	55.6′
4	243°49.7	41.0	121°45.3	14.3′	13°13.5	13.2′	55.6′
5	258°49.8	41.9	136°18.6	14.3′	13°00.3	13.2′	55.6′
6	273°49.9	S10°42.7	150°51.9	14.4′	S12°47.1	13.2′	55.7′
7	288°50.0	43.6	165°25.3	14.4′	12°33.9	13.4′	55.7′
8	303°50.1	44.5	179°58.7	14.4′	12°20.5	13.4′	55.7′
9	318°50.2	·· 45.4	194°32.1	14.4′	12°07.1	13.4′	55.8′
10	333°50.3	46.3	209°05.5	14.4′	11°53.7	13.6′	55.8′
11	348°50.4	47.2	223°38.9	14.4′	11°40.1	13.5′	55.8′
12	3°50.5	S10°48.1	238°12.4	14.5′	S11°26.6	13.7′	55.8′
13	18°50.6	49.0	252°45.8	14.5′	11°12.9	13.7′	55.9′
14	33°50.7	49.8	267°19.3	14.5′	10°59.2	13.8′	55.9′
15	48°50.8	·· 50.7	281°52.8	14.5′	10°45.4	13.8′	55.9′
16	63°50.9	51.6	296°26.3	14.5′	10°31.6	13.9′	56.0′
17	78°51.0	52.5	310°59.8	14.5′	10°17.7	14.0′	56.0′
18	93°51.1	S10°53.4	325°33.3	14.5′	S10°03.7	14.0′	56.0′
19	108°51.2	54.3	340°06.8	14.5′	09°49.7	14.1′	56.1′
20	123°51.3	55.2	354°40.3	14.5′	09°35.6	14.1′	56.1′
21	138°51.4	·· 56.0	9°13.9	14.5′	09°21.5	14.2′	56.1′
22	153°51.5	56.9	23°47.4	14.5′	09°07.3	14.3′	56.2′
23	168°51.6	57.8	38°20.9	14.5′	08°53.0	14.3′	56.2′
	SD = 16.1′	d = 0.9′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:17	06:35	07:49	15:39	16:52	18:10
N 70°	05:18	06:29	07:34	15:54	16:59	18:09
68°	05:19	06:24	07:23	16:06	17:04	18:09
66°	05:20	06:19	07:13	16:15	17:09	18:08
64°	05:20	06:15	07:05	16:24	17:13	18:08
62°	05:20	06:12	06:58	16:31	17:17	18:08
60°	05:20	06:09	06:52	16:37	17:20	18:08
N 58°	05:20	06:06	06:46	16:42	17:23	18:08
56°	05:20	06:03	06:42	16:47	17:25	18:08
54°	05:20	06:01	06:37	16:51	17:28	18:09
52°	05:20	05:59	06:33	16:55	17:30	18:09
50°	05:19	05:57	06:30	16:59	17:32	18:09
45°	05:18	05:52	06:22	17:07	17:37	18:11
N 40°	05:17	05:48	06:16	17:13	17:41	18:12
35°	05:15	05:44	06:10	17:19	17:45	18:14
30°	05:13	05:41	06:05	17:24	17:48	18:16
20°	05:08	05:34	05:56	17:33	17:55	18:21
N 10°	05:03	05:27	05:49	17:41	18:02	18:27
0°	04:56	05:20	05:41	17:48	18:09	18:34
S 10°	04:48	05:13	05:34	17:56	18:17	18:42
20°	04:37	05:03	05:26	18:04	18:26	18:53
30°	04:23	04:52	05:17	18:13	18:38	19:07
35°	04:14	04:45	05:11	18:19	18:45	19:16
40°	04:03	04:37	05:05	18:25	18:53	19:27
45°	03:50	04:27	04:58	18:33	19:03	19:41
S 50°	03:33	04:15	04:49	18:41	19:16	19:59
52°	03:24	04:09	04:45	18:46	19:22	20:07
54°	03:15	04:03	04:41	18:50	19:28	20:17
56°	03:03	03:55	04:36	18:55	19:36	20:28
58°	02:50	03:47	04:30	19:01	19:44	20:42
S 60°	02:35	03:37	04:24	19:07	19:54	20:58

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	17:30	16:34	▬	22:10	·· ··
N 70°	18:30	16:55	16:18	19:34	22:43	·· ··
68°	17:11	16:30	16:05	20:52	23:07	·· ··
66°	16:32	16:10	15:54	21:29	23:25	·· ··
64°	16:06	15:54	15:45	21:55	23:39	·· ··
62°	15:45	15:41	15:37	22:15	23:52	·· ··
60°	15:27	15:30	15:30	22:31	·· ··	00:02
N 58°	15:13	15:20	15:24	22:45	·· ··	00:11
56°	15:01	15:11	15:19	22:57	·· ··	00:19
54°	14:50	15:03	15:14	23:07	·· ··	00:26
52°	14:40	14:56	15:10	23:16	·· ··	00:32
50°	14:31	14:50	15:06	23:24	·· ··	00:37
45°	14:13	14:36	14:57	23:41	·· ··	00:49
N 40°	13:58	14:25	14:50	23:55	·· ··	00:59
35°	13:45	14:16	14:43	·· ··	00:07	01:08
30°	13:34	14:07	14:38	·· ··	00:17	01:15
20°	13:15	13:52	14:28	·· ··	00:35	01:28
N 10°	12:58	13:40	14:20	00:00	00:50	01:38
0°	12:42	13:27	14:12	00:18	01:04	01:49
S 10°	12:26	13:15	14:03	00:35	01:18	01:59
20°	12:09	13:02	13:55	00:54	01:33	02:09
30°	11:49	12:47	13:45	01:15	01:50	02:22
35°	11:38	12:38	13:39	01:27	02:00	02:29
40°	11:24	12:28	13:33	01:42	02:11	02:37
45°	11:09	12:16	13:25	01:58	02:24	02:46
S 50°	10:49	12:02	13:16	02:19	02:40	02:57
52°	10:40	11:55	13:11	02:29	02:47	03:02
54°	10:30	11:48	13:07	02:40	02:55	03:07
56°	10:18	11:39	13:01	02:52	03:05	03:13
58°	10:04	11:30	12:56	03:06	03:15	03:20
S 60°	09:48	11:19	12:49	03:23	03:27	03:28

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 9-11 53-72%
19	14:56	15:01	11:45	18:53	06:30	
20	15:07	15:12	11:45	19:38	07:16	
21	15:17	15:22	11:45	20:22	08:00	

October 22, 23, 24 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	30°26.6	183°02.7	S18°36.4	254°07.4	N18°07.7	244°53.0	N14°28.3	20°13.5	N01°27.6
1	45°29.1	198°06.5	35.5	269°08.5	07.4	259°55.1	28.2	35°16.1	27.5
2	60°31.5	213°10.3	34.7	284°09.6	07.0	274°57.2	28.1	50°18.7	27.5
3	75°34.0	228°14.1	·· 33.8	299°10.7	·· 06.7	289°59.3	·· 28.0	65°21.4	·· 27.4
4	90°36.5	243°17.9	32.9	314°11.8	06.4	305°01.4	27.9	80°24.0	27.3
5	105°38.9	258°21.7	32.1	329°12.9	06.0	320°03.5	27.8	95°26.6	27.3
6	120°41.4	273°25.5	S18°31.2	344°14.0	N18°05.7	335°05.6	N14°27.6	110°29.3	N01°27.2
7	135°43.8	288°29.3	30.3	359°15.1	05.3	350°07.8	27.5	125°31.9	27.1
8	150°46.3	303°33.1	29.4	14°16.3	05.0	5°09.9	27.4	140°34.5	27.1
9	165°48.8	318°36.9	·· 28.6	29°17.4	·· 04.7	20°12.0	·· 27.3	155°37.2	·· 27.0
10	180°51.2	333°40.7	27.7	44°18.5	04.3	35°14.1	27.2	170°39.8	26.9
11	195°53.7	348°44.5	26.8	59°19.6	04.0	50°16.2	27.1	185°42.4	26.8
12	210°56.2	3°48.3	S18°25.9	74°20.7	N18°03.7	65°18.3	N14°27.0	200°45.0	N01°26.8
13	225°58.6	18°52.1	25.0	89°21.8	03.3	80°20.4	26.9	215°47.7	26.7
14	241°01.1	33°55.9	24.2	104°22.9	03.0	95°22.6	26.8	230°50.3	26.6
15	256°03.6	48°59.7	·· 23.3	119°24.0	·· 02.7	110°24.7	·· 26.7	245°52.9	·· 26.6
16	271°06.0	64°03.5	22.4	134°25.1	02.3	125°26.8	26.6	260°55.6	26.5
17	286°08.5	79°07.3	21.5	149°26.3	02.0	140°28.9	26.4	275°58.2	26.4
18	301°10.9	94°11.2	S18°20.6	164°27.4	N18°01.6	155°31.0	N14°26.3	291°00.8	N01°26.4
19	316°13.4	109°15.0	19.7	179°28.5	01.3	170°33.1	26.2	306°03.5	26.3
20	331°15.9	124°18.8	18.8	194°29.6	01.0	185°35.3	26.1	321°06.1	26.2
21	346°18.3	139°22.6	·· 17.9	209°30.7	·· 00.6	200°37.4	·· 26.0	336°08.7	·· 26.2
22	1°20.8	154°26.4	17.0	224°31.8	18°00.3	215°39.5	25.9	351°11.3	26.1
23	16°23.3	169°30.2	16.1	239°32.9	17°59.9	230°41.6	25.8	6°14.0	26.0
Mer.pass. 21:55		ν 3.8′ d 0.9′	m -4.25	ν 1.1′ d 0.3′	m 0.95	ν 2.1′ d 0.1′	m -1.95	ν 2.6′ d 0.1′	m 0.41

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	31°25.7	184°34.0	S18°15.2	254°34.1	N17°59.6	245°43.7	N14°25.7	21°16.6	N01°26.0
1	46°28.2	199°37.8	14.3	269°35.2	59.3	260°45.8	25.6	36°19.2	25.9
2	61°30.7	214°41.6	13.4	284°36.3	58.9	275°48.0	25.5	51°21.9	25.9
3	76°33.1	229°45.4	·· 12.5	299°37.4	·· 58.6	290°50.1	·· 25.4	66°24.5	·· 25.8
4	91°35.6	244°49.2	11.6	314°38.5	58.3	305°52.2	25.2	81°27.1	25.7
5	106°38.1	259°53.0	10.7	329°39.6	57.9	320°54.3	25.1	96°29.8	25.7
6	121°40.5	274°56.8	S18°09.8	344°40.8	N17°57.6	335°56.4	N14°25.0	111°32.4	N01°25.6
7	136°43.0	290°00.6	08.9	359°41.9	57.2	350°58.6	24.9	126°35.0	25.5
8	151°45.4	305°04.4	08.0	14°43.0	56.9	6°00.7	24.8	141°37.6	25.5
9	166°47.9	320°08.2	·· 07.0	29°44.1	·· 56.6	21°02.8	·· 24.7	156°40.3	·· 25.4
10	181°50.4	335°12.0	06.1	44°45.2	56.2	36°04.9	24.6	171°42.9	25.3
11	196°52.8	350°15.8	05.2	59°46.3	55.9	51°07.0	24.5	186°45.5	25.3
12	211°55.3	5°19.6	S18°04.3	74°47.5	N17°55.6	66°09.2	N14°24.4	201°48.2	N01°25.2
13	226°57.8	20°23.4	03.4	89°48.6	55.2	81°11.3	24.3	216°50.8	25.1
14	242°00.2	35°27.2	02.4	104°49.7	54.9	96°13.4	24.2	231°53.4	25.1
15	257°02.7	50°31.0	·· 01.5	119°50.8	·· 54.5	111°15.5	·· 24.1	246°56.0	·· 25.0
16	272°05.2	65°34.8	18°00.6	134°51.9	54.2	126°17.6	24.0	261°58.7	24.9
17	287°07.6	80°38.6	17°59.7	149°53.1	53.9	141°19.8	23.8	277°01.3	24.9
18	302°10.1	95°42.4	S17°58.7	164°54.2	N17°53.5	156°21.9	N14°23.7	292°03.9	N01°24.8
19	317°12.5	110°46.2	57.8	179°55.3	53.2	171°24.0	23.6	307°06.6	24.7
20	332°15.0	125°50.0	56.9	194°56.4	52.8	186°26.1	23.5	322°09.2	24.7
21	347°17.5	140°53.8	·· 55.9	209°57.6	·· 52.5	201°28.2	·· 23.4	337°11.8	·· 24.6
22	2°19.9	155°57.6	55.0	224°58.7	52.2	216°30.4	23.3	352°14.4	24.5
23	17°22.4	171°01.4	54.1	239°59.8	51.8	231°32.5	23.2	7°17.1	24.5
Mer.pass. 21:51		ν 3.8′ d 0.9′	m -4.23	ν 1.1′ d 0.3′	m 0.94	ν 2.1′ d 0.1′	m -1.96	ν 2.6′ d 0.1′	m 0.42

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	32°24.9	186°05.2	S17°53.1	255°00.9	N17°51.5	246°34.6	N14°23.1	22°19.7	N01°24.4
1	47°27.3	201°09.0	52.2	270°02.1	51.2	261°36.7	23.0	37°22.3	24.3
2	62°29.8	216°12.8	51.3	285°03.2	50.8	276°38.9	22.9	52°24.9	24.3
3	77°32.3	231°16.6	·· 50.3	300°04.3	·· 50.5	291°41.0	·· 22.8	67°27.6	·· 24.2
4	92°34.7	246°20.4	49.4	315°05.4	50.1	306°43.1	22.7	82°30.2	24.1
5	107°37.2	261°24.2	48.4	330°06.6	49.8	321°45.2	22.6	97°32.8	24.1
6	122°39.7	276°28.0	S17°47.5	345°07.7	N17°49.5	336°47.3	N14°22.5	112°35.5	N01°24.0
7	137°42.1	291°31.8	46.5	0°08.8	49.1	351°49.5	22.4	127°38.1	23.9
8	152°44.6	306°35.6	45.6	15°09.9	48.8	6°51.6	22.2	142°40.7	23.9
9	167°47.0	321°39.4	·· 44.6	30°11.1	·· 48.4	21°53.7	·· 22.1	157°43.3	·· 23.8
10	182°49.5	336°43.2	43.7	45°12.2	48.1	36°55.8	22.0	172°46.0	23.7
11	197°52.0	351°47.0	42.7	60°13.3	47.8	51°58.0	21.9	187°48.6	23.7
12	212°54.4	6°50.8	S17°41.8	75°14.5	N17°47.4	67°00.1	N14°21.8	202°51.2	N01°23.6
13	227°56.9	21°54.6	40.8	90°15.6	47.1	82°02.2	21.7	217°53.8	23.6
14	242°59.4	36°58.4	39.9	105°16.7	46.7	97°04.3	21.6	232°56.5	23.5
15	258°01.8	52°02.1	·· 38.9	120°17.8	·· 46.4	112°06.5	·· 21.5	247°59.1	·· 23.4
16	273°04.3	67°05.9	38.0	135°19.0	46.1	127°08.6	21.4	263°01.7	23.4
17	288°06.8	82°09.7	37.0	150°20.1	45.7	142°10.7	21.3	278°04.4	23.3
18	303°09.2	97°13.5	S17°36.0	165°21.2	N17°45.4	157°12.9	N14°21.2	293°07.0	N01°23.2
19	318°11.7	112°17.3	35.1	180°22.4	45.0	172°15.0	21.1	308°09.6	23.2
20	333°14.1	127°21.1	34.1	195°23.5	44.7	187°17.1	21.0	323°12.2	23.1
21	348°16.6	142°24.9	·· 33.2	210°24.6	·· 44.4	202°19.2	·· 20.9	338°14.9	·· 23.0
22	3°19.1	157°28.6	32.2	225°25.8	44.0	217°21.4	20.8	353°17.5	23.0
23	18°21.5	172°32.4	31.2	240°26.9	43.7	232°23.5	20.7	8°20.1	22.9
Mer.pass. 21:47		ν 3.8′ d 0.9′	m -4.20	ν 1.1′ d 0.3′	m 0.93	ν 2.1′ d 0.1′	m -1.96	ν 2.6′ d 0.1′	m 0.42

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°05.9
Hamal	327°49.2	23°35.5
Polaris	312°48.1	89°22.5
Acamar	315°10.3	-40°11.6
Menkar	314°04.3	4°11.8
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.7	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.4	46°01.4
Bellatrix	278°21.1	6°22.5
Elnath	277°59.8	28°37.8
Alnilam	275°36.1	-1°11.0
Betelgeuse	270°50.3	7°24.8
Canopus	263°51.5	-52°42.2
Sirius	258°24.8	-16°45.0
Adhara	255°04.6	-29°00.2
Procyon	244°49.3	5°09.4
Pollux	243°15.5	27°57.6
Avior	234°14.2	-59°35.4
Suhail	222°45.4	-43°32.2
Miaplacidus	221°38.3	-69°49.3
Alphard	217°46.4	-8°46.4
Regulus	207°33.1	11°50.2
Dubhe	193°39.7	61°36.2
Denebola	182°23.7	14°25.3
Gienah	175°42.4	-17°41.3
Acrux	172°59.1	-63°14.7
Gacrux	171°50.6	-57°15.7
Alioth	166°12.2	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.8
Hadar	148°34.6	-60°30.1
Menkent	147°56.3	-36°30.1
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°21.0	74°02.7
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.6	-69°04.7
Sabik	102°01.3	-15°45.4
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.8	51°29.4
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.4	38°48.8
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.4	-56°39.1
Deneb	49°24.7	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.9	-46°49.9
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.5	28°14.0
Markab	13°28.2	15°21.2

Oct 22 Thu	SHA	Mer.pass
Venus	152°36.1	11:45
Mars	223°40.8	07:03
Jupiter	214°26.4	07:39
Saturn	349°46.9	22:35

Oct 23 Fri	SHA	Mer.pass
Venus	153°08.3	11:39
Mars	223°08.3	07:01
Jupiter	214°18.0	07:36
Saturn	349°50.9	22:31

Oct 24 Sat	SHA	Mer.pass
Venus	153°40.4	11:33
Mars	222°36.1	06:59
Jupiter	214°09.7	07:33
Saturn	349°54.8	22:27

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°51.7	S10°58.7	52°54.5	14.5′	S08°38.7	14.3′	56.2′
1	198°51.8	10°59.6	67°28.0	14.5′	08°24.4	14.4′	56.3′
2	213°51.9	11°00.5	82°01.6	14.5′	08°10.0	14.5′	56.3′
3	228°52.0	·· 01.4	96°35.1	14.5′	07°55.5	14.5′	56.3′
4	243°52.1	02.2	111°08.7	14.5′	07°41.0	14.5′	56.3′
5	258°52.2	03.1	125°42.2	14.5′	07°26.5	14.6′	56.4′
6	273°52.3	S11°04.0	140°15.7	14.5′	S07°11.9	14.7′	56.4′
7	288°52.4	04.9	154°49.3	14.5′	06°57.2	14.7′	56.4′
8	303°52.5	05.8	169°22.8	14.5′	06°42.5	14.7′	56.5′
9	318°52.6	·· 06.6	183°56.3	14.5′	06°27.8	14.8′	56.5′
10	333°52.7	07.5	198°29.8	14.5′	06°13.0	14.9′	56.5′
11	348°52.8	08.4	213°03.3	14.5′	05°58.1	14.8′	56.6′
12	3°52.9	S11°09.3	227°36.8	14.5′	S05°43.3	15.0′	56.6′
13	18°52.9	10.2	242°10.3	14.5′	05°28.3	14.9′	56.6′
14	33°53.0	11.1	256°43.7	14.5′	05°13.4	15.0′	56.7′
15	48°53.1	·· 11.9	271°17.2	14.4′	04°58.4	15.1′	56.7′
16	63°53.2	12.8	285°50.6	14.4′	04°43.3	15.1′	56.7′
17	78°53.3	13.7	300°24.0	14.4′	04°28.2	15.1′	56.8′
18	93°53.4	S11°14.6	314°57.4	14.4′	S04°13.1	15.1′	56.8′
19	108°53.5	15.5	329°30.8	14.4′	03°58.0	15.2′	56.8′
20	123°53.6	16.3	344°04.2	14.3′	03°42.8	15.3′	56.9′
21	138°53.7	·· 17.2	358°37.5	14.3′	03°27.5	15.2′	56.9′
22	153°53.8	18.1	13°10.9	14.3′	03°12.3	15.3′	56.9′
23	168°53.9	19.0	27°44.2	14.3′	02°57.0	15.4′	57.0′
	SD = 16.1′	d = 0.9′	SD = 15.3′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°54.0	S11°19.8	42°17.4	14.3′	S02°41.6	15.3′	57.0′
1	198°54.1	20.7	56°50.7	14.2′	02°26.3	15.4′	57.0′
2	213°54.1	21.6	71°23.9	14.2′	02°10.9	15.4′	57.1′
3	228°54.2	·· 22.5	85°57.1	14.2′	01°55.5	15.5′	57.1′
4	243°54.3	23.3	100°30.3	14.1′	01°40.0	15.4′	57.2′
5	258°54.4	24.2	115°03.4	14.1′	01°24.6	15.5′	57.2′
6	273°54.5	S11°25.1	129°36.5	14.1′	S01°09.1	15.6′	57.2′
7	288°54.6	26.0	144°09.6	14.0′	00°53.5	15.5′	57.3′
8	303°54.7	26.8	158°42.7	14.0′	00°38.0	15.6′	57.3′
9	318°54.8	·· 27.7	173°15.7	14.0′	00°22.4	15.6′	57.3′
10	333°54.8	28.6	187°48.6	13.9′	S00°06.8	15.6′	57.4′
11	348°54.9	29.5	202°21.6	13.9′	N00°08.8	15.6′	57.4′
12	3°55.0	S11°30.3	216°54.5	13.9′	N00°24.4	15.6′	57.4′
13	18°55.1	31.2	231°27.3	13.8′	00°40.0	15.7′	57.5′
14	33°55.2	32.1	246°00.1	13.8′	00°55.7	15.7′	57.5′
15	48°55.3	·· 33.0	260°32.9	13.7′	01°11.4	15.7′	57.5′
16	63°55.4	33.8	275°05.6	13.7′	01°27.1	15.7′	57.6′
17	78°55.5	34.7	289°38.3	13.6′	01°42.8	15.7′	57.6′
18	93°55.5	S11°35.6	304°11.0	13.6′	N01°58.5	15.7′	57.6′
19	108°55.6	36.5	318°43.6	13.5′	02°14.2	15.8′	57.7′
20	123°55.7	37.3	333°16.1	13.5′	02°30.0	15.7′	57.7′
21	138°55.8	·· 38.2	347°48.6	13.4′	02°45.7	15.8′	57.7′
22	153°55.9	39.1	2°21.1	13.4′	03°01.5	15.7′	57.8′
23	168°56.0	39.9	16°53.5	13.3′	03°17.2	15.8′	57.8′
	SD = 16.1′	d = 0.9′	SD = 15.5′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°56.0	S11°40.8	31°25.8	13.3′	N03°33.0	15.7′	57.8′
1	198°56.1	41.7	45°58.1	13.2′	03°48.7	15.8′	57.9′
2	213°56.2	42.5	60°30.3	13.2′	04°04.5	15.8′	57.9′
3	228°56.3	·· 43.4	75°02.5	13.1′	04°20.3	15.7′	57.9′
4	243°56.4	44.3	89°34.6	13.1′	04°36.0	15.8′	58.0′
5	258°56.5	45.2	104°06.7	13.0′	04°51.8	15.7′	58.0′
6	273°56.5	S11°46.0	118°38.7	12.9′	N05°07.5	15.8′	58.0′
7	288°56.6	46.9	133°10.6	12.9′	05°23.3	15.7′	58.1′
8	303°56.7	47.8	147°42.5	12.8′	05°39.0	15.8′	58.1′
9	318°56.8	·· 48.6	162°14.3	12.7′	05°54.8	15.7′	58.1′
10	333°56.9	49.5	176°46.0	12.7′	06°10.5	15.7′	58.2′
11	348°56.9	50.4	191°17.7	12.6′	06°26.2	15.7′	58.2′
12	3°57.0	S11°51.2	205°49.3	12.5′	N06°41.9	15.7′	58.2′
13	18°57.1	52.1	220°20.8	12.5′	06°57.6	15.7′	58.3′
14	33°57.2	53.0	234°52.3	12.4′	07°13.3	15.6′	58.3′
15	48°57.3	·· 53.8	249°23.7	12.3′	07°28.9	15.7′	58.3′
16	63°57.3	54.7	263°55.0	12.2′	07°44.6	15.6′	58.4′
17	78°57.4	55.6	278°26.3	12.2′	08°00.2	15.6′	58.4′
18	93°57.5	S11°56.4	292°57.4	12.1′	N08°15.8	15.5′	58.4′
19	108°57.6	57.3	307°28.5	12.0′	08°31.3	15.6′	58.5′
20	123°57.6	58.1	321°59.6	11.9′	08°46.9	15.5′	58.5′
21	138°57.7	·· 59.0	336°30.5	11.9′	09°02.4	15.5′	58.5′
22	153°57.8	11°59.9	351°01.4	11.8′	09°17.9	15.4′	58.5′
23	168°57.9	12°00.7	5°32.1	11.7′	09°33.3	15.5′	58.6′
	SD = 16.1′	d = 0.9′	SD = 15.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:29	06:49	08:05	15:22	16:38	17:57
N 70°	05:29	06:41	07:48	15:39	16:46	17:57
68°	05:29	06:34	07:34	15:53	16:53	17:58
66°	05:29	06:29	07:23	16:04	16:59	17:58
64°	05:28	06:24	07:14	16:14	17:04	17:59
62°	05:28	06:20	07:06	16:22	17:08	17:59
60°	05:27	06:16	06:59	16:28	17:12	18:00
N 58°	05:27	06:12	06:53	16:35	17:15	18:01
56°	05:26	06:09	06:48	16:40	17:18	18:02
54°	05:25	06:07	06:43	16:45	17:21	18:02
52°	05:25	06:04	06:39	16:49	17:24	18:03
50°	05:24	06:02	06:35	16:53	17:26	18:04
45°	05:22	05:56	06:26	17:02	17:32	18:06
N 40°	05:20	05:51	06:19	17:09	17:37	18:08
35°	05:17	05:47	06:13	17:15	17:41	18:11
30°	05:15	05:43	06:07	17:21	17:45	18:13
20°	05:09	05:35	05:58	17:31	17:53	18:19
N 10°	05:03	05:28	05:49	17:39	18:01	18:26
0°	04:55	05:20	05:41	17:48	18:09	18:33
S 10°	04:46	05:11	05:33	17:56	18:18	18:43
20°	04:35	05:01	05:24	18:05	18:28	18:54
30°	04:20	04:49	05:14	18:15	18:40	19:10
35°	04:10	04:41	05:08	18:22	18:48	19:19
40°	03:58	04:33	05:01	18:28	18:57	19:31
45°	03:44	04:22	04:53	18:37	19:08	19:46
S 50°	03:25	04:09	04:43	18:46	19:21	20:05
52°	03:16	04:02	04:39	18:51	19:28	20:14
54°	03:06	03:55	04:34	18:56	19:35	20:25
56°	02:54	03:47	04:28	19:02	19:43	20:37
58°	02:40	03:38	04:22	19:08	19:52	20:52
S 60°	02:22	03:28	04:15	19:15	20:03	21:10

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	15:57	15:24	14:49	00:38	02:50	05:03
N 70°	15:51	15:26	15:00	00:52	02:53	04:56
68°	15:45	15:27	15:08	01:03	02:55	04:50
66°	15:41	15:28	15:15	01:12	02:57	04:45
64°	15:37	15:29	15:21	01:20	02:59	04:41
62°	15:33	15:30	15:26	01:26	03:01	04:38
60°	15:31	15:31	15:31	01:32	03:02	04:35
N 58°	15:28	15:31	15:35	01:37	03:03	04:32
56°	15:25	15:32	15:39	01:41	03:04	04:30
54°	15:23	15:32	15:42	01:45	03:05	04:28
52°	15:21	15:33	15:45	01:48	03:06	04:26
50°	15:20	15:33	15:48	01:51	03:07	04:24
45°	15:16	15:34	15:54	01:58	03:08	04:20
N 40°	15:12	15:35	15:59	02:04	03:10	04:17
35°	15:10	15:36	16:03	02:09	03:11	04:15
30°	15:07	15:36	16:07	02:13	03:12	04:12
20°	15:03	15:38	16:14	02:20	03:13	04:08
N 10°	14:59	15:39	16:20	02:26	03:15	04:05
0°	14:55	15:40	16:26	02:32	03:16	04:01
S 10°	14:52	15:41	16:32	02:38	03:18	03:58
20°	14:48	15:42	16:38	02:44	03:19	03:54
30°	14:43	15:43	16:45	02:51	03:20	03:50
35°	14:41	15:44	16:49	02:55	03:21	03:48
40°	14:38	15:44	16:54	03:00	03:22	03:45
45°	14:34	15:45	16:59	03:05	03:23	03:42
S 50°	14:30	15:47	17:06	03:11	03:25	03:39
52°	14:28	15:47	17:09	03:14	03:25	03:37
54°	14:26	15:48	17:13	03:17	03:26	03:35
56°	14:24	15:49	17:16	03:21	03:27	03:33
58°	14:22	15:49	17:21	03:24	03:28	03:31
S 60°	14:19	15:50	17:25	03:29	03:29	03:29

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 12-14 80-94%
22	15:27	15:31	11:44	21:06	08:44	
23	15:36	15:40	11:44	21:50	09:28	
24	15:44	15:48	11:44	22:37	10:13	

October 25, 26, 27 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	33°24.0	187°36.2	S17°30.3	255°28.0	N17°43.3	247°25.6	N14°20.6	23°22.7	N01°22.8
1	48°26.5	202°40.0	29.3	270°29.2	43.0	262°27.7	20.4	38°25.4	22.8
2	63°28.9	217°43.8	28.3	285°30.3	42.7	277°29.9	20.3	53°28.0	22.7
3	78°31.4	232°47.6	·· 27.4	300°31.4	·· 42.3	292°32.0	·· 20.2	68°30.6	·· 22.7
4	93°33.9	247°51.3	26.4	315°32.6	42.0	307°34.1	20.1	83°33.2	22.6
5	108°36.3	262°55.1	25.4	330°33.7	41.6	322°36.3	20.0	98°35.9	22.5
6	123°38.8	277°58.9	S17°24.4	345°34.8	N17°41.3	337°38.4	N14°19.9	113°38.5	N01°22.5
7	138°41.3	293°02.7	23.5	0°36.0	41.0	352°40.5	19.8	128°41.1	22.4
8	153°43.7	308°06.4	22.5	15°37.1	40.6	7°42.6	19.7	143°43.7	22.3
9	168°46.2	323°10.2	·· 21.5	30°38.2	·· 40.3	22°44.8	·· 19.6	158°46.4	·· 22.3
10	183°48.6	338°14.0	20.5	45°39.4	39.9	37°46.9	19.5	173°49.0	22.2
11	198°51.1	353°17.7	19.6	60°40.5	39.6	52°49.0	19.4	188°51.6	22.1
12	213°53.6	8°21.5	S17°18.6	75°41.7	N17°39.3	67°51.2	N14°19.3	203°54.2	N01°22.1
13	228°56.0	23°25.3	17.6	90°42.8	38.9	82°53.3	19.2	218°56.9	22.0
14	243°58.5	38°29.1	16.6	105°43.9	38.6	97°55.4	19.1	233°59.5	21.9
15	259°01.0	53°32.8	·· 15.6	120°45.1	·· 38.2	112°57.6	·· 19.0	249°02.1	·· 21.9
16	274°03.4	68°36.6	14.6	135°46.2	37.9	127°59.7	18.9	264°04.7	21.8
17	289°05.9	83°40.4	13.7	150°47.3	37.6	143°01.8	18.8	279°07.4	21.8
18	304°08.4	98°44.1	S17°12.7	165°48.5	N17°37.2	158°03.9	N14°18.7	294°10.0	N01°21.7
19	319°10.8	113°47.9	11.7	180°49.6	36.9	173°06.1	18.6	309°12.6	21.6
20	334°13.3	128°51.6	10.7	195°50.8	36.5	188°08.2	18.5	324°15.2	21.6
21	349°15.8	143°55.4	·· 09.7	210°51.9	·· 36.2	203°10.3	·· 18.4	339°17.9	·· 21.5
22	4°18.2	158°59.2	08.7	225°53.1	35.9	218°12.5	18.3	354°20.5	21.4
23	19°20.7	174°02.9	07.7	240°54.2	35.5	233°14.6	18.2	9°23.1	21.4
Mer.pass. 21:43		ν 3.8′	d 1.0′	m -4.20	ν 1.1′	d 0.3′	m 0.93	ν 2.1′	d 0.1′ m -1.97	ν 2.6′	d 0.1′ m 0.43

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	34°23.1	189°06.7	S17°06.7	255°55.3	N17°35.2	248°16.7	N14°18.0	24°25.7	N01°21.3
1	49°25.6	204°10.4	05.7	270°56.5	34.8	263°18.9	17.9	39°28.4	21.2
2	64°28.1	219°14.2	04.7	285°57.6	34.5	278°21.0	17.8	54°31.0	21.2
3	79°30.5	234°17.9	·· 03.8	300°58.8	·· 34.2	293°23.1	·· 17.7	69°33.6	·· 21.1
4	94°33.0	249°21.7	02.8	315°59.9	33.8	308°25.3	17.6	84°36.2	21.1
5	109°35.5	264°25.4	01.8	331°01.1	33.5	323°27.4	17.5	99°38.9	21.0
6	124°37.9	279°29.2	S17°00.8	346°02.2	N17°33.1	338°29.5	N14°17.4	114°41.5	N01°20.9
7	139°40.4	294°32.9	16°59.8	1°03.3	32.8	353°31.7	17.3	129°44.1	20.9
8	154°42.9	309°36.7	58.8	16°04.5	32.5	8°33.8	17.2	144°46.7	20.8
9	169°45.3	324°40.4	·· 57.8	31°05.6	·· 32.1	23°35.9	·· 17.1	159°49.4	·· 20.7
10	184°47.8	339°44.2	56.8	46°06.8	31.8	38°38.1	17.0	174°52.0	20.7
11	199°50.2	354°47.9	55.8	61°07.9	31.4	53°40.2	16.9	189°54.6	20.6
12	214°52.7	9°51.6	S16°54.8	76°09.1	N17°31.1	68°42.4	N14°16.8	204°57.2	N01°20.6
13	229°55.2	24°55.4	53.8	91°10.2	30.7	83°44.5	16.7	219°59.9	20.5
14	244°57.6	39°59.1	52.8	106°11.4	30.4	98°46.6	16.6	235°02.5	20.4
15	260°00.1	55°02.8	·· 51.8	121°12.5	·· 30.1	113°48.8	·· 16.5	250°05.1	·· 20.4
16	275°02.6	70°06.6	50.7	136°13.7	29.7	128°50.9	16.4	265°07.7	20.3
17	290°05.0	85°10.3	49.7	151°14.8	29.4	143°53.0	16.3	280°10.3	20.2
18	305°07.5	100°14.0	S16°48.7	166°16.0	N17°29.0	158°55.2	N14°16.2	295°13.0	N01°20.2
19	320°10.0	115°17.8	47.7	181°17.1	28.7	173°57.3	16.1	310°15.6	20.1
20	335°12.4	130°21.5	46.7	196°18.3	28.4	188°59.4	16.0	325°18.2	20.1
21	350°14.9	145°25.2	·· 45.7	211°19.4	·· 28.0	204°01.6	·· 15.9	340°20.8	·· 20.0
22	5°17.4	160°28.9	44.7	226°20.6	27.7	219°03.7	15.8	355°23.5	19.9
23	20°19.8	175°32.7	43.7	241°21.7	27.3	234°05.9	15.7	10°26.1	19.9
Mer.pass. 21:39		ν 3.8′	d 1.0′	m -4.22	ν 1.1′	d 0.3′	m 0.92	ν 2.1′	d 0.1′ m -1.97	ν 2.6′	d 0.1′ m 0.43

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	35°22.3	190°36.4	S16°42.7	256°22.9	N17°27.0	249°08.0	N14°15.6	25°28.7	N01°19.8
1	50°24.7	205°40.1	41.7	271°24.0	26.7	264°10.1	15.5	40°31.3	19.7
2	65°27.2	220°43.8	40.7	286°25.2	26.3	279°12.3	15.4	55°33.9	19.7
3	80°29.7	235°47.5	·· 39.6	301°26.3	·· 26.0	294°14.4	·· 15.3	70°36.6	·· 19.6
4	95°32.1	250°51.3	38.6	316°27.5	25.6	309°16.6	15.2	85°39.2	19.6
5	110°34.6	265°55.0	37.6	331°28.6	25.3	324°18.7	15.1	100°41.8	19.5
6	125°37.1	280°58.7	S16°36.6	346°29.8	N17°24.9	339°20.8	N14°15.0	115°44.4	N01°19.4
7	140°39.5	296°02.4	35.6	1°30.9	24.6	354°23.0	14.9	130°47.1	19.4
8	155°42.0	311°06.1	34.6	16°32.1	24.3	9°25.1	14.8	145°49.7	19.3
9	170°44.5	326°09.8	·· 33.6	31°33.2	·· 23.9	24°27.3	·· 14.7	160°52.3	·· 19.2
10	185°46.9	341°13.5	32.5	46°34.4	23.6	39°29.4	14.6	175°54.9	19.2
11	200°49.4	356°17.2	31.5	61°35.5	23.2	54°31.5	14.5	190°57.5	19.1
12	215°51.9	11°20.9	S16°30.5	76°36.7	N17°22.9	69°33.7	N14°14.4	206°00.2	N01°19.1
13	230°54.3	26°24.6	29.5	91°37.9	22.6	84°35.8	14.3	221°02.8	19.0
14	245°56.8	41°28.3	28.5	106°39.0	22.2	99°38.0	14.2	236°05.4	18.9
15	260°59.2	56°32.0	·· 27.5	121°40.2	·· 21.9	114°40.1	·· 14.1	251°08.0	·· 18.9
16	276°01.7	71°35.7	26.4	136°41.3	21.5	129°42.2	14.0	266°10.6	18.8
17	291°04.2	86°39.4	25.4	151°42.5	21.2	144°44.4	13.9	281°13.3	18.8
18	306°06.6	101°43.1	S16°24.4	166°43.6	N17°20.8	159°46.5	N14°13.8	296°15.9	N01°18.7
19	321°09.1	116°46.7	23.4	181°44.8	20.5	174°48.7	13.7	311°18.5	18.6
20	336°11.6	131°50.4	22.3	196°46.0	20.2	189°50.8	13.6	326°21.1	18.6
21	351°14.0	146°54.1	·· 21.3	211°47.1	·· 19.8	204°53.0	·· 13.5	341°23.7	·· 18.5
22	6°16.5	161°57.8	20.3	226°48.3	19.5	219°55.1	13.4	356°26.4	18.4
23	21°19.0	177°01.5	19.3	241°49.4	19.1	234°57.2	13.2	11°29.0	18.4
Mer.pass. 21:35		ν 3.7′	d 1.0′	m -4.25	ν 1.2′	d 0.3′	m 0.91	ν 2.1′	d 0.1′ m -1.98	ν 2.6′	d 0.1′ m 0.44

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.5
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.2
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°47.5	89°22.5
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.7	49°57.4
Aldebaran	290°37.7	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.4	46°01.4
Bellatrix	278°21.1	6°22.5
Elnath	277°59.8	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.3	7°24.8
Canopus	263°51.5	-52°42.3
Sirius	258°24.8	-16°45.0
Adhara	255°04.6	-29°00.2
Procyon	244°49.2	5°09.4
Pollux	243°15.5	27°57.6
Avior	234°14.2	-59°35.4
Suhail	222°45.3	-43°32.2
Miaplacidus	221°38.2	-69°49.3
Alphard	217°46.4	-8°46.4
Regulus	207°33.0	11°50.2
Dubhe	193°39.7	61°36.2
Denebola	182°23.7	14°25.3
Gienah	175°42.4	-17°41.3
Acrux	172°59.1	-63°14.7
Gacrux	171°50.5	-57°15.7
Alioth	166°12.2	55°48.8
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.6	-60°30.1
Menkent	147°56.3	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.8
Kochab	137°21.0	74°02.7
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.7
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.8	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.4	38°48.8
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.4	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.2	10°00.1
Al Na'ir	27°30.9	-46°49.9
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.5	28°14.0
Markab	13°28.2	15°21.2

Oct 25 Sun	SHA	Mer.pass
Venus	154°12.2	11:27
Mars	222°04.0	06:58
Jupiter	214°01.6	07:29
Saturn	349°58.7	22:23

Oct 26 Mon	SHA	Mer.pass
Venus	154°43.5	11:21
Mars	221°32.2	06:56
Jupiter	213°53.6	07:26
Saturn	350°02.6	22:18

Oct 27 Tue	SHA	Mer.pass
Venus	155°14.1	11:15
Mars	221°00.6	06:54
Jupiter	213°45.7	07:22
Saturn	350°06.4	22:14

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.0	S12°01.6	20°02.8	11.6′	N09°48.8	15.4′	58.6′
1	198°58.0	02.5	34°33.4	11.5′	10°04.2	15.3′	58.6′
2	213°58.1	03.3	49°04.0	11.4′	10°19.5	15.4′	58.7′
3	228°58.2	·· 04.2	63°34.4	11.4′	10°34.9	15.2′	58.7′
4	243°58.3	05.0	78°04.8	11.3′	10°50.1	15.3′	58.7′
5	258°58.3	05.9	92°35.0	11.2′	11°05.4	15.2′	58.8′
6	273°58.4	S12°06.8	107°05.2	11.1′	N11°20.6	15.1′	58.8′
7	288°58.5	07.6	121°35.3	11.0′	11°35.7	15.2′	58.8′
8	303°58.6	08.5	136°05.3	10.9′	11°50.9	15.0′	58.8′
9	318°58.6	·· 09.3	150°35.2	10.8′	12°05.9	15.0′	58.9′
10	333°58.7	10.2	165°05.0	10.7′	12°20.9	15.0′	58.9′
11	348°58.8	11.1	179°34.7	10.6′	12°35.9	14.9′	58.9′
12	3°58.8	S12°11.9	194°04.3	10.5′	N12°50.8	14.9′	59.0′
13	18°58.9	12.8	208°33.9	10.4′	13°05.7	14.8′	59.0′
14	33°59.0	13.6	223°03.3	10.3′	13°20.5	14.7′	59.0′
15	48°59.1	·· 14.5	237°32.6	10.2′	13°35.2	14.7′	59.0′
16	63°59.1	15.4	252°01.8	10.1′	13°49.9	14.7′	59.1′
17	78°59.2	16.2	266°31.0	10.0′	14°04.6	14.5′	59.1′
18	93°59.3	S12°17.1	281°00.0	9.9′	N14°19.1	14.5′	59.1′
19	108°59.3	17.9	295°28.9	9.8′	14°33.6	14.4′	59.1′
20	123°59.4	18.8	309°57.7	9.7′	14°48.0	14.4′	59.2′
21	138°59.5	·· 19.6	324°26.4	9.6′	15°02.4	14.3′	59.2′
22	153°59.6	20.5	338°55.0	9.5′	15°16.7	14.2′	59.2′
23	168°59.6	21.3	353°23.5	9.4′	15°30.9	14.1′	59.2′
	SD = 16.1′	d = 0.9′		SD = 16.0′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.7	S12°22.2	7°51.9	9.3′	N15°45.0	14.1′	59.3′
1	198°59.8	23.1	22°20.2	9.2′	15°59.1	14.0′	59.3′
2	213°59.8	23.9	36°48.4	9.1′	16°13.1	13.9′	59.3′
3	228°59.9	·· 24.8	51°16.5	9.0′	16°27.0	13.8′	59.3′
4	244°00.0	25.6	65°44.4	8.9′	16°40.8	13.7′	59.4′
5	259°00.0	26.5	80°12.3	8.7′	16°54.5	13.7′	59.4′
6	274°00.1	S12°27.3	94°40.0	8.6′	N17°08.2	13.5′	59.4′
7	289°00.2	28.2	109°07.7	8.5′	17°21.7	13.5′	59.4′
8	304°00.2	29.0	123°35.2	8.4′	17°35.2	13.4′	59.5′
9	319°00.3	·· 29.9	138°02.6	8.3′	17°48.6	13.2′	59.5′
10	334°00.4	30.7	152°29.9	8.2′	18°01.8	13.2′	59.5′
11	349°00.4	31.6	166°57.1	8.1′	18°15.0	13.1′	59.5′
12	4°00.5	S12°32.4	181°24.1	8.0′	N18°28.1	13.0′	59.5′
13	19°00.6	33.3	195°51.1	7.8′	18°41.1	12.9′	59.6′
14	34°00.6	34.1	210°17.9	7.7′	18°54.0	12.7′	59.6′
15	49°00.7	·· 35.0	224°44.7	7.6′	19°06.7	12.7′	59.6′
16	64°00.7	35.8	239°11.3	7.5′	19°19.4	12.5′	59.6′
17	79°00.8	36.7	253°37.8	7.4′	19°31.9	12.5′	59.6′
18	94°00.9	S12°37.5	268°04.1	7.3′	N19°44.4	12.3′	59.7′
19	109°00.9	38.4	282°30.4	7.2′	19°56.7	12.2′	59.7′
20	124°01.0	39.2	296°56.6	7.0′	20°08.9	12.1′	59.7′
21	139°01.1	·· 40.1	311°22.6	6.9′	20°21.0	12.0′	59.7′
22	154°01.1	40.9	325°48.5	6.8′	20°33.0	11.8′	59.7′
23	169°01.2	41.8	340°14.3	6.7′	20°44.8	11.8′	59.7′
	SD = 16.1′	d = 0.9′		SD = 16.2′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.2	S12°42.6	354°40.0	6.6′	N20°56.6	11.6′	59.8′
1	199°01.3	43.5	9°05.6	6.5′	21°08.2	11.4′	59.8′
2	214°01.4	44.3	23°31.1	6.3′	21°19.6	11.4′	59.8′
3	229°01.4	·· 45.2	37°56.4	6.2′	21°31.0	11.2′	59.8′
4	244°01.5	46.0	52°21.6	6.1′	21°42.2	11.1′	59.8′
5	259°01.5	46.8	66°46.8	6.0′	21°53.3	10.9′	59.8′
6	274°01.6	S12°47.7	81°11.8	5.9′	N22°04.2	10.8′	59.8′
7	289°01.7	48.5	95°36.7	5.8′	22°15.0	10.7′	59.9′
8	304°01.7	49.4	110°01.4	5.7′	22°25.7	10.5′	59.9′
9	319°01.8	·· 50.2	124°26.1	5.6′	22°36.2	10.3′	59.9′
10	334°01.8	51.1	138°50.7	5.5′	22°46.5	10.3′	59.9′
11	349°01.9	51.9	153°15.1	5.3′	22°56.8	10.1′	59.9′
12	4°02.0	S12°52.8	167°39.5	5.2′	N23°06.9	9.9′	59.9′
13	19°02.0	53.6	182°03.7	5.1′	23°16.8	9.8′	59.9′
14	34°02.1	54.4	196°27.8	5.0′	23°26.6	9.6′	59.9′
15	49°02.1	·· 55.3	210°51.9	4.9′	23°36.2	9.5′	60.0′
16	64°02.2	56.1	225°15.8	4.8′	23°45.7	9.3′	60.0′
17	79°02.2	57.0	239°39.6	4.7′	23°55.0	9.1′	60.0′
18	94°02.3	S12°57.8	254°03.3	4.6′	N24°04.1	9.0′	60.0′
19	109°02.3	58.6	268°26.9	4.5′	24°13.1	8.8′	60.0′
20	124°02.4	12°59.5	282°50.4	4.4′	24°21.9	8.7′	60.0′
21	139°02.5	13°00.3	297°13.8	4.3′	24°30.6	8.5′	60.0′
22	154°02.5	01.2	311°37.2	4.2′	24°39.1	8.3′	60.0′
23	169°02.6	02.0	326°00.4	4.1′	24°47.4	8.2′	60.0′
	SD = 16.1′	d = 0.8′		SD = 16.3′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:42	07:02	08:21	15:05	16:24	17:44
N 70°	05:40	06:53	08:02	15:25	16:34	17:46
68°	05:39	06:45	07:46	15:40	16:42	17:47
66°	05:38	06:38	07:34	15:53	16:49	17:49
64°	05:36	06:32	07:23	16:04	16:54	17:50
62°	05:35	06:27	07:14	16:12	17:00	17:51
60°	05:34	06:23	07:07	16:20	17:04	17:53
N 58°	05:33	06:19	07:00	16:27	17:08	17:54
56°	05:32	06:15	06:54	16:33	17:12	17:55
54°	05:31	06:12	06:49	16:38	17:15	17:56
52°	05:29	06:09	06:44	16:43	17:18	17:58
50°	05:28	06:06	06:40	16:48	17:21	17:59
45°	05:26	06:00	06:30	16:57	17:27	18:02
N 40°	05:23	05:54	06:22	17:05	17:33	18:05
35°	05:20	05:49	06:15	17:12	17:38	18:08
30°	05:17	05:45	06:09	17:18	17:43	18:11
20°	05:10	05:36	05:59	17:29	17:51	18:17
N 10°	05:03	05:28	05:49	17:38	18:00	18:25
0°	04:55	05:19	05:41	17:47	18:09	18:33
S 10°	04:45	05:10	05:32	17:56	18:18	18:43
20°	04:33	04:59	05:22	18:06	18:29	18:56
30°	04:16	04:46	05:11	18:18	18:43	19:12
35°	04:06	04:38	05:04	18:24	18:51	19:23
40°	03:54	04:28	04:57	18:32	19:01	19:35
45°	03:38	04:17	04:48	18:41	19:12	19:51
S 50°	03:18	04:02	04:38	18:51	19:27	20:11
52°	03:09	03:56	04:33	18:56	19:34	20:21
54°	02:57	03:48	04:27	19:02	19:42	20:33
56°	02:44	03:39	04:21	19:08	19:50	20:46
58°	02:28	03:29	04:14	19:15	20:01	21:02
S 60°	02:09	03:18	04:07	19:23	20:12	21:23

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	14:03	▭	▭	07:31	▭	▭
N 70°	14:27	13:26	▭	07:10	10:00	▭
68°	14:45	14:10	▭	06:53	09:17	▭
66°	15:00	14:40	13:54	06:40	08:49	11:34
64°	15:13	15:02	14:46	06:29	08:28	10:43
62°	15:23	15:20	15:18	06:20	08:11	10:12
60°	15:32	15:35	15:42	06:13	07:57	09:48
N 58°	15:40	15:48	16:02	06:06	07:45	09:30
56°	15:47	15:59	16:18	06:00	07:35	09:14
54°	15:54	16:09	16:32	05:54	07:26	09:01
52°	15:59	16:18	16:44	05:50	07:18	08:49
50°	16:05	16:26	16:55	05:45	07:11	08:39
45°	16:16	16:43	17:18	05:36	06:55	08:17
N 40°	16:26	16:57	17:36	05:28	06:43	08:00
35°	16:34	17:09	17:52	05:21	06:32	07:46
30°	16:41	17:20	18:05	05:16	06:23	07:33
20°	16:53	17:38	18:28	05:06	06:07	07:12
N 10°	17:05	17:54	18:48	04:57	05:53	06:53
0°	17:15	18:09	19:07	04:49	05:40	06:36
S 10°	17:26	18:24	19:26	04:41	05:27	06:19
20°	17:37	18:40	19:47	04:32	05:13	06:01
30°	17:50	18:59	20:11	04:22	04:58	05:40
35°	17:58	19:10	20:25	04:16	04:49	05:27
40°	18:07	19:23	20:41	04:10	04:39	05:13
45°	18:17	19:38	21:01	04:03	04:27	04:57
S 50°	18:30	19:57	21:25	03:54	04:12	04:37
52°	18:35	20:06	21:38	03:50	04:06	04:27
54°	18:42	20:16	21:51	03:45	03:58	04:17
56°	18:49	20:27	22:07	03:41	03:50	04:04
58°	18:57	20:40	22:26	03:35	03:41	03:51
S 60°	19:07	20:56	22:50	03:29	03:30	03:34

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 15-17 98-99%
25	15:52	15:55	11:44	23:27	11:02	
26	15:59	16:02	11:44	–:–	11:54	
27	16:05	16:08	11:44	00:22	12:51	

October 28, 29, 30 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	36°21.4	192°05.1	S16°18.3	256°50.6	N17°18.8	249°59.4	N14°13.1	26°31.6	N01°18.3
1	51°23.9	207°08.8	17.2	271°51.8	18.5	265°01.5	13.0	41°34.2	18.3
2	66°26.3	222°12.5	16.2	286°52.9	18.1	280°03.7	12.9	56°36.8	18.2
3	81°28.8	237°16.2	·· 15.2	301°54.1	·· 17.8	295°05.8	·· 12.8	71°39.5	·· 18.1
4	96°31.3	252°19.8	14.2	316°55.2	17.4	310°08.0	12.7	86°42.1	18.1
5	111°33.7	267°23.5	13.1	331°56.4	17.1	325°10.1	12.6	101°44.7	18.0
6	126°36.2	282°27.2	S16°12.1	346°57.6	N17°16.7	340°12.2	N14°12.5	116°47.3	N01°18.0
7	141°38.7	297°30.8	11.1	1°58.7	16.4	355°14.4	12.4	131°49.9	17.9
8	156°41.1	312°34.5	10.1	16°59.9	16.1	10°16.5	12.3	146°52.6	17.8
9	171°43.6	327°38.1	·· 09.0	32°01.1	·· 15.7	25°18.7	·· 12.2	161°55.2	·· 17.8
10	186°46.1	342°41.8	08.0	47°02.2	15.4	40°20.8	12.1	176°57.8	17.7
11	201°48.5	357°45.4	07.0	62°03.4	15.0	55°23.0	12.0	192°00.4	17.7
12	216°51.0	12°49.1	S16°06.0	77°04.6	N17°14.7	70°25.1	N14°12.0	207°03.0	N01°17.6
13	231°53.5	27°52.7	04.9	92°05.7	14.3	85°27.3	11.9	222°05.7	17.5
14	246°55.9	42°56.4	03.9	107°06.9	14.0	100°29.4	11.8	237°08.3	17.5
15	261°58.4	58°00.0	·· 02.9	122°08.1	·· 13.7	115°31.6	·· 11.7	252°10.9	·· 17.4
16	277°00.8	73°03.7	01.8	137°09.2	13.3	130°33.7	11.6	267°13.5	17.3
17	292°03.3	88°07.3	16°00.8	152°10.4	13.0	145°35.9	11.5	282°16.1	17.3
18	307°05.8	103°11.0	S15°59.8	167°11.6	N17°12.6	160°38.0	N14°11.4	297°18.8	N01°17.2
19	322°08.2	118°14.6	58.8	182°12.7	12.3	175°40.2	11.3	312°21.4	17.2
20	337°10.7	133°18.2	57.7	197°13.9	11.9	190°42.3	11.2	327°24.0	17.1
21	352°13.2	148°21.9	·· 56.7	212°15.1	·· 11.6	205°44.5	·· 11.1	342°26.6	·· 17.0
22	7°15.6	163°25.5	55.7	227°16.2	11.3	220°46.6	11.0	357°29.2	17.0
23	22°18.1	178°29.1	54.6	242°17.4	10.9	235°48.7	10.9	12°31.8	16.9
Mer.pass. 21:31		ν 3.7′ d 1.0′		m -4.27		ν 1.2′ d 0.3′		m 0.90	
		ν 2.1′ d 0.1′		m -1.98		ν 2.6′ d 0.1′		m 0.44	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	37°20.6	193°32.7	S15°53.6	257°18.6	N17°10.6	250°50.9	N14°10.8	27°34.5	N01°16.9
1	52°23.0	208°36.4	52.6	272°19.7	10.2	265°53.0	10.7	42°37.1	16.8
2	67°25.5	223°40.0	51.5	287°20.9	09.9	280°55.2	10.6	57°39.7	16.7
3	82°28.0	238°43.6	·· 50.5	302°22.1	·· 09.6	295°57.3	·· 10.5	72°42.3	·· 16.7
4	97°30.4	253°47.2	49.5	317°23.2	09.2	310°59.5	10.4	87°44.9	16.6
5	112°32.9	268°50.8	48.5	332°24.4	08.9	326°01.6	10.3	102°47.5	16.6
6	127°35.3	283°54.4	S15°47.4	347°25.6	N17°08.5	341°03.8	N14°10.2	117°50.2	N01°16.5
7	142°37.8	298°58.0	46.4	2°26.8	08.2	356°05.9	10.1	132°52.8	16.4
8	157°40.3	314°01.6	45.4	17°27.9	07.8	11°08.1	10.0	147°55.4	16.4
9	172°42.7	329°05.2	·· 44.3	32°29.1	·· 07.5	26°10.2	·· 09.9	162°58.0	·· 16.3
10	187°45.2	344°08.8	43.3	47°30.3	07.2	41°12.4	09.8	178°00.6	16.3
11	202°47.7	359°12.4	42.3	62°31.5	06.8	56°14.6	09.7	193°03.3	16.2
12	217°50.1	14°16.0	S15°41.2	77°32.6	N17°06.5	71°16.7	N14°09.6	208°05.9	N01°16.2
13	232°52.6	29°19.6	40.2	92°33.8	06.1	86°18.9	09.5	223°08.5	16.1
14	247°55.1	44°23.2	39.2	107°35.0	05.8	101°21.0	09.4	238°11.1	16.0
15	262°57.5	59°26.8	·· 38.1	122°36.2	·· 05.4	116°23.2	·· 09.3	253°13.7	·· 16.0
16	278°00.0	74°30.4	37.1	137°37.3	05.1	131°25.3	09.2	268°16.3	15.9
17	293°02.5	89°34.0	36.1	152°38.5	04.8	146°27.5	09.1	283°19.0	15.9
18	308°04.9	104°37.6	S15°35.0	167°39.7	N17°04.4	161°29.6	N14°09.0	298°21.6	N01°15.8
19	323°07.4	119°41.1	34.0	182°40.9	04.1	176°31.8	08.9	313°24.2	15.7
20	338°09.8	134°44.7	33.0	197°42.0	03.7	191°33.9	08.8	328°26.8	15.7
21	353°12.3	149°48.3	·· 32.0	212°43.2	·· 03.4	206°36.1	·· 08.7	343°29.4	·· 15.6
22	8°14.8	164°51.9	30.9	227°44.4	03.0	221°38.2	08.6	358°32.0	15.6
23	23°17.2	179°55.4	29.9	242°45.6	02.7	236°40.4	08.5	13°34.6	15.5
Mer.pass. 21:27		ν 3.6′ d 1.0′		m -4.26		ν 1.2′ d 0.3′		m 0.89	
		ν 2.1′ d 0.1′		m -1.99		ν 2.6′ d 0.1′		m 0.45	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	38°19.7	194°59.0	S15°28.9	257°46.7	N17°02.4	251°42.5	N14°08.4	28°37.3	N01°15.4
1	53°22.2	210°02.5	27.8	272°47.9	02.0	266°44.7	08.3	43°39.9	15.4
2	68°24.6	225°06.1	26.8	287°49.1	01.7	281°46.9	08.2	58°42.5	15.3
3	83°27.1	240°09.7	·· 25.8	302°50.3	·· 01.3	296°49.0	·· 08.1	73°45.1	·· 15.3
4	98°29.6	255°13.2	24.7	317°51.5	01.0	311°51.2	08.0	88°47.7	15.2
5	113°32.0	270°16.8	23.7	332°52.6	00.6	326°53.3	07.9	103°50.3	15.1
6	128°34.5	285°20.3	S15°22.7	347°53.8	N17°00.3	341°55.5	N14°07.8	118°53.0	N01°15.1
7	143°37.0	300°23.9	21.7	2°55.0	17°00.0	356°57.6	07.7	133°55.6	15.0
8	158°39.4	315°27.4	20.6	17°56.2	16°59.6	11°59.8	07.6	148°58.2	15.0
9	173°41.9	330°30.9	·· 19.6	32°57.4	·· 59.3	27°01.9	·· 07.5	164°00.8	·· 14.9
10	188°44.3	345°34.5	18.6	47°58.6	58.9	42°04.1	07.5	179°03.4	14.9
11	203°46.8	0°38.0	17.5	62°59.7	58.6	57°06.3	07.4	194°06.0	14.8
12	218°49.3	15°41.5	S15°16.5	78°00.9	N16°58.2	72°08.4	N14°07.3	209°08.6	N01°14.7
13	233°51.7	30°45.1	15.5	93°02.1	57.9	87°10.6	07.2	224°11.3	14.7
14	248°54.2	45°48.6	14.4	108°03.3	57.6	102°12.7	07.1	239°13.9	14.6
15	263°56.7	60°52.1	·· 13.4	123°04.5	·· 57.2	117°14.9	·· 07.0	254°16.5	·· 14.6
16	278°59.1	75°55.6	12.4	138°05.7	56.9	132°17.0	06.9	269°19.1	14.5
17	294°01.6	90°59.2	11.4	153°06.9	56.5	147°19.2	06.8	284°21.7	14.4
18	309°04.1	106°02.7	S15°10.3	168°08.0	N16°56.2	162°21.4	N14°06.7	299°24.3	N01°14.4
19	324°06.5	121°06.2	09.3	183°09.2	55.8	177°23.5	06.6	314°26.9	14.3
20	339°09.0	136°09.7	08.3	198°10.4	55.5	192°25.7	06.5	329°29.6	14.3
21	354°11.5	151°13.2	·· 07.3	213°11.6	·· 55.2	207°27.8	·· 06.4	344°32.2	·· 14.2
22	9°13.9	166°16.7	06.2	228°12.8	54.8	222°30.0	06.3	359°34.8	14.2
23	24°16.4	181°20.2	05.2	243°14.0	54.5	237°32.2	06.2	14°37.4	14.1
Mer.pass. 21:23		ν 3.6′ d 1.0′		m -4.20		ν 1.2′ d 0.3′		m 0.88	
		ν 2.2′ d 0.1′		m -1.99		ν 2.6′ d 0.1′		m 0.45	

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.6
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°46.5	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.4	46°01.4
Bellatrix	278°21.1	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.3	7°24.8
Canopus	263°51.5	-52°42.3
Sirius	258°24.8	-16°45.0
Adhara	255°04.6	-29°00.3
Procyon	244°49.2	5°09.4
Pollux	243°15.4	27°57.6
Avior	234°14.1	-59°35.4
Suhail	222°45.3	-43°32.2
Miaplacidus	221°38.1	-69°49.3
Alphard	217°46.4	-8°46.4
Regulus	207°33.0	11°50.2
Dubhe	193°39.7	61°36.2
Denebola	182°23.7	14°25.3
Gienah	175°42.4	-17°41.3
Acrux	172°59.1	-63°14.7
Gacrux	171°50.5	-57°15.7
Alioth	166°12.2	55°48.7
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.6	-60°30.1
Menkent	147°56.3	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.7
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.6
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.8	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.4	38°48.8
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.4	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°49.9
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.5	28°14.0
Markab	13°28.2	15°21.2

Oct 28 Wed	SHA	Mer.pass
Venus	155°43.7	11:09
Mars	220°29.2	06:52
Jupiter	213°38.0	07:19
Saturn	350°10.2	22:10

Oct 29 Thu	SHA	Mer.pass
Venus	156°12.2	11:03
Mars	219°58.0	06:50
Jupiter	213°30.3	07:16
Saturn	350°13.9	22:06

Oct 30 Fri	SHA	Mer.pass
Venus	156°39.3	10:57
Mars	219°27.0	06:48
Jupiter	213°22.8	07:12
Saturn	350°17.6	22:02

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°02.6	S13°02.8	340°23.5	4.0′	N24°55.6	8.0′	60.0′
1	199°02.7	03.7	354°46.5	3.9′	25°03.6	7.8′	60.0′
2	214°02.7	04.5	9°09.5	3.8′	25°11.4	7.6′	60.1′
3	229°02.8	·· 05.4	23°32.3	3.8′	25°19.0	7.5′	60.1′
4	244°02.8	06.2	37°55.1	3.7′	25°26.5	7.3′	60.1′
5	259°02.9	07.0	52°17.7	3.6′	25°33.8	7.1′	60.1′
6	274°02.9	S13°07.9	66°40.3	3.5′	N25°40.9	6.9′	60.1′
7	289°03.0	08.7	81°02.8	3.4′	25°47.8	6.7′	60.1′
8	304°03.0	09.5	95°25.3	3.4′	25°54.5	6.6′	60.1′
9	319°03.1	·· 10.4	109°47.6	3.3′	26°01.1	6.4′	60.1′
10	334°03.1	11.2	124°09.9	3.2′	26°07.5	6.2′	60.1′
11	349°03.2	12.0	138°32.1	3.1′	26°13.7	6.0′	60.1′
12	4°03.2	S13°12.9	152°54.2	3.1′	N26°19.7	5.8′	60.1′
13	19°03.3	13.7	167°16.3	3.0′	26°25.5	5.6′	60.1′
14	34°03.3	14.5	181°38.3	2.9′	26°31.1	5.4′	60.1′
15	49°03.4	·· 15.4	196°00.2	2.9′	26°36.5	5.3′	60.1′
16	64°03.4	16.2	210°22.1	2.8′	26°41.8	5.0′	60.1′
17	79°03.5	17.0	224°43.9	2.8′	26°46.8	4.8′	60.1′
18	94°03.5	S13°17.9	239°05.6	2.7′	N26°51.6	4.7′	60.1′
19	109°03.6	18.7	253°27.3	2.6′	26°56.3	4.5′	60.1′
20	124°03.6	19.5	267°49.0	2.6′	27°00.8	4.2′	60.1′
21	139°03.7	·· 20.4	282°10.6	2.5′	27°05.0	4.1′	60.1′
22	154°03.7	21.2	296°32.1	2.5′	27°09.1	3.9′	60.1′
23	169°03.7	22.0	310°53.6	2.5′	27°13.0	3.6′	60.1′
	SD = 16.1′	d = 0.8′	SD = 16.4′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°03.8	S13°22.9	325°15.1	2.4′	N27°16.6	3.5′	60.1′
1	199°03.8	23.7	339°36.5	2.4′	27°20.1	3.3′	60.1′
2	214°03.9	24.5	353°57.9	2.4′	27°23.4	3.0′	60.1′
3	229°03.9	·· 25.3	8°19.3	2.3′	27°26.4	2.9′	60.1′
4	244°04.0	26.2	22°40.6	2.3′	27°29.3	2.6′	60.1′
5	259°04.0	27.0	37°01.9	2.3′	27°31.9	2.5′	60.1′
6	274°04.1	S13°27.8	51°23.2	2.3′	N27°34.4	2.2′	60.1′
7	289°04.1	28.7	65°44.4	2.2′	27°36.6	2.1′	60.1′
8	304°04.1	29.5	80°05.7	2.2′	27°38.7	1.8′	60.1′
9	319°04.2	·· 30.3	94°26.9	2.2′	27°40.5	1.7′	60.1′
10	334°04.2	31.1	108°48.1	2.2′	27°42.2	1.4′	60.1′
11	349°04.3	32.0	123°09.3	2.2′	27°43.6	1.2′	60.0′
12	4°04.3	S13°32.8	137°30.5	2.2′	N27°44.8	1.1′	60.0′
13	19°04.3	33.6	151°51.7	2.2′	27°45.9	0.8′	60.0′
14	34°04.4	34.4	166°12.9	2.2′	27°46.7	0.6′	60.0′
15	49°04.4	·· 35.3	180°34.1	2.2′	27°47.3	0.4′	60.0′
16	64°04.5	36.1	194°55.3	2.2′	27°47.7	0.2′	60.0′
17	79°04.5	36.9	209°16.6	2.2′	27°47.9	0.0′	60.0′
18	94°04.5	S13°37.7	223°37.8	2.2′	N27°47.9	0.2′	60.0′
19	109°04.6	38.6	237°59.0	2.3′	27°47.7	0.4′	60.0′
20	124°04.6	39.4	252°20.3	2.3′	27°47.3	0.6′	60.0′
21	139°04.7	·· 40.2	266°41.6	2.3′	27°46.7	0.8′	60.0′
22	154°04.7	41.0	281°02.9	2.3′	27°45.9	1.0′	60.0′
23	169°04.7	41.8	295°24.2	2.4′	27°44.9	1.2′	60.0′
	SD = 16.1′	d = 0.8′	SD = 16.4′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°04.8	S13°42.7	309°45.6	2.4′	N27°43.7	1.4′	59.9′
1	199°04.8	43.5	324°07.0	2.4′	27°42.3	1.7′	59.9′
2	214°04.8	44.3	338°28.4	2.5′	27°40.6	1.8′	59.9′
3	229°04.9	·· 45.1	352°49.9	2.5′	27°38.8	2.0′	59.9′
4	244°04.9	45.9	7°11.4	2.6′	27°36.8	2.2′	59.9′
5	259°05.0	46.8	21°33.0	2.6′	27°34.6	2.4′	59.9′
6	274°05.0	S13°47.6	35°54.6	2.7′	N27°32.2	2.7′	59.9′
7	289°05.0	48.4	50°16.3	2.7′	27°29.5	2.8′	59.9′
8	304°05.1	49.2	64°38.0	2.8′	27°26.7	3.0′	59.9′
9	319°05.1	·· 50.0	78°59.7	2.8′	27°23.7	3.2′	59.8′
10	334°05.1	50.9	93°21.6	2.9′	27°20.5	3.4′	59.8′
11	349°05.2	51.7	107°43.4	2.9′	27°17.1	3.6′	59.8′
12	4°05.2	S13°52.5	122°05.4	3.0′	N27°13.5	3.8′	59.8′
13	19°05.2	53.3	136°27.4	3.1′	27°09.7	3.9′	59.8′
14	34°05.3	54.1	150°49.5	3.1′	27°05.8	4.2′	59.8′
15	49°05.3	·· 54.9	165°11.6	3.2′	27°01.6	4.4′	59.8′
16	64°05.3	55.8	179°33.8	3.3′	26°57.2	4.5′	59.8′
17	79°05.3	56.6	193°56.1	3.4′	26°52.7	4.7′	59.7′
18	94°05.4	S13°57.4	208°18.5	3.5′	N26°48.0	5.0′	59.7′
19	109°05.4	58.2	222°41.0	3.5′	26°43.0	5.1′	59.7′
20	124°05.4	59.0	237°03.5	3.6′	26°37.9	5.2′	59.7′
21	139°05.5	13°59.8	251°26.1	3.7′	26°32.7	5.5′	59.7′
22	154°05.5	14°00.6	265°48.8	3.8′	26°27.2	5.6′	59.7′
23	169°05.5	01.5	280°11.6	3.9′	26°21.6	5.9′	59.6′
	SD = 16.1′	d = 0.8′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	05:54	07:16	08:38	14:47	16:10	17:31
N 70°	05:51	07:04	08:16	15:10	16:22	17:34
68°	05:49	06:55	07:58	15:28	16:31	17:37
66°	05:47	06:47	07:44	15:42	16:39	17:39
64°	05:44	06:41	07:33	15:54	16:45	17:42
62°	05:43	06:35	07:23	16:04	16:51	17:44
60°	05:41	06:30	07:14	16:12	16:57	17:46
N 58°	05:39	06:25	07:07	16:20	17:01	17:47
56°	05:37	06:21	07:00	16:26	17:05	17:49
54°	05:36	06:18	06:55	16:32	17:09	17:51
52°	05:34	06:14	06:49	16:37	17:13	17:52
50°	05:33	06:11	06:45	16:42	17:16	17:54
45°	05:29	06:04	06:34	16:53	17:23	17:57
N 40°	05:26	05:58	06:26	17:01	17:29	18:01
35°	05:22	05:52	06:18	17:09	17:35	18:05
30°	05:19	05:47	06:12	17:16	17:40	18:08
20°	05:11	05:37	06:00	17:27	17:50	18:16
N 10°	05:03	05:28	05:50	17:37	17:59	18:24
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:44	05:09	05:31	17:57	18:19	18:44
20°	04:30	04:57	05:20	18:08	18:30	18:57
30°	04:13	04:43	05:08	18:20	18:45	19:15
35°	04:02	04:34	05:01	18:27	18:54	19:26
40°	03:49	04:24	04:53	18:35	19:04	19:39
45°	03:33	04:12	04:43	18:45	19:17	19:56
S 50°	03:11	03:56	04:32	18:57	19:32	20:18
52°	03:01	03:49	04:27	19:02	19:40	20:28
54°	02:49	03:41	04:21	19:08	19:48	20:41
56°	02:34	03:31	04:14	19:15	19:58	20:56
58°	02:17	03:21	04:07	19:22	20:09	21:14
S 60°	01:55	03:08	03:58	19:31	20:22	21:36

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	▭	▭	▭	▭
62°	15:19	15:40	17:21	12:20	14:15	14:49
60°	15:59	16:42	18:06	11:40	13:13	14:03
N 58°	16:27	17:16	18:35	11:13	12:39	13:34
56°	16:49	17:41	18:58	10:51	12:14	13:11
54°	17:07	18:01	19:16	10:33	11:53	12:52
52°	17:22	18:18	19:32	10:18	11:37	12:36
50°	17:36	18:33	19:46	10:05	11:22	12:22
45°	18:03	19:02	20:13	09:39	10:53	11:54
N 40°	18:25	19:25	20:35	09:17	10:30	11:32
35°	18:43	19:44	20:53	09:00	10:11	11:13
30°	18:59	20:01	21:08	08:45	09:54	10:57
20°	19:25	20:28	21:35	08:19	09:27	10:30
N 10°	19:48	20:52	21:57	07:57	09:03	10:07
0°	20:10	21:15	22:18	07:37	08:41	09:45
S 10°	20:31	21:37	22:39	07:16	08:18	09:23
20°	20:55	22:01	23:02	06:54	07:55	09:00
30°	21:22	22:29	23:28	06:29	07:27	08:32
35°	21:38	22:45	23:43	06:14	07:11	08:16
40°	21:57	23:04	·· ··	05:57	06:52	07:57
45°	22:19	23:28	·· ··	05:36	06:28	07:34
S 50°	22:48	23:57	·· ··	05:11	05:59	07:04
52°	23:03	·· ··	00:12	04:58	05:45	06:50
54°	23:19	·· ··	00:29	04:44	05:28	06:33
56°	23:39	·· ··	00:50	04:28	05:08	06:12
58°	·· ··	00:04	01:15	04:08	04:43	05:47
S 60°	·· ··	00:38	01:50	03:44	04:09	05:12

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 95-81%
28	16:10	16:13	11:44	01:22	13:53	
29	16:15	16:17	11:44	02:25	14:58	
30	16:19	16:21	11:44	03:30	16:02	

October 31, 01, 02 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	39°18.8	196°23.7	S15°04.2	258°15.2	N16°54.1	252°34.3	N14°06.1	29°40.0	N01°14.0
1	54°21.3	211°27.2	03.2	273°16.3	53.8	267°36.5	06.0	44°42.6	14.0
2	69°23.8	226°30.7	02.1	288°17.5	53.4	282°38.6	05.9	59°45.2	13.9
3	84°26.2	241°34.2	·· 01.1	303°18.7	·· 53.1	297°40.8	·· 05.8	74°47.9	·· 13.9
4	99°28.7	256°37.7	15°00.1	318°19.9	52.8	312°43.0	05.7	89°50.5	13.8
5	114°31.2	271°41.1	14°59.1	333°21.1	52.4	327°45.1	05.6	104°53.1	13.8
6	129°33.6	286°44.6	S14°58.0	348°22.3	N16°52.1	342°47.3	N14°05.5	119°55.7	N01°13.7
7	144°36.1	301°48.1	57.0	3°23.5	51.7	357°49.4	05.4	134°58.3	13.6
8	159°38.6	316°51.6	56.0	18°24.7	51.4	12°51.6	05.4	150°00.9	13.6
9	174°41.0	331°55.0	·· 55.0	33°25.9	·· 51.1	27°53.8	·· 05.3	165°03.5	·· 13.5
10	189°43.5	346°58.5	53.9	48°27.1	50.7	42°55.9	05.2	180°06.1	13.5
11	204°46.0	2°02.0	52.9	63°28.3	50.4	57°58.1	05.1	195°08.8	13.4
12	219°48.4	17°05.4	S14°51.9	78°29.5	N16°50.0	73°00.3	N14°05.0	210°11.4	N01°13.4
13	234°50.9	32°08.9	50.9	93°30.6	49.7	88°02.4	04.9	225°14.0	13.3
14	249°53.3	47°12.4	49.9	108°31.8	49.3	103°04.6	04.8	240°16.6	13.2
15	264°55.8	62°15.8	·· 48.8	123°33.0	·· 49.0	118°06.7	·· 04.7	255°19.2	·· 13.2
16	279°58.3	77°19.3	47.8	138°34.2	48.7	133°08.9	04.6	270°21.8	13.1
17	295°00.7	92°22.7	46.8	153°35.4	48.3	148°11.1	04.5	285°24.4	13.1
18	310°03.2	107°26.1	S14°45.8	168°36.6	N16°48.0	163°13.2	N14°04.4	300°27.0	N01°13.0
19	325°05.7	122°29.6	44.8	183°37.8	47.6	178°15.4	04.3	315°29.6	13.0
20	340°08.1	137°33.0	43.8	198°39.0	47.3	193°17.6	04.2	330°32.3	12.9
21	355°10.6	152°36.5	·· 42.7	213°40.2	·· 46.9	208°19.7	·· 04.1	345°34.9	·· 12.8
22	10°13.1	167°39.9	41.7	228°41.4	46.6	223°21.9	04.0	0°37.5	12.8
23	25°15.5	182°43.3	40.7	243°42.6	46.3	238°24.1	03.9	15°40.1	12.7
Mer.pass. 21:19		ν 3.5′	d 1.0′	m -4.09	ν 1.2′	d 0.3′	m 0.87	ν 2.2′	d 0.1′ m -2.00	ν 2.6′	d 0.1′ m 0.46

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	40°18.0	197°46.7	S14°39.7	258°43.8	N16°45.9	253°26.2	N14°03.9	30°42.7	N01°12.7
1	55°20.4	212°50.2	38.7	273°45.0	45.6	268°28.4	03.8	45°45.3	12.6
2	70°22.9	227°53.6	37.7	288°46.2	45.2	283°30.6	03.7	60°47.9	12.6
3	85°25.4	242°57.0	·· 36.7	303°47.4	·· 44.9	298°32.7	·· 03.6	75°50.5	·· 12.5
4	100°27.8	258°00.4	35.6	318°48.6	44.5	313°34.9	03.5	90°53.1	12.4
5	115°30.3	273°03.8	34.6	333°49.8	44.2	328°37.1	03.4	105°55.8	12.4
6	130°32.8	288°07.2	S14°33.6	348°51.0	N16°43.9	343°39.2	N14°03.3	120°58.4	N01°12.3
7	145°35.2	303°10.6	32.6	3°52.2	43.5	358°41.4	03.2	136°01.0	12.3
8	160°37.7	318°14.0	31.6	18°53.4	43.2	13°43.6	03.1	151°03.6	12.2
9	175°40.2	333°17.4	·· 30.6	33°54.6	·· 42.8	28°45.7	·· 03.0	166°06.2	·· 12.2
10	190°42.6	348°20.8	29.6	48°55.8	42.5	43°47.9	02.9	181°08.8	12.1
11	205°45.1	3°24.2	28.6	63°57.0	42.1	58°50.1	02.8	196°11.4	12.1
12	220°47.6	18°27.6	S14°27.6	78°58.2	N16°41.8	73°52.2	N14°02.7	211°14.0	N01°12.0
13	235°50.0	33°31.0	26.6	93°59.4	41.5	88°54.4	02.6	226°16.6	11.9
14	250°52.5	48°34.3	25.5	109°00.6	41.1	103°56.6	02.6	241°19.2	11.9
15	265°54.9	63°37.7	·· 24.5	124°01.8	·· 40.8	118°58.7	·· 02.5	256°21.9	·· 11.8
16	280°57.4	78°41.1	23.5	139°03.0	40.4	134°00.9	02.4	271°24.5	11.8
17	295°59.9	93°44.5	22.5	154°04.2	40.1	149°03.1	02.3	286°27.1	11.7
18	311°02.3	108°47.8	S14°21.5	169°05.4	N16°39.7	164°05.3	N14°02.2	301°29.7	N01°11.7
19	326°04.8	123°51.2	20.5	184°06.6	39.4	179°07.4	02.1	316°32.3	11.6
20	341°07.3	138°54.6	19.5	199°07.8	39.1	194°09.6	02.0	331°34.9	11.6
21	356°09.7	153°57.9	·· 18.5	214°09.0	·· 38.7	209°11.8	·· 01.9	346°37.5	·· 11.5
22	11°12.2	169°01.3	17.5	229°10.3	38.4	224°13.9	01.8	1°40.1	11.4
23	26°14.7	184°04.6	16.5	244°11.5	38.0	239°16.1	01.7	16°42.7	11.4
Mer.pass. 21:15		ν 3.4′	d 1.0′	m -4.17	ν 1.2′	d 0.3′	m 0.86	ν 2.2′	d 0.1′ m -2.00	ν 2.6′	d 0.1′ m 0.46

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	41°17.1	199°08.0	S14°15.5	259°12.7	N16°37.7	254°18.3	N14°01.6	31°45.3	N01°11.3
1	56°19.6	214°11.3	14.5	274°13.9	37.3	269°20.5	01.5	46°47.9	11.3
2	71°22.1	229°14.6	13.5	289°15.1	37.0	284°22.6	01.5	61°50.6	11.2
3	86°24.5	244°18.0	·· 12.5	304°16.3	·· 36.7	299°24.8	·· 01.4	76°53.2	·· 11.2
4	101°27.0	259°21.3	11.5	319°17.5	36.3	314°27.0	01.3	91°55.8	11.1
5	116°29.4	274°24.6	10.5	334°18.7	36.0	329°29.1	01.2	106°58.4	11.1
6	131°31.9	289°28.0	S14°09.6	349°19.9	N16°35.6	344°31.3	N14°01.1	122°01.0	N01°11.0
7	146°34.4	304°31.3	08.6	4°21.1	35.3	359°33.5	01.0	137°03.6	10.9
8	161°36.8	319°34.6	07.6	19°22.3	34.9	14°35.7	00.9	152°06.2	10.9
9	176°39.3	334°37.9	·· 06.6	34°23.6	·· 34.6	29°37.8	·· 00.8	167°08.8	·· 10.8
10	191°41.8	349°41.2	05.6	49°24.8	34.3	44°40.0	00.7	182°11.4	10.8
11	206°44.2	4°44.5	04.6	64°26.0	33.9	59°42.2	00.6	197°14.0	10.7
12	221°46.7	19°47.8	S14°03.6	79°27.2	N16°33.6	74°44.4	N14°00.5	212°16.6	N01°10.7
13	236°49.2	34°51.2	02.6	94°28.4	33.2	89°46.5	00.5	227°19.2	10.6
14	251°51.6	49°54.4	01.6	109°29.6	32.9	104°48.7	00.4	242°21.8	10.6
15	266°54.1	64°57.7	14°00.6	124°30.8	·· 32.6	119°50.9	·· 00.3	257°24.5	·· 10.5
16	281°56.6	80°01.0	13°59.7	139°32.0	32.2	134°53.1	00.2	272°27.1	10.5
17	296°59.0	95°04.3	58.7	154°33.3	31.9	149°55.2	00.1	287°29.7	10.4
18	312°01.5	110°07.6	S13°57.7	169°34.5	N16°31.5	164°57.4	N14°00.0	302°32.3	N01°10.3
19	327°03.9	125°10.9	56.7	184°35.7	31.2	179°59.6	13°59.9	317°34.9	10.3
20	342°06.4	140°14.2	55.7	199°36.9	30.8	195°01.8	59.8	332°37.5	10.2
21	357°08.9	155°17.4	·· 54.8	214°38.1	·· 30.5	210°03.9	·· 59.7	347°40.1	·· 10.2
22	12°11.3	170°20.7	53.8	229°39.3	30.2	225°06.1	59.6	2°42.7	10.1
23	27°13.8	185°24.0	52.8	244°40.6	29.8	240°08.3	59.6	17°45.3	10.1
Mer.pass. 21:11		ν 3.3′	d 1.0′	m -4.25	ν 1.2′	d 0.3′	m 0.85	ν 2.2′	d 0.1′ m -2.01	ν 2.6′	d 0.1′ m 0.47

Stars

	SHA	Dec
Alpheratz	357°32.9	29°14.6
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°45.8	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.3	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.8	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.2	5°09.4
Pollux	243°15.4	27°57.6
Avior	234°14.1	-59°35.4
Suhail	222°45.3	-43°32.2
Miaplacidus	221°38.1	-69°49.3
Alphard	217°46.4	-8°46.4
Regulus	207°33.0	11°50.2
Dubhe	193°39.6	61°36.1
Denebola	182°23.7	14°25.3
Gienah	175°42.3	-17°41.3
Acrux	172°59.0	-63°14.7
Gacrux	171°50.5	-57°15.6
Alioth	166°12.2	55°48.7
Spica	158°21.1	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.1
Menkent	147°56.3	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.7
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.8	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.4	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.2	15°21.2

Oct 31 Sat	SHA	Mer.pass
Venus	157°04.9	10:52
Mars	218°56.3	06:46
Jupiter	213°15.5	07:09
Saturn	350°21.2	21:58

Nov 01 Sun	SHA	Mer.pass
Venus	157°28.8	10:46
Mars	218°25.8	06:45
Jupiter	213°08.2	07:05
Saturn	350°24.7	21:53

Nov 02 Mon	SHA	Mer.pass
Venus	157°50.8	10:41
Mars	217°55.5	06:43
Jupiter	213°01.2	07:02
Saturn	350°28.2	21:49

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°05.6	S14°02.3	294°34.5	4.0′	N26°15.7	6.0′	59.6′
1	199°05.6	03.1	308°57.4	4.1′	26°09.7	6.1′	59.6′
2	214°05.6	03.9	323°20.5	4.2′	26°03.6	6.4′	59.6′
3	229°05.6	·· 04.7	337°43.7	4.2′	25°57.2	6.5′	59.6′
4	244°05.7	05.5	352°06.9	4.3′	25°50.7	6.7′	59.6′
5	259°05.7	06.3	6°30.2	4.4′	25°44.0	6.9′	59.6′
6	274°05.7	S14°07.1	20°53.7	4.5′	N25°37.1	7.0′	59.5′
7	289°05.7	07.9	35°17.2	4.6′	25°30.1	7.2′	59.5′
8	304°05.8	08.7	49°40.9	4.7′	25°22.9	7.4′	59.5′
9	319°05.8	·· 09.6	64°04.6	4.8′	25°15.5	7.5′	59.5′
10	334°05.8	10.4	78°28.5	5.0′	25°08.0	7.7′	59.5′
11	349°05.9	11.2	92°52.4	5.1′	25°00.3	7.8′	59.4′
12	4°05.9	S14°12.0	107°16.5	5.2′	N24°52.5	8.0′	59.4′
13	19°05.9	12.8	121°40.6	5.3′	24°44.5	8.2′	59.4′
14	34°05.9	13.6	136°04.9	5.4′	24°36.3	8.3′	59.4′
15	49°05.9	·· 14.4	150°29.3	5.5′	24°28.0	8.5′	59.4′
16	64°06.0	15.2	164°53.8	5.6′	24°19.5	8.6′	59.4′
17	79°06.0	16.0	179°18.4	5.7′	24°10.9	8.8′	59.3′
18	94°06.0	S14°16.8	193°43.1	5.8′	N24°02.1	8.9′	59.3′
19	109°06.0	17.6	208°07.9	5.9′	23°53.2	9.1′	59.3′
20	124°06.1	18.4	222°32.9	6.1′	23°44.1	9.2′	59.3′
21	139°06.1	·· 19.2	236°57.9	6.2′	23°34.9	9.3′	59.3′
22	154°06.1	20.0	251°23.1	6.3′	23°25.6	9.5′	59.2′
23	169°06.1	20.8	265°48.4	6.4′	23°16.1	9.7′	59.2′
	SD = 16.1′	d = 0.8′	SD = 16.3′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.1	S14°21.6	280°13.8	6.5′	N23°06.4	9.7′	59.2′
1	199°06.2	22.4	294°39.3	6.6′	22°56.7	9.9′	59.2′
2	214°06.2	23.2	309°04.9	6.7′	22°46.8	10.1′	59.2′
3	229°06.2	·· 24.0	323°30.7	6.9′	22°36.7	10.1′	59.1′
4	244°06.2	24.8	337°56.5	7.0′	22°26.6	10.3′	59.1′
5	259°06.2	25.6	352°22.5	7.1′	22°16.3	10.5′	59.1′
6	274°06.3	S14°26.4	6°48.6	7.2′	N22°05.8	10.5′	59.1′
7	289°06.3	27.2	21°14.8	7.3′	21°55.3	10.7′	59.1′
8	304°06.3	28.0	35°41.1	7.4′	21°44.6	10.8′	59.0′
9	319°06.3	·· 28.8	50°07.5	7.6′	21°33.8	10.9′	59.0′
10	334°06.3	29.6	64°34.1	7.7′	21°22.9	11.1′	59.0′
11	349°06.3	30.4	79°00.8	7.8′	21°11.8	11.1′	59.0′
12	4°06.4	S14°31.2	93°27.5	7.9′	N21°00.7	11.3′	59.0′
13	19°06.4	32.0	107°54.4	8.0′	20°49.4	11.4′	58.9′
14	34°06.4	32.8	122°21.5	8.1′	20°38.0	11.5′	58.9′
15	49°06.4	·· 33.6	136°48.6	8.2′	20°26.5	11.6′	58.9′
16	64°06.4	34.4	151°15.8	8.4′	20°14.9	11.7′	58.9′
17	79°06.4	35.2	165°43.2	8.5′	20°03.2	11.8′	58.9′
18	94°06.4	S14°36.0	180°10.6	8.6′	N19°51.4	12.0′	58.8′
19	109°06.5	36.8	194°38.2	8.7′	19°39.4	12.0′	58.8′
20	124°06.5	37.6	209°05.9	8.8′	19°27.4	12.1′	58.8′
21	139°06.5	·· 38.4	223°33.7	8.9′	19°15.3	12.3′	58.8′
22	154°06.5	39.2	238°01.6	9.0′	19°03.0	12.3′	58.7′
23	169°06.5	40.0	252°29.7	9.1′	18°50.7	12.4′	58.7′
	SD = 16.1′	d = 0.8′	SD = 16.1′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.5	S14°40.8	266°57.8	9.2′	N18°38.3	12.5′	58.7′
1	199°06.5	41.6	281°26.0	9.4′	18°25.8	12.7′	58.7′
2	214°06.5	42.4	295°54.4	9.5′	18°13.1	12.7′	58.7′
3	229°06.6	·· 43.2	310°22.9	9.6′	18°00.4	12.8′	58.6′
4	244°06.6	44.0	324°51.4	9.7′	17°47.6	12.8′	58.6′
5	259°06.6	44.7	339°20.1	9.8′	17°34.8	13.0′	58.6′
6	274°06.6	S14°45.5	353°48.9	9.9′	N17°21.8	13.1′	58.6′
7	289°06.6	46.3	8°17.8	10.0′	17°08.7	13.1′	58.5′
8	304°06.6	47.1	22°46.7	10.1′	16°55.6	13.2′	58.5′
9	319°06.6	·· 47.9	37°15.8	10.2′	16°42.4	13.3′	58.5′
10	334°06.6	48.7	51°45.0	10.3′	16°29.1	13.4′	58.5′
11	349°06.6	49.5	66°14.3	10.4′	16°15.7	13.4′	58.5′
12	4°06.6	S14°50.3	80°43.7	10.5′	N16°02.3	13.5′	58.4′
13	19°06.6	51.1	95°13.2	10.6′	15°48.8	13.6′	58.4′
14	34°06.6	51.8	109°42.8	10.7′	15°35.2	13.7′	58.4′
15	49°06.7	·· 52.6	124°12.5	10.8′	15°21.5	13.7′	58.4′
16	64°06.7	53.4	138°42.3	10.9′	15°07.8	13.8′	58.3′
17	79°06.7	54.2	153°12.1	11.0′	14°54.0	13.9′	58.3′
18	94°06.7	S14°55.0	167°42.1	11.1′	N14°40.1	13.9′	58.3′
19	109°06.7	55.8	182°12.2	11.2′	14°26.2	14.0′	58.3′
20	124°06.7	56.6	196°42.3	11.2′	14°12.2	14.1′	58.3′
21	139°06.7	·· 57.3	211°12.6	11.3′	13°58.1	14.1′	58.2′
22	154°06.7	58.1	225°42.9	11.4′	13°44.0	14.2′	58.2′
23	169°06.7	58.9	240°13.3	11.5′	13°29.8	14.2′	58.2′
	SD = 16.1′	d = 0.8′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:06	07:29	08:57	14:29	15:56	17:19
N 70°	06:02	07:16	08:30	14:55	16:10	17:24
68°	05:58	07:06	08:11	15:15	16:20	17:27
66°	05:55	06:57	07:55	15:31	16:29	17:31
64°	05:52	06:49	07:42	15:44	16:37	17:34
62°	05:50	06:43	07:31	15:55	16:43	17:36
60°	05:47	06:37	07:22	16:04	16:49	17:39
N 58°	05:45	06:32	07:14	16:12	16:54	17:41
56°	05:43	06:27	07:07	16:19	16:59	17:43
54°	05:41	06:23	07:00	16:26	17:03	17:45
52°	05:39	06:19	06:55	16:32	17:07	17:47
50°	05:37	06:16	06:50	16:37	17:11	17:49
45°	05:33	06:08	06:38	16:48	17:19	17:54
N 40°	05:29	06:01	06:29	16:58	17:26	17:58
35°	05:25	05:55	06:21	17:06	17:32	18:02
30°	05:21	05:49	06:14	17:13	17:38	18:06
20°	05:13	05:39	06:01	17:25	17:48	18:14
N 10°	05:04	05:29	05:51	17:37	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:43	05:08	05:30	17:58	18:19	18:45
20°	04:28	04:55	05:18	18:09	18:32	18:59
30°	04:10	04:40	05:05	18:22	18:47	19:18
35°	03:59	04:31	04:58	18:30	18:57	19:29
40°	03:45	04:20	04:49	18:39	19:08	19:43
45°	03:27	04:07	04:39	18:49	19:21	20:01
S 50°	03:04	03:50	04:27	19:02	19:38	20:24
52°	02:53	03:42	04:21	19:08	19:46	20:36
54°	02:40	03:34	04:14	19:14	19:55	20:49
56°	02:24	03:24	04:07	19:21	20:05	21:06
58°	02:05	03:12	03:59	19:29	20:17	21:25
S 60°	01:40	02:58	03:50	19:39	20:31	21:51

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▭	▭	21:43	▭	▭	16:26
N 70°	▭	18:53	22:12	▭	17:26	15:55
68°	▭	20:03	22:33	▭	16:14	15:32
66°	▭	20:40	22:49	▭	15:37	15:14
64°	18:49	21:05	23:03	15:29	15:10	14:59
62°	19:26	21:25	23:14	14:51	14:49	14:46
60°	19:53	21:41	23:24	14:24	14:32	14:35
N 58°	20:14	21:55	23:32	14:02	14:17	14:26
56°	20:31	22:06	23:39	13:45	14:05	14:18
54°	20:45	22:17	23:46	13:30	13:54	14:10
52°	20:57	22:26	23:51	13:17	13:44	14:04
50°	21:08	22:34	23:57	13:05	13:36	13:58
45°	21:31	22:51	·· ··	12:41	13:17	13:45
N 40°	21:50	23:05	·· ··	12:22	13:02	13:34
35°	22:05	23:16	·· ··	12:06	12:49	13:25
30°	22:18	23:26	·· ··	11:52	12:38	13:16
20°	22:41	23:44	·· ··	11:28	12:18	13:02
N 10°	23:00	23:59	·· ··	11:07	12:01	12:50
0°	23:18	·· ··	00:13	10:47	11:45	12:38
S 10°	23:36	·· ··	00:27	10:28	11:29	12:26
20°	23:55	·· ··	00:42	10:06	11:11	12:13
30°	·· ··	00:17	00:59	09:42	10:51	11:58
35°	·· ··	00:30	01:09	09:27	10:39	11:49
40°	00:01	00:45	01:20	09:10	10:25	11:39
45°	00:22	01:03	01:34	08:49	10:09	11:28
S 50°	00:49	01:24	01:50	08:24	09:49	11:13
52°	01:02	01:35	01:57	08:11	09:39	11:07
54°	01:16	01:46	02:05	07:56	09:28	10:59
56°	01:34	01:59	02:15	07:40	09:16	10:51
58°	01:55	02:14	02:25	07:19	09:01	10:41
S 60°	02:21	02:32	02:37	06:53	08:44	10:30

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 71-48%
31	16:22	16:23	11:44	04:33	17:03	
01	16:25	16:25	11:44	05:32	17:59	
02	16:26	16:27	11:44	06:26	18:51	

November 03, 04, 05 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	42°16.3	200°27.2	S13°51.8	259°41.8	N16°29.5	255°10.5	N13°59.5	32°47.9	N01°10.0
1	57°18.7	215°30.5	50.8	274°43.0	29.1	270°12.6	59.4	47°50.5	10.0
2	72°21.2	230°33.8	49.9	289°44.2	28.8	285°14.8	59.3	62°53.1	09.9
3	87°23.7	245°37.0	·· 48.9	304°45.4	·· 28.4	300°17.0	·· 59.2	77°55.7	·· 09.9
4	102°26.1	260°40.3	47.9	319°46.6	28.1	315°19.2	59.1	92°58.3	09.8
5	117°28.6	275°43.5	46.9	334°47.9	27.8	330°21.4	59.0	108°00.9	09.8
6	132°31.0	290°46.8	S13°46.0	349°49.1	N16°27.4	345°23.5	N13°58.9	123°03.5	N01°09.7
7	147°33.5	305°50.0	45.0	4°50.3	27.1	0°25.7	58.8	138°06.2	09.6
8	162°36.0	320°53.2	44.0	19°51.5	26.7	15°27.9	58.8	153°08.8	09.6
9	177°38.4	335°56.5	·· 43.1	34°52.8	·· 26.4	30°30.1	·· 58.7	168°11.4	·· 09.5
10	192°40.9	350°59.7	42.1	49°54.0	26.0	45°32.3	58.6	183°14.0	09.5
11	207°43.4	6°02.9	41.1	64°55.2	25.7	60°34.4	58.5	198°16.6	09.4
12	222°45.8	21°06.1	S13°40.2	79°56.4	N16°25.4	75°36.6	N13°58.4	213°19.2	N01°09.4
13	237°48.3	36°09.3	39.2	94°57.6	25.0	90°38.8	58.3	228°21.8	09.3
14	252°50.8	51°12.6	38.2	109°58.9	24.7	105°41.0	58.2	243°24.4	09.3
15	267°53.2	66°15.8	·· 37.3	125°00.1	·· 24.3	120°43.2	·· 58.1	258°27.0	·· 09.2
16	282°55.7	81°19.0	36.3	140°01.3	24.0	135°45.3	58.0	273°29.6	09.2
17	297°58.2	96°22.2	35.4	155°02.5	23.7	150°47.5	58.0	288°32.2	09.1
18	313°00.6	111°25.4	S13°34.4	170°03.8	N16°23.3	165°49.7	N13°57.9	303°34.8	N01°09.1
19	328°03.1	126°28.6	33.4	185°05.0	23.0	180°51.9	57.8	318°37.4	09.0
20	343°05.5	141°31.8	32.5	200°06.2	22.6	195°54.1	57.7	333°40.0	09.0
21	358°08.0	156°35.0	·· 31.5	215°07.4	·· 22.3	210°56.2	·· 57.6	348°42.6	·· 08.9
22	13°10.5	171°38.1	30.6	230°08.7	21.9	225°58.4	57.5	3°45.2	08.9
23	28°12.9	186°41.3	29.6	245°09.9	21.6	241°00.6	57.4	18°47.8	08.8
Mer.pass. 21:07		ν 3.3′	d 1.0′	m -4.31	ν 1.2′	d 0.3′	m 0.83	ν 2.2′	d 0.1′ m -2.02	ν 2.6′	d 0.1′ m 0.47

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	43°15.4	201°44.5	S13°28.7	260°11.1	N16°21.3	256°02.8	N13°57.3	33°50.4	N01°08.7
1	58°17.9	216°47.7	27.7	275°12.3	20.9	271°05.0	57.3	48°53.0	08.7
2	73°20.3	231°50.8	26.8	290°13.6	20.6	286°07.2	57.2	63°55.6	08.6
3	88°22.8	246°54.0	·· 25.8	305°14.8	·· 20.2	301°09.3	·· 57.1	78°58.2	·· 08.6
4	103°25.3	261°57.2	24.9	320°16.0	19.9	316°11.5	57.0	94°00.8	08.5
5	118°27.7	277°00.3	23.9	335°17.3	19.6	331°13.7	56.9	109°03.4	08.5
6	133°30.2	292°03.5	S13°23.0	350°18.5	N16°19.2	346°15.9	N13°56.8	124°06.0	N01°08.4
7	148°32.6	307°06.6	22.0	5°19.7	18.9	1°18.1	56.7	139°08.6	08.4
8	163°35.1	322°09.8	21.1	20°21.0	18.5	16°20.3	56.6	154°11.2	08.3
9	178°37.6	337°12.9	·· 20.2	35°22.2	·· 18.2	31°22.5	·· 56.6	169°13.9	·· 08.3
10	193°40.0	352°16.1	19.2	50°23.4	17.8	46°24.6	56.5	184°16.5	08.2
11	208°42.5	7°19.2	18.3	65°24.6	17.5	61°26.8	56.4	199°19.1	08.2
12	223°45.0	22°22.3	S13°17.3	80°25.9	N16°17.2	76°29.0	N13°56.3	214°21.7	N01°08.1
13	238°47.4	37°25.5	16.4	95°27.1	16.8	91°31.2	56.2	229°24.3	08.1
14	253°49.9	52°28.6	15.5	110°28.3	16.5	106°33.4	56.1	244°26.9	08.0
15	268°52.4	67°31.7	·· 14.5	125°29.6	·· 16.1	121°35.6	·· 56.0	259°29.5	·· 08.0
16	283°54.8	82°34.8	13.6	140°30.8	15.8	136°37.8	56.0	274°32.1	07.9
17	298°57.3	97°37.9	12.7	155°32.0	15.5	151°40.0	55.9	289°34.7	07.9
18	313°59.8	112°41.1	S13°11.7	170°33.3	N16°15.1	166°42.1	N13°55.8	304°37.3	N01°07.8
19	329°02.2	127°44.2	10.8	185°34.5	14.8	181°44.3	55.7	319°39.9	07.8
20	344°04.7	142°47.3	09.9	200°35.8	14.4	196°46.5	55.6	334°42.5	07.7
21	359°07.1	157°50.4	·· 09.0	215°37.0	·· 14.1	211°48.7	·· 55.5	349°45.1	·· 07.7
22	14°09.6	172°53.5	08.0	230°38.2	13.8	226°50.9	55.4	4°47.7	07.6
23	29°12.1	187°56.6	07.1	245°39.5	13.4	241°53.1	55.4	19°50.3	07.6
Mer.pass. 21:04		ν 3.2′	d 1.0′	m -4.38	ν 1.2′	d 0.3′	m 0.82	ν 2.2′	d 0.1′ m -2.02	ν 2.6′	d 0.1′ m 0.48

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°14.5	202°59.6	S13°06.2	260°40.7	N16°13.1	256°55.3	N13°55.3	34°52.9	N01°07.5
1	59°17.0	218°02.7	05.3	275°41.9	12.7	271°57.5	55.2	49°55.5	07.4
2	74°19.5	233°05.8	04.3	290°43.2	12.4	286°59.6	55.1	64°58.1	07.4
3	89°21.9	248°08.9	·· 03.4	305°44.4	·· 12.0	302°01.8	·· 55.0	80°00.7	·· 07.3
4	104°24.4	263°12.0	02.5	320°45.7	11.7	317°04.0	54.9	95°03.3	07.3
5	119°26.9	278°15.0	01.6	335°46.9	11.4	332°06.2	54.8	110°05.9	07.2
6	134°29.3	293°18.1	S13°00.7	350°48.1	N16°11.0	347°08.4	N13°54.8	125°08.5	N01°07.2
7	149°31.8	308°21.1	12°59.8	5°49.4	10.7	2°10.6	54.7	140°11.1	07.1
8	164°34.3	323°24.2	58.9	20°50.6	10.3	17°12.8	54.6	155°13.7	07.1
9	179°36.7	338°27.3	·· 58.0	35°51.9	·· 10.0	32°15.0	·· 54.5	170°16.3	·· 07.0
10	194°39.2	353°30.3	57.0	50°53.1	09.7	47°17.2	54.4	185°18.9	07.0
11	209°41.6	8°33.4	56.1	65°54.3	09.3	62°19.4	54.3	200°21.5	06.9
12	224°44.1	23°36.4	S12°55.2	80°55.6	N16°09.0	77°21.6	N13°54.3	215°24.1	N01°06.9
13	239°46.6	38°39.4	54.3	95°56.8	08.6	92°23.8	54.2	230°26.7	06.8
14	254°49.0	53°42.5	53.4	110°58.1	08.3	107°25.9	54.1	245°29.3	06.8
15	269°51.5	68°45.5	·· 52.5	125°59.3	·· 08.0	122°28.1	·· 54.0	260°31.9	·· 06.7
16	284°54.0	83°48.5	51.6	141°00.6	07.6	137°30.3	53.9	275°34.5	06.7
17	299°56.4	98°51.6	50.7	156°01.8	07.3	152°32.5	53.8	290°37.1	06.6
18	314°58.9	113°54.6	S12°49.8	171°03.1	N16°06.9	167°34.7	N13°53.7	305°39.7	N01°06.6
19	330°01.4	128°57.6	48.9	186°04.3	06.6	182°36.9	53.7	320°42.3	06.5
20	345°03.8	144°00.6	48.0	201°05.5	06.3	197°39.1	53.6	335°44.9	06.5
21	0°06.3	159°03.6	·· 47.1	216°06.8	·· 05.9	212°41.3	·· 53.5	350°47.5	·· 06.4
22	15°08.7	174°06.6	46.2	231°08.0	05.6	227°43.5	53.4	5°50.1	06.4
23	30°11.2	189°09.6	45.4	246°09.3	05.2	242°45.7	53.3	20°52.7	06.3
Mer.pass. 21:00		ν 3.1′	d 0.9′	m -4.44	ν 1.2′	d 0.3′	m 0.81	ν 2.2′	d 0.1′ m -2.03	ν 2.6′	d 0.1′ m 0.48

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°45.4	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.2	5°09.4
Pollux	243°15.4	27°57.6
Avior	234°14.0	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°38.0	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°33.0	11°50.1
Dubhe	193°39.6	61°36.1
Denebola	182°23.7	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°59.0	-63°14.7
Gacrux	171°50.5	-57°15.6
Alioth	166°12.2	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.1
Menkent	147°56.3	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.2	15°21.2

Nov 03 Tue	SHA	Mer.pass
Venus	158°11.0	10:36
Mars	217°25.5	06:41
Jupiter	212°54.2	06:58
Saturn	350°31.7	21:45

Nov 04 Wed	SHA	Mer.pass
Venus	158°29.1	10:31
Mars	216°55.7	06:39
Jupiter	212°47.4	06:55
Saturn	350°35.0	21:41

Nov 05 Thu	SHA	Mer.pass
Venus	158°45.1	10:26
Mars	216°26.2	06:37
Jupiter	212°40.7	06:51
Saturn	350°38.3	21:37

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.7	S14°59.7	254°43.8	11.6′	N13°15.6	14.3′	58.2′
1	199°06.7	15°00.5	269°14.4	11.7′	13°01.3	14.3′	58.1′
2	214°06.7	01.3	283°45.1	11.8′	12°47.0	14.4′	58.1′
3	229°06.7	·· 02.0	298°15.9	11.8′	12°32.6	14.5′	58.1′
4	244°06.7	02.8	312°46.7	11.9′	12°18.1	14.5′	58.1′
5	259°06.7	03.6	327°17.6	12.0′	12°03.6	14.5′	58.1′
6	274°06.7	S15°04.4	341°48.7	12.1′	N11°49.1	14.6′	58.0′
7	289°06.7	05.2	356°19.7	12.2′	11°34.5	14.6′	58.0′
8	304°06.7	05.9	10°50.9	12.2′	11°19.9	14.7′	58.0′
9	319°06.7	·· 06.7	25°22.1	12.3′	11°05.2	14.8′	58.0′
10	334°06.7	07.5	39°53.4	12.4′	10°50.4	14.7′	57.9′
11	349°06.7	08.3	54°24.8	12.5′	10°35.7	14.8′	57.9′
12	4°06.7	S15°09.1	68°56.3	12.5′	N10°20.9	14.9′	57.9′
13	19°06.7	09.8	83°27.8	12.6′	10°06.0	14.8′	57.9′
14	34°06.7	10.6	97°59.4	12.7′	09°51.2	15.0′	57.9′
15	49°06.7	·· 11.4	112°31.1	12.7′	09°36.2	14.9′	57.8′
16	64°06.7	12.2	127°02.8	12.8′	09°21.3	15.0′	57.8′
17	79°06.7	12.9	141°34.6	12.9′	09°06.3	15.0′	57.8′
18	94°06.7	S15°13.7	156°06.5	12.9′	N08°51.3	15.0′	57.8′
19	109°06.7	14.5	170°38.4	13.0′	08°36.3	15.1′	57.7′
20	124°06.7	15.3	185°10.4	13.1′	08°21.2	15.1′	57.7′
21	139°06.7	·· 16.0	199°42.5	13.1′	08°06.1	15.1′	57.7′
22	154°06.7	16.8	214°14.6	13.2′	07°51.0	15.2′	57.7′
23	169°06.7	17.6	228°46.8	13.2′	07°35.8	15.2′	57.7′
	SD = 16.1′	d = 0.8′	SD = 15.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.7	S15°18.4	243°19.0	13.3′	N07°20.6	15.2′	57.6′
1	199°06.7	19.1	257°51.3	13.3′	07°05.4	15.2′	57.6′
2	214°06.7	19.9	272°23.6	13.4′	06°50.2	15.2′	57.6′
3	229°06.6	·· 20.7	286°56.0	13.4′	06°35.0	15.3′	57.6′
4	244°06.6	21.4	301°28.4	13.5′	06°19.7	15.3′	57.5′
5	259°06.6	22.2	316°00.9	13.5′	06°04.4	15.3′	57.5′
6	274°06.6	S15°23.0	330°33.5	13.6′	N05°49.1	15.3′	57.5′
7	289°06.6	23.8	345°06.1	13.6′	05°33.8	15.3′	57.5′
8	304°06.6	24.5	359°38.7	13.7′	05°18.5	15.3′	57.5′
9	319°06.6	·· 25.3	14°11.4	13.7′	05°03.2	15.4′	57.4′
10	334°06.6	26.1	28°44.1	13.8′	04°47.8	15.3′	57.4′
11	349°06.6	26.8	43°16.9	13.8′	04°32.5	15.4′	57.4′
12	4°06.6	S15°27.6	57°49.7	13.9′	N04°17.1	15.4′	57.4′
13	19°06.6	28.4	72°22.6	13.9′	04°01.7	15.4′	57.3′
14	34°06.5	29.1	86°55.5	13.9′	03°46.3	15.4′	57.3′
15	49°06.5	·· 29.9	101°28.4	14.0′	03°30.9	15.4′	57.3′
16	64°06.5	30.7	116°01.4	14.0′	03°15.5	15.3′	57.3′
17	79°06.5	31.4	130°34.4	14.0′	03°00.2	15.4′	57.3′
18	94°06.5	S15°32.2	145°07.4	14.1′	N02°44.8	15.4′	57.2′
19	109°06.5	33.0	159°40.5	14.1′	02°29.4	15.4′	57.2′
20	124°06.5	33.7	174°13.6	14.1′	02°14.0	15.4′	57.2′
21	139°06.5	·· 34.5	188°46.7	14.2′	01°58.6	15.4′	57.2′
22	154°06.4	35.3	203°19.9	14.2′	01°43.2	15.4′	57.1′
23	169°06.4	36.0	217°53.0	14.2′	01°27.8	15.4′	57.1′
	SD = 16.1′	d = 0.8′	SD = 15.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.4	S15°36.8	232°26.3	14.2′	N01°12.4	15.4′	57.1′
1	199°06.4	37.5	246°59.5	14.3′	00°57.0	15.4′	57.1′
2	214°06.4	38.3	261°32.8	14.3′	00°41.6	15.4′	57.1′
3	229°06.4	·· 39.1	276°06.0	14.3′	00°26.2	15.3′	57.0′
4	244°06.4	39.8	290°39.4	14.3′	N00°10.9	15.4′	57.0′
5	259°06.3	40.6	305°12.7	14.3′	S00°04.5	15.3′	57.0′
6	274°06.3	S15°41.3	319°46.0	14.4′	S00°19.8	15.3′	57.0′
7	289°06.3	42.1	334°19.4	14.4′	00°35.1	15.3′	56.9′
8	304°06.3	42.9	348°52.8	14.4′	00°50.4	15.3′	56.9′
9	319°06.3	·· 43.6	3°26.2	14.4′	01°05.7	15.3′	56.9′
10	334°06.3	44.4	17°59.6	14.4′	01°21.0	15.3′	56.9′
11	349°06.2	45.1	32°33.0	14.4′	01°36.3	15.3′	56.9′
12	4°06.2	S15°45.9	47°06.5	14.4′	S01°51.6	15.2′	56.8′
13	19°06.2	46.6	61°39.9	14.5′	02°06.8	15.2′	56.8′
14	34°06.2	47.4	76°13.4	14.5′	02°22.0	15.2′	56.8′
15	49°06.2	·· 48.2	90°46.8	14.5′	02°37.2	15.2′	56.8′
16	64°06.1	48.9	105°20.3	14.5′	02°52.4	15.1′	56.8′
17	79°06.1	49.7	119°53.8	14.5′	03°07.5	15.1′	56.7′
18	94°06.1	S15°50.4	134°27.3	14.5′	S03°22.6	15.1′	56.7′
19	109°06.1	51.2	149°00.8	14.5′	03°37.7	15.1′	56.7′
20	124°06.1	51.9	163°34.3	14.5′	03°52.8	15.1′	56.7′
21	139°06.0	·· 52.7	178°07.7	14.5′	04°07.9	15.0′	56.6′
22	154°06.0	53.4	192°41.2	14.5′	04°22.9	15.0′	56.6′
23	169°06.0	54.2	207°14.7	14.5′	04°37.9	14.9′	56.6′
	SD = 16.1′	d = 0.8′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:18	07:43	09:16	14:09	15:43	17:07
N 70°	06:12	07:28	08:46	14:40	15:58	17:13
68°	06:08	07:16	08:23	15:03	16:10	17:18
66°	06:04	07:06	08:06	15:20	16:20	17:22
64°	06:00	06:58	07:52	15:34	16:28	17:26
62°	05:57	06:50	07:40	15:46	16:36	17:29
60°	05:54	06:44	07:30	15:56	16:42	17:32
N 58°	05:51	06:38	07:21	16:05	16:48	17:35
56°	05:49	06:33	07:13	16:13	16:53	17:38
54°	05:46	06:28	07:06	16:20	16:58	17:40
52°	05:44	06:24	07:00	16:26	17:02	17:42
50°	05:42	06:20	06:55	16:32	17:06	17:45
45°	05:37	06:12	06:42	16:44	17:15	17:50
N 40°	05:32	06:04	06:32	16:54	17:23	17:55
35°	05:27	05:57	06:24	17:03	17:29	17:59
30°	05:23	05:51	06:16	17:11	17:35	18:04
20°	05:14	05:40	06:03	17:24	17:47	18:13
N 10°	05:04	05:29	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:42	05:07	05:29	17:58	18:20	18:46
20°	04:27	04:54	05:17	18:10	18:34	19:01
30°	04:07	04:38	05:03	18:25	18:50	19:20
35°	03:55	04:28	04:55	18:33	19:00	19:33
40°	03:40	04:16	04:46	18:42	19:12	19:48
45°	03:22	04:02	04:35	18:53	19:26	20:06
S 50°	02:58	03:45	04:21	19:07	19:44	20:31
52°	02:45	03:36	04:15	19:13	19:52	20:44
54°	02:31	03:27	04:08	19:20	20:02	20:58
56°	02:14	03:16	04:01	19:28	20:13	21:16
58°	01:53	03:03	03:52	19:37	20:26	21:38
S 60°	01:24	02:48	03:42	19:47	20:41	22:08

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	·· ··	00:17	02:29	15:32	14:56	14:24
N 70°	·· ··	00:28	02:30	15:19	14:52	14:27
68°	·· ··	00:37	02:30	15:07	14:48	14:30
66°	·· ··	00:44	02:31	14:58	14:45	14:32
64°	·· ··	00:50	02:31	14:50	14:42	14:34
62°	·· ··	00:55	02:32	14:43	14:40	14:36
60°	·· ··	01:00	02:32	14:37	14:38	14:38
N 58°	·· ··	01:04	02:32	14:32	14:36	14:39
56°	·· ··	01:07	02:32	14:27	14:34	14:40
54°	·· ··	01:11	02:33	14:23	14:32	14:42
52°	·· ··	01:14	02:33	14:19	14:31	14:43
50°	·· ··	01:16	02:33	14:15	14:30	14:43
45°	00:08	01:22	02:33	14:07	14:27	14:46
N 40°	00:17	01:27	02:34	14:01	14:25	14:47
35°	00:25	01:31	02:34	13:55	14:23	14:49
30°	00:32	01:34	02:34	13:50	14:21	14:50
20°	00:44	01:40	02:35	13:41	14:18	14:52
N 10°	00:54	01:46	02:35	13:34	14:15	14:54
0°	01:04	01:51	02:35	13:26	14:12	14:56
S 10°	01:13	01:56	02:36	13:19	14:09	14:58
20°	01:24	02:01	02:36	13:11	14:06	15:00
30°	01:35	02:07	02:37	13:02	14:03	15:02
35°	01:42	02:11	02:37	12:57	14:01	15:04
40°	01:49	02:14	02:37	12:51	13:59	15:05
45°	01:58	02:19	02:38	12:44	13:56	15:07
S 50°	02:09	02:24	02:38	12:35	13:53	15:09
52°	02:14	02:27	02:38	12:31	13:52	15:10
54°	02:19	02:30	02:39	12:27	13:50	15:11
56°	02:25	02:32	02:39	12:22	13:48	15:12
58°	02:31	02:36	02:39	12:16	13:46	15:14
S 60°	02:39	02:39	02:40	12:10	13:44	15:15

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 37-18%
03	16:27	16:27	11:44	07:15	19:39	
04	16:27	16:26	11:44	08:01	20:24	
05	16:26	16:25	11:44	08:46	21:08	



November 06, 07, 08 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°13.7	204°12.6	S12°44.5	261°10.5	N16°04.9	257°47.9	N13°53.2	35°55.3	N01°06.3
1	60°16.1	219°15.6	43.6	276°11.8	04.6	272°50.1	53.2	50°57.9	06.2
2	75°18.6	234°18.6	42.7	291°13.0	04.2	287°52.3	53.1	66°00.4	06.2
3	90°21.1	249°21.6	·· 41.8	306°14.3	·· 03.9	302°54.5	·· 53.0	81°03.0	·· 06.1
4	105°23.5	264°24.6	40.9	321°15.5	03.5	317°56.7	52.9	96°05.6	06.1
5	120°26.0	279°27.5	40.1	336°16.8	03.2	332°58.9	52.8	111°08.2	06.0
6	135°28.5	294°30.5	S12°39.2	351°18.0	N16°02.9	348°01.1	N13°52.7	126°10.8	N01°06.0
7	150°30.9	309°33.5	38.3	6°19.3	02.5	3°03.3	52.7	141°13.4	05.9
8	165°33.4	324°36.4	37.4	21°20.5	02.2	18°05.5	52.6	156°16.0	05.9
9	180°35.9	339°39.4	·· 36.5	36°21.8	·· 01.8	33°07.7	·· 52.5	171°18.6	·· 05.8
10	195°38.3	354°42.4	35.7	51°23.0	01.5	48°09.9	52.4	186°21.2	05.8
11	210°40.8	9°45.3	34.8	66°24.3	01.2	63°12.0	52.3	201°23.8	05.7
12	225°43.2	24°48.3	S12°33.9	81°25.5	N16°00.8	78°14.2	N13°52.2	216°26.4	N01°05.7
13	240°45.7	39°51.2	33.1	96°26.8	00.5	93°16.4	52.2	231°29.0	05.6
14	255°48.2	54°54.1	32.2	111°28.0	16°00.1	108°18.6	52.1	246°31.6	05.6
15	270°50.6	69°57.1	·· 31.3	126°29.3	15°59.8	123°20.8	·· 52.0	261°34.2	·· 05.5
16	285°53.1	85°00.0	30.5	141°30.6	59.5	138°23.0	51.9	276°36.8	05.5
17	300°55.6	100°03.0	29.6	156°31.8	59.1	153°25.2	51.8	291°39.4	05.4
18	315°58.0	115°05.9	S12°28.7	171°33.1	N15°58.8	168°27.4	N13°51.8	306°42.0	N01°05.4
19	331°00.5	130°08.8	27.9	186°34.3	58.4	183°29.6	51.7	321°44.6	05.4
20	346°03.0	145°11.7	27.0	201°35.6	58.1	198°31.8	51.6	336°47.2	05.3
21	1°05.4	160°14.6	·· 26.2	216°36.8	·· 57.8	213°34.0	·· 51.5	351°49.8	·· 05.3
22	16°07.9	175°17.5	25.3	231°38.1	57.4	228°36.2	51.4	6°52.4	05.2
23	31°10.3	190°20.5	24.5	246°39.4	57.1	243°38.4	51.3	21°55.0	05.2
Mer.pass. 20:56		ν 3.0′	d 0.9′	m -4.50	ν 1.2′	d 0.3′	m 0.80	ν 2.2′	d 0.1′ m -2.03	ν 2.6′	d 0.0′ m 0.48

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°12.8	205°23.4	S12°23.6	261°40.6	N15°56.7	258°40.6	N13°51.3	36°57.6	N01°05.1
1	61°15.3	220°26.3	22.7	276°41.9	56.4	273°42.8	51.2	52°00.2	05.1
2	76°17.7	235°29.2	21.9	291°43.1	56.1	288°45.1	51.1	67°02.8	05.0
3	91°20.2	250°32.0	·· 21.1	306°44.4	·· 55.7	303°47.3	·· 51.0	82°05.4	·· 05.0
4	106°22.7	265°34.9	20.2	321°45.6	55.4	318°49.5	50.9	97°07.9	04.9
5	121°25.1	280°37.8	19.4	336°46.9	55.0	333°51.7	50.9	112°10.5	04.9
6	136°27.6	295°40.7	S12°18.5	351°48.2	N15°54.7	348°53.9	N13°50.8	127°13.1	N01°04.8
7	151°30.1	310°43.6	17.7	6°49.4	54.4	3°56.1	50.7	142°15.7	04.8
8	166°32.5	325°46.4	16.8	21°50.7	54.0	18°58.3	50.6	157°18.3	04.7
9	181°35.0	340°49.3	·· 16.0	36°52.0	·· 53.7	34°00.5	·· 50.5	172°20.9	·· 04.7
10	196°37.5	355°52.2	15.2	51°53.2	53.4	49°02.7	50.5	187°23.5	04.6
11	211°39.9	10°55.0	14.3	66°54.5	53.0	64°04.9	50.4	202°26.1	04.6
12	226°42.4	25°57.9	S12°13.5	81°55.7	N15°52.7	79°07.1	N13°50.3	217°28.7	N01°04.5
13	241°44.8	41°00.7	12.7	96°57.0	52.3	94°09.3	50.2	232°31.3	04.5
14	256°47.3	56°03.6	11.8	111°58.3	52.0	109°11.5	50.1	247°33.9	04.4
15	271°49.8	71°06.4	·· 11.0	126°59.5	·· 51.7	124°13.7	·· 50.1	262°36.5	·· 04.4
16	286°52.2	86°09.3	10.2	142°00.8	51.3	139°15.9	50.0	277°39.1	04.3
17	301°54.7	101°12.1	09.4	157°02.1	51.0	154°18.1	49.9	292°41.7	04.3
18	316°57.2	116°14.9	S12°08.5	172°03.3	N15°50.6	169°20.3	N13°49.8	307°44.3	N01°04.2
19	331°59.6	131°17.8	07.7	187°04.6	50.3	184°22.5	49.7	322°46.8	04.2
20	347°02.1	146°20.6	06.9	202°05.9	50.0	199°24.7	49.7	337°49.4	04.2
21	2°04.6	161°23.4	·· 06.1	217°07.1	·· 49.6	214°26.9	·· 49.6	352°52.0	·· 04.1
22	17°07.0	176°26.2	05.3	232°08.4	49.3	229°29.1	49.5	7°54.6	04.1
23	32°09.5	191°29.0	04.5	247°09.7	49.0	244°31.3	49.4	22°57.2	04.0
Mer.pass. 20:52		ν 2.9′	d 0.9′	m -4.55	ν 1.3′	d 0.3′	m 0.79	ν 2.2′	d 0.1′ m -2.04	ν 2.6′	d 0.0′ m 0.49

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	47°12.0	206°31.9	S12°03.6	262°10.9	N15°48.6	259°33.6	N13°49.3	37°59.8	N01°04.0
1	62°14.4	221°34.7	02.8	277°12.2	48.3	274°35.8	49.3	53°02.4	03.9
2	77°16.9	236°37.5	02.0	292°13.5	47.9	289°38.0	49.2	68°05.0	03.9
3	92°19.3	251°40.3	·· 01.2	307°14.7	·· 47.6	304°40.2	·· 49.1	83°07.6	·· 03.8
4	107°21.8	266°43.0	12°00.4	322°16.0	47.3	319°42.4	49.0	98°10.2	03.8
5	122°24.3	281°45.8	11°59.6	337°17.3	46.9	334°44.6	48.9	113°12.8	03.7
6	137°26.7	296°48.6	S11°58.8	352°18.6	N15°46.6	349°46.8	N13°48.9	128°15.4	N01°03.7
7	152°29.2	311°51.4	58.0	7°19.8	46.2	4°49.0	48.8	143°18.0	03.6
8	167°31.7	326°54.2	57.2	22°21.1	45.9	19°51.2	48.7	158°20.5	03.6
9	182°34.1	341°57.0	·· 56.4	37°22.4	·· 45.6	34°53.4	·· 48.6	173°23.1	·· 03.5
10	197°36.6	356°59.7	55.6	52°23.7	45.2	49°55.6	48.5	188°25.7	03.5
11	212°39.1	12°02.5	54.8	67°24.9	44.9	64°57.9	48.5	203°28.3	03.4
12	227°41.5	27°05.3	S11°54.0	82°26.2	N15°44.6	80°00.1	N13°48.4	218°30.9	N01°03.4
13	242°44.0	42°08.0	53.2	97°27.5	44.2	95°02.3	48.3	233°33.5	03.4
14	257°46.4	57°10.8	52.5	112°28.7	43.9	110°04.5	48.2	248°36.1	03.3
15	272°48.9	72°13.5	·· 51.7	127°30.0	·· 43.5	125°06.7	·· 48.2	263°38.7	·· 03.3
16	287°51.4	87°16.3	50.9	142°31.3	43.2	140°08.9	48.1	278°41.3	03.2
17	302°53.8	102°19.0	50.1	157°32.6	42.9	155°11.1	48.0	293°43.9	03.2
18	317°56.3	117°21.7	S11°49.3	172°33.9	N15°42.5	170°13.3	N13°47.9	308°46.4	N01°03.1
19	332°58.8	132°24.5	48.5	187°35.1	42.2	185°15.6	47.8	323°49.0	03.1
20	348°01.2	147°27.2	47.8	202°36.4	41.9	200°17.8	47.8	338°51.6	03.0
21	3°03.7	162°29.9	·· 47.0	217°37.7	·· 41.5	215°20.0	·· 47.7	353°54.2	·· 03.0
22	18°06.2	177°32.7	46.2	232°39.0	41.2	230°22.2	47.6	8°56.8	02.9
23	33°08.6	192°35.4	45.4	247°40.2	40.8	245°24.4	47.5	23°59.4	02.9
Mer.pass. 20:48		ν 2.8′	d 0.8′	m -4.60	ν 1.3′	d 0.3′	m 0.78	ν 2.2′	d 0.1′ m -2.04	ν 2.6′	d 0.0′ m 0.49

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°45.1	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.2	5°09.4
Pollux	243°15.4	27°57.6
Avior	234°14.0	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°38.0	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°33.0	11°50.1
Dubhe	193°39.5	61°36.1
Denebola	182°23.7	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°59.0	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.2	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.2	15°21.2

Nov 06 Fri	SHA	Mer.pass
Venus	158°58.9	10:21
Mars	215°56.9	06:35
Jupiter	212°34.2	06:48
Saturn	350°41.6	21:33

Nov 07 Sat	SHA	Mer.pass
Venus	159°10.5	10:16
Mars	215°27.8	06:33
Jupiter	212°27.8	06:44
Saturn	350°44.8	21:28

Nov 08 Sun	SHA	Mer.pass
Venus	159°19.9	10:12
Mars	214°59.0	06:31
Jupiter	212°21.6	06:41
Saturn	350°47.9	21:24

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°06.0	S15°54.9	221°48.2	14.5′	S04°52.8	15.0′	56.6′
1	199°05.9	55.7	236°21.7	14.5′	05°07.8	14.9′	56.6′
2	214°05.9	56.4	250°55.2	14.5′	05°22.7	14.8′	56.5′
3	229°05.9	·· 57.2	265°28.7	14.5′	05°37.5	14.8′	56.5′
4	244°05.9	57.9	280°02.2	14.5′	05°52.3	14.8′	56.5′
5	259°05.8	58.7	294°35.7	14.5′	06°07.1	14.8′	56.5′
6	274°05.8	S15°59.4	309°09.1	14.5′	S06°21.9	14.7′	56.5′
7	289°05.8	16°00.2	323°42.6	14.4′	06°36.6	14.7′	56.4′
8	304°05.8	00.9	338°16.0	14.4′	06°51.3	14.7′	56.4′
9	319°05.7	·· 01.7	352°49.4	14.4′	07°06.0	14.6′	56.4′
10	334°05.7	02.4	7°22.9	14.4′	07°20.6	14.5′	56.4′
11	349°05.7	03.2	21°56.3	14.4′	07°35.1	14.6′	56.4′
12	4°05.7	S16°03.9	36°29.7	14.4′	S07°49.7	14.4′	56.3′
13	19°05.6	04.7	51°03.1	14.4′	08°04.1	14.5′	56.3′
14	34°05.6	05.4	65°36.4	14.3′	08°18.6	14.4′	56.3′
15	49°05.6	·· 06.2	80°09.8	14.3′	08°33.0	14.3′	56.3′
16	64°05.5	06.9	94°43.1	14.3′	08°47.3	14.3′	56.3′
17	79°05.5	07.6	109°16.4	14.3′	09°01.6	14.2′	56.2′
18	94°05.5	S16°08.4	123°49.7	14.3′	S09°15.8	14.3′	56.2′
19	109°05.5	09.1	138°23.0	14.2′	09°30.1	14.1′	56.2′
20	124°05.4	09.9	152°56.2	14.2′	09°44.2	14.1′	56.2′
21	139°05.4	·· 10.6	167°29.4	14.2′	09°58.3	14.0′	56.2′
22	154°05.4	11.4	182°02.7	14.2′	10°12.3	14.0′	56.1′
23	169°05.3	12.1	196°35.8	14.2′	10°26.3	14.0′	56.1′
	SD = 16.1′	d = 0.8′	SD = 15.4′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°05.3	S16°12.8	211°09.0	14.1′	S10°40.3	13.9′	56.1′
1	199°05.3	13.6	225°42.1	14.1′	10°54.2	13.8′	56.1′
2	214°05.2	14.3	240°15.2	14.1′	11°08.0	13.8′	56.0′
3	229°05.2	·· 15.1	254°48.3	14.0′	11°21.8	13.7′	56.0′
4	244°05.2	15.8	269°21.3	14.0′	11°35.5	13.6′	56.0′
5	259°05.1	16.5	283°54.4	14.0′	11°49.1	13.6′	56.0′
6	274°05.1	S16°17.3	298°27.3	14.0′	S12°02.7	13.6′	56.0′
7	289°05.1	18.0	313°00.3	13.9′	12°16.3	13.5′	55.9′
8	304°05.0	18.7	327°33.2	13.9′	12°29.8	13.4′	55.9′
9	319°05.0	·· 19.5	342°06.1	13.9′	12°43.2	13.3′	55.9′
10	334°05.0	20.2	356°39.0	13.8′	12°56.5	13.3′	55.9′
11	349°04.9	20.9	11°11.8	13.8′	13°09.8	13.2′	55.9′
12	4°04.9	S16°21.7	25°44.6	13.8′	S13°23.0	13.2′	55.9′
13	19°04.8	22.4	40°17.3	13.7′	13°36.2	13.0′	55.8′
14	34°04.8	23.1	54°50.1	13.7′	13°49.2	13.1′	55.8′
15	49°04.8	·· 23.9	69°22.8	13.6′	14°02.3	12.9′	55.8′
16	64°04.7	24.6	83°55.4	13.6′	14°15.2	12.9′	55.8′
17	79°04.7	25.3	98°28.0	13.6′	14°28.1	12.8′	55.8′
18	94°04.7	S16°26.1	113°00.6	13.5′	S14°40.9	12.7′	55.7′
19	109°04.6	26.8	127°33.1	13.5′	14°53.6	12.7′	55.7′
20	124°04.6	27.5	142°05.6	13.5′	15°06.3	12.6′	55.7′
21	139°04.5	·· 28.3	156°38.0	13.4′	15°18.9	12.5′	55.7′
22	154°04.5	29.0	171°10.5	13.4′	15°31.4	12.4′	55.7′
23	169°04.5	29.7	185°42.8	13.3′	15°43.8	12.3′	55.6′
	SD = 16.1′	d = 0.7′	SD = 15.3′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°04.4	S16°30.5	200°15.1	13.3′	S15°56.1	12.3′	55.6′
1	199°04.4	31.2	214°47.4	13.2′	16°08.4	12.2′	55.6′
2	214°04.3	31.9	229°19.7	13.2′	16°20.6	12.1′	55.6′
3	229°04.3	·· 32.6	243°51.9	13.2′	16°32.7	12.1′	55.6′
4	244°04.3	33.4	258°24.0	13.1′	16°44.8	11.9′	55.5′
5	259°04.2	34.1	272°56.1	13.1′	16°56.7	11.9′	55.5′
6	274°04.2	S16°34.8	287°28.2	13.0′	S17°08.6	11.8′	55.5′
7	289°04.1	35.5	302°00.2	13.0′	17°20.4	11.7′	55.5′
8	304°04.1	36.3	316°32.2	12.9′	17°32.1	11.6′	55.5′
9	319°04.0	·· 37.0	331°04.1	12.9′	17°43.7	11.5′	55.4′
10	334°04.0	37.7	345°36.0	12.8′	17°55.2	11.5′	55.4′
11	349°03.9	38.4	0°07.8	12.8′	18°06.7	11.3′	55.4′
12	4°03.9	S16°39.2	14°39.6	12.7′	S18°18.0	11.3′	55.4′
13	19°03.9	39.9	29°11.3	12.7′	18°29.3	11.2′	55.4′
14	34°03.8	40.6	43°43.0	12.6′	18°40.5	11.1′	55.4′
15	49°03.8	·· 41.3	58°14.7	12.6′	18°51.6	10.9′	55.3′
16	64°03.7	42.1	72°46.3	12.5′	19°02.5	10.9′	55.3′
17	79°03.7	42.8	87°17.8	12.5′	19°13.4	10.8′	55.3′
18	94°03.6	S16°43.5	101°49.3	12.4′	S19°24.2	10.8′	55.3′
19	109°03.6	44.2	116°20.8	12.4′	19°35.0	10.6′	55.3′
20	124°03.5	44.9	130°52.2	12.3′	19°45.6	10.5′	55.2′
21	139°03.5	·· 45.7	145°23.5	12.3′	19°56.1	10.4′	55.2′
22	154°03.4	46.4	159°54.8	12.3′	20°06.5	10.3′	55.2′
23	169°03.4	47.1	174°26.1	12.2′	20°16.8	10.3′	55.2′
	SD = 16.1′	d = 0.7′	SD = 15.2′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:30	07:57	09:38	13:48	15:29	16:56
N 70°	06:23	07:40	09:02	14:24	15:46	17:03
68°	06:17	07:26	08:36	14:50	16:00	17:09
66°	06:12	07:15	08:17	15:09	16:11	17:14
64°	06:08	07:06	08:01	15:25	16:20	17:18
62°	06:04	06:58	07:48	15:38	16:29	17:22
60°	06:00	06:51	07:37	15:49	16:36	17:26
N 58°	05:57	06:45	07:28	15:59	16:42	17:29
56°	05:54	06:39	07:20	16:07	16:48	17:32
54°	05:51	06:34	07:12	16:14	16:53	17:35
52°	05:49	06:29	07:06	16:21	16:57	17:38
50°	05:46	06:25	07:00	16:27	17:02	17:40
45°	05:40	06:15	06:47	16:40	17:11	17:46
N 40°	05:35	06:07	06:36	16:51	17:20	17:52
35°	05:30	06:00	06:27	17:00	17:27	17:57
30°	05:25	05:54	06:18	17:09	17:33	18:02
20°	05:15	05:41	06:04	17:23	17:46	18:12
N 10°	05:05	05:30	05:52	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:41	05:06	05:28	17:59	18:21	18:47
20°	04:25	04:52	05:16	18:12	18:35	19:03
30°	04:05	04:35	05:01	18:27	18:53	19:23
35°	03:52	04:25	04:52	18:36	19:03	19:36
40°	03:36	04:13	04:42	18:46	19:16	19:52
45°	03:17	03:58	04:31	18:58	19:31	20:12
S 50°	02:51	03:39	04:16	19:12	19:49	20:38
52°	02:38	03:30	04:10	19:19	19:59	20:51
54°	02:22	03:20	04:02	19:26	20:09	21:07
56°	02:04	03:08	03:54	19:35	20:21	21:27
58°	01:40	02:55	03:45	19:44	20:35	21:52
S 60°	01:05	02:39	03:34	19:55	20:51	22:28

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	04:38	06:58	▬	13:49	13:04	▬
N 70°	04:29	06:34	09:05	14:01	13:30	12:35
68°	04:22	06:16	08:24	14:11	13:49	13:17
66°	04:16	06:02	07:56	14:20	14:05	13:46
64°	04:10	05:50	07:35	14:27	14:18	14:08
62°	04:06	05:41	07:18	14:33	14:29	14:26
60°	04:02	05:32	07:04	14:38	14:39	14:41
N 58°	03:59	05:25	06:52	14:43	14:47	14:53
56°	03:56	05:19	06:42	14:47	14:55	15:04
54°	03:53	05:13	06:33	14:51	15:01	15:14
52°	03:50	05:08	06:25	14:54	15:07	15:23
50°	03:48	05:03	06:18	14:57	15:13	15:31
45°	03:43	04:53	06:03	15:04	15:24	15:47
N 40°	03:39	04:45	05:50	15:10	15:34	16:01
35°	03:36	04:38	05:40	15:15	15:42	16:13
30°	03:33	04:32	05:31	15:19	15:50	16:23
20°	03:28	04:21	05:15	15:27	16:03	16:41
N 10°	03:23	04:12	05:01	15:34	16:14	16:56
0°	03:19	04:03	04:48	15:40	16:25	17:11
S 10°	03:15	03:55	04:36	15:46	16:35	17:25
20°	03:11	03:46	04:22	15:53	16:47	17:41
30°	03:06	03:35	04:07	16:01	17:00	17:59
35°	03:03	03:30	03:58	16:06	17:08	18:10
40°	03:00	03:23	03:48	16:11	17:16	18:22
45°	02:56	03:15	03:37	16:17	17:27	18:36
S 50°	02:52	03:06	03:23	16:24	17:39	18:54
52°	02:50	03:02	03:16	16:27	17:45	19:02
54°	02:48	02:57	03:09	16:31	17:51	19:12
56°	02:45	02:52	03:01	16:35	17:58	19:22
58°	02:43	02:47	02:52	16:40	18:07	19:34
S 60°	02:40	02:40	02:42	16:45	18:16	19:49

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 27-29 11-2%
06	16:24	16:23	11:44	09:30	21:52	
07	16:21	16:20	11:44	10:14	22:36	
08	16:18	16:16	11:44	10:59	23:23	

November 09, 10, 11 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	48°11.1	207°38.1	S11°44.7	262°41.5	N15°40.5	260°26.6	N13°47.5	39°02.0	N01°02.9
1	63°13.6	222°40.8	43.9	277°42.8	40.2	275°28.8	47.4	54°04.6	02.8
2	78°16.0	237°43.5	43.1	292°44.1	39.8	290°31.0	47.3	69°07.2	02.8
3	93°18.5	252°46.2	·· 42.4	307°45.4	·· 39.5	305°33.3	·· 47.2	84°09.7	·· 02.7
4	108°20.9	267°48.9	41.6	322°46.6	39.2	320°35.5	47.1	99°12.3	02.7
5	123°23.4	282°51.6	40.9	337°47.9	38.8	335°37.7	47.1	114°14.9	02.6
6	138°25.9	297°54.3	S11°40.1	352°49.2	N15°38.5	350°39.9	N13°47.0	129°17.5	N01°02.6
7	153°28.3	312°57.0	39.3	7°50.5	38.2	5°42.1	46.9	144°20.1	02.5
8	168°30.8	327°59.7	38.6	22°51.8	37.8	20°44.3	46.8	159°22.7	02.5
9	183°33.3	343°02.3	·· 37.8	37°53.1	·· 37.5	35°46.6	·· 46.8	174°25.3	·· 02.4
10	198°35.7	358°05.0	37.1	52°54.3	37.1	50°48.8	46.7	189°27.9	02.4
11	213°38.2	13°07.7	36.3	67°55.6	36.8	65°51.0	46.6	204°30.5	02.4
12	228°40.7	28°10.3	S11°35.6	82°56.9	N15°36.5	80°53.2	N13°46.5	219°33.0	N01°02.3
13	243°43.1	43°13.0	34.8	97°58.2	36.1	95°55.4	46.5	234°35.6	02.3
14	258°45.6	58°15.7	34.1	112°59.5	35.8	110°57.6	46.4	249°38.2	02.2
15	273°48.1	73°18.3	·· 33.3	128°00.8	·· 35.5	125°59.9	·· 46.3	264°40.8	·· 02.2
16	288°50.5	88°21.0	32.6	143°02.1	35.1	141°02.1	46.2	279°43.4	02.1
17	303°53.0	103°23.6	31.9	158°03.3	34.8	156°04.3	46.2	294°46.0	02.1
18	318°55.4	118°26.3	S11°31.1	173°04.6	N15°34.5	171°06.5	N13°46.1	309°48.6	N01°02.0
19	333°57.9	133°28.9	30.4	188°05.9	34.1	186°08.7	46.0	324°51.2	02.0
20	349°00.4	148°31.5	29.7	203°07.2	33.8	201°10.9	45.9	339°53.7	02.0
21	4°02.8	163°34.2	·· 28.9	218°08.5	·· 33.4	216°13.2	·· 45.9	354°56.3	·· 01.9
22	19°05.3	178°36.8	28.2	233°09.8	33.1	231°15.4	45.8	9°58.9	01.9
23	34°07.8	193°39.4	27.5	248°11.1	32.8	246°17.6	45.7	25°01.5	01.8
Mer.pass. 20:44		ν 2.7′	d 0.8′	m -4.64	ν 1.3′	d 0.3′	m 0.77	ν 2.2′	d 0.1′ m -2.05	ν 2.6′	d 0.0′ m 0.50

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	49°10.2	208°42.0	S11°26.7	263°12.4	N15°32.4	261°19.8	N13°45.6	40°04.1	N01°01.8
1	64°12.7	223°44.7	26.0	278°13.7	32.1	276°22.0	45.6	55°06.7	01.7
2	79°15.2	238°47.3	25.3	293°14.9	31.8	291°24.3	45.5	70°09.3	01.7
3	94°17.6	253°49.9	·· 24.6	308°16.2	·· 31.4	306°26.5	·· 45.4	85°11.8	·· 01.6
4	109°20.1	268°52.5	23.9	323°17.5	31.1	321°28.7	45.3	100°14.4	01.6
5	124°22.5	283°55.1	23.1	338°18.8	30.8	336°30.9	45.3	115°17.0	01.6
6	139°25.0	298°57.7	S11°22.4	353°20.1	N15°30.4	351°33.2	N13°45.2	130°19.6	N01°01.5
7	154°27.5	314°00.3	21.7	8°21.4	30.1	6°35.4	45.1	145°22.2	01.5
8	169°29.9	329°02.9	21.0	23°22.7	29.8	21°37.6	45.0	160°24.8	01.4
9	184°32.4	344°05.4	·· 20.3	38°24.0	·· 29.4	36°39.8	·· 45.0	175°27.3	·· 01.4
10	199°34.9	359°08.0	19.6	53°25.3	29.1	51°42.0	44.9	190°29.9	01.3
11	214°37.3	14°10.6	18.9	68°26.6	28.8	66°44.3	44.8	205°32.5	01.3
12	229°39.8	29°13.2	S11°18.2	83°27.9	N15°28.4	81°46.5	N13°44.7	220°35.1	N01°01.3
13	244°42.3	44°15.7	17.5	98°29.2	28.1	96°48.7	44.7	235°37.7	01.2
14	259°44.7	59°18.3	16.8	113°30.5	27.7	111°50.9	44.6	250°40.3	01.2
15	274°47.2	74°20.9	·· 16.1	128°31.8	·· 27.4	126°53.2	·· 44.5	265°42.9	·· 01.1
16	289°49.7	89°23.4	15.4	143°33.1	27.1	141°55.4	44.4	280°45.4	01.1
17	304°52.1	104°26.0	14.7	158°34.4	26.7	156°57.6	44.4	295°48.0	01.0
18	319°54.6	119°28.5	S11°14.0	173°35.7	N15°26.4	171°59.8	N13°44.3	310°50.6	N01°01.0
19	334°57.0	134°31.1	13.3	188°37.0	26.1	187°02.1	44.2	325°53.2	01.0
20	349°59.5	149°33.6	12.6	203°38.3	25.7	202°04.3	44.1	340°55.8	00.9
21	5°02.0	164°36.1	·· 11.9	218°39.6	·· 25.4	217°06.5	·· 44.1	355°58.4	·· 00.9
22	20°04.4	179°38.7	11.2	233°40.9	25.1	232°08.7	44.0	11°00.9	00.8
23	35°06.9	194°41.2	10.6	248°42.2	24.7	247°11.0	43.9	26°03.5	00.8
Mer.pass. 20:40		ν 2.6′	d 0.7′	m -4.68	ν 1.3′	d 0.3′	m 0.75	ν 2.2′	d 0.1′ m -2.06	ν 2.6′	d 0.0′ m 0.50

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°09.4	209°43.7	S11°09.9	263°43.5	N15°24.4	262°13.2	N13°43.8	41°06.1	N01°00.7
1	65°11.8	224°46.3	09.2	278°44.8	24.1	277°15.4	43.8	56°08.7	00.7
2	80°14.3	239°48.8	08.5	293°46.1	23.7	292°17.6	43.7	71°11.3	00.7
3	95°16.8	254°51.3	·· 07.8	308°47.4	·· 23.4	307°19.9	·· 43.6	86°13.9	·· 00.6
4	110°19.2	269°53.8	07.2	323°48.7	23.1	322°22.1	43.6	101°16.4	00.6
5	125°21.7	284°56.3	06.5	338°50.0	22.7	337°24.3	43.5	116°19.0	00.5
6	140°24.2	299°58.8	S11°05.8	353°51.3	N15°22.4	352°26.6	N13°43.4	131°21.6	N01°00.5
7	155°26.6	315°01.3	05.2	8°52.6	22.1	7°28.8	43.3	146°24.2	00.4
8	170°29.1	330°03.8	04.5	23°53.9	21.7	22°31.0	43.3	161°26.8	00.4
9	185°31.5	345°06.3	·· 03.8	38°55.2	·· 21.4	37°33.2	·· 43.2	176°29.3	·· 00.4
10	200°34.0	0°08.8	03.2	53°56.5	21.1	52°35.5	43.1	191°31.9	00.3
11	215°36.5	15°11.3	02.5	68°57.8	20.7	67°37.7	43.1	206°34.5	00.3
12	230°38.9	30°13.7	S11°01.9	83°59.1	N15°20.4	82°39.9	N13°43.0	221°37.1	N01°00.2
13	245°41.4	45°16.2	01.2	99°00.4	20.1	97°42.2	42.9	236°39.7	00.2
14	260°43.9	60°18.7	11°00.5	114°01.7	19.7	112°44.4	42.8	251°42.3	00.2
15	275°46.3	75°21.1	10°59.9	129°03.0	·· 19.4	127°46.6	·· 42.8	266°44.8	·· 00.1
16	290°48.8	90°23.6	59.2	144°04.3	19.1	142°48.9	42.7	281°47.4	00.1
17	305°51.3	105°26.1	58.6	159°05.7	18.7	157°51.1	42.6	296°50.0	00.0
18	320°53.7	120°28.5	S10°58.0	174°07.0	N15°18.4	172°53.3	N13°42.6	311°52.6	N01°00.0
19	335°56.2	135°31.0	57.3	189°08.3	18.1	187°55.5	42.5	326°55.2	00°59.9
20	350°58.7	150°33.4	56.7	204°09.6	17.7	202°57.8	42.4	341°57.7	59.9
21	6°01.1	165°35.9	·· 56.0	219°10.9	·· 17.4	218°00.0	·· 42.3	357°00.3	·· 59.9
22	21°03.6	180°38.3	55.4	234°12.2	17.1	233°02.2	42.3	12°02.9	59.8
23	36°06.0	195°40.7	54.8	249°13.5	16.7	248°04.5	42.2	27°05.5	59.8
Mer.pass. 20:36		ν 2.5′	d 0.7′	m -4.71	ν 1.3′	d 0.3′	m 0.74	ν 2.2′	d 0.1′ m -2.06	ν 2.6′	d 0.0′ m 0.51

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.6
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°44.6	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.5
Aldebaran	290°37.6	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°14.0	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°37.9	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.5	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°58.9	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.1	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.1	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.4	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 09 Mon	SHA	Mer.pass
Venus	159°27.0	10:08
Mars	214°30.4	06:29
Jupiter	212°15.5	06:37
Saturn	350°50.9	21:20

Nov 10 Tue	SHA	Mer.pass
Venus	159°31.8	10:03
Mars	214°02.1	06:27
Jupiter	212°09.6	06:34
Saturn	350°53.9	21:16

Nov 11 Wed	SHA	Mer.pass
Venus	159°34.4	09:59
Mars	213°34.1	06:25
Jupiter	212°03.8	06:30
Saturn	350°56.7	21:12

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°03.3	S16°47.8	188°57.3	12.2′	S20°27.1	10.1′	55.2′
1	199°03.3	48.5	203°28.4	12.1′	20°37.2	10.0′	55.2′
2	214°03.2	49.2	217°59.5	12.1′	20°47.2	9.9′	55.1′
3	229°03.2	·· 50.0	232°30.6	12.0′	20°57.1	9.8′	55.1′
4	244°03.1	50.7	247°01.6	12.0′	21°06.9	9.7′	55.1′
5	259°03.1	51.4	261°32.5	11.9′	21°16.6	9.7′	55.1′
6	274°03.0	S16°52.1	276°03.4	11.9′	S21°26.3	9.5′	55.1′
7	289°03.0	52.8	290°34.3	11.8′	21°35.8	9.4′	55.1′
8	304°02.9	53.5	305°05.1	11.8′	21°45.2	9.3′	55.0′
9	319°02.9	·· 54.2	319°35.8	11.7′	21°54.5	9.1′	55.0′
10	334°02.8	55.0	334°06.5	11.7′	22°03.6	9.1′	55.0′
11	349°02.8	55.7	348°37.2	11.6′	22°12.7	9.0′	55.0′
12	4°02.7	S16°56.4	3°07.8	11.6′	S22°21.7	8.8′	55.0′
13	19°02.7	57.1	17°38.4	11.5′	22°30.5	8.8′	55.0′
14	34°02.6	57.8	32°08.9	11.5′	22°39.3	8.6′	54.9′
15	49°02.5	·· 58.5	46°39.3	11.4′	22°47.9	8.5′	54.9′
16	64°02.5	59.2	61°09.7	11.4′	22°56.4	8.5′	54.9′
17	79°02.4	16°59.9	75°40.1	11.3′	23°04.9	8.2′	54.9′
18	94°02.4	S17°00.6	90°10.4	11.3′	S23°13.1	8.2′	54.9′
19	109°02.3	01.3	104°40.7	11.2′	23°21.3	8.1′	54.9′
20	124°02.3	02.0	119°10.9	11.2′	23°29.4	7.9′	54.8′
21	139°02.2	·· 02.8	133°41.1	11.1′	23°37.3	7.9′	54.8′
22	154°02.1	03.5	148°11.2	11.1′	23°45.2	7.7′	54.8′
23	169°02.1	04.2	162°41.3	11.0′	23°52.9	7.6′	54.8′
	SD = 16.1′	d = 0.7′	SD = 15.0′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°02.0	S17°04.9	177°11.4	11.0′	S24°00.5	7.5′	54.8′
1	199°02.0	05.6	191°41.4	11.0′	24°08.0	7.3′	54.8′
2	214°01.9	06.3	206°11.3	10.9′	24°15.3	7.3′	54.8′
3	229°01.8	·· 07.0	220°41.2	10.9′	24°22.6	7.1′	54.7′
4	244°01.8	07.7	235°11.1	10.8′	24°29.7	7.0′	54.7′
5	259°01.7	08.4	249°40.9	10.8′	24°36.7	6.9′	54.7′
6	274°01.7	S17°09.1	264°10.7	10.7′	S24°43.6	6.7′	54.7′
7	289°01.6	09.8	278°40.4	10.7′	24°50.3	6.7′	54.7′
8	304°01.5	10.5	293°10.1	10.7′	24°57.0	6.5′	54.7′
9	319°01.5	·· 11.2	307°39.8	10.6′	25°03.5	6.3′	54.6′
10	334°01.4	11.9	322°09.4	10.6′	25°09.8	6.3′	54.6′
11	349°01.4	12.6	336°39.0	10.5′	25°16.1	6.1′	54.6′
12	4°01.3	S17°13.3	351°08.6	10.5′	S25°22.2	6.0′	54.6′
13	19°01.2	14.0	5°38.1	10.5′	25°28.2	5.9′	54.6′
14	34°01.2	14.7	20°07.5	10.4′	25°34.1	5.8′	54.6′
15	49°01.1	·· 15.4	34°37.0	10.4′	25°39.9	5.6′	54.6′
16	64°01.0	16.1	49°06.4	10.4′	25°45.5	5.5′	54.5′
17	79°01.0	16.8	63°35.8	10.3′	25°51.0	5.4′	54.5′
18	94°00.9	S17°17.5	78°05.1	10.3′	S25°56.4	5.2′	54.5′
19	109°00.8	18.2	92°34.4	10.3′	26°01.6	5.1′	54.5′
20	124°00.8	18.9	107°03.7	10.2′	26°06.7	5.0′	54.5′
21	139°00.7	·· 19.6	121°32.9	10.2′	26°11.7	4.8′	54.5′
22	154°00.6	20.3	136°02.1	10.2′	26°16.5	4.8′	54.5′
23	169°00.6	20.9	150°31.3	10.2′	26°21.3	4.6′	54.5′
	SD = 16.1′	d = 0.7′	SD = 14.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°00.5	S17°21.6	165°00.5	10.1′	S26°25.9	4.4′	54.4′
1	199°00.4	22.3	179°29.6	10.1′	26°30.3	4.3′	54.4′
2	214°00.4	23.0	193°58.7	10.1′	26°34.6	4.2′	54.4′
3	229°00.3	·· 23.7	208°27.8	10.1′	26°38.8	4.1′	54.4′
4	244°00.2	24.4	222°56.9	10.0′	26°42.9	3.9′	54.4′
5	259°00.2	25.1	237°25.9	10.0′	26°46.8	3.8′	54.4′
6	274°00.1	S17°25.8	251°54.9	10.0′	S26°50.6	3.7′	54.4′
7	289°00.0	26.5	266°23.9	10.0′	26°54.3	3.5′	54.4′
8	304°00.0	27.2	280°52.9	10.0′	26°57.8	3.4′	54.3′
9	318°59.9	·· 27.9	295°21.9	9.9′	27°01.2	3.2′	54.3′
10	333°59.8	28.5	309°50.8	9.9′	27°04.4	3.2′	54.3′
11	348°59.7	29.2	324°19.7	9.9′	27°07.6	3.0′	54.3′
12	3°59.7	S17°29.9	338°48.6	9.9′	S27°10.6	2.8′	54.3′
13	18°59.6	30.6	353°17.5	9.9′	27°13.4	2.7′	54.3′
14	33°59.5	31.3	7°46.4	9.9′	27°16.1	2.6′	54.3′
15	48°59.5	·· 32.0	22°15.3	9.9′	27°18.7	2.5′	54.3′
16	63°59.4	32.7	36°44.2	9.9′	27°21.2	2.3′	54.3′
17	78°59.3	33.3	51°13.0	9.8′	27°23.5	2.2′	54.2′
18	93°59.2	S17°34.0	65°41.9	9.8′	S27°25.7	2.0′	54.2′
19	108°59.2	34.7	80°10.7	9.8′	27°27.7	1.9′	54.2′
20	123°59.1	35.4	94°39.5	9.8′	27°29.6	1.8′	54.2′
21	138°59.0	·· 36.1	109°08.4	9.8′	27°31.4	1.6′	54.2′
22	153°58.9	36.8	123°37.2	9.8′	27°33.0	1.5′	54.2′
23	168°58.9	37.4	138°06.0	9.8′	27°34.5	1.4′	54.2′
	SD = 16.1′	d = 0.7′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:41	08:11	10:02	13:24	15:16	16:45
N 70°	06:33	07:52	09:19	14:08	15:35	16:54
68°	06:26	07:37	08:50	14:37	15:50	17:00
66°	06:20	07:25	08:28	14:59	16:02	17:06
64°	06:15	07:14	08:11	15:16	16:13	17:11
62°	06:11	07:05	07:57	15:30	16:22	17:16
60°	06:07	06:58	07:45	15:42	16:29	17:20
N 58°	06:03	06:51	07:35	15:52	16:36	17:24
56°	06:00	06:45	07:26	16:01	16:42	17:27
54°	05:56	06:39	07:18	16:09	16:48	17:31
52°	05:53	06:34	07:11	16:16	16:53	17:34
50°	05:51	06:30	07:04	16:23	16:58	17:37
45°	05:44	06:19	06:51	16:37	17:08	17:43
N 40°	05:38	06:11	06:39	16:48	17:17	17:49
35°	05:33	06:03	06:29	16:58	17:25	17:55
30°	05:27	05:56	06:21	17:07	17:32	18:00
20°	05:16	05:43	06:06	17:22	17:45	18:11
N 10°	05:06	05:31	05:53	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:23	04:51	05:14	18:14	18:37	19:05
30°	04:02	04:33	04:59	18:29	18:55	19:26
35°	03:49	04:22	04:50	18:39	19:06	19:40
40°	03:32	04:09	04:39	18:49	19:19	19:56
45°	03:12	03:54	04:27	19:02	19:35	20:17
S 50°	02:44	03:34	04:12	19:17	19:55	20:45
52°	02:30	03:24	04:05	19:24	20:05	20:59
54°	02:14	03:14	03:57	19:32	20:16	21:16
56°	01:53	03:01	03:48	19:41	20:29	21:38
58°	01:26	02:46	03:38	19:51	20:43	22:06
S 60°	00:43	02:29	03:27	20:03	21:02	22:54

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	10:09	▬	▬	13:12	▬	▬
64°	09:28	11:44	▬	13:54	13:21	▬
62°	09:00	10:45	12:30	14:23	14:21	14:22
60°	08:38	10:11	11:36	14:45	14:55	15:16
N 58°	08:21	09:47	11:05	15:03	15:20	15:48
56°	08:06	09:27	10:41	15:18	15:39	16:12
54°	07:53	09:11	10:21	15:32	15:56	16:31
52°	07:42	08:57	10:05	15:43	16:10	16:48
50°	07:33	08:45	09:51	15:53	16:23	17:02
45°	07:12	08:20	09:23	16:15	16:49	17:31
N 40°	06:56	08:00	09:00	16:32	17:09	17:53
35°	06:42	07:43	08:42	16:47	17:27	18:12
30°	06:30	07:29	08:26	17:00	17:41	18:28
20°	06:09	07:05	08:00	17:22	18:07	18:55
N 10°	05:52	06:44	07:37	17:41	18:28	19:18
0°	05:35	06:25	07:15	17:59	18:49	19:40
S 10°	05:19	06:05	06:54	18:17	19:09	20:02
20°	05:02	05:45	06:31	18:36	19:31	20:26
30°	04:42	05:21	06:05	18:58	19:57	20:53
35°	04:30	05:07	05:50	19:12	20:12	21:09
40°	04:17	04:51	05:32	19:27	20:29	21:28
45°	04:02	04:32	05:10	19:45	20:51	21:50
S 50°	03:43	04:09	04:43	20:08	21:17	22:19
52°	03:34	03:57	04:29	20:19	21:30	22:33
54°	03:24	03:45	04:14	20:31	21:45	22:50
56°	03:13	03:30	03:56	20:45	22:03	23:10
58°	03:00	03:13	03:34	21:02	22:25	23:34
S 60°	02:45	02:52	03:06	21:22	22:52	·· ··

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 0-2 0-3%
09	16:13	16:11	11:44	11:47	–:–	
10	16:08	16:05	11:44	12:37	00:12	
11	16:02	15:59	11:44	13:28	01:02	

November 12, 13, 14 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	51°08.5	210°43.2	S10°54.1	264°14.8	N15°16.4	263°06.7	N13°42.1	42°08.1	N00°59.7
1	66°11.0	225°45.6	53.5	279°16.1	16.1	278°08.9	42.1	57°10.6	59.7
2	81°13.4	240°48.0	52.9	294°17.5	15.7	293°11.2	42.0	72°13.2	59.7
3	96°15.9	255°50.4	·· 52.2	309°18.8	·· 15.4	308°13.4	·· 41.9	87°15.8	·· 59.6
4	111°18.4	270°52.9	51.6	324°20.1	15.1	323°15.6	41.8	102°18.4	59.6
5	126°20.8	285°55.3	51.0	339°21.4	14.8	338°17.9	41.8	117°20.9	59.5
6	141°23.3	300°57.7	S10°50.4	354°22.7	N15°14.4	353°20.1	N13°41.7	132°23.5	N00°59.5
7	156°25.8	316°00.1	49.7	9°24.0	14.1	8°22.3	41.6	147°26.1	59.5
8	171°28.2	331°02.5	49.1	24°25.3	13.8	23°24.6	41.6	162°28.7	59.4
9	186°30.7	346°04.9	·· 48.5	39°26.7	·· 13.4	38°26.8	·· 41.5	177°31.3	·· 59.4
10	201°33.2	1°07.3	47.9	54°28.0	13.1	53°29.1	41.4	192°33.8	59.3
11	216°35.6	16°09.7	47.3	69°29.3	12.8	68°31.3	41.4	207°36.4	59.3
12	231°38.1	31°12.1	S10°46.7	84°30.6	N15°12.4	83°33.5	N13°41.3	222°39.0	N00°59.3
13	246°40.5	46°14.4	46.1	99°31.9	12.1	98°35.8	41.2	237°41.6	59.2
14	261°43.0	61°16.8	45.5	114°33.3	11.8	113°38.0	41.1	252°44.2	59.2
15	276°45.5	76°19.2	·· 44.8	129°34.6	·· 11.4	128°40.2	·· 41.1	267°46.7	·· 59.1
16	291°47.9	91°21.6	44.2	144°35.9	11.1	143°42.5	41.0	282°49.3	59.1
17	306°50.4	106°23.9	43.6	159°37.2	10.8	158°44.7	40.9	297°51.9	59.1
18	321°52.9	121°26.3	S10°43.0	174°38.5	N15°10.4	173°46.9	N13°40.9	312°54.5	N00°59.0
19	336°55.3	136°28.6	42.5	189°39.9	10.1	188°49.2	40.8	327°57.0	59.0
20	351°57.8	151°31.0	41.9	204°41.2	09.8	203°51.4	40.7	342°59.6	58.9
21	7°00.3	166°33.3	·· 41.3	219°42.5	·· 09.5	218°53.7	·· 40.7	358°02.2	·· 58.9
22	22°02.7	181°35.7	40.7	234°43.8	09.1	233°55.9	40.6	13°04.8	58.9
23	37°05.2	196°38.0	40.1	249°45.1	08.8	248°58.1	40.5	28°07.3	58.8
Mer.pass. 20:32		ν 2.4′	d 0.6′	m -4.74	ν 1.3′	d 0.3′	m 0.73	ν 2.2′	d 0.1′ m -2.07	ν 2.6′	d 0.0′ m 0.51

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	52°07.6	211°40.4	S10°39.5	264°46.5	N15°08.5	264°00.4	N13°40.5	43°09.9	N00°58.8
1	67°10.1	226°42.7	38.9	279°47.8	08.1	279°02.6	40.4	58°12.5	58.7
2	82°12.6	241°45.0	38.3	294°49.1	07.8	294°04.9	40.3	73°15.1	58.7
3	97°15.0	256°47.4	·· 37.8	309°50.4	·· 07.5	309°07.1	·· 40.2	88°17.7	·· 58.7
4	112°17.5	271°49.7	37.2	324°51.8	07.1	324°09.3	40.2	103°20.2	58.6
5	127°20.0	286°52.0	36.6	339°53.1	06.8	339°11.6	40.1	118°22.8	58.6
6	142°22.4	301°54.3	S10°36.0	354°54.4	N15°06.5	354°13.8	N13°40.0	133°25.4	N00°58.5
7	157°24.9	316°56.7	35.5	9°55.7	06.1	9°16.1	40.0	148°28.0	58.5
8	172°27.4	331°59.0	34.9	24°57.1	05.8	24°18.3	39.9	163°30.5	58.5
9	187°29.8	347°01.3	·· 34.3	39°58.4	·· 05.5	39°20.6	·· 39.8	178°33.1	·· 58.4
10	202°32.3	2°03.6	33.7	54°59.7	05.2	54°22.8	39.8	193°35.7	58.4
11	217°34.8	17°05.9	33.2	70°01.1	04.8	69°25.0	39.7	208°38.3	58.3
12	232°37.2	32°08.2	S10°32.6	85°02.4	N15°04.5	84°27.3	N13°39.6	223°40.8	N00°58.3
13	247°39.7	47°10.4	32.1	100°03.7	04.2	99°29.5	39.6	238°43.4	58.3
14	262°42.1	62°12.7	31.5	115°05.0	03.8	114°31.8	39.5	253°46.0	58.2
15	277°44.6	77°15.0	·· 30.9	130°06.4	·· 03.5	129°34.0	·· 39.4	268°48.6	·· 58.2
16	292°47.1	92°17.3	30.4	145°07.7	03.2	144°36.3	39.4	283°51.1	58.2
17	307°49.5	107°19.6	29.8	160°09.0	02.9	159°38.5	39.3	298°53.7	58.1
18	322°52.0	122°21.8	S10°29.3	175°10.4	N15°02.5	174°40.7	N13°39.2	313°56.3	N00°58.1
19	337°54.5	137°24.1	28.7	190°11.7	02.2	189°43.0	39.2	328°58.8	58.0
20	352°56.9	152°26.4	28.2	205°13.0	01.9	204°45.2	39.1	344°01.4	58.0
21	7°59.4	167°28.6	·· 27.7	220°14.4	·· 01.5	219°47.5	·· 39.0	359°04.0	·· 58.0
22	23°01.9	182°30.9	27.1	235°15.7	01.2	234°49.7	39.0	14°06.6	57.9
23	38°04.3	197°33.1	26.6	250°17.0	00.9	249°52.0	38.9	29°09.1	57.9
Mer.pass. 20:28		ν 2.3′	d 0.6′	m -4.77	ν 1.3′	d 0.3′	m 0.72	ν 2.2′	d 0.1′ m -2.07	ν 2.6′	d 0.0′ m 0.52

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	53°06.8	212°35.4	S10°26.0	265°18.4	N15°00.6	264°54.2	N13°38.8	44°11.7	N00°57.9
1	68°09.3	227°37.6	25.5	280°19.7	15°00.2	279°56.5	38.8	59°14.3	57.8
2	83°11.7	242°39.9	25.0	295°21.0	14°59.9	294°58.7	38.7	74°16.9	57.8
3	98°14.2	257°42.1	·· 24.4	310°22.4	·· 59.6	310°01.0	·· 38.6	89°19.4	·· 57.7
4	113°16.6	272°44.4	23.9	325°23.7	59.2	325°03.2	38.6	104°22.0	57.7
5	128°19.1	287°46.6	23.4	340°25.1	58.9	340°05.4	38.5	119°24.6	57.7
6	143°21.6	302°48.8	S10°22.8	355°26.4	N14°58.6	355°07.7	N13°38.4	134°27.1	N00°57.6
7	158°24.0	317°51.0	22.3	10°27.7	58.3	10°09.9	38.4	149°29.7	57.6
8	173°26.5	332°53.2	21.8	25°29.1	57.9	25°12.2	38.3	164°32.3	57.6
9	188°29.0	347°55.5	·· 21.3	40°30.4	·· 57.6	40°14.4	·· 38.2	179°34.9	·· 57.5
10	203°31.4	2°57.7	20.8	55°31.7	57.3	55°16.7	38.2	194°37.4	57.5
11	218°33.9	17°59.9	20.2	70°33.1	56.9	70°18.9	38.1	209°40.0	57.4
12	233°36.4	33°02.1	S10°19.7	85°34.4	N14°56.6	85°21.2	N13°38.1	224°42.6	N00°57.4
13	248°38.8	48°04.3	19.2	100°35.8	56.3	100°23.4	38.0	239°45.1	57.4
14	263°41.3	63°06.5	18.7	115°37.1	56.0	115°25.7	37.9	254°47.7	57.3
15	278°43.8	78°08.7	·· 18.2	130°38.4	·· 55.6	130°27.9	·· 37.9	269°50.3	·· 57.3
16	293°46.2	93°10.9	17.7	145°39.8	55.3	145°30.2	37.8	284°52.9	57.3
17	308°48.7	108°13.1	17.2	160°41.1	55.0	160°32.4	37.7	299°55.4	57.2
18	323°51.1	123°15.2	S10°16.7	175°42.5	N14°54.7	175°34.7	N13°37.7	314°58.0	N00°57.2
19	338°53.6	138°17.4	16.2	190°43.8	54.3	190°36.9	37.6	330°00.6	57.1
20	353°56.1	153°19.6	15.7	205°45.2	54.0	205°39.2	37.5	345°03.1	57.1
21	8°58.5	168°21.8	·· 15.2	220°46.5	·· 53.7	220°41.4	·· 37.5	0°05.7	·· 57.1
22	24°01.0	183°23.9	14.7	235°47.9	53.4	235°43.7	37.4	15°08.3	57.0
23	39°03.5	198°26.1	14.2	250°49.2	53.0	250°46.0	37.3	30°10.9	57.0
Mer.pass. 20:24		ν 2.2′	d 0.5′	m -4.80	ν 1.3′	d 0.3′	m 0.71	ν 2.2′	d 0.1′ m -2.08	ν 2.6′	d 0.0′ m 0.52

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.6
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.1
Hamal	327°49.2	23°35.5
Polaris	312°44.1	89°22.7
Acamar	315°10.2	-40°11.7
Menkar	314°04.2	4°11.8
Mirfak	308°25.6	49°57.5
Aldebaran	290°37.6	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.4	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°13.9	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°37.9	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.5	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°58.9	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.1	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.6
Hadar	148°34.5	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.1	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 12 Thu	SHA	Mer.pass
Venus	159°34.7	09:56
Mars	213°06.3	06:22
Jupiter	211°58.2	06:27
Saturn	350°59.5	21:08

Nov 13 Fri	SHA	Mer.pass
Venus	159°32.7	09:52
Mars	212°38.8	06:20
Jupiter	211°52.7	06:23
Saturn	351°02.3	21:04

Nov 14 Sat	SHA	Mer.pass
Venus	159°28.6	09:48
Mars	212°11.6	06:18
Jupiter	211°47.4	06:19
Saturn	351°04.9	21:00

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°58.8	S17°38.1	152°34.8	9.8′	S27°35.9	1.2′	54.2′
1	198°58.7	38.8	167°03.7	9.8′	27°37.1	1.1′	54.2′
2	213°58.6	39.5	181°32.5	9.8′	27°38.2	0.9′	54.2′
3	228°58.6	·· 40.2	196°01.3	9.8′	27°39.1	0.9′	54.2′
4	243°58.5	40.8	210°30.1	9.8′	27°40.0	0.6′	54.1′
5	258°58.4	41.5	224°59.0	9.8′	27°40.6	0.6′	54.1′
6	273°58.3	S17°42.2	239°27.8	9.9′	S27°41.2	0.4′	54.1′
7	288°58.2	42.9	253°56.7	9.9′	27°41.6	0.3′	54.1′
8	303°58.2	43.5	268°25.5	9.9′	27°41.9	0.1′	54.1′
9	318°58.1	·· 44.2	282°54.4	9.9′	27°42.0	0.0′	54.1′
10	333°58.0	44.9	297°23.3	9.9′	27°42.0	0.1′	54.1′
11	348°57.9	45.6	311°52.2	9.9′	27°41.9	0.3′	54.1′
12	3°57.8	S17°46.2	326°21.1	9.9′	S27°41.6	0.4′	54.1′
13	18°57.8	46.9	340°50.0	9.9′	27°41.2	0.5′	54.1′
14	33°57.7	47.6	355°18.9	10.0′	27°40.7	0.7′	54.1′
15	48°57.6	·· 48.3	9°47.9	10.0′	27°40.0	0.8′	54.1′
16	63°57.5	48.9	24°16.9	10.0′	27°39.2	0.9′	54.1′
17	78°57.4	49.6	38°45.9	10.0′	27°38.3	1.1′	54.1′
18	93°57.4	S17°50.3	53°14.9	10.0′	S27°37.2	1.2′	54.1′
19	108°57.3	50.9	67°43.9	10.1′	27°36.0	1.4′	54.0′
20	123°57.2	51.6	82°13.0	10.1′	27°34.6	1.4′	54.0′
21	138°57.1	·· 52.3	96°42.0	10.1′	27°33.2	1.6′	54.0′
22	153°57.0	52.9	111°11.1	10.1′	27°31.6	1.8′	54.0′
23	168°56.9	53.6	125°40.3	10.2′	27°29.8	1.9′	54.0′
	SD = 16.1′	d = 0.7′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°56.9	S17°54.3	140°09.4	10.2′	S27°27.9	2.0′	54.0′
1	198°56.8	54.9	154°38.6	10.2′	27°25.9	2.1′	54.0′
2	213°56.7	55.6	169°07.8	10.2′	27°23.8	2.3′	54.0′
3	228°56.6	·· 56.3	183°37.0	10.3′	27°21.5	2.4′	54.0′
4	243°56.5	56.9	198°06.3	10.3′	27°19.1	2.5′	54.0′
5	258°56.4	57.6	212°35.6	10.3′	27°16.6	2.7′	54.0′
6	273°56.3	S17°58.3	227°04.9	10.4′	S27°13.9	2.7′	54.0′
7	288°56.2	58.9	241°34.3	10.4′	27°11.2	3.0′	54.0′
8	303°56.2	17°59.6	256°03.7	10.4′	27°08.2	3.0′	54.0′
9	318°56.1	18°00.3	270°33.2	10.5′	27°05.2	3.2′	54.0′
10	333°56.0	00.9	285°02.6	10.5′	27°02.0	3.3′	54.0′
11	348°55.9	01.6	299°32.1	10.5′	26°58.7	3.4′	54.0′
12	3°55.8	S18°02.2	314°01.7	10.6′	S26°55.3	3.6′	54.0′
13	18°55.7	02.9	328°31.3	10.6′	26°51.7	3.6′	54.0′
14	33°55.6	03.6	343°00.9	10.7′	26°48.1	3.9′	54.0′
15	48°55.5	·· 04.2	357°30.6	10.7′	26°44.2	3.9′	54.0′
16	63°55.4	04.9	12°00.3	10.7′	26°40.3	4.0′	54.0′
17	78°55.4	05.5	26°30.0	10.8′	26°36.3	4.2′	54.0′
18	93°55.3	S18°06.2	40°59.8	10.8′	S26°32.1	4.3′	54.0′
19	108°55.2	06.9	55°29.7	10.9′	26°27.8	4.5′	54.0′
20	123°55.1	07.5	69°59.5	10.9′	26°23.3	4.5′	54.0′
21	138°55.0	·· 08.2	84°29.5	11.0′	26°18.8	4.7′	54.0′
22	153°54.9	08.8	98°59.4	11.0′	26°14.1	4.8′	54.0′
23	168°54.8	09.5	113°29.4	11.1′	26°09.3	4.9′	54.0′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°54.7	S18°10.1	127°59.5	11.1′	S26°04.4	5.0′	54.0′
1	198°54.6	10.8	142°29.6	11.2′	25°59.4	5.2′	54.0′
2	213°54.5	11.4	156°59.8	11.2′	25°54.2	5.3′	54.0′
3	228°54.4	·· 12.1	171°30.0	11.3′	25°48.9	5.4′	54.0′
4	243°54.3	12.7	186°00.2	11.3′	25°43.5	5.5′	54.0′
5	258°54.2	13.4	200°30.5	11.4′	25°38.0	5.6′	54.0′
6	273°54.1	S18°14.0	215°00.9	11.4′	S25°32.4	5.8′	54.0′
7	288°54.0	14.7	229°31.3	11.5′	25°26.6	5.8′	54.0′
8	303°53.9	15.4	244°01.7	11.5′	25°20.8	6.0′	54.0′
9	318°53.8	·· 16.0	258°32.2	11.6′	25°14.8	6.1′	54.0′
10	333°53.8	16.6	273°02.8	11.6′	25°08.7	6.2′	54.0′
11	348°53.7	17.3	287°33.4	11.7′	25°02.5	6.3′	54.0′
12	3°53.6	S18°17.9	302°04.1	11.7′	S24°56.2	6.5′	54.0′
13	18°53.5	18.6	316°34.8	11.8′	24°49.7	6.5′	54.0′
14	33°53.4	19.2	331°05.5	11.8′	24°43.2	6.7′	54.0′
15	48°53.3	·· 19.9	345°36.3	11.9′	24°36.5	6.8′	54.0′
16	63°53.2	20.5	0°07.2	11.9′	24°29.7	6.9′	54.0′
17	78°53.1	21.2	14°38.1	12.0′	24°22.8	6.9′	54.1′
18	93°53.0	S18°21.8	29°09.1	12.0′	S24°15.9	7.1′	54.1′
19	108°52.9	22.5	43°40.1	12.1′	24°08.8	7.3′	54.1′
20	123°52.8	23.1	58°11.2	12.1′	24°01.5	7.3′	54.1′
21	138°52.7	·· 23.7	72°42.3	12.2′	23°54.2	7.4′	54.1′
22	153°52.6	24.4	87°13.5	12.2′	23°46.8	7.5′	54.1′
23	168°52.5	25.0	101°44.8	12.3′	23°39.3	7.7′	54.1′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	06:52	08:25	10:33	12:54	15:03	16:35
N 70°	06:43	08:04	09:37	13:51	15:24	16:44
68°	06:35	07:47	09:03	14:24	15:40	16:52
66°	06:28	07:34	08:40	14:48	15:54	16:59
64°	06:23	07:22	08:21	15:07	16:05	17:05
62°	06:18	07:13	08:06	15:22	16:15	17:10
60°	06:13	07:04	07:53	15:35	16:23	17:15
N 58°	06:09	06:57	07:42	15:46	16:31	17:19
56°	06:05	06:50	07:32	15:56	16:37	17:23
54°	06:01	06:44	07:24	16:04	16:43	17:26
52°	05:58	06:39	07:16	16:12	16:49	17:30
50°	05:55	06:34	07:09	16:19	16:54	17:33
45°	05:48	06:23	06:55	16:33	17:05	17:40
N 40°	05:41	06:14	06:43	16:45	17:14	17:47
35°	05:35	06:06	06:32	16:56	17:23	17:53
30°	05:29	05:58	06:23	17:05	17:30	17:59
20°	05:18	05:45	06:08	17:21	17:44	18:10
N 10°	05:06	05:32	05:54	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:35
S 10°	04:39	05:05	05:28	18:01	18:23	18:49
20°	04:22	04:50	05:13	18:15	18:39	19:07
30°	04:00	04:31	04:57	18:32	18:58	19:29
35°	03:46	04:20	04:47	18:42	19:10	19:43
40°	03:29	04:06	04:36	18:53	19:23	20:01
45°	03:07	03:50	04:23	19:06	19:40	20:23
S 50°	02:38	03:29	04:07	19:22	20:01	20:52
52°	02:23	03:19	04:00	19:30	20:11	21:07
54°	02:05	03:07	03:52	19:38	20:23	21:26
56°	01:42	02:54	03:42	19:48	20:36	21:49
58°	01:11	02:38	03:32	19:59	20:52	22:23
S 60°	00:03	02:19	03:19	20:11	21:12	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	14:40	▬	▬	17:28
62°	13:46	13:58	13:57	14:53	16:28	18:11
60°	12:39	13:13	13:28	16:00	17:12	18:39
N 58°	12:05	12:43	13:06	16:35	17:42	19:01
56°	11:39	12:21	12:48	17:00	18:04	19:19
54°	11:19	12:02	12:32	17:20	18:22	19:34
52°	11:02	11:47	12:19	17:37	18:38	19:47
50°	10:48	11:33	12:07	17:52	18:51	19:58
45°	10:18	11:05	11:43	18:21	19:19	20:22
N 40°	09:55	10:43	11:23	18:44	19:40	20:40
35°	09:36	10:25	11:07	19:03	19:58	20:56
30°	09:20	10:09	10:53	19:19	20:13	21:10
20°	08:53	09:43	10:28	19:46	20:39	21:33
N 10°	08:29	09:20	10:07	20:10	21:02	21:53
0°	08:07	08:58	09:48	20:32	21:22	22:11
S 10°	07:45	08:37	09:28	20:54	21:43	22:29
20°	07:21	08:14	09:07	21:17	22:05	22:49
30°	06:54	07:47	08:42	21:44	22:31	23:11
35°	06:38	07:31	08:28	22:00	22:46	23:25
40°	06:19	07:13	08:11	22:19	23:03	23:40
45°	05:56	06:50	07:51	22:42	23:24	23:58
S 50°	05:27	06:22	07:26	23:10	23:50	·· ··
52°	05:13	06:08	07:13	23:24	·· ··	00:02
54°	04:56	05:52	06:59	23:41	·· ··	00:17
56°	04:36	05:33	06:43	·· ··	00:00	00:34
58°	04:12	05:09	06:23	·· ··	00:24	00:54
S 60°	03:38	04:37	05:58	00:08	00:56	01:19

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 7-19%
12	15:55	15:51	11:44	14:19	01:54	
13	15:47	15:43	11:44	15:10	02:45	
14	15:39	15:34	11:44	16:00	03:35	

November 15, 16, 17 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°05.9	213°28.2	S10°13.7	265°50.5	N14°52.7	265°48.2	N13°37.3	45°13.4	N00°57.0
1	69°08.4	228°30.4	13.2	280°51.9	52.4	280°50.5	37.2	60°16.0	56.9
2	84°10.9	243°32.6	12.7	295°53.2	52.0	295°52.7	37.2	75°18.6	56.9
3	99°13.3	258°34.7	·· 12.3	310°54.6	·· 51.7	310°55.0	·· 37.1	90°21.1	·· 56.9
4	114°15.8	273°36.8	11.8	325°55.9	51.4	325°57.2	37.0	105°23.7	56.8
5	129°18.3	288°39.0	11.3	340°57.3	51.1	340°59.5	37.0	120°26.3	56.8
6	144°20.7	303°41.1	S10°10.8	355°58.6	N14°50.7	356°01.7	N13°36.9	135°28.8	N00°56.8
7	159°23.2	318°43.3	10.3	11°00.0	50.4	11°04.0	36.8	150°31.4	56.7
8	174°25.6	333°45.4	09.9	26°01.3	50.1	26°06.2	36.8	165°34.0	56.7
9	189°28.1	348°47.5	·· 09.4	41°02.7	·· 49.8	41°08.5	·· 36.7	180°36.5	·· 56.6
10	204°30.6	3°49.6	08.9	56°04.0	49.4	56°10.7	36.6	195°39.1	56.6
11	219°33.0	18°51.8	08.5	71°05.4	49.1	71°13.0	36.6	210°41.7	56.6
12	234°35.5	33°53.9	S10°08.0	86°06.7	N14°48.8	86°15.3	N13°36.5	225°44.2	N00°56.5
13	249°38.0	48°56.0	07.5	101°08.1	48.5	101°17.5	36.5	240°46.8	56.5
14	264°40.4	63°58.1	07.1	116°09.4	48.1	116°19.8	36.4	255°49.4	56.5
15	279°42.9	79°00.2	·· 06.6	131°10.8	·· 47.8	131°22.0	·· 36.3	270°51.9	·· 56.4
16	294°45.4	94°02.3	06.2	146°12.2	47.5	146°24.3	36.3	285°54.5	56.4
17	309°47.8	109°04.4	05.7	161°13.5	47.2	161°26.5	36.2	300°57.1	56.4
18	324°50.3	124°06.5	S10°05.3	176°14.9	N14°46.8	176°28.8	N13°36.1	315°59.7	N00°56.3
19	339°52.7	139°08.6	04.8	191°16.2	46.5	191°31.1	36.1	331°02.2	56.3
20	354°55.2	154°10.7	04.3	206°17.6	46.2	206°33.3	36.0	346°04.8	56.3
21	9°57.7	169°12.8	·· 03.9	221°18.9	·· 45.9	221°35.6	·· 36.0	1°07.4	·· 56.2
22	25°00.1	184°14.8	03.5	236°20.3	45.5	236°37.8	35.9	16°09.9	56.2
23	40°02.6	199°16.9	03.0	251°21.6	45.2	251°40.1	35.8	31°12.5	56.2
Mer.pass. 20:20		ν 2.2′	d 0.5′	m -4.82	ν 1.3′	d 0.3′	m 0.69	ν 2.3′	d 0.1′ m -2.09	ν 2.6′	d 0.0′ m 0.53

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	55°05.1	214°19.0	S10°02.6	266°23.0	N14°44.9	266°42.4	N13°35.8	46°15.0	N00°56.1
1	70°07.5	229°21.0	02.1	281°24.4	44.6	281°44.6	35.7	61°17.6	56.1
2	85°10.0	244°23.1	01.7	296°25.7	44.2	296°46.9	35.7	76°20.2	56.1
3	100°12.5	259°25.2	·· 01.3	311°27.1	·· 43.9	311°49.1	·· 35.6	91°22.7	·· 56.0
4	115°14.9	274°27.2	00.8	326°28.4	43.6	326°51.4	35.5	106°25.3	56.0
5	130°17.4	289°29.3	00.4	341°29.8	43.3	341°53.7	35.5	121°27.9	55.9
6	145°19.9	304°31.3	S10°00.0	356°31.2	N14°43.0	356°55.9	N13°35.4	136°30.4	N00°55.9
7	160°22.3	319°33.4	09°59.5	11°32.5	42.6	11°58.2	35.3	151°33.0	55.9
8	175°24.8	334°35.4	59.1	26°33.9	42.3	27°00.4	35.3	166°35.6	55.8
9	190°27.2	349°37.5	·· 58.7	41°35.2	·· 42.0	42°02.7	·· 35.2	181°38.1	·· 55.8
10	205°29.7	4°39.5	58.3	56°36.6	41.7	57°05.0	35.2	196°40.7	55.8
11	220°32.2	19°41.5	57.9	71°38.0	41.3	72°07.2	35.1	211°43.3	55.7
12	235°34.6	34°43.6	S09°57.4	86°39.3	N14°41.0	87°09.5	N13°35.0	226°45.8	N00°55.7
13	250°37.1	49°45.6	57.0	101°40.7	40.7	102°11.8	35.0	241°48.4	55.7
14	265°39.6	64°47.6	56.6	116°42.1	40.4	117°14.0	34.9	256°51.0	55.6
15	280°42.0	79°49.6	·· 56.2	131°43.4	·· 40.0	132°16.3	·· 34.9	271°53.5	·· 55.6
16	295°44.5	94°51.6	55.8	146°44.8	39.7	147°18.5	34.8	286°56.1	55.6
17	310°47.0	109°53.7	55.4	161°46.2	39.4	162°20.8	34.7	301°58.7	55.5
18	325°49.4	124°55.7	S09°55.0	176°47.5	N14°39.1	177°23.1	N13°34.7	317°01.2	N00°55.5
19	340°51.9	139°57.7	54.6	191°48.9	38.8	192°25.3	34.6	332°03.8	55.5
20	355°54.4	154°59.7	54.2	206°50.3	38.4	207°27.6	34.6	347°06.3	55.4
21	10°56.8	170°01.7	·· 53.8	221°51.6	·· 38.1	222°29.9	·· 34.5	2°08.9	·· 55.4
22	25°59.3	185°03.7	53.4	236°53.0	37.8	237°32.1	34.4	17°11.5	55.4
23	41°01.7	200°05.7	53.0	251°54.4	37.5	252°34.4	34.4	32°14.0	55.3
Mer.pass. 20:16		ν 2.1′	d 0.4′	m -4.84	ν 1.4′	d 0.3′	m 0.68	ν 2.3′	d 0.1′ m -2.09	ν 2.6′	d 0.0′ m 0.53

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°04.2	215°07.6	S09°52.6	266°55.7	N14°37.2	267°36.7	N13°34.3	47°16.6	N00°55.3
1	71°06.7	230°09.6	52.2	281°57.1	36.8	282°38.9	34.3	62°19.2	55.3
2	86°09.1	245°11.6	51.8	296°58.5	36.5	297°41.2	34.2	77°21.7	55.2
3	101°11.6	260°13.6	·· 51.4	311°59.8	·· 36.2	312°43.5	·· 34.1	92°24.3	·· 55.2
4	116°14.1	275°15.6	51.0	327°01.2	35.9	327°45.7	34.1	107°26.8	55.2
5	131°16.5	290°17.5	50.6	342°02.6	35.5	342°48.0	34.0	122°29.4	55.1
6	146°19.0	305°19.5	S09°50.3	357°04.0	N14°35.2	357°50.3	N13°34.0	137°32.0	N00°55.1
7	161°21.5	320°21.4	49.9	12°05.3	34.9	12°52.5	33.9	152°34.5	55.1
8	176°23.9	335°23.4	49.5	27°06.7	34.6	27°54.8	33.9	167°37.1	55.0
9	191°26.4	350°25.4	·· 49.1	42°08.1	·· 34.3	42°57.1	·· 33.8	182°39.7	·· 55.0
10	206°28.8	5°27.3	48.8	57°09.5	33.9	57°59.3	33.7	197°42.2	55.0
11	221°31.3	20°29.3	48.4	72°10.8	33.6	73°01.6	33.7	212°44.8	55.0
12	236°33.8	35°31.2	S09°48.0	87°12.2	N14°33.3	88°03.9	N13°33.6	227°47.3	N00°54.9
13	251°36.2	50°33.2	47.7	102°13.6	33.0	103°06.2	33.6	242°49.9	54.9
14	266°38.7	65°35.1	47.3	117°15.0	32.7	118°08.4	33.5	257°52.5	54.9
15	281°41.2	80°37.0	·· 46.9	132°16.3	·· 32.3	133°10.7	·· 33.4	272°55.0	·· 54.8
16	296°43.6	95°39.0	46.6	147°17.7	32.0	148°13.0	33.4	287°57.6	54.8
17	311°46.1	110°40.9	46.2	162°19.1	31.7	163°15.2	33.3	303°00.1	54.8
18	326°48.6	125°42.8	S09°45.9	177°20.5	N14°31.4	178°17.5	N13°33.3	318°02.7	N00°54.7
19	341°51.0	140°44.7	45.5	192°21.8	31.1	193°19.8	33.2	333°05.3	54.7
20	356°53.5	155°46.6	45.1	207°23.2	30.7	208°22.1	33.2	348°07.8	54.7
21	11°56.0	170°48.6	·· 44.8	222°24.6	·· 30.4	223°24.3	·· 33.1	3°10.4	·· 54.6
22	26°58.4	185°50.5	44.4	237°26.0	30.1	238°26.6	33.0	18°12.9	54.6
23	42°00.9	200°52.4	44.1	252°27.4	29.8	253°28.9	33.0	33°15.5	54.6
Mer.pass. 20:12		ν 2.0′	d 0.4′	m -4.85	ν 1.4′	d 0.3′	m 0.67	ν 2.3′	d 0.1′ m -2.10	ν 2.6′	d 0.0′ m 0.54

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.6
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°43.9	89°22.7
Acamar	315°10.2	-40°11.7
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.4	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°13.9	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.8	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.4	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.2	-17°41.4
Acrux	172°58.9	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.1	55°48.6
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.8	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 15 Sun	SHA	Mer.pass
Venus	159°22.3	09:45
Mars	211°44.6	06:16
Jupiter	211°42.3	06:16
Saturn	351°07.5	20:56

Nov 16 Mon	SHA	Mer.pass
Venus	159°13.9	09:41
Mars	211°17.9	06:14
Jupiter	211°37.3	06:12
Saturn	351°10.0	20:51

Nov 17 Tue	SHA	Mer.pass
Venus	159°03.4	09:38
Mars	210°51.5	06:12
Jupiter	211°32.5	06:09
Saturn	351°12.4	20:47

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°52.4	S18°25.7	116°16.1	12.4′	S23°31.6	7.7′	54.1′
1	198°52.3	26.3	130°47.4	12.4′	23°23.9	7.9′	54.1′
2	213°52.1	27.0	145°18.8	12.5′	23°16.0	7.9′	54.1′
3	228°52.0	·· 27.6	159°50.3	12.5′	23°08.1	8.1′	54.1′
4	243°51.9	28.2	174°21.8	12.6′	23°00.0	8.1′	54.1′
5	258°51.8	28.9	188°53.4	12.6′	22°51.9	8.3′	54.1′
6	273°51.7	S18°29.5	203°25.0	12.7′	S22°43.6	8.3′	54.2′
7	288°51.6	30.1	217°56.7	12.7′	22°35.3	8.5′	54.2′
8	303°51.5	30.8	232°28.4	12.8′	22°26.8	8.6′	54.2′
9	318°51.4	·· 31.4	247°00.2	12.8′	22°18.2	8.6′	54.2′
10	333°51.3	32.0	261°32.0	12.9′	22°09.6	8.8′	54.2′
11	348°51.2	32.7	276°03.9	12.9′	22°00.8	8.8′	54.2′
12	3°51.1	S18°33.3	290°35.8	13.0′	S21°52.0	9.0′	54.2′
13	18°51.0	34.0	305°07.8	13.0′	21°43.0	9.0′	54.2′
14	33°50.9	34.6	319°39.9	13.1′	21°34.0	9.2′	54.2′
15	48°50.8	·· 35.2	334°12.0	13.1′	21°24.8	9.2′	54.3′
16	63°50.7	35.8	348°44.1	13.2′	21°15.6	9.3′	54.3′
17	78°50.6	36.5	3°16.3	13.3′	21°06.3	9.5′	54.3′
18	93°50.5	S18°37.1	17°48.6	13.3′	S20°56.8	9.5′	54.3′
19	108°50.3	37.7	32°20.9	13.4′	20°47.3	9.6′	54.3′
20	123°50.2	38.4	46°53.2	13.4′	20°37.7	9.7′	54.3′
21	138°50.1	·· 39.0	61°25.6	13.5′	20°28.0	9.8′	54.3′
22	153°50.0	39.6	75°58.1	13.5′	20°18.2	9.9′	54.3′
23	168°49.9	40.3	90°30.6	13.6′	20°08.3	9.9′	54.4′
	SD = 16.2′	d = 0.6′	SD = 14.8′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°49.8	S18°40.9	105°03.1	13.6′	S19°58.4	10.1′	54.4′
1	198°49.7	41.5	119°35.7	13.6′	19°48.3	10.1′	54.4′
2	213°49.6	42.1	134°08.4	13.7′	19°38.2	10.3′	54.4′
3	228°49.5	·· 42.8	148°41.1	13.7′	19°27.9	10.3′	54.4′
4	243°49.3	43.4	163°13.8	13.8′	19°17.6	10.4′	54.4′
5	258°49.2	44.0	177°46.6	13.8′	19°07.2	10.5′	54.5′
6	273°49.1	S18°44.6	192°19.5	13.9′	S18°56.7	10.6′	54.5′
7	288°49.0	45.3	206°52.4	13.9′	18°46.1	10.6′	54.5′
8	303°48.9	45.9	221°25.3	14.0′	18°35.5	10.8′	54.5′
9	318°48.8	·· 46.5	235°58.3	14.0′	18°24.7	10.8′	54.5′
10	333°48.7	47.1	250°31.3	14.1′	18°13.9	10.9′	54.5′
11	348°48.6	47.7	265°04.3	14.1′	18°03.0	11.0′	54.6′
12	3°48.4	S18°48.4	279°37.4	14.1′	S17°52.0	11.0′	54.6′
13	18°48.3	49.0	294°10.6	14.2′	17°41.0	11.2′	54.6′
14	33°48.2	49.6	308°43.8	14.2′	17°29.8	11.2′	54.6′
15	48°48.1	·· 50.2	323°17.0	14.3′	17°18.6	11.3′	54.6′
16	63°48.0	50.8	337°50.3	14.3′	17°07.3	11.4′	54.6′
17	78°47.9	51.5	352°23.6	14.3′	16°55.9	11.5′	54.7′
18	93°47.7	S18°52.1	6°56.9	14.4′	S16°44.4	11.5′	54.7′
19	108°47.6	52.7	21°30.3	14.4′	16°32.9	11.6′	54.7′
20	123°47.5	53.3	36°03.7	14.5′	16°21.3	11.7′	54.7′
21	138°47.4	·· 53.9	50°37.2	14.5′	16°09.6	11.7′	54.7′
22	153°47.3	54.5	65°10.7	14.5′	15°57.9	11.9′	54.8′
23	168°47.1	55.1	79°44.2	14.6′	15°46.0	11.9′	54.8′
	SD = 16.2′	d = 0.6′	SD = 14.8′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°47.0	S18°55.8	94°17.8	14.6′	S15°34.1	11.9′	54.8′
1	198°46.9	56.4	108°51.4	14.6′	15°22.2	12.1′	54.8′
2	213°46.8	57.0	123°25.0	14.7′	15°10.1	12.1′	54.9′
3	228°46.7	·· 57.6	137°58.6	14.7′	14°58.0	12.2′	54.9′
4	243°46.5	58.2	152°32.3	14.7′	14°45.8	12.3′	54.9′
5	258°46.4	58.8	167°06.1	14.8′	14°33.5	12.3′	54.9′
6	273°46.3	S18°59.4	181°39.8	14.8′	S14°21.2	12.4′	54.9′
7	288°46.2	19°00.0	196°13.6	14.8′	14°08.8	12.4′	55.0′
8	303°46.1	00.6	210°47.4	14.8′	13°56.4	12.6′	55.0′
9	318°45.9	·· 01.3	225°21.2	14.9′	13°43.8	12.6′	55.0′
10	333°45.8	01.9	239°55.1	14.9′	13°31.2	12.6′	55.0′
11	348°45.7	02.5	254°29.0	14.9′	13°18.6	12.7′	55.1′
12	3°45.6	S19°03.1	269°02.9	14.9′	S13°05.9	12.8′	55.1′
13	18°45.4	03.7	283°36.8	15.0′	12°53.1	12.9′	55.1′
14	33°45.3	04.3	298°10.8	15.0′	12°40.2	12.9′	55.1′
15	48°45.2	·· 04.9	312°44.7	15.0′	12°27.3	13.0′	55.2′
16	63°45.1	05.5	327°18.7	15.0′	12°14.3	13.0′	55.2′
17	78°44.9	06.1	341°52.8	15.0′	12°01.3	13.1′	55.2′
18	93°44.8	S19°06.7	356°26.8	15.1′	S11°48.2	13.2′	55.2′
19	108°44.7	07.3	11°00.8	15.1′	11°35.0	13.2′	55.3′
20	123°44.6	07.9	25°34.9	15.1′	11°21.8	13.2′	55.3′
21	138°44.4	·· 08.5	40°09.0	15.1′	11°08.6	13.4′	55.3′
22	153°44.3	09.1	54°43.1	15.1′	10°55.2	13.4′	55.4′
23	168°44.2	09.7	69°17.2	15.1′	10°41.8	13.4′	55.4′
	SD = 16.2′	d = 0.6′	SD = 14.9′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:03	08:39	11:31	11:57	14:49	16:25
N 70°	06:52	08:15	09:56	13:32	15:13	16:36
68°	06:44	07:57	09:18	14:11	15:31	16:45
66°	06:36	07:43	08:51	14:38	15:46	16:52
64°	06:30	07:30	08:31	14:58	15:58	16:59
62°	06:24	07:20	08:14	15:15	16:09	17:05
60°	06:19	07:11	08:00	15:28	16:18	17:10
N 58°	06:14	07:03	07:49	15:40	16:26	17:14
56°	06:10	06:56	07:38	15:50	16:33	17:19
54°	06:06	06:50	07:30	15:59	16:39	17:23
52°	06:03	06:44	07:22	16:07	16:45	17:26
50°	05:59	06:39	07:14	16:15	16:50	17:30
45°	05:51	06:27	06:59	16:30	17:02	17:38
N 40°	05:44	06:17	06:46	16:43	17:12	17:45
35°	05:38	06:08	06:35	16:54	17:21	17:51
30°	05:32	06:00	06:26	17:03	17:29	17:58
20°	05:19	05:46	06:09	17:20	17:43	18:10
N 10°	05:07	05:33	05:55	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:36
S 10°	04:39	05:05	05:27	18:02	18:25	18:51
20°	04:21	04:49	05:13	18:17	18:41	19:09
30°	03:58	04:29	04:55	18:35	19:01	19:32
35°	03:43	04:17	04:45	18:45	19:13	19:47
40°	03:25	04:03	04:34	18:56	19:27	20:05
45°	03:03	03:46	04:20	19:10	19:44	20:28
S 50°	02:32	03:24	04:03	19:27	20:07	20:59
52°	02:16	03:14	03:56	19:35	20:17	21:16
54°	01:56	03:01	03:47	19:44	20:30	21:36
56°	01:31	02:47	03:37	19:54	20:44	22:02
58°	00:53	02:30	03:25	20:06	21:01	22:42
S 60°	////	02:09	03:12	20:19	21:23	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	16:17	15:02	▬	19:07	21:53
N 70°	▬	15:24	14:40	▬	19:59	22:13
68°	15:48	14:51	14:23	18:00	20:30	22:28
66°	14:52	14:26	14:10	18:54	20:53	22:40
64°	14:19	14:07	13:58	19:27	21:11	22:50
62°	13:55	13:52	13:48	19:50	21:26	22:59
60°	13:35	13:38	13:40	20:09	21:38	23:06
N 58°	13:19	13:27	13:32	20:25	21:49	23:12
56°	13:05	13:17	13:26	20:38	21:58	23:18
54°	12:53	13:08	13:20	20:49	22:06	23:23
52°	12:43	13:00	13:14	20:59	22:13	23:28
50°	12:33	12:53	13:10	21:08	22:20	23:32
45°	12:13	12:38	12:59	21:27	22:34	23:40
N 40°	11:57	12:25	12:50	21:43	22:45	23:48
35°	11:43	12:14	12:43	21:55	22:55	23:54
30°	11:31	12:05	12:36	22:07	23:03	·· ··
20°	11:10	11:49	12:24	22:26	23:18	·· ··
N 10°	10:52	11:34	12:14	22:42	23:30	·· ··
0°	10:35	11:21	12:04	22:57	23:42	·· ··
S 10°	10:18	11:07	11:55	23:13	23:53	·· ··
20°	10:00	10:53	11:44	23:29	·· ··	00:06
30°	09:39	10:36	11:32	23:47	·· ··	00:20
35°	09:27	10:26	11:25	23:58	·· ··	00:28
40°	09:13	10:15	11:18	·· ··	00:10	00:37
45°	08:56	10:02	11:08	·· ··	00:25	00:48
S 50°	08:34	09:45	10:57	00:20	00:42	01:00
52°	08:24	09:38	10:52	00:30	00:51	01:06
54°	08:13	09:29	10:46	00:42	01:00	01:13
56°	08:00	09:20	10:40	00:56	01:10	01:20
58°	07:45	09:09	10:32	01:11	01:22	01:28
S 60°	07:26	08:56	10:24	01:30	01:35	01:37

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 27-45%
15	15:29	15:24	11:45	16:46	04:23	
16	15:19	15:14	11:45	17:31	05:09	
17	15:08	15:02	11:45	18:15	05:53	

November 18, 19, 20 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	57°03.3	215°54.3	S09°43.8	267°28.7	N14°29.5	268°31.1	N13°32.9	48°18.1	N00°54.5
1	72°05.8	230°56.2	43.4	282°30.1	29.1	283°33.4	32.9	63°20.6	54.5
2	87°08.3	245°58.1	43.1	297°31.5	28.8	298°35.7	32.8	78°23.2	54.5
3	102°10.7	261°00.0	·· 42.7	312°32.9	·· 28.5	313°38.0	·· 32.8	93°25.7	·· 54.4
4	117°13.2	276°01.9	42.4	327°34.3	28.2	328°40.2	32.7	108°28.3	54.4
5	132°15.7	291°03.7	42.1	342°35.7	27.9	343°42.5	32.7	123°30.8	54.4
6	147°18.1	306°05.6	S09°41.7	357°37.0	N14°27.6	358°44.8	N13°32.6	138°33.4	N00°54.4
7	162°20.6	321°07.5	41.4	12°38.4	27.2	13°47.1	32.5	153°36.0	54.3
8	177°23.1	336°09.4	41.1	27°39.8	26.9	28°49.3	32.5	168°38.5	54.3
9	192°25.5	351°11.3	·· 40.7	42°41.2	·· 26.6	43°51.6	·· 32.4	183°41.1	·· 54.3
10	207°28.0	6°13.1	40.4	57°42.6	26.3	58°53.9	32.4	198°43.6	54.2
11	222°30.5	21°15.0	40.1	72°44.0	26.0	73°56.2	32.3	213°46.2	54.2
12	237°32.9	36°16.9	S09°39.8	87°45.4	N14°25.6	88°58.4	N13°32.3	228°48.8	N00°54.2
13	252°35.4	51°18.7	39.4	102°46.7	25.3	104°00.7	32.2	243°51.3	54.1
14	267°37.8	66°20.6	39.1	117°48.1	25.0	119°03.0	32.1	258°53.9	54.1
15	282°40.3	81°22.4	·· 38.8	132°49.5	·· 24.7	134°05.3	·· 32.1	273°56.4	·· 54.1
16	297°42.8	96°24.3	38.5	147°50.9	24.4	149°07.6	32.0	288°59.0	54.1
17	312°45.2	111°26.1	38.2	162°52.3	24.1	164°09.8	32.0	304°01.5	54.0
18	327°47.7	126°28.0	S09°37.9	177°53.7	N14°23.7	179°12.1	N13°31.9	319°04.1	N00°54.0
19	342°50.2	141°29.8	37.6	192°55.1	23.4	194°14.4	31.9	334°06.6	54.0
20	357°52.6	156°31.6	37.3	207°56.5	23.1	209°16.7	31.8	349°09.2	53.9
21	12°55.1	171°33.5	·· 37.0	222°57.9	·· 22.8	224°18.9	·· 31.8	4°11.8	·· 53.9
22	27°57.6	186°35.3	36.7	237°59.3	22.5	239°21.2	31.7	19°14.3	53.9
23	43°00.0	201°37.1	36.4	253°00.7	22.2	254°23.5	31.7	34°16.9	53.8
Mer.pass. 20:08		ν 1.9′	d 0.3′	m -4.87	ν 1.4′	d 0.3′	m 0.65	ν 2.3′	d 0.1′ m -2.10	ν 2.6′	d 0.0′ m 0.54

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	58°02.5	216°38.9	S09°36.1	268°02.0	N14°21.8	269°25.8	N13°31.6	49°19.4	N00°53.8
1	73°04.9	231°40.8	35.8	283°03.4	21.5	284°28.1	31.5	64°22.0	53.8
2	88°07.4	246°42.6	35.5	298°04.8	21.2	299°30.3	31.5	79°24.5	53.8
3	103°09.9	261°44.4	·· 35.2	313°06.2	·· 20.9	314°32.6	·· 31.4	94°27.1	·· 53.7
4	118°12.3	276°46.2	34.9	328°07.6	20.6	329°34.9	31.4	109°29.6	53.7
5	133°14.8	291°48.0	34.6	343°09.0	20.3	344°37.2	31.3	124°32.2	53.7
6	148°17.3	306°49.8	S09°34.3	358°10.4	N14°20.0	359°39.5	N13°31.3	139°34.8	N00°53.6
7	163°19.7	321°51.6	34.0	13°11.8	19.6	14°41.8	31.2	154°37.3	53.6
8	178°22.2	336°53.4	33.7	28°13.2	19.3	29°44.0	31.2	169°39.9	53.6
9	193°24.7	351°55.2	·· 33.5	43°14.6	·· 19.0	44°46.3	·· 31.1	184°42.4	·· 53.5
10	208°27.1	6°57.0	33.2	58°16.0	18.7	59°48.6	31.1	199°45.0	53.5
11	223°29.6	21°58.8	32.9	73°17.4	18.4	74°50.9	31.0	214°47.5	53.5
12	238°32.1	37°00.5	S09°32.6	88°18.8	N14°18.1	89°53.2	N13°31.0	229°50.1	N00°53.5
13	253°34.5	52°02.3	32.4	103°20.2	17.7	104°55.4	30.9	244°52.6	53.4
14	268°37.0	67°04.1	32.1	118°21.6	17.4	119°57.7	30.8	259°55.2	53.4
15	283°39.4	82°05.9	·· 31.8	133°23.0	·· 17.1	135°00.0	·· 30.8	274°57.7	·· 53.4
16	298°41.9	97°07.6	31.6	148°24.4	16.8	150°02.3	30.7	290°00.3	53.3
17	313°44.4	112°09.4	31.3	163°25.8	16.5	165°04.6	30.7	305°02.8	53.3
18	328°46.8	127°11.2	S09°31.0	178°27.2	N14°16.2	180°06.9	N13°30.6	320°05.4	N00°53.3
19	343°49.3	142°12.9	30.8	193°28.6	15.9	195°09.2	30.6	335°08.0	53.3
20	358°51.8	157°14.7	30.5	208°30.0	15.5	210°11.4	30.5	350°10.5	53.2
21	13°54.2	172°16.4	·· 30.2	223°31.4	·· 15.2	225°13.7	·· 30.5	5°13.1	·· 53.2
22	28°56.7	187°18.2	30.0	238°32.8	14.9	240°16.0	30.4	20°15.6	53.2
23	43°59.2	202°19.9	29.7	253°34.2	14.6	255°18.3	30.4	35°18.2	53.2
Mer.pass. 20:05		ν 1.8′	d 0.3′	m -4.88	ν 1.4′	d 0.3′	m 0.64	ν 2.3′	d 0.1′ m -2.11	ν 2.6′	d 0.0′ m 0.55

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	59°01.6	217°21.7	S09°29.5	268°35.6	N14°14.3	270°20.6	N13°30.3	50°20.7	N00°53.1
1	74°04.1	232°23.4	29.2	283°37.0	14.0	285°22.9	30.3	65°23.3	53.1
2	89°06.6	247°25.2	29.0	298°38.4	13.7	300°25.2	30.2	80°25.8	53.1
3	104°09.0	262°26.9	·· 28.7	313°39.9	·· 13.4	315°27.5	·· 30.2	95°28.4	·· 53.0
4	119°11.5	277°28.6	28.5	328°41.3	13.0	330°29.7	30.1	110°30.9	53.0
5	134°13.9	292°30.4	28.3	343°42.7	12.7	345°32.0	30.1	125°33.5	53.0
6	149°16.4	307°32.1	S09°28.0	358°44.1	N14°12.4	0°34.3	N13°30.0	140°36.0	N00°53.0
7	164°18.9	322°33.8	27.8	13°45.5	12.1	15°36.6	30.0	155°38.6	52.9
8	179°21.3	337°35.5	27.5	28°46.9	11.8	30°38.9	29.9	170°41.1	52.9
9	194°23.8	352°37.2	·· 27.3	43°48.3	·· 11.5	45°41.2	·· 29.9	185°43.7	·· 52.9
10	209°26.3	7°38.9	27.1	58°49.7	11.2	60°43.5	29.8	200°46.2	52.8
11	224°28.7	22°40.6	26.8	73°51.1	10.9	75°45.8	29.8	215°48.8	52.8
12	239°31.2	37°42.4	S09°26.6	88°52.5	N14°10.5	90°48.1	N13°29.7	230°51.3	N00°52.8
13	254°33.7	52°44.1	26.4	103°54.0	10.2	105°50.3	29.7	245°53.9	52.8
14	269°36.1	67°45.8	26.2	118°55.4	09.9	120°52.6	29.6	260°56.4	52.7
15	284°38.6	82°47.4	·· 25.9	133°56.8	·· 09.6	135°54.9	·· 29.6	275°59.0	·· 52.7
16	299°41.0	97°49.1	25.7	148°58.2	09.3	150°57.2	29.5	291°01.5	52.7
17	314°43.5	112°50.8	25.5	163°59.6	09.0	165°59.5	29.5	306°04.1	52.7
18	329°46.0	127°52.5	S09°25.3	179°01.0	N14°08.7	181°01.8	N13°29.4	321°06.6	N00°52.6
19	344°48.4	142°54.2	25.1	194°02.4	08.4	196°04.1	29.4	336°09.2	52.6
20	359°50.9	157°55.9	24.9	209°03.9	08.1	211°06.4	29.3	351°11.7	52.6
21	14°53.4	172°57.5	·· 24.6	224°05.3	·· 07.7	226°08.7	·· 29.3	6°14.3	·· 52.6
22	29°55.8	187°59.2	24.4	239°06.7	07.4	241°11.0	29.2	21°16.8	52.5
23	44°58.3	203°00.9	24.2	254°08.1	07.1	256°13.3	29.2	36°19.4	52.5
Mer.pass. 20:01		ν 1.7′	d 0.2′	m -4.89	ν 1.4′	d 0.3′	m 0.63	ν 2.3′	d 0.1′ m -2.12	ν 2.6′	d 0.0′ m 0.55

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°44.0	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.8
Canopus	263°51.3	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.4	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°13.9	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.8	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.4	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.2	-17°41.4
Acrux	172°58.8	-63°14.7
Gacrux	171°50.3	-57°15.6
Alioth	166°12.1	55°48.6
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.8	-60°56.7
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.5	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 18 Wed	SHA	Mer.pass
Venus	158°50.9	09:35
Mars	210°25.4	06:10
Jupiter	211°27.8	06:05
Saturn	351°14.7	20:43

Nov 19 Thu	SHA	Mer.pass
Venus	158°36.5	09:32
Mars	209°59.6	06:07
Jupiter	211°23.3	06:01
Saturn	351°16.9	20:39

Nov 20 Fri	SHA	Mer.pass
Venus	158°20.1	09:29
Mars	209°34.0	06:05
Jupiter	211°19.0	05:58
Saturn	351°19.1	20:35

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°44.1	S19°10.3	83°51.3	15.1′	S10°28.4	13.5′	55.4′
1	198°43.9	10.9	98°25.5	15.1′	10°14.9	13.6′	55.4′
2	213°43.8	11.5	112°59.6	15.2′	10°01.3	13.6′	55.5′
3	228°43.7	·· 12.1	127°33.8	15.2′	09°47.7	13.6′	55.5′
4	243°43.5	12.7	142°07.9	15.2′	09°34.1	13.8′	55.5′
5	258°43.4	13.3	156°42.1	15.2′	09°20.3	13.7′	55.6′
6	273°43.3	S19°13.9	171°16.3	15.2′	S09°06.6	13.9′	55.6′
7	288°43.2	14.5	185°50.5	15.2′	08°52.7	13.8′	55.6′
8	303°43.0	15.1	200°24.7	15.2′	08°38.9	14.0′	55.6′
9	318°42.9	·· 15.7	214°58.9	15.2′	08°24.9	13.9′	55.7′
10	333°42.8	16.3	229°33.1	15.2′	08°11.0	14.0′	55.7′
11	348°42.6	16.9	244°07.2	15.2′	07°57.0	14.1′	55.7′
12	3°42.5	S19°17.4	258°41.4	15.2′	S07°42.9	14.1′	55.8′
13	18°42.4	18.0	273°15.6	15.2′	07°28.8	14.2′	55.8′
14	33°42.2	18.6	287°49.8	15.2′	07°14.6	14.2′	55.8′
15	48°42.1	·· 19.2	302°24.0	15.2′	07°00.4	14.3′	55.9′
16	63°42.0	19.8	316°58.2	15.2′	06°46.1	14.2′	55.9′
17	78°41.8	20.4	331°32.4	15.2′	06°31.9	14.4′	55.9′
18	93°41.7	S19°21.0	346°06.5	15.2′	S06°17.5	14.4′	56.0′
19	108°41.6	21.6	0°40.7	15.1′	06°03.1	14.4′	56.0′
20	123°41.4	22.2	15°14.8	15.1′	05°48.7	14.5′	56.0′
21	138°41.3	·· 22.7	29°49.0	15.1′	05°34.2	14.5′	56.1′
22	153°41.2	23.3	44°23.1	15.1′	05°19.7	14.5′	56.1′
23	168°41.0	23.9	58°57.2	15.1′	05°05.2	14.6′	56.1′
	SD = 16.2′	d = 0.6′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°40.9	S19°24.5	73°31.3	15.1′	S04°50.6	14.6′	56.2′
1	198°40.7	25.1	88°05.4	15.1′	04°36.0	14.7′	56.2′
2	213°40.6	25.7	102°39.5	15.0′	04°21.3	14.7′	56.2′
3	228°40.5	·· 26.3	117°13.5	15.0′	04°06.6	14.7′	56.3′
4	243°40.3	26.8	131°47.5	15.0′	03°51.9	14.8′	56.3′
5	258°40.2	27.4	146°21.6	15.0′	03°37.1	14.8′	56.3′
6	273°40.1	S19°28.0	160°55.5	15.0′	S03°22.3	14.8′	56.4′
7	288°39.9	28.6	175°29.5	14.9′	03°07.5	14.9′	56.4′
8	303°39.8	29.2	190°03.5	14.9′	02°52.6	14.9′	56.4′
9	318°39.6	·· 29.7	204°37.4	14.9′	02°37.7	14.9′	56.5′
10	333°39.5	30.3	219°11.3	14.9′	02°22.8	15.0′	56.5′
11	348°39.4	30.9	233°45.1	14.8′	02°07.8	14.9′	56.6′
12	3°39.2	S19°31.5	248°19.0	14.8′	S01°52.9	15.1′	56.6′
13	18°39.1	32.0	262°52.8	14.8′	01°37.8	15.0′	56.6′
14	33°38.9	32.6	277°26.5	14.7′	01°22.8	15.1′	56.7′
15	48°38.8	·· 33.2	292°00.3	14.7′	01°07.7	15.1′	56.7′
16	63°38.7	33.8	306°34.0	14.7′	00°52.6	15.1′	56.7′
17	78°38.5	34.3	321°07.6	14.6′	00°37.5	15.1′	56.8′
18	93°38.4	S19°34.9	335°41.3	14.6′	S00°22.4	15.2′	56.8′
19	108°38.2	35.5	350°14.9	14.6′	S00°07.2	15.2′	56.8′
20	123°38.1	36.1	4°48.4	14.5′	N00°08.0	15.2′	56.9′
21	138°37.9	·· 36.6	19°21.9	14.5′	00°23.2	15.2′	56.9′
22	153°37.8	37.2	33°55.4	14.4′	00°38.4	15.2′	57.0′
23	168°37.7	37.8	48°28.8	14.4′	00°53.6	15.3′	57.0′
	SD = 16.2′	d = 0.6′	SD = 15.3′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°37.5	S19°38.3	63°02.2	14.3′	N01°08.9	15.3′	57.0′
1	198°37.4	38.9	77°35.5	14.3′	01°24.2	15.2′	57.1′
2	213°37.2	39.5	92°08.8	14.2′	01°39.4	15.4′	57.1′
3	228°37.1	·· 40.1	106°42.1	14.2′	01°54.8	15.3′	57.1′
4	243°36.9	40.6	121°15.3	14.1′	02°10.1	15.3′	57.2′
5	258°36.8	41.2	135°48.4	14.1′	02°25.4	15.3′	57.2′
6	273°36.6	S19°41.8	150°21.5	14.0′	N02°40.7	15.4′	57.3′
7	288°36.5	42.3	164°54.5	14.0′	02°56.1	15.4′	57.3′
8	303°36.3	42.9	179°27.5	13.9′	03°11.5	15.3′	57.3′
9	318°36.2	·· 43.4	194°00.4	13.9′	03°26.8	15.4′	57.4′
10	333°36.0	44.0	208°33.3	13.8′	03°42.2	15.4′	57.4′
11	348°35.9	44.6	223°06.1	13.7′	03°57.6	15.4′	57.5′
12	3°35.7	S19°45.1	237°38.8	13.7′	N04°13.0	15.3′	57.5′
13	18°35.6	45.7	252°11.5	13.6′	04°28.3	15.4′	57.5′
14	33°35.4	46.3	266°44.1	13.5′	04°43.7	15.4′	57.6′
15	48°35.3	·· 46.8	281°16.6	13.5′	04°59.1	15.4′	57.6′
16	63°35.1	47.4	295°49.1	13.4′	05°14.5	15.4′	57.7′
17	78°35.0	47.9	310°21.5	13.3′	05°29.9	15.4′	57.7′
18	93°34.8	S19°48.5	324°53.9	13.3′	N05°45.3	15.3′	57.7′
19	108°34.7	49.1	339°26.1	13.2′	06°00.6	15.4′	57.8′
20	123°34.5	49.6	353°58.3	13.1′	06°16.0	15.4′	57.8′
21	138°34.4	·· 50.2	8°30.5	13.1′	06°31.4	15.3′	57.9′
22	153°34.2	50.7	23°02.5	13.0′	06°46.7	15.4′	57.9′
23	168°34.1	51.3	37°34.5	12.9′	07°02.1	15.3′	57.9′
	SD = 16.2′	d = 0.6′	SD = 15.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:13	08:53	▬	▬	14:37	16:16
N 70°	07:02	08:27	10:18	13:12	15:03	16:28
68°	06:52	08:07	09:32	13:58	15:23	16:38
66°	06:44	07:51	09:02	14:28	15:39	16:46
64°	06:37	07:38	08:40	14:50	15:52	16:53
62°	06:30	07:27	08:22	15:08	16:03	17:00
60°	06:25	07:17	08:08	15:22	16:13	17:05
N 58°	06:20	07:09	07:55	15:35	16:21	17:10
56°	06:15	07:01	07:45	15:46	16:29	17:15
54°	06:11	06:55	07:35	15:55	16:35	17:19
52°	06:07	06:49	07:27	16:04	16:42	17:23
50°	06:03	06:43	07:19	16:11	16:47	17:27
45°	05:55	06:31	07:03	16:27	17:00	17:35
N 40°	05:47	06:20	06:50	16:41	17:10	17:43
35°	05:40	06:11	06:38	16:52	17:19	17:50
30°	05:34	06:03	06:28	17:02	17:28	17:57
20°	05:21	05:48	06:11	17:19	17:43	18:10
N 10°	05:08	05:34	05:56	17:35	17:57	18:23
0°	04:54	05:20	05:42	17:49	18:11	18:36
S 10°	04:39	05:05	05:27	18:03	18:26	18:52
20°	04:20	04:48	05:12	18:19	18:43	19:11
30°	03:56	04:28	04:54	18:37	19:03	19:35
35°	03:41	04:15	04:44	18:48	19:16	19:50
40°	03:22	04:01	04:32	19:00	19:31	20:09
45°	02:59	03:43	04:17	19:14	19:49	20:33
S 50°	02:26	03:20	04:00	19:32	20:12	21:06
52°	02:09	03:09	03:51	19:40	20:23	21:24
54°	01:48	02:56	03:42	19:50	20:37	21:45
56°	01:19	02:41	03:32	20:00	20:52	22:15
58°	00:31	02:23	03:20	20:13	21:10	23:09
S 60°	////	02:00	03:06	20:27	21:34	////

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	14:22	13:49	13:17	·· ··	00:04	02:11
N 70°	14:12	13:47	13:23	·· ··	00:12	02:09
68°	14:03	13:45	13:28	·· ··	00:18	02:07
66°	13:56	13:44	13:32	·· ··	00:22	02:05
64°	13:50	13:43	13:35	·· ··	00:27	02:04
62°	13:45	13:42	13:38	·· ··	00:30	02:03
60°	13:40	13:41	13:41	·· ··	00:33	02:02
N 58°	13:36	13:40	13:44	·· ··	00:36	02:01
56°	13:33	13:39	13:46	·· ··	00:38	02:00
54°	13:30	13:39	13:48	·· ··	00:40	02:00
52°	13:27	13:38	13:50	·· ··	00:42	01:59
50°	13:24	13:37	13:51	·· ··	00:44	01:58
45°	13:18	13:36	13:55	·· ··	00:48	01:57
N 40°	13:13	13:35	13:58	·· ··	00:51	01:56
35°	13:09	13:34	14:00	·· ··	00:54	01:55
30°	13:05	13:33	14:03	00:00	00:56	01:54
20°	12:58	13:32	14:07	00:09	01:00	01:53
N 10°	12:53	13:31	14:11	00:17	01:04	01:52
0°	12:47	13:30	14:14	00:25	01:07	01:51
S 10°	12:42	13:29	14:18	00:32	01:11	01:49
20°	12:36	13:28	14:21	00:40	01:14	01:48
30°	12:29	13:26	14:26	00:50	01:18	01:47
35°	12:25	13:26	14:28	00:55	01:20	01:46
40°	12:21	13:25	14:31	01:01	01:23	01:45
45°	12:15	13:24	14:34	01:07	01:26	01:44
S 50°	12:09	13:23	14:38	01:16	01:29	01:43
52°	12:06	13:22	14:40	01:19	01:31	01:42
54°	12:03	13:21	14:42	01:23	01:32	01:41
56°	12:00	13:21	14:45	01:28	01:34	01:41
58°	11:56	13:20	14:47	01:33	01:36	01:40
S 60°	11:51	13:19	14:50	01:38	01:39	01:39

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 9-11 55-74%
18	14:56	14:50	11:45	18:57	06:36	
19	14:44	14:37	11:45	19:40	07:19	
20	14:30	14:23	11:46	20:25	08:02	

November 21, 22, 23 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°00.8	218°02.6	S09°24.0	269°09.5	N14°06.8	271°15.6	N13°29.1	51°21.9	N00°52.5
1	75°03.2	233°04.2	23.8	284°10.9	06.5	286°17.9	29.1	66°24.5	52.4
2	90°05.7	248°05.9	23.6	299°12.4	06.2	301°20.2	29.0	81°27.0	52.4
3	105°08.2	263°07.5	·· 23.4	314°13.8	·· 05.9	316°22.4	·· 29.0	96°29.6	·· 52.4
4	120°10.6	278°09.2	23.2	329°15.2	05.6	331°24.7	28.9	111°32.1	52.4
5	135°13.1	293°10.8	23.0	344°16.6	05.3	346°27.0	28.9	126°34.7	52.3
6	150°15.5	308°12.5	S09°22.8	359°18.0	N14°04.9	1°29.3	N13°28.8	141°37.2	N00°52.3
7	165°18.0	323°14.1	22.6	14°19.5	04.6	16°31.6	28.8	156°39.7	52.3
8	180°20.5	338°15.8	22.4	29°20.9	04.3	31°33.9	28.7	171°42.3	52.3
9	195°22.9	353°17.4	·· 22.3	44°22.3	·· 04.0	46°36.2	·· 28.7	186°44.8	·· 52.2
10	210°25.4	8°19.1	22.1	59°23.7	03.7	61°38.5	28.6	201°47.4	52.2
11	225°27.9	23°20.7	21.9	74°25.1	03.4	76°40.8	28.6	216°49.9	52.2
12	240°30.3	38°22.3	S09°21.7	89°26.6	N14°03.1	91°43.1	N13°28.5	231°52.5	N00°52.2
13	255°32.8	53°23.9	21.5	104°28.0	02.8	106°45.4	28.5	246°55.0	52.1
14	270°35.3	68°25.6	21.3	119°29.4	02.5	121°47.7	28.4	261°57.6	52.1
15	285°37.7	83°27.2	·· 21.2	134°30.8	·· 02.2	136°50.0	·· 28.4	277°00.1	·· 52.1
16	300°40.2	98°28.8	21.0	149°32.3	01.9	151°52.3	28.3	292°02.7	52.1
17	315°42.6	113°30.4	20.8	164°33.7	01.6	166°54.6	28.3	307°05.2	52.0
18	330°45.1	128°32.0	S09°20.6	179°35.1	N14°01.2	181°56.9	N13°28.2	322°07.8	N00°52.0
19	345°47.6	143°33.6	20.5	194°36.6	00.9	196°59.2	28.2	337°10.3	52.0
20	0°50.0	158°35.2	20.3	209°38.0	00.6	212°01.5	28.1	352°12.8	52.0
21	15°52.5	173°36.8	·· 20.1	224°39.4	·· 00.3	227°03.8	·· 28.1	7°15.4	·· 51.9
22	30°55.0	188°38.4	20.0	239°40.8	14°00.0	242°06.1	28.0	22°17.9	51.9
23	45°57.4	203°40.0	19.8	254°42.3	13°59.7	257°08.4	28.0	37°20.5	51.9
Mer.pass. 19:57		ν 1.7′	d 0.2′	m -4.89	ν 1.4′	d 0.3′	m 0.61	ν 2.3′	d 0.0′ m -2.12	ν 2.5′	d 0.0′ m 0.56

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°59.9	218°41.6	S09°19.6	269°43.7	N13°59.4	272°10.7	N13°27.9	52°23.0	N00°51.9
1	76°02.4	233°43.2	19.5	284°45.1	59.1	287°13.0	27.9	67°25.6	51.8
2	91°04.8	248°44.8	19.3	299°46.6	58.8	302°15.3	27.9	82°28.1	51.8
3	106°07.3	263°46.4	·· 19.2	314°48.0	·· 58.5	317°17.6	·· 27.8	97°30.7	·· 51.8
4	121°09.8	278°48.0	19.0	329°49.4	58.2	332°19.9	27.8	112°33.2	51.8
5	136°12.2	293°49.5	18.9	344°50.9	57.9	347°22.2	27.7	127°35.7	51.7
6	151°14.7	308°51.1	S09°18.7	359°52.3	N13°57.6	2°24.5	N13°27.7	142°38.3	N00°51.7
7	166°17.1	323°52.7	18.6	14°53.7	57.3	17°26.8	27.6	157°40.8	51.7
8	181°19.6	338°54.2	18.4	29°55.2	56.9	32°29.1	27.6	172°43.4	51.7
9	196°22.1	353°55.8	·· 18.3	44°56.6	·· 56.6	47°31.4	·· 27.5	187°45.9	·· 51.6
10	211°24.5	8°57.4	18.1	59°58.0	56.3	62°33.7	27.5	202°48.5	51.6
11	226°27.0	23°58.9	18.0	74°59.5	56.0	77°36.0	27.4	217°51.0	51.6
12	241°29.5	39°00.5	S09°17.9	90°00.9	N13°55.7	92°38.3	N13°27.4	232°53.5	N00°51.6
13	256°31.9	54°02.0	17.7	105°02.3	55.4	107°40.6	27.3	247°56.1	51.6
14	271°34.4	69°03.6	17.6	120°03.8	55.1	122°42.9	27.3	262°58.6	51.5
15	286°36.9	84°05.1	·· 17.5	135°05.2	·· 54.8	137°45.3	·· 27.3	278°01.2	·· 51.5
16	301°39.3	99°06.7	17.3	150°06.6	54.5	152°47.6	27.2	293°03.7	51.5
17	316°41.8	114°08.2	17.2	165°08.1	54.2	167°49.9	27.2	308°06.3	51.5
18	331°44.3	129°09.8	S09°17.1	180°09.5	N13°53.9	182°52.2	N13°27.1	323°08.8	N00°51.4
19	346°46.7	144°11.3	16.9	195°11.0	53.6	197°54.5	27.1	338°11.3	51.4
20	1°49.2	159°12.8	16.8	210°12.4	53.3	212°56.8	27.0	353°13.9	51.4
21	16°51.6	174°14.4	·· 16.7	225°13.9	·· 53.0	227°59.1	·· 27.0	8°16.4	·· 51.4
22	31°54.1	189°15.9	16.6	240°15.3	52.7	243°01.4	26.9	23°19.0	51.3
23	46°56.6	204°17.4	16.4	255°16.7	52.4	258°03.7	26.9	38°21.5	51.3
Mer.pass. 19:53		ν 1.6′	d 0.2′	m -4.90	ν 1.4′	d 0.3′	m 0.60	ν 2.3′	d 0.0′ m -2.13	ν 2.5′	d 0.0′ m 0.56

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	61°59.0	219°18.9	S09°16.3	270°18.2	N13°52.1	273°06.0	N13°26.8	53°24.0	N00°51.3
1	77°01.5	234°20.4	16.2	285°19.6	51.8	288°08.3	26.8	68°26.6	51.3
2	92°04.0	249°22.0	16.1	300°21.1	51.5	303°10.6	26.8	83°29.1	51.3
3	107°06.4	264°23.5	·· 16.0	315°22.5	·· 51.2	318°12.9	·· 26.7	98°31.7	·· 51.2
4	122°08.9	279°25.0	15.9	330°24.0	50.9	333°15.2	26.7	113°34.2	51.2
5	137°11.4	294°26.5	15.8	345°25.4	50.5	348°17.6	26.6	128°36.7	51.2
6	152°13.8	309°28.0	S09°15.7	0°26.8	N13°50.2	3°19.9	N13°26.6	143°39.3	N00°51.2
7	167°16.3	324°29.5	15.6	15°28.3	49.9	18°22.2	26.5	158°41.8	51.1
8	182°18.8	339°31.0	15.5	30°29.7	49.6	33°24.5	26.5	173°44.4	51.1
9	197°21.2	354°32.5	·· 15.4	45°31.2	·· 49.3	48°26.8	·· 26.5	188°46.9	·· 51.1
10	212°23.7	9°34.0	15.3	60°32.6	49.0	63°29.1	26.4	203°49.4	51.1
11	227°26.1	24°35.4	15.2	75°34.1	48.7	78°31.4	26.4	218°52.0	51.1
12	242°28.6	39°36.9	S09°15.1	90°35.5	N13°48.4	93°33.7	N13°26.3	233°54.5	N00°51.0
13	257°31.1	54°38.4	15.0	105°37.0	48.1	108°36.0	26.3	248°57.1	51.0
14	272°33.5	69°39.9	14.9	120°38.4	47.8	123°38.4	26.2	263°59.6	51.0
15	287°36.0	84°41.4	·· 14.8	135°39.9	·· 47.5	138°40.7	·· 26.2	279°02.1	·· 51.0
16	302°38.5	99°42.8	14.7	150°41.3	47.2	153°43.0	26.1	294°04.7	50.9
17	317°40.9	114°44.3	14.6	165°42.8	46.9	168°45.3	26.1	309°07.2	50.9
18	332°43.4	129°45.8	S09°14.5	180°44.2	N13°46.6	183°47.6	N13°26.1	324°09.8	N00°50.9
19	347°45.9	144°47.2	14.4	195°45.7	46.3	198°49.9	26.0	339°12.3	50.9
20	2°48.3	159°48.7	14.4	210°47.1	46.0	213°52.2	26.0	354°14.8	50.9
21	17°50.8	174°50.2	·· 14.3	225°48.6	·· 45.7	228°54.5	·· 25.9	9°17.4	·· 50.8
22	32°53.2	189°51.6	14.2	240°50.0	45.4	243°56.9	25.9	24°19.9	50.8
23	47°55.7	204°53.1	14.1	255°51.5	45.1	258°59.2	25.8	39°22.4	50.8
Mer.pass. 19:49		ν 1.5′	d 0.1′	m -4.90	ν 1.4′	d 0.3′	m 0.58	ν 2.3′	d 0.0′ m -2.14	ν 2.5′	d 0.0′ m 0.57

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.2	23°35.5
Polaris	312°44.0	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.8
Canopus	263°51.3	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.4	-29°00.3
Procyon	244°49.0	5°09.4
Pollux	243°15.2	27°57.6
Avior	234°13.8	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.7	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.8	11°50.1
Dubhe	193°39.4	61°36.0
Denebola	182°23.6	14°25.2
Gienah	175°42.2	-17°41.4
Acrux	172°58.8	-63°14.7
Gacrux	171°50.3	-57°15.6
Alioth	166°12.1	55°48.6
Spica	158°21.0	-11°18.0
Alkaid	152°51.2	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.8	-60°56.7
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.5	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 21 Sat	SHA	Mer.pass
Venus	158°01.8	09:27
Mars	209°08.8	06:03
Jupiter	211°14.8	05:54
Saturn	351°21.2	20:31

Nov 22 Sun	SHA	Mer.pass
Venus	157°41.7	09:24
Mars	208°43.8	06:01
Jupiter	211°10.8	05:50
Saturn	351°23.1	20:27

Nov 23 Mon	SHA	Mer.pass
Venus	157°19.9	09:22
Mars	208°19.1	05:58
Jupiter	211°07.0	05:47
Saturn	351°25.0	20:23

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°33.9	S19°51.8	52°06.4	12.8′	N07°17.4	15.3′	58.0′
1	198°33.8	52.4	66°38.2	12.7′	07°32.7	15.4′	58.0′
2	213°33.6	52.9	81°09.9	12.7′	07°48.1	15.3′	58.1′
3	228°33.5	·· 53.5	95°41.6	12.6′	08°03.4	15.2′	58.1′
4	243°33.3	54.1	110°13.2	12.5′	08°18.6	15.3′	58.1′
5	258°33.2	54.6	124°44.7	12.4′	08°33.9	15.2′	58.2′
6	273°33.0	S19°55.2	139°16.1	12.3′	N08°49.1	15.2′	58.2′
7	288°32.9	55.7	153°47.4	12.2′	09°04.3	15.2′	58.2′
8	303°32.7	56.3	168°18.6	12.1′	09°19.5	15.2′	58.3′
9	318°32.5	·· 56.8	182°49.7	12.0′	09°34.7	15.2′	58.3′
10	333°32.4	57.4	197°20.8	11.9′	09°49.9	15.1′	58.4′
11	348°32.2	57.9	211°51.7	11.9′	10°05.0	15.1′	58.4′
12	3°32.1	S19°58.4	226°22.6	11.8′	N10°20.1	15.0′	58.4′
13	18°31.9	59.0	240°53.3	11.7′	10°35.1	15.1′	58.5′
14	33°31.8	19°59.5	255°24.0	11.6′	10°50.2	14.9′	58.5′
15	48°31.6	20°00.1	269°54.6	11.5′	11°05.1	15.0′	58.6′
16	63°31.4	00.6	284°25.0	11.4′	11°20.1	14.9′	58.6′
17	78°31.3	01.2	298°55.4	11.3′	11°35.0	14.9′	58.6′
18	93°31.1	S20°01.7	313°25.7	11.2′	N11°49.9	14.9′	58.7′
19	108°31.0	02.3	327°55.8	11.1′	12°04.8	14.8′	58.7′
20	123°30.8	02.8	342°25.9	10.9′	12°19.6	14.7′	58.8′
21	138°30.6	·· 03.3	356°55.8	10.8′	12°34.3	14.7′	58.8′
22	153°30.5	03.9	11°25.7	10.7′	12°49.0	14.7′	58.8′
23	168°30.3	04.4	25°55.4	10.6′	13°03.7	14.6′	58.9′
	SD = 16.2′	d = 0.6′	SD = 15.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°30.2	S20°05.0	40°25.0	10.5′	N13°18.3	14.6′	58.9′
1	198°30.0	05.5	54°54.5	10.4′	13°32.9	14.5′	58.9′
2	213°29.8	06.0	69°23.9	10.3′	13°47.4	14.4′	59.0′
3	228°29.7	·· 06.6	83°53.2	10.2′	14°01.8	14.4′	59.0′
4	243°29.5	07.1	98°22.4	10.1′	14°16.2	14.4′	59.1′
5	258°29.4	07.7	112°51.5	9.9′	14°30.6	14.2′	59.1′
6	273°29.2	S20°08.2	127°20.4	9.8′	N14°44.8	14.2′	59.1′
7	288°29.0	08.7	141°49.2	9.7′	14°59.0	14.2′	59.2′
8	303°28.9	09.3	156°17.9	9.6′	15°13.2	14.1′	59.2′
9	318°28.7	·· 09.8	170°46.5	9.5′	15°27.3	14.0′	59.2′
10	333°28.5	10.3	185°15.0	9.3′	15°41.3	13.9′	59.3′
11	348°28.4	10.9	199°43.3	9.2′	15°55.2	13.9′	59.3′
12	3°28.2	S20°11.4	214°11.6	9.1′	N16°09.1	13.8′	59.3′
13	18°28.0	11.9	228°39.7	9.0′	16°22.9	13.7′	59.4′
14	33°27.9	12.5	243°07.7	8.9′	16°36.6	13.7′	59.4′
15	48°27.7	·· 13.0	257°35.5	8.7′	16°50.3	13.5′	59.4′
16	63°27.5	13.5	272°03.2	8.6′	17°03.8	13.5′	59.5′
17	78°27.4	14.0	286°30.8	8.5′	17°17.3	13.4′	59.5′
18	93°27.2	S20°14.6	300°58.3	8.3′	N17°30.7	13.3′	59.6′
19	108°27.0	15.1	315°25.7	8.2′	17°44.0	13.2′	59.6′
20	123°26.9	15.6	329°52.9	8.1′	17°57.2	13.2′	59.6′
21	138°26.7	·· 16.2	344°20.0	8.0′	18°10.4	13.0′	59.7′
22	153°26.5	16.7	358°46.9	7.8′	18°23.4	12.9′	59.7′
23	168°26.4	17.2	13°13.8	7.7′	18°36.3	12.9′	59.7′
	SD = 16.2′	d = 0.5′	SD = 16.1′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°26.2	S20°17.7	27°40.4	7.6′	N18°49.2	12.7′	59.7′
1	198°26.0	18.3	42°07.0	7.4′	19°01.9	12.7′	59.8′
2	213°25.9	18.8	56°33.5	7.3′	19°14.6	12.5′	59.8′
3	228°25.7	·· 19.3	70°59.8	7.2′	19°27.1	12.4′	59.8′
4	243°25.5	19.8	85°25.9	7.0′	19°39.5	12.3′	59.9′
5	258°25.3	20.3	99°52.0	6.9′	19°51.8	12.3′	59.9′
6	273°25.2	S20°20.9	114°17.9	6.8′	N20°04.1	12.0′	59.9′
7	288°25.0	21.4	128°43.6	6.6′	20°16.1	12.0′	60.0′
8	303°24.8	21.9	143°09.3	6.5′	20°28.1	11.9′	60.0′
9	318°24.7	·· 22.4	157°34.8	6.4′	20°40.0	11.7′	60.0′
10	333°24.5	22.9	172°00.2	6.2′	20°51.7	11.6′	60.1′
11	348°24.3	23.5	186°25.4	6.1′	21°03.3	11.5′	60.1′
12	3°24.1	S20°24.0	200°50.5	6.0′	N21°14.8	11.4′	60.1′
13	18°24.0	24.5	215°15.5	5.8′	21°26.2	11.2′	60.1′
14	33°23.8	25.0	229°40.3	5.7′	21°37.4	11.1′	60.2′
15	48°23.6	·· 25.5	244°05.0	5.6′	21°48.5	11.0′	60.2′
16	63°23.4	26.0	258°29.6	5.4′	21°59.5	10.8′	60.2′
17	78°23.3	26.5	272°54.0	5.3′	22°10.3	10.7′	60.2′
18	93°23.1	S20°27.1	287°18.4	5.2′	N22°21.0	10.6′	60.3′
19	108°22.9	27.6	301°42.5	5.1′	22°31.6	10.4′	60.3′
20	123°22.7	28.1	316°06.6	4.9′	22°42.0	10.3′	60.3′
21	138°22.6	·· 28.6	330°30.5	4.8′	22°52.3	10.1′	60.3′
22	153°22.4	29.1	344°54.3	4.7′	23°02.4	10.0′	60.4′
23	168°22.2	29.6	359°18.0	4.5′	23°12.4	9.8′	60.4′
	SD = 16.2′	d = 0.5′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:24	09:08	▬	▬	14:24	16:08
N 70°	07:11	08:38	10:45	12:46	14:53	16:21
68°	07:00	08:17	09:47	13:44	15:15	16:31
66°	06:51	08:00	09:14	14:18	15:32	16:40
64°	06:43	07:46	08:50	14:42	15:46	16:48
62°	06:36	07:34	08:31	15:01	15:58	16:55
60°	06:30	07:24	08:15	15:17	16:08	17:01
N 58°	06:25	07:15	08:02	15:30	16:17	17:07
56°	06:20	07:07	07:50	15:41	16:25	17:12
54°	06:15	07:00	07:41	15:51	16:32	17:16
52°	06:11	06:53	07:32	16:00	16:39	17:20
50°	06:07	06:47	07:24	16:08	16:44	17:24
45°	05:58	06:34	07:07	16:25	16:57	17:33
N 40°	05:50	06:23	06:53	16:39	17:08	17:42
35°	05:43	06:14	06:41	16:51	17:18	17:49
30°	05:36	06:05	06:31	17:01	17:27	17:56
20°	05:23	05:49	06:13	17:19	17:43	18:09
N 10°	05:09	05:35	05:57	17:35	17:57	18:23
0°	04:55	05:20	05:43	17:50	18:12	18:37
S 10°	04:39	05:05	05:28	18:05	18:27	18:54
20°	04:19	04:48	05:12	18:21	18:45	19:13
30°	03:55	04:27	04:53	18:40	19:06	19:38
35°	03:39	04:14	04:42	18:51	19:19	19:54
40°	03:20	03:58	04:30	19:03	19:34	20:13
45°	02:55	03:40	04:15	19:18	19:53	20:38
S 50°	02:21	03:16	03:56	19:37	20:18	21:13
52°	02:02	03:04	03:48	19:46	20:29	21:32
54°	01:39	02:50	03:38	19:55	20:43	21:56
56°	01:07	02:35	03:27	20:07	20:59	22:29
58°	////	02:15	03:14	20:19	21:19	////
S 60°	////	01:50	02:59	20:35	21:45	////

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	12:39	11:37	▭	04:26	07:13	▭
N 70°	12:55	12:15	▭	04:13	06:37	▭
68°	13:08	12:41	11:47	04:03	06:12	09:01
66°	13:19	13:02	12:36	03:54	05:53	08:14
64°	13:28	13:19	13:07	03:47	05:38	07:43
62°	13:35	13:33	13:31	03:40	05:25	07:21
60°	13:42	13:44	13:50	03:35	05:15	07:03
N 58°	13:48	13:55	14:06	03:30	05:06	06:48
56°	13:53	14:04	14:19	03:26	04:57	06:35
54°	13:58	14:12	14:31	03:22	04:50	06:24
52°	14:03	14:19	14:41	03:19	04:44	06:14
50°	14:07	14:26	14:51	03:16	04:38	06:05
45°	14:15	14:40	15:11	03:09	04:26	05:47
N 40°	14:23	14:51	15:27	03:04	04:16	05:32
35°	14:29	15:02	15:41	02:59	04:07	05:19
30°	14:34	15:10	15:53	02:55	04:00	05:08
20°	14:44	15:26	16:13	02:48	03:47	04:50
N 10°	14:53	15:39	16:32	02:42	03:35	04:33
0°	15:01	15:52	16:49	02:36	03:25	04:18
S 10°	15:09	16:05	17:06	02:30	03:14	04:03
20°	15:18	16:19	17:24	02:24	03:03	03:47
30°	15:28	16:35	17:46	02:17	02:50	03:29
35°	15:34	16:44	17:59	02:13	02:43	03:18
40°	15:41	16:55	18:13	02:08	02:35	03:06
45°	15:49	17:08	18:31	02:03	02:25	02:52
S 50°	15:58	17:23	18:52	01:57	02:14	02:35
52°	16:03	17:31	19:03	01:54	02:08	02:27
54°	16:08	17:39	19:15	01:51	02:02	02:18
56°	16:13	17:48	19:28	01:47	01:56	02:08
58°	16:20	17:59	19:44	01:44	01:49	01:56
S 60°	16:27	18:11	20:04	01:39	01:40	01:43

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 12-14 83-96%
21	14:16	14:08	11:46	21:13	08:48	
22	14:01	13:53	11:46	22:05	09:38	
23	13:45	13:37	11:46	23:03	10:33	

November 24, 25, 26 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°58.2	219°54.5	S09°14.0	270°53.0	N13°44.8	274°01.5	N13°25.8	54°25.0	N00°50.8
1	78°00.6	234°56.0	14.0	285°54.4	44.5	289°03.8	25.8	69°27.5	50.8
2	93°03.1	249°57.4	13.9	300°55.9	44.2	304°06.1	25.7	84°30.0	50.7
3	108°05.6	264°58.9	·· 13.8	315°57.3	·· 43.9	319°08.4	·· 25.7	99°32.6	·· 50.7
4	123°08.0	280°00.3	13.8	330°58.8	43.6	334°10.8	25.6	114°35.1	50.7
5	138°10.5	295°01.7	13.7	346°00.2	43.3	349°13.1	25.6	129°37.7	50.7
6	153°13.0	310°03.2	S09°13.6	1°01.7	N13°43.0	4°15.4	N13°25.6	144°40.2	N00°50.7
7	168°15.4	325°04.6	13.6	16°03.2	42.7	19°17.7	25.5	159°42.7	50.6
8	183°17.9	340°06.0	13.5	31°04.6	42.4	34°20.0	25.5	174°45.3	50.6
9	198°20.4	355°07.4	·· 13.4	46°06.1	·· 42.1	49°22.3	·· 25.4	189°47.8	·· 50.6
10	213°22.8	10°08.9	13.4	61°07.5	41.8	64°24.7	25.4	204°50.3	50.6
11	228°25.3	25°10.3	13.3	76°09.0	41.5	79°27.0	25.4	219°52.9	50.5
12	243°27.7	40°11.7	S09°13.3	91°10.5	N13°41.2	94°29.3	N13°25.3	234°55.4	N00°50.5
13	258°30.2	55°13.1	13.2	106°11.9	40.9	109°31.6	25.3	249°57.9	50.5
14	273°32.7	70°14.5	13.2	121°13.4	40.6	124°33.9	25.2	265°00.5	50.5
15	288°35.1	85°15.9	·· 13.1	136°14.9	·· 40.3	139°36.3	·· 25.2	280°03.0	·· 50.5
16	303°37.6	100°17.3	13.1	151°16.3	40.0	154°38.6	25.1	295°05.5	50.4
17	318°40.1	115°18.7	13.0	166°17.8	39.7	169°40.9	25.1	310°08.1	50.4
18	333°42.5	130°20.1	S09°13.0	181°19.2	N13°39.4	184°43.2	N13°25.1	325°10.6	N00°50.4
19	348°45.0	145°21.5	12.9	196°20.7	39.1	199°45.5	25.0	340°13.1	50.4
20	3°47.5	160°22.9	12.9	211°22.2	38.8	214°47.9	25.0	355°15.7	50.4
21	18°49.9	175°24.3	·· 12.9	226°23.6	·· 38.5	229°50.2	·· 24.9	10°18.2	·· 50.4
22	33°52.4	190°25.7	12.8	241°25.1	38.2	244°52.5	24.9	25°20.7	50.3
23	48°54.9	205°27.1	12.8	256°26.6	37.9	259°54.8	24.9	40°23.3	50.3
Mer.pass. 19:45		ν 1.4′	d 0.1′	m -4.90	ν 1.5′	d 0.3′	m 0.57	ν 2.3′	d 0.0′ m -2.14	ν 2.5′	d 0.0′ m 0.57

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°57.3	220°28.5	S09°12.8	271°28.1	N13°37.6	274°57.1	N13°24.8	55°25.8	N00°50.3
1	78°59.8	235°29.8	12.7	286°29.5	37.4	289°59.5	24.8	70°28.3	50.3
2	94°02.2	250°31.2	12.7	301°31.0	37.1	305°01.8	24.7	85°30.9	50.3
3	109°04.7	265°32.6	·· 12.7	316°32.5	·· 36.8	320°04.1	·· 24.7	100°33.4	·· 50.2
4	124°07.2	280°34.0	12.6	331°33.9	36.5	335°06.4	24.7	115°35.9	50.2
5	139°09.6	295°35.3	12.6	346°35.4	36.2	350°08.8	24.6	130°38.5	50.2
6	154°12.1	310°36.7	S09°12.6	1°36.9	N13°35.9	5°11.1	N13°24.6	145°41.0	N00°50.2
7	169°14.6	325°38.1	12.6	16°38.3	35.6	20°13.4	24.6	160°43.5	50.2
8	184°17.0	340°39.4	12.6	31°39.8	35.3	35°15.7	24.5	175°46.1	50.1
9	199°19.5	355°40.8	·· 12.5	46°41.3	·· 35.0	50°18.1	·· 24.5	190°48.6	·· 50.1
10	214°22.0	10°42.1	12.5	61°42.8	34.7	65°20.4	24.4	205°51.1	50.1
11	229°24.4	25°43.5	12.5	76°44.2	34.4	80°22.7	24.4	220°53.7	50.1
12	244°26.9	40°44.8	S09°12.5	91°45.7	N13°34.1	95°25.0	N13°24.4	235°56.2	N00°50.1
13	259°29.4	55°46.2	12.5	106°47.2	33.8	110°27.4	24.3	250°58.7	50.0
14	274°31.8	70°47.5	12.5	121°48.7	33.5	125°29.7	24.3	266°01.3	50.0
15	289°34.3	85°48.9	·· 12.5	136°50.1	·· 33.2	140°32.0	·· 24.2	281°03.8	·· 50.0
16	304°36.7	100°50.2	12.5	151°51.6	32.9	155°34.3	24.2	296°06.3	50.0
17	319°39.2	115°51.5	12.4	166°53.1	32.6	170°36.7	24.2	311°08.9	50.0
18	334°41.7	130°52.9	S09°12.4	181°54.6	N13°32.3	185°39.0	N13°24.1	326°11.4	N00°50.0
19	349°44.1	145°54.2	12.4	196°56.1	32.0	200°41.3	24.1	341°13.9	49.9
20	4°46.6	160°55.5	12.4	211°57.5	31.7	215°43.7	24.1	356°16.4	49.9
21	19°49.1	175°56.9	·· 12.4	226°59.0	·· 31.5	230°46.0	·· 24.0	11°19.0	·· 49.9
22	34°51.5	190°58.2	12.4	242°00.5	31.2	245°48.3	24.0	26°21.5	49.9
23	49°54.0	205°59.5	12.5	257°02.0	30.9	260°50.6	23.9	41°24.0	49.9
Mer.pass. 19:41		ν 1.4′	d 0.0′	m -4.91	ν 1.5′	d 0.3′	m 0.55	ν 2.3′	d 0.0′ m -2.15	ν 2.5′	d 0.0′ m 0.58

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	64°56.5	221°00.8	S09°12.5	272°03.5	N13°30.6	275°53.0	N13°23.9	56°26.6	N00°49.9
1	79°58.9	236°02.1	12.5	287°04.9	30.3	290°55.3	23.9	71°29.1	49.8
2	95°01.4	251°03.4	12.5	302°06.4	30.0	305°57.6	23.8	86°31.6	49.8
3	110°03.9	266°04.7	·· 12.5	317°07.9	·· 29.7	321°00.0	·· 23.8	101°34.1	·· 49.8
4	125°06.3	281°06.1	12.5	332°09.4	29.4	336°02.3	23.8	116°36.7	49.8
5	140°08.8	296°07.4	12.5	347°10.9	29.1	351°04.6	23.7	131°39.2	49.8
6	155°11.2	311°08.7	S09°12.5	2°12.4	N13°28.8	6°07.0	N13°23.7	146°41.7	N00°49.7
7	170°13.7	326°10.0	12.5	17°13.8	28.5	21°09.3	23.7	161°44.3	49.7
8	185°16.2	341°11.2	12.6	32°15.3	28.2	36°11.6	23.6	176°46.8	49.7
9	200°18.6	356°12.5	·· 12.6	47°16.8	·· 27.9	51°14.0	·· 23.6	191°49.3	·· 49.7
10	215°21.1	11°13.8	12.6	62°18.3	27.6	66°16.3	23.5	206°51.8	49.7
11	230°23.6	26°15.1	12.6	77°19.8	27.4	81°18.6	23.5	221°54.4	49.7
12	245°26.0	41°16.4	S09°12.7	92°21.3	N13°27.1	96°20.9	N13°23.5	236°56.9	N00°49.6
13	260°28.5	56°17.7	12.7	107°22.8	26.8	111°23.3	23.4	251°59.4	49.6
14	275°31.0	71°19.0	12.7	122°24.3	26.5	126°25.6	23.4	267°02.0	49.6
15	290°33.4	86°20.2	·· 12.7	137°25.7	·· 26.2	141°28.0	·· 23.4	282°04.5	·· 49.6
16	305°35.9	101°21.5	12.8	152°27.2	25.9	156°30.3	23.3	297°07.0	49.6
17	320°38.4	116°22.8	12.8	167°28.7	25.6	171°32.6	23.3	312°09.5	49.6
18	335°40.8	131°24.1	S09°12.8	182°30.2	N13°25.3	186°35.0	N13°23.3	327°12.1	N00°49.6
19	350°43.3	146°25.3	12.9	197°31.7	25.0	201°37.3	23.2	342°14.6	49.5
20	5°45.7	161°26.6	12.9	212°33.2	24.7	216°39.6	23.2	357°17.1	49.5
21	20°48.2	176°27.8	·· 13.0	227°34.7	·· 24.5	231°42.0	·· 23.2	12°19.6	·· 49.5
22	35°50.7	191°29.1	13.0	242°36.2	24.2	246°44.3	23.1	27°22.2	49.5
23	50°53.1	206°30.4	13.1	257°37.7	23.9	261°46.6	23.1	42°24.7	49.5
Mer.pass. 19:37		ν 1.3′	d 0.0′	m -4.91	ν 1.5′	d 0.3′	m 0.54	ν 2.3′	d 0.0′ m -2.16	ν 2.5′	d 0.0′ m 0.58

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°43.8	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.8
Rigel	281°02.1	-8°10.2
Capella	280°19.1	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.8
Canopus	263°51.2	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°49.0	5°09.4
Pollux	243°15.2	27°57.5
Avior	234°13.8	-59°35.5
Suhail	222°45.0	-43°32.2
Miaplacidus	221°37.7	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.8	11°50.1
Dubhe	193°39.3	61°36.0
Denebola	182°23.5	14°25.2
Gienah	175°42.2	-17°41.4
Acrux	172°58.8	-63°14.7
Gacrux	171°50.3	-57°15.6
Alioth	166°12.0	55°48.6
Spica	158°20.9	-11°18.0
Alkaid	152°51.2	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.8	-60°56.6
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.6	-16°09.1
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.5	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 24 Tue	SHA	Mer.pass
Venus	156°56.3	09:19
Mars	207°54.8	05:56
Jupiter	211°03.3	05:43
Saturn	351°26.8	20:19

Nov 25 Wed	SHA	Mer.pass
Venus	156°31.1	09:17
Mars	207°30.7	05:54
Jupiter	210°59.8	05:39
Saturn	351°28.5	20:15

Nov 26 Thu	SHA	Mer.pass
Venus	156°04.4	09:15
Mars	207°07.0	05:51
Jupiter	210°56.5	05:36
Saturn	351°30.1	20:11

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°22.0	S20°30.1	13°41.5	4.4′	N23°22.2	9.6′	60.4′
1	198°21.9	30.6	28°04.9	4.3′	23°31.8	9.6′	60.4′
2	213°21.7	31.1	42°28.2	4.2′	23°41.4	9.3′	60.5′
3	228°21.5	·· 31.6	56°51.4	4.0′	23°50.7	9.2′	60.5′
4	243°21.3	32.1	71°14.4	3.9′	23°59.9	9.0′	60.5′
5	258°21.1	32.6	85°37.3	3.8′	24°08.9	8.9′	60.5′
6	273°21.0	S20°33.2	100°00.1	3.7′	N24°17.8	8.7′	60.5′
7	288°20.8	33.7	114°22.8	3.6′	24°26.5	8.5′	60.6′
8	303°20.6	34.2	128°45.4	3.4′	24°35.0	8.4′	60.6′
9	318°20.4	·· 34.7	143°07.8	3.3′	24°43.4	8.2′	60.6′
10	333°20.2	35.2	157°30.2	3.2′	24°51.6	8.0′	60.6′
11	348°20.1	35.7	171°52.4	3.1′	24°59.6	7.8′	60.6′
12	3°19.9	S20°36.2	186°14.5	3.0′	N25°07.4	7.7′	60.7′
13	18°19.7	36.7	200°36.5	2.9′	25°15.1	7.4′	60.7′
14	33°19.5	37.2	214°58.4	2.8′	25°22.5	7.3′	60.7′
15	48°19.3	·· 37.7	229°20.2	2.7′	25°29.8	7.1′	60.7′
16	63°19.2	38.2	243°41.9	2.6′	25°36.9	6.9′	60.7′
17	78°19.0	38.7	258°03.5	2.5′	25°43.8	6.8′	60.7′
18	93°18.8	S20°39.2	272°25.0	2.4′	N25°50.6	6.5′	60.7′
19	108°18.6	39.7	286°46.4	2.3′	25°57.1	6.4′	60.8′
20	123°18.4	40.2	301°07.7	2.2′	26°03.5	6.1′	60.8′
21	138°18.2	·· 40.6	315°28.9	2.1′	26°09.6	6.0′	60.8′
22	153°18.1	41.1	329°50.0	2.0′	26°15.6	5.8′	60.8′
23	168°17.9	41.6	344°11.0	2.0′	26°21.4	5.6′	60.8′
	SD = 16.2′	d = 0.5′	SD = 16.5′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°17.7	S20°42.1	358°32.0	1.9′	N26°27.0	5.3′	60.8′
1	198°17.5	42.6	12°52.9	1.8′	26°32.3	5.2′	60.8′
2	213°17.3	43.1	27°13.7	1.7′	26°37.5	5.0′	60.8′
3	228°17.1	·· 43.6	41°34.4	1.6′	26°42.5	4.7′	60.9′
4	243°16.9	44.1	55°55.0	1.6′	26°47.2	4.6′	60.9′
5	258°16.8	44.6	70°15.6	1.5′	26°51.8	4.4′	60.9′
6	273°16.6	S20°45.1	84°36.1	1.5′	N26°56.2	4.1′	60.9′
7	288°16.4	45.6	98°56.6	1.4′	27°00.3	4.0′	60.9′
8	303°16.2	46.0	113°17.0	1.3′	27°04.3	3.7′	60.9′
9	318°16.0	·· 46.5	127°37.3	1.3′	27°08.0	3.5′	60.9′
10	333°15.8	47.0	141°57.6	1.2′	27°11.5	3.4′	60.9′
11	348°15.6	47.5	156°17.8	1.2′	27°14.9	3.1′	60.9′
12	3°15.4	S20°48.0	170°38.0	1.1′	N27°18.0	2.9′	60.9′
13	18°15.2	48.5	184°58.1	1.1′	27°20.9	2.6′	60.9′
14	33°15.1	49.0	199°18.2	1.1′	27°23.5	2.5′	60.9′
15	48°14.9	·· 49.4	213°38.3	1.0′	27°26.0	2.3′	60.9′
16	63°14.7	49.9	227°58.3	1.0′	27°28.3	2.0′	60.9′
17	78°14.5	50.4	242°18.3	1.0′	27°30.3	1.8′	60.9′
18	93°14.3	S20°50.9	256°38.3	1.0′	N27°32.1	1.6′	60.9′
19	108°14.1	51.4	270°58.3	0.9′	27°33.7	1.4′	60.9′
20	123°13.9	51.8	285°18.2	0.9′	27°35.1	1.2′	60.9′
21	138°13.7	·· 52.3	299°38.1	0.9′	27°36.3	0.9′	60.9′
22	153°13.5	52.8	313°58.0	0.9′	27°37.2	0.8′	60.9′
23	168°13.3	53.3	328°17.9	0.9′	27°38.0	0.5′	60.9′
	SD = 16.2′	d = 0.5′	SD = 16.6′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°13.1	S20°53.8	342°37.8	0.9′	N27°38.5	0.3′	60.9′
1	198°12.9	54.2	356°57.7	0.9′	27°38.8	0.1′	60.9′
2	213°12.8	54.7	11°17.6	0.9′	27°38.9	0.1′	60.9′
3	228°12.6	·· 55.2	25°37.5	0.9′	27°38.8	0.4′	60.9′
4	243°12.4	55.7	39°57.4	0.9′	27°38.4	0.5′	60.9′
5	258°12.2	56.1	54°17.3	0.9′	27°37.9	0.8′	60.9′
6	273°12.0	S20°56.6	68°37.3	1.0′	N27°37.1	1.0′	60.9′
7	288°11.8	57.1	82°57.2	1.0′	27°36.1	1.2′	60.9′
8	303°11.6	57.5	97°17.2	1.0′	27°34.9	1.4′	60.9′
9	318°11.4	·· 58.0	111°37.2	1.0′	27°33.5	1.7′	60.9′
10	333°11.2	58.5	125°57.2	1.1′	27°31.8	1.8′	60.9′
11	348°11.0	59.0	140°17.3	1.1′	27°30.0	2.1′	60.9′
12	3°10.8	S20°59.4	154°37.4	1.2′	N27°27.9	2.3′	60.9′
13	18°10.6	20°59.9	168°57.6	1.2′	27°25.6	2.5′	60.9′
14	33°10.4	21°00.4	183°17.8	1.2′	27°23.1	2.7′	60.9′
15	48°10.2	·· 00.8	197°38.0	1.3′	27°20.4	2.9′	60.9′
16	63°10.0	01.3	211°58.3	1.3′	27°17.5	3.1′	60.9′
17	78°09.8	01.8	226°18.7	1.4′	27°14.4	3.4′	60.8′
18	93°09.6	S21°02.2	240°39.1	1.5′	N27°11.0	3.5′	60.8′
19	108°09.4	02.7	254°59.5	1.5′	27°07.5	3.8′	60.8′
20	123°09.2	03.1	269°20.1	1.6′	27°03.7	3.9′	60.8′
21	138°09.0	·· 03.6	283°40.7	1.7′	26°59.8	4.2′	60.8′
22	153°08.8	04.1	298°01.3	1.7′	26°55.6	4.3′	60.8′
23	168°08.6	04.5	312°22.1	1.8′	26°51.3	4.6′	60.8′
	SD = 16.2′	d = 0.5′	SD = 16.6′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:33	09:22	▬	▬	14:11	16:00
N 70°	07:19	08:50	11:33	12:00	14:43	16:14
68°	07:08	08:26	10:03	13:31	15:07	16:26
66°	06:58	08:08	09:25	14:08	15:25	16:35
64°	06:50	07:53	08:59	14:35	15:40	16:44
62°	06:42	07:40	08:38	14:55	15:53	16:51
60°	06:36	07:30	08:22	15:11	16:04	16:57
N 58°	06:30	07:20	08:08	15:25	16:13	17:03
56°	06:25	07:12	07:56	15:37	16:22	17:09
54°	06:20	07:04	07:46	15:48	16:29	17:14
52°	06:15	06:58	07:36	15:57	16:36	17:18
50°	06:11	06:51	07:28	16:05	16:42	17:22
45°	06:02	06:38	07:11	16:23	16:56	17:32
N 40°	05:53	06:27	06:56	16:37	17:07	17:40
35°	05:45	06:17	06:44	16:50	17:17	17:48
30°	05:38	06:07	06:33	17:00	17:26	17:56
20°	05:24	05:51	06:15	17:19	17:43	18:10
N 10°	05:10	05:36	05:59	17:35	17:58	18:24
0°	04:56	05:21	05:43	17:51	18:13	18:38
S 10°	04:39	05:05	05:28	18:06	18:29	18:55
20°	04:19	04:47	05:11	18:23	18:47	19:15
30°	03:53	04:26	04:52	18:42	19:09	19:41
35°	03:37	04:12	04:41	18:53	19:22	19:57
40°	03:17	03:56	04:28	19:07	19:38	20:18
45°	02:51	03:37	04:12	19:22	19:58	20:43
S 50°	02:16	03:12	03:53	19:41	20:23	21:20
52°	01:56	03:00	03:44	19:51	20:35	21:40
54°	01:31	02:46	03:34	20:01	20:50	22:06
56°	00:54	02:29	03:23	20:13	21:07	22:45
58°	////	02:08	03:09	20:26	21:28	////
S 60°	////	01:41	02:53	20:42	21:56	////

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	12:43	▭	▭	10:13	▭	▭
62°	13:31	13:41	14:49	09:27	11:33	12:47
60°	14:02	14:32	15:41	08:56	10:43	11:55
N 58°	14:25	15:03	16:13	08:33	10:12	11:23
56°	14:44	15:27	16:37	08:15	09:48	10:59
54°	15:00	15:47	16:56	07:59	09:29	10:39
52°	15:14	16:03	17:12	07:46	09:12	10:23
50°	15:26	16:17	17:26	07:34	08:59	10:09
45°	15:52	16:46	17:55	07:10	08:30	09:40
N 40°	16:12	17:09	18:17	06:51	08:08	09:17
35°	16:29	17:27	18:36	06:34	07:49	08:58
30°	16:43	17:44	18:52	06:21	07:33	08:42
20°	17:09	18:11	19:19	05:57	07:06	08:14
N 10°	17:30	18:35	19:42	05:36	06:43	07:51
0°	17:51	18:57	20:04	05:17	06:22	07:29
S 10°	18:11	19:19	20:25	04:59	06:00	07:07
20°	18:33	19:43	20:48	04:38	05:37	06:43
30°	18:59	20:10	21:15	04:15	05:10	06:15
35°	19:14	20:27	21:31	04:01	04:55	05:58
40°	19:32	20:46	21:50	03:46	04:36	05:39
45°	19:53	21:09	22:12	03:27	04:14	05:16
S 50°	20:21	21:39	22:40	03:04	03:46	04:46
52°	20:34	21:54	22:54	02:53	03:33	04:32
54°	20:49	22:11	23:09	02:41	03:17	04:14
56°	21:07	22:31	23:28	02:27	02:59	03:54
58°	21:30	22:57	23:51	02:10	02:36	03:28
S 60°	21:58	23:32	·· ··	01:50	02:07	02:53

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 15-17 99-97%
24	13:28	13:20	11:47	–:–	11:34	
25	13:11	13:02	11:47	00:06	12:39	
26	12:53	12:43	11:47	01:13	13:46	

November 27, 28, 29 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	65°55.6	221°31.6	S09°13.1	272°39.2	N13°23.6	276°49.0	N13°23.1	57°27.2	N00°49.5
1	80°58.1	236°32.9	13.1	287°40.7	23.3	291°51.3	23.0	72°29.7	49.4
2	96°00.5	251°34.1	13.2	302°42.2	23.0	306°53.6	23.0	87°32.3	49.4
3	111°03.0	266°35.4	·· 13.2	317°43.7	·· 22.7	321°56.0	·· 23.0	102°34.8	·· 49.4
4	126°05.5	281°36.6	13.3	332°45.2	22.4	336°58.3	22.9	117°37.3	49.4
5	141°07.9	296°37.8	13.3	347°46.7	22.1	352°00.7	22.9	132°39.8	49.4
6	156°10.4	311°39.1	S09°13.4	2°48.2	N13°21.9	7°03.0	N13°22.8	147°42.4	N00°49.4
7	171°12.9	326°40.3	13.5	17°49.7	21.6	22°05.3	22.8	162°44.9	49.3
8	186°15.3	341°41.5	13.5	32°51.2	21.3	37°07.7	22.8	177°47.4	49.3
9	201°17.8	356°42.8	·· 13.6	47°52.7	·· 21.0	52°10.0	·· 22.7	192°49.9	·· 49.3
10	216°20.2	11°44.0	13.6	62°54.2	20.7	67°12.4	22.7	207°52.5	49.3
11	231°22.7	26°45.2	13.7	77°55.7	20.4	82°14.7	22.7	222°55.0	49.3
12	246°25.2	41°46.4	S09°13.8	92°57.2	N13°20.1	97°17.0	N13°22.6	237°57.5	N00°49.3
13	261°27.6	56°47.7	13.8	107°58.7	19.8	112°19.4	22.6	253°00.0	49.3
14	276°30.1	71°48.9	13.9	123°00.2	19.6	127°21.7	22.6	268°02.6	49.2
15	291°32.6	86°50.1	·· 14.0	138°01.7	·· 19.3	142°24.1	·· 22.5	283°05.1	·· 49.2
16	306°35.0	101°51.3	14.0	153°03.2	19.0	157°26.4	22.5	298°07.6	49.2
17	321°37.5	116°52.5	14.1	168°04.7	18.7	172°28.7	22.5	313°10.1	49.2
18	336°40.0	131°53.7	S09°14.2	183°06.2	N13°18.4	187°31.1	N13°22.5	328°12.6	N00°49.2
19	351°42.4	146°54.9	14.2	198°07.7	18.1	202°33.4	22.4	343°15.2	49.2
20	6°44.9	161°56.1	14.3	213°09.2	17.8	217°35.8	22.4	358°17.7	49.2
21	21°47.4	176°57.3	·· 14.4	228°10.7	·· 17.6	232°38.1	·· 22.4	13°20.2	·· 49.1
22	36°49.8	191°58.5	14.5	243°12.2	17.3	247°40.5	22.3	28°22.7	49.1
23	51°52.3	206°59.7	14.6	258°13.7	17.0	262°42.8	22.3	43°25.3	49.1
Mer.pass. 19:33		ν 1.3′	d 0.0′	m -4.90	ν 1.5′	d 0.3′	m 0.52	ν 2.3′	d 0.0′ m -2.16	ν 2.5′	d 0.0′ m 0.59

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	66°54.7	222°00.9	S09°14.6	273°15.2	N13°16.7	277°45.1	N13°22.3	58°27.8	N00°49.1
1	81°57.2	237°02.1	14.7	288°16.7	16.4	292°47.5	22.2	73°30.3	49.1
2	96°59.7	252°03.3	14.8	303°18.2	16.1	307°49.8	22.2	88°32.8	49.1
3	112°02.1	267°04.5	·· 14.9	318°19.8	·· 15.8	322°52.2	·· 22.2	103°35.3	·· 49.1
4	127°04.6	282°05.7	15.0	333°21.3	15.6	337°54.5	22.1	118°37.9	49.0
5	142°07.1	297°06.8	15.1	348°22.8	15.3	352°56.9	22.1	133°40.4	49.0
6	157°09.5	312°08.0	S09°15.2	3°24.3	N13°15.0	7°59.2	N13°22.1	148°42.9	N00°49.0
7	172°12.0	327°09.2	15.3	18°25.8	14.7	23°01.6	22.0	163°45.4	49.0
8	187°14.5	342°10.4	15.4	33°27.3	14.4	38°03.9	22.0	178°47.9	49.0
9	202°16.9	357°11.5	·· 15.5	48°28.8	·· 14.1	53°06.3	·· 22.0	193°50.5	·· 49.0
10	217°19.4	12°12.7	15.6	63°30.3	13.9	68°08.6	21.9	208°53.0	49.0
11	232°21.9	27°13.9	15.6	78°31.9	13.6	83°11.0	21.9	223°55.5	49.0
12	247°24.3	42°15.0	S09°15.7	93°33.4	N13°13.3	98°13.3	N13°21.9	238°58.0	N00°48.9
13	262°26.8	57°16.2	15.9	108°34.9	13.0	113°15.6	21.9	254°00.5	48.9
14	277°29.2	72°17.3	16.0	123°36.4	12.7	128°18.0	21.8	269°03.1	48.9
15	292°31.7	87°18.5	·· 16.1	138°37.9	·· 12.4	143°20.3	·· 21.8	284°05.6	·· 48.9
16	307°34.2	102°19.6	16.2	153°39.4	12.2	158°22.7	21.8	299°08.1	48.9
17	322°36.6	117°20.8	16.3	168°41.0	11.9	173°25.0	21.7	314°10.6	48.9
18	337°39.1	132°21.9	S09°16.4	183°42.5	N13°11.6	188°27.4	N13°21.7	329°13.1	N00°48.9
19	352°41.6	147°23.1	16.5	198°44.0	11.3	203°29.7	21.7	344°15.7	48.8
20	7°44.0	162°24.2	16.6	213°45.5	11.0	218°32.1	21.6	359°18.2	48.8
21	22°46.5	177°25.4	·· 16.7	228°47.0	·· 10.8	233°34.4	·· 21.6	14°20.7	·· 48.8
22	37°49.0	192°26.5	16.8	243°48.6	10.5	248°36.8	21.6	29°23.2	48.8
23	52°51.4	207°27.6	17.0	258°50.1	10.2	263°39.1	21.6	44°25.7	48.8
Mer.pass. 19:29		ν 1.2′	d 0.1′	m -4.90	ν 1.5′	d 0.3′	m 0.51	ν 2.3′	d 0.0′ m -2.17	ν 2.5′	d 0.0′ m 0.59

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	67°53.9	222°28.8	S09°17.1	273°51.6	N13°09.9	278°41.5	N13°21.5	59°28.2	N00°48.8
1	82°56.3	237°29.9	17.2	288°53.1	09.6	293°43.9	21.5	74°30.8	48.8
2	97°58.8	252°31.0	17.3	303°54.6	09.4	308°46.2	21.5	89°33.3	48.8
3	113°01.3	267°32.2	·· 17.4	318°56.2	·· 09.1	323°48.6	·· 21.4	104°35.8	·· 48.8
4	128°03.7	282°33.3	17.6	333°57.7	08.8	338°50.9	21.4	119°38.3	48.7
5	143°06.2	297°34.4	17.7	348°59.2	08.5	353°53.3	21.4	134°40.8	48.7
6	158°08.7	312°35.5	S09°17.8	4°00.7	N13°08.2	8°55.6	N13°21.4	149°43.3	N00°48.7
7	173°11.1	327°36.6	17.9	19°02.3	08.0	23°58.0	21.3	164°45.9	48.7
8	188°13.6	342°37.8	18.1	34°03.8	07.7	39°00.3	21.3	179°48.4	48.7
9	203°16.1	357°38.9	·· 18.2	49°05.3	·· 07.4	54°02.7	·· 21.3	194°50.9	·· 48.7
10	218°18.5	12°40.0	18.3	64°06.9	07.1	69°05.0	21.2	209°53.4	48.7
11	233°21.0	27°41.1	18.5	79°08.4	06.8	84°07.4	21.2	224°55.9	48.7
12	248°23.5	42°42.2	S09°18.6	94°09.9	N13°06.6	99°09.7	N13°21.2	239°58.4	N00°48.6
13	263°25.9	57°43.3	18.7	109°11.4	06.3	114°12.1	21.2	255°01.0	48.6
14	278°28.4	72°44.4	18.9	124°13.0	06.0	129°14.5	21.1	270°03.5	48.6
15	293°30.8	87°45.5	·· 19.0	139°14.5	·· 05.7	144°16.8	·· 21.1	285°06.0	·· 48.6
16	308°33.3	102°46.6	19.2	154°16.0	05.5	159°19.2	21.1	300°08.5	48.6
17	323°35.8	117°47.7	19.3	169°17.6	05.2	174°21.5	21.1	315°11.0	48.6
18	338°38.2	132°48.8	S09°19.4	184°19.1	N13°04.9	189°23.9	N13°21.0	330°13.5	N00°48.6
19	353°40.7	147°49.8	19.6	199°20.6	04.6	204°26.2	21.0	345°16.0	48.6
20	8°43.2	162°50.9	19.7	214°22.2	04.3	219°28.6	21.0	0°18.6	48.6
21	23°45.6	177°52.0	·· 19.9	229°23.7	·· 04.1	234°31.0	·· 20.9	15°21.1	·· 48.5
22	38°48.1	192°53.1	20.0	244°25.2	03.8	249°33.3	20.9	30°23.6	48.5
23	53°50.6	207°54.2	20.2	259°26.8	03.5	264°35.7	20.9	45°26.1	48.5
Mer.pass. 19:25		ν 1.1′	d 0.1′	m -4.90	ν 1.5′	d 0.3′	m 0.49	ν 2.4′	d 0.0′ m -2.18	ν 2.5′	d 0.0′ m 0.60

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°43.7	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.1	46°01.5
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°51.2	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°49.0	5°09.3
Pollux	243°15.2	27°57.5
Avior	234°13.7	-59°35.5
Suhail	222°45.0	-43°32.2
Miaplacidus	221°37.6	-69°49.3
Alphard	217°46.1	-8°46.5
Regulus	207°32.8	11°50.1
Dubhe	193°39.3	61°36.0
Denebola	182°23.5	14°25.2
Gienah	175°42.2	-17°41.4
Acrux	172°58.7	-63°14.7
Gacrux	171°50.2	-57°15.6
Alioth	166°12.0	55°48.6
Spica	158°20.9	-11°18.1
Alkaid	152°51.2	49°10.5
Hadar	148°34.3	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.7	-60°56.6
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.6	-16°09.1
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.0
Deneb	49°25.0	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 27 Fri	SHA	Mer.pass
Venus	155°36.0	09:13
Mars	206°43.6	05:49
Jupiter	210°53.4	05:32
Saturn	351°31.6	20:07

Nov 28 Sat	SHA	Mer.pass
Venus	155°06.2	09:11
Mars	206°20.5	05:46
Jupiter	210°50.4	05:28
Saturn	351°33.0	20:03

Nov 29 Sun	SHA	Mer.pass
Venus	154°34.9	09:09
Mars	205°57.7	05:44
Jupiter	210°47.6	05:24
Saturn	351°34.4	19:59

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°08.4	S21°05.0	326°42.9	1.9′	N26°46.7	4.8′	60.8′
1	198°08.2	05.4	341°03.8	2.0′	26°41.9	4.9′	60.7′
2	213°08.0	05.9	355°24.7	2.1′	26°37.0	5.2′	60.7′
3	228°07.8	·· 06.4	9°45.8	2.1′	26°31.8	5.4′	60.7′
4	243°07.6	06.8	24°06.9	2.2′	26°26.4	5.5′	60.7′
5	258°07.4	07.3	38°28.2	2.3′	26°20.9	5.8′	60.7′
6	273°07.2	S21°07.7	52°49.5	2.4′	N26°15.1	5.9′	60.7′
7	288°07.0	08.2	67°10.9	2.5′	26°09.2	6.1′	60.7′
8	303°06.8	08.6	81°32.4	2.6′	26°03.1	6.3′	60.6′
9	318°06.6	·· 09.1	95°54.0	2.7′	25°56.8	6.5′	60.6′
10	333°06.4	09.6	110°15.7	2.8′	25°50.3	6.7′	60.6′
11	348°06.2	10.0	124°37.6	2.9′	25°43.6	6.9′	60.6′
12	3°06.0	S21°10.5	138°59.5	3.0′	N25°36.7	7.1′	60.6′
13	18°05.8	10.9	153°21.5	3.1′	25°29.6	7.2′	60.6′
14	33°05.6	11.4	167°43.6	3.2′	25°22.4	7.4′	60.5′
15	48°05.4	·· 11.8	182°05.9	3.4′	25°15.0	7.6′	60.5′
16	63°05.2	12.3	196°28.2	3.5′	25°07.4	7.8′	60.5′
17	78°04.9	12.7	210°50.7	3.6′	24°59.6	7.9′	60.5′
18	93°04.7	S21°13.2	225°13.3	3.7′	N24°51.7	8.1′	60.5′
19	108°04.5	13.6	239°36.0	3.8′	24°43.6	8.3′	60.4′
20	123°04.3	14.1	253°58.8	3.9′	24°35.3	8.4′	60.4′
21	138°04.1	·· 14.5	268°21.7	4.1′	24°26.9	8.6′	60.4′
22	153°03.9	14.9	282°44.8	4.2′	24°18.3	8.8′	60.4′
23	168°03.7	15.4	297°08.0	4.3′	24°09.5	8.9′	60.3′
	SD = 16.2′	d = 0.5′	SD = 16.6′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°03.5	S21°15.8	311°31.3	4.4′	N24°00.6	9.1′	60.3′
1	198°03.3	16.3	325°54.7	4.5′	23°51.5	9.2′	60.3′
2	213°03.1	16.7	340°18.2	4.7′	23°42.3	9.4′	60.3′
3	228°02.9	·· 17.2	354°41.9	4.8′	23°32.9	9.6′	60.3′
4	243°02.7	17.6	9°05.7	4.9′	23°23.3	9.7′	60.2′
5	258°02.4	18.0	23°29.6	5.1′	23°13.6	9.8′	60.2′
6	273°02.2	S21°18.5	37°53.7	5.2′	N23°03.8	10.0′	60.2′
7	288°02.0	18.9	52°17.9	5.3′	22°53.8	10.1′	60.2′
8	303°01.8	19.4	66°42.2	5.4′	22°43.7	10.3′	60.1′
9	318°01.6	·· 19.8	81°06.6	5.6′	22°33.4	10.4′	60.1′
10	333°01.4	20.2	95°31.2	5.7′	22°23.0	10.6′	60.1′
11	348°01.2	20.7	109°55.9	5.8′	22°12.4	10.7′	60.1′
12	3°01.0	S21°21.1	124°20.7	6.0′	N22°01.7	10.8′	60.0′
13	18°00.8	21.5	138°45.7	6.1′	21°50.9	10.9′	60.0′
14	33°00.5	22.0	153°10.8	6.2′	21°40.0	11.1′	60.0′
15	48°00.3	·· 22.4	167°36.0	6.4′	21°28.9	11.2′	59.9′
16	63°00.1	22.8	182°01.4	6.5′	21°17.7	11.3′	59.9′
17	77°59.9	23.3	196°26.9	6.6′	21°06.4	11.5′	59.9′
18	92°59.7	S21°23.7	210°52.5	6.8′	N20°54.9	11.5′	59.9′
19	107°59.5	24.1	225°18.2	6.9′	20°43.4	11.7′	59.8′
20	122°59.3	24.6	239°44.1	7.0′	20°31.7	11.8′	59.8′
21	137°59.0	·· 25.0	254°10.1	7.1′	20°19.9	12.0′	59.8′
22	152°58.8	25.4	268°36.3	7.3′	20°07.9	12.0′	59.8′
23	167°58.6	25.9	283°02.5	7.4′	19°55.9	12.1′	59.7′
	SD = 16.2′	d = 0.4′	SD = 16.5′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°58.4	S21°26.3	297°28.9	7.5′	N19°43.8	12.3′	59.7′
1	197°58.2	26.7	311°55.5	7.7′	19°31.5	12.3′	59.7′
2	212°58.0	27.1	326°22.1	7.8′	19°19.2	12.5′	59.6′
3	227°57.7	·· 27.6	340°48.9	7.9′	19°06.7	12.5′	59.6′
4	242°57.5	28.0	355°15.8	8.0′	18°54.2	12.7′	59.6′
5	257°57.3	28.4	9°42.9	8.2′	18°41.5	12.7′	59.5′
6	272°57.1	S21°28.8	24°10.0	8.3′	N18°28.8	12.9′	59.5′
7	287°56.9	29.2	38°37.3	8.4′	18°15.9	12.9′	59.5′
8	302°56.7	29.7	53°04.8	8.5′	18°03.0	13.0′	59.5′
9	317°56.4	·· 30.1	67°32.3	8.7′	17°50.0	13.2′	59.4′
10	332°56.2	30.5	82°00.0	8.8′	17°36.8	13.2′	59.4′
11	347°56.0	30.9	96°27.8	8.9′	17°23.6	13.3′	59.4′
12	2°55.8	S21°31.3	110°55.7	9.0′	N17°10.3	13.3′	59.3′
13	17°55.6	31.8	125°23.7	9.1′	16°57.0	13.5′	59.3′
14	32°55.3	32.2	139°51.8	9.3′	16°43.5	13.5′	59.3′
15	47°55.1	·· 32.6	154°20.1	9.4′	16°30.0	13.6′	59.2′
16	62°54.9	33.0	168°48.5	9.5′	16°16.4	13.7′	59.2′
17	77°54.7	33.4	183°17.0	9.6′	16°02.7	13.8′	59.2′
18	92°54.5	S21°33.8	197°45.6	9.7′	N15°48.9	13.8′	59.1′
19	107°54.2	34.3	212°14.3	9.8′	15°35.1	13.9′	59.1′
20	122°54.0	34.7	226°43.2	10.0′	15°21.2	14.0′	59.1′
21	137°53.8	·· 35.1	241°12.2	10.1′	15°07.2	14.0′	59.1′
22	152°53.6	35.5	255°41.2	10.2′	14°53.2	14.1′	59.0′
23	167°53.3	35.9	270°10.4	10.3′	14°39.1	14.2′	59.0′
	SD = 16.2′	d = 0.4′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:42	09:36	▬	▬	13:59	15:53
N 70°	07:27	09:00	▬	▬	14:35	16:08
68°	07:15	08:35	10:19	13:16	15:00	16:20
66°	07:04	08:16	09:36	13:59	15:20	16:31
64°	06:56	08:00	09:08	14:28	15:35	16:40
62°	06:48	07:47	08:46	14:49	15:49	16:47
60°	06:41	07:35	08:29	15:07	16:00	16:54
N 58°	06:35	07:25	08:14	15:21	16:10	17:01
56°	06:29	07:17	08:02	15:34	16:19	17:06
54°	06:24	07:09	07:51	15:45	16:27	17:11
52°	06:19	07:02	07:41	15:54	16:34	17:16
50°	06:15	06:55	07:33	16:03	16:40	17:21
45°	06:05	06:41	07:14	16:21	16:54	17:31
N 40°	05:56	06:30	06:59	16:36	17:06	17:39
35°	05:48	06:19	06:47	16:49	17:16	17:48
30°	05:40	06:10	06:36	17:00	17:26	17:55
20°	05:26	05:53	06:17	17:19	17:43	18:10
N 10°	05:12	05:38	06:00	17:36	17:58	18:24
0°	04:56	05:22	05:44	17:52	18:14	18:40
S 10°	04:39	05:06	05:28	18:08	18:30	18:57
20°	04:19	04:47	05:11	18:25	18:49	19:17
30°	03:52	04:25	04:52	18:45	19:11	19:44
35°	03:36	04:11	04:40	18:56	19:25	20:01
40°	03:15	03:55	04:27	19:10	19:42	20:21
45°	02:48	03:35	04:11	19:26	20:02	20:48
S 50°	02:11	03:09	03:51	19:46	20:28	21:26
52°	01:50	02:56	03:41	19:55	20:41	21:48
54°	01:23	02:41	03:31	20:06	20:56	22:16
56°	00:38	02:23	03:19	20:18	21:14	23:04
58°	////	02:01	03:05	20:32	21:36	////
S 60°	////	01:32	02:48	20:49	22:07	////

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	▭	▭	18:58	▭	▭	15:01
N 70°	▭	▭	19:38	▭	▭	14:19
68°	▭	17:10	20:04	▭	14:51	13:51
66°	▭	18:03	20:25	▭	13:56	13:29
64°	16:04	18:36	20:41	13:49	13:23	13:11
62°	16:54	18:59	20:54	12:58	12:59	12:57
60°	17:26	19:18	21:05	12:26	12:39	12:44
N 58°	17:49	19:34	21:15	12:02	12:23	12:34
56°	18:08	19:47	21:23	11:43	12:09	12:24
54°	18:24	19:58	21:31	11:27	11:57	12:16
52°	18:37	20:08	21:37	11:13	11:46	12:08
50°	18:49	20:17	21:43	11:00	11:36	12:02
45°	19:14	20:36	21:56	10:35	11:16	11:47
N 40°	19:33	20:51	22:07	10:14	10:59	11:35
35°	19:50	21:04	22:16	09:57	10:45	11:25
30°	20:04	21:15	22:24	09:42	10:33	11:15
20°	20:28	21:35	22:37	09:17	10:12	11:00
N 10°	20:48	21:51	22:49	08:55	09:54	10:46
0°	21:08	22:06	23:00	08:35	09:36	10:33
S 10°	21:27	22:22	23:11	08:14	09:19	10:19
20°	21:47	22:38	23:22	07:52	09:00	10:05
30°	22:11	22:57	23:36	07:26	08:38	09:48
35°	22:24	23:08	23:43	07:10	08:25	09:39
40°	22:40	23:20	23:52	06:52	08:10	09:28
45°	22:59	23:35	·· ··	06:31	07:53	09:15
S 50°	23:23	23:52	·· ··	06:03	07:30	08:59
52°	23:34	·· ··	00:01	05:50	07:20	08:51
54°	23:46	·· ··	00:10	05:34	07:08	08:42
56°	·· ··	00:01	00:20	05:16	06:54	08:33
58°	·· ··	00:18	00:32	04:54	06:37	08:22
S 60°	00:20	00:38	00:46	04:24	06:18	08:09

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 92-74%
27	12:34	12:24	11:48	02:19	14:51	
28	12:14	12:04	11:48	03:22	15:52	
29	11:54	11:43	11:48	04:20	16:46	

November 30, 01, 02 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	68°53.0	222°55.2	S09°20.3	274°28.3	N13°03.2	279°38.0	N13°20.9	60°28.6	N00°48.5
1	83°55.5	237°56.3	20.5	289°29.8	03.0	294°40.4	20.8	75°31.1	48.5
2	98°58.0	252°57.4	20.6	304°31.4	02.7	309°42.8	20.8	90°33.6	48.5
3	114°00.4	267°58.5	·· 20.8	319°32.9	·· 02.4	324°45.1	·· 20.8	105°36.2	·· 48.5
4	129°02.9	282°59.5	21.0	334°34.5	02.1	339°47.5	20.8	120°38.7	48.5
5	144°05.3	298°00.6	21.1	349°36.0	01.9	354°49.8	20.7	135°41.2	48.5
6	159°07.8	313°01.7	S09°21.3	4°37.5	N13°01.6	9°52.2	N13°20.7	150°43.7	N00°48.5
7	174°10.3	328°02.7	21.4	19°39.1	01.3	24°54.6	20.7	165°46.2	48.4
8	189°12.7	343°03.8	21.6	34°40.6	01.0	39°56.9	20.7	180°48.7	48.4
9	204°15.2	358°04.8	·· 21.8	49°42.2	·· 00.8	54°59.3	·· 20.6	195°51.2	·· 48.4
10	219°17.7	13°05.9	21.9	64°43.7	00.5	70°01.6	20.6	210°53.7	48.4
11	234°20.1	28°06.9	22.1	79°45.3	13°00.2	85°04.0	20.6	225°56.3	48.4
12	249°22.6	43°08.0	S09°22.3	94°46.8	N12°59.9	100°06.4	N13°20.6	240°58.8	N00°48.4
13	264°25.1	58°09.0	22.4	109°48.3	59.7	115°08.7	20.5	256°01.3	48.4
14	279°27.5	73°10.1	22.6	124°49.9	59.4	130°11.1	20.5	271°03.8	48.4
15	294°30.0	88°11.1	·· 22.8	139°51.4	·· 59.1	145°13.5	·· 20.5	286°06.3	·· 48.4
16	309°32.5	103°12.1	23.0	154°53.0	58.9	160°15.8	20.5	301°08.8	48.4
17	324°34.9	118°13.2	23.1	169°54.5	58.6	175°18.2	20.4	316°11.3	48.4
18	339°37.4	133°14.2	S09°23.3	184°56.1	N12°58.3	190°20.5	N13°20.4	331°13.8	N00°48.3
19	354°39.8	148°15.3	23.5	199°57.6	58.0	205°22.9	20.4	346°16.3	48.3
20	9°42.3	163°16.3	23.7	214°59.2	57.8	220°25.3	20.4	1°18.9	48.3
21	24°44.8	178°17.3	·· 23.9	230°00.7	·· 57.5	235°27.6	·· 20.3	16°21.4	·· 48.3
22	39°47.2	193°18.3	24.0	245°02.3	57.2	250°30.0	20.3	31°23.9	48.3
23	54°49.7	208°19.4	24.2	260°03.8	57.0	265°32.4	20.3	46°26.4	48.3
Mer.pass.	19:21	ν 1.1′	d 0.2′	m -4.89	ν 1.5′	d 0.3′	m 0.48	ν 2.4′	d 0.0′ m -2.19	ν 2.5′	d 0.0′ m 0.60

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	69°52.2	223°20.4	S09°24.4	275°05.4	N12°56.7	280°34.7	N13°20.3	61°28.9	N00°48.3
1	84°54.6	238°21.4	24.6	290°06.9	56.4	295°37.1	20.2	76°31.4	48.3
2	99°57.1	253°22.4	24.8	305°08.5	56.1	310°39.5	20.2	91°33.9	48.3
3	114°59.6	268°23.4	·· 25.0	320°10.0	·· 55.9	325°41.8	·· 20.2	106°36.4	·· 48.3
4	130°02.0	283°24.4	25.2	335°11.6	55.6	340°44.2	20.2	121°38.9	48.3
5	145°04.5	298°25.4	25.4	350°13.1	55.3	355°46.6	20.1	136°41.4	48.2
6	160°06.9	313°26.5	S09°25.6	5°14.7	N12°55.1	10°48.9	N13°20.1	151°44.0	N00°48.2
7	175°09.4	328°27.5	25.7	20°16.2	54.8	25°51.3	20.1	166°46.5	48.2
8	190°11.9	343°28.5	25.9	35°17.8	54.5	40°53.7	20.1	181°49.0	48.2
9	205°14.3	358°29.5	·· 26.1	50°19.4	·· 54.2	55°56.1	·· 20.1	196°51.5	·· 48.2
10	220°16.8	13°30.5	26.3	65°20.9	54.0	70°58.4	20.0	211°54.0	48.2
11	235°19.3	28°31.5	26.5	80°22.5	53.7	86°00.8	20.0	226°56.5	48.2
12	250°21.7	43°32.5	S09°26.7	95°24.0	N12°53.4	101°03.2	N13°20.0	241°59.0	N00°48.2
13	265°24.2	58°33.4	26.9	110°25.6	53.2	116°05.5	20.0	257°01.5	48.2
14	280°26.7	73°34.4	27.1	125°27.1	52.9	131°07.9	19.9	272°04.0	48.2
15	295°29.1	88°35.4	·· 27.4	140°28.7	·· 52.6	146°10.3	·· 19.9	287°06.5	·· 48.2
16	310°31.6	103°36.4	27.6	155°30.3	52.4	161°12.7	19.9	302°09.0	48.2
17	325°34.1	118°37.4	27.8	170°31.8	52.1	176°15.0	19.9	317°11.5	48.2
18	340°36.5	133°38.4	S09°28.0	185°33.4	N12°51.8	191°17.4	N13°19.9	332°14.0	N00°48.1
19	355°39.0	148°39.4	28.2	200°35.0	51.6	206°19.8	19.8	347°16.5	48.1
20	10°41.4	163°40.3	28.4	215°36.5	51.3	221°22.1	19.8	2°19.1	48.1
21	25°43.9	178°41.3	·· 28.6	230°38.1	·· 51.0	236°24.5	·· 19.8	17°21.6	·· 48.1
22	40°46.4	193°42.3	28.8	245°39.6	50.8	251°26.9	19.8	32°24.1	48.1
23	55°48.8	208°43.2	29.0	260°41.2	50.5	266°29.3	19.7	47°26.6	48.1
Mer.pass.	19:17	ν 1.0′	d 0.2′	m -4.89	ν 1.6′	d 0.3′	m 0.46	ν 2.4′	d 0.0′ m -2.19	ν 2.5′	d 0.0′ m 0.61

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	70°51.3	223°44.2	S09°29.3	275°42.8	N12°50.2	281°31.6	N13°19.7	62°29.1	N00°48.1
1	85°53.8	238°45.2	29.5	290°44.3	50.0	296°34.0	19.7	77°31.6	48.1
2	100°56.2	253°46.1	29.7	305°45.9	49.7	311°36.4	19.7	92°34.1	48.1
3	115°58.7	268°47.1	·· 29.9	320°47.5	·· 49.4	326°38.8	·· 19.7	107°36.6	·· 48.1
4	131°01.2	283°48.1	30.1	335°49.0	49.2	341°41.1	19.6	122°39.1	48.1
5	146°03.6	298°49.0	30.4	350°50.6	48.9	356°43.5	19.6	137°41.6	48.1
6	161°06.1	313°50.0	S09°30.6	5°52.2	N12°48.6	11°45.9	N13°19.6	152°44.1	N00°48.1
7	176°08.5	328°50.9	30.8	20°53.8	48.4	26°48.3	19.6	167°46.6	48.1
8	191°11.0	343°51.9	31.0	35°55.3	48.1	41°50.6	19.6	182°49.1	48.1
9	206°13.5	358°52.8	·· 31.3	50°56.9	·· 47.8	56°53.0	·· 19.5	197°51.6	·· 48.0
10	221°15.9	13°53.8	31.5	65°58.5	47.6	71°55.4	19.5	212°54.1	48.0
11	236°18.4	28°54.7	31.7	81°00.0	47.3	86°57.8	19.5	227°56.6	48.0
12	251°20.9	43°55.7	S09°32.0	96°01.6	N12°47.1	102°00.2	N13°19.5	242°59.1	N00°48.0
13	266°23.3	58°56.6	32.2	111°03.2	46.8	117°02.5	19.5	258°01.6	48.0
14	281°25.8	73°57.5	32.4	126°04.8	46.5	132°04.9	19.4	273°04.1	48.0
15	296°28.3	88°58.5	·· 32.7	141°06.3	·· 46.3	147°07.3	·· 19.4	288°06.6	·· 48.0
16	311°30.7	103°59.4	32.9	156°07.9	46.0	162°09.7	19.4	303°09.1	48.0
17	326°33.2	119°00.3	33.1	171°09.5	45.7	177°12.0	19.4	318°11.6	48.0
18	341°35.7	134°01.3	S09°33.4	186°11.1	N12°45.5	192°14.4	N13°19.4	333°14.1	N00°48.0
19	356°38.1	149°02.2	33.6	201°12.6	45.2	207°16.8	19.3	348°16.7	48.0
20	11°40.6	164°03.1	33.9	216°14.2	45.0	222°19.2	19.3	3°19.2	48.0
21	26°43.0	179°04.0	·· 34.1	231°15.8	·· 44.7	237°21.6	·· 19.3	18°21.7	·· 48.0
22	41°45.5	194°05.0	34.4	246°17.4	44.4	252°23.9	19.3	33°24.2	48.0
23	56°48.0	209°05.9	34.6	261°19.0	44.2	267°26.3	19.3	48°26.7	48.0
Mer.pass.	19:13	ν 1.0′	d 0.2′	m -4.88	ν 1.6′	d 0.3′	m 0.44	ν 2.4′	d 0.0′ m -2.20	ν 2.5′	d 0.0′ m 0.61

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°44.0	89°22.8
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.0	-8°10.2
Capella	280°19.1	46°01.5
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°51.2	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°49.0	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°13.7	-59°35.5
Suhail	222°45.0	-43°32.2
Miaplacidus	221°37.6	-69°49.4
Alphard	217°46.1	-8°46.5
Regulus	207°32.7	11°50.1
Dubhe	193°39.2	61°36.0
Denebola	182°23.5	14°25.2
Gienah	175°42.1	-17°41.4
Acrux	172°58.7	-63°14.7
Gacrux	171°50.2	-57°15.6
Alioth	166°12.0	55°48.6
Spica	158°20.9	-11°18.1
Alkaid	152°51.2	49°10.5
Hadar	148°34.3	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.7	-60°56.6
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.3	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.0
Deneb	49°25.0	45°22.9
Enif	33°37.4	10°00.1
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 30 Mon	SHA	Mer.pass
Venus	154°02.2	09:08
Mars	205°35.3	05:42
Jupiter	210°45.0	05:21
Saturn	351°35.6	19:55

Dec 01 Tue	SHA	Mer.pass
Venus	153°28.2	09:06
Mars	205°13.2	05:39
Jupiter	210°42.6	05:17
Saturn	351°36.7	19:51

Dec 02 Wed	SHA	Mer.pass
Venus	152°52.9	09:04
Mars	204°51.5	05:37
Jupiter	210°40.3	05:13
Saturn	351°37.8	19:47

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°53.1	S21°36.3	284°39.7	10.4′	N14°24.9	14.2′	59.0′
1	197°52.9	36.7	299°09.1	10.5′	14°10.7	14.3′	58.9′
2	212°52.7	37.1	313°38.6	10.6′	13°56.4	14.3′	58.9′
3	227°52.5	·· 37.5	328°08.2	10.7′	13°42.1	14.4′	58.9′
4	242°52.2	38.0	342°37.9	10.8′	13°27.7	14.5′	58.8′
5	257°52.0	38.4	357°07.7	10.9′	13°13.2	14.5′	58.8′
6	272°51.8	S21°38.8	11°37.7	11.0′	N12°58.7	14.6′	58.8′
7	287°51.6	39.2	26°07.7	11.1′	12°44.1	14.6′	58.7′
8	302°51.3	39.6	40°37.8	11.2′	12°29.5	14.6′	58.7′
9	317°51.1	·· 40.0	55°08.0	11.3′	12°14.9	14.7′	58.7′
10	332°50.9	40.4	69°38.3	11.4′	12°00.2	14.8′	58.6′
11	347°50.6	40.8	84°08.7	11.5′	11°45.4	14.7′	58.6′
12	2°50.4	S21°41.2	98°39.2	11.6′	N11°30.7	14.9′	58.6′
13	17°50.2	41.6	113°09.8	11.7′	11°15.8	14.8′	58.5′
14	32°50.0	42.0	127°40.5	11.8′	11°01.0	14.9′	58.5′
15	47°49.7	·· 42.4	142°11.3	11.9′	10°46.1	15.0′	58.5′
16	62°49.5	42.8	156°42.1	11.9′	10°31.1	15.0′	58.4′
17	77°49.3	43.2	171°13.1	12.0′	10°16.1	15.0′	58.4′
18	92°49.1	S21°43.6	185°44.1	12.1′	N10°01.1	15.0′	58.4′
19	107°48.8	44.0	200°15.2	12.2′	09°46.1	15.1′	58.3′
20	122°48.6	44.4	214°46.4	12.3′	09°31.0	15.1′	58.3′
21	137°48.4	·· 44.8	229°17.7	12.4′	09°15.9	15.1′	58.3′
22	152°48.1	45.2	243°49.1	12.4′	09°00.8	15.2′	58.2′
23	167°47.9	45.6	258°20.5	12.5′	08°45.6	15.1′	58.2′
	SD = 16.2′	d = 0.4′	SD = 16.1′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°47.7	S21°45.9	272°52.0	12.6′	N08°30.5	15.2′	58.2′
1	197°47.4	46.3	287°23.6	12.7′	08°15.3	15.3′	58.1′
2	212°47.2	46.7	301°55.3	12.7′	08°00.0	15.2′	58.1′
3	227°47.0	·· 47.1	316°27.0	12.8′	07°44.8	15.3′	58.1′
4	242°46.8	47.5	330°58.9	12.9′	07°29.5	15.3′	58.0′
5	257°46.5	47.9	345°30.7	13.0′	07°14.2	15.3′	58.0′
6	272°46.3	S21°48.3	0°02.7	13.0′	N06°58.9	15.3′	58.0′
7	287°46.1	48.7	14°34.7	13.1′	06°43.6	15.3′	57.9′
8	302°45.8	49.1	29°06.8	13.1′	06°28.3	15.4′	57.9′
9	317°45.6	·· 49.4	43°38.9	13.2′	06°12.9	15.3′	57.9′
10	332°45.4	49.8	58°11.1	13.3′	05°57.6	15.4′	57.9′
11	347°45.1	50.2	72°43.4	13.3′	05°42.2	15.4′	57.8′
12	2°44.9	S21°50.6	87°15.8	13.4′	N05°26.8	15.4′	57.8′
13	17°44.7	51.0	101°48.1	13.4′	05°11.4	15.3′	57.8′
14	32°44.4	51.4	116°20.6	13.5′	04°56.1	15.4′	57.7′
15	47°44.2	·· 51.8	130°53.1	13.6′	04°40.7	15.4′	57.7′
16	62°43.9	52.1	145°25.7	13.6′	04°25.3	15.4′	57.7′
17	77°43.7	52.5	159°58.3	13.7′	04°09.9	15.5′	57.6′
18	92°43.5	S21°52.9	174°30.9	13.7′	N03°54.4	15.4′	57.6′
19	107°43.2	53.3	189°03.6	13.8′	03°39.0	15.4′	57.6′
20	122°43.0	53.7	203°36.4	13.8′	03°23.6	15.4′	57.5′
21	137°42.8	·· 54.0	218°09.2	13.9′	03°08.2	15.4′	57.5′
22	152°42.5	54.4	232°42.1	13.9′	02°52.8	15.4′	57.5′
23	167°42.3	54.8	247°15.0	13.9′	02°37.4	15.4′	57.4′
	SD = 16.2′	d = 0.4′	SD = 15.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°42.1	S21°55.2	261°47.9	14.0′	N02°22.0	15.4′	57.4′
1	197°41.8	55.5	276°20.9	14.0′	02°06.6	15.3′	57.4′
2	212°41.6	55.9	290°53.9	14.1′	01°51.3	15.4′	57.4′
3	227°41.3	·· 56.3	305°27.0	14.1′	01°35.9	15.4′	57.3′
4	242°41.1	56.7	320°00.1	14.1′	01°20.5	15.3′	57.3′
5	257°40.9	57.0	334°33.2	14.2′	01°05.2	15.4′	57.3′
6	272°40.6	S21°57.4	349°06.4	14.2′	N00°49.8	15.3′	57.2′
7	287°40.4	57.8	3°39.6	14.2′	00°34.5	15.3′	57.2′
8	302°40.2	58.1	18°12.8	14.3′	00°19.2	15.3′	57.2′
9	317°39.9	·· 58.5	32°46.1	14.3′	N00°03.9	15.3′	57.1′
10	332°39.7	58.9	47°19.4	14.3′	S00°11.4	15.3′	57.1′
11	347°39.4	59.2	61°52.7	14.4′	00°26.7	15.3′	57.1′
12	2°39.2	S21°59.6	76°26.1	14.4′	S00°42.0	15.2′	57.1′
13	17°38.9	22°00.0	90°59.5	14.4′	00°57.2	15.2′	57.0′
14	32°38.7	00.3	105°32.9	14.4′	01°12.4	15.2′	57.0′
15	47°38.5	·· 00.7	120°06.3	14.4′	01°27.6	15.2′	57.0′
16	62°38.2	01.1	134°39.7	14.5′	01°42.8	15.2′	56.9′
17	77°38.0	01.4	149°13.2	14.5′	01°58.0	15.1′	56.9′
18	92°37.7	S22°01.8	163°46.7	14.5′	S02°13.1	15.1′	56.9′
19	107°37.5	02.2	178°20.2	14.5′	02°28.2	15.1′	56.8′
20	122°37.3	02.5	192°53.7	14.5′	02°43.3	15.0′	56.8′
21	137°37.0	·· 02.9	207°27.3	14.6′	02°58.3	15.1′	56.8′
22	152°36.8	03.2	222°00.8	14.6′	03°13.4	15.0′	56.8′
23	167°36.5	03.6	236°34.4	14.6′	03°28.4	14.9′	56.7′
	SD = 16.2′	d = 0.4′	SD = 15.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:51	09:50	▬	▬	13:47	15:46
N 70°	07:35	09:11	▬	▬	14:27	16:03
68°	07:21	08:44	10:36	13:01	14:54	16:16
66°	07:10	08:23	09:47	13:51	15:14	16:27
64°	07:01	08:06	09:16	14:21	15:31	16:36
62°	06:53	07:52	08:53	14:44	15:45	16:45
60°	06:46	07:41	08:35	15:03	15:57	16:52
N 58°	06:39	07:30	08:20	15:18	16:07	16:58
56°	06:33	07:21	08:07	15:31	16:16	17:04
54°	06:28	07:13	07:55	15:42	16:24	17:10
52°	06:23	07:06	07:46	15:52	16:32	17:15
50°	06:18	06:59	07:37	16:01	16:38	17:19
45°	06:08	06:45	07:18	16:20	16:53	17:30
N 40°	05:59	06:32	07:02	16:35	17:05	17:39
35°	05:50	06:22	06:49	16:48	17:16	17:47
30°	05:43	06:12	06:38	17:00	17:26	17:55
20°	05:28	05:55	06:19	17:19	17:43	18:10
N 10°	05:13	05:39	06:01	17:36	17:59	18:25
0°	04:57	05:23	05:45	17:53	18:15	18:41
S 10°	04:40	05:06	05:29	18:09	18:32	18:59
20°	04:19	04:47	05:12	18:27	18:51	19:20
30°	03:52	04:24	04:51	18:47	19:14	19:47
35°	03:35	04:10	04:39	18:59	19:28	20:04
40°	03:13	03:54	04:25	19:13	19:45	20:25
45°	02:46	03:33	04:09	19:29	20:06	20:53
S 50°	02:07	03:06	03:49	19:50	20:33	21:33
52°	01:45	02:53	03:39	20:00	20:46	21:55
54°	01:15	02:37	03:28	20:11	21:02	22:26
56°	00:17	02:19	03:15	20:24	21:21	23:32
58°	////	01:55	03:01	20:38	21:45	////
S 60°	////	01:23	02:44	20:56	22:18	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	21:49	·· ··	00:06	13:54	13:16	12:43
N 70°	22:03	·· ··	00:09	13:37	13:09	12:44
68°	22:15	·· ··	00:12	13:23	13:03	12:45
66°	22:24	·· ··	00:14	13:12	12:59	12:46
64°	22:32	·· ··	00:16	13:02	12:55	12:47
62°	22:39	·· ··	00:17	12:54	12:51	12:48
60°	22:45	·· ··	00:19	12:47	12:48	12:48
N 58°	22:50	·· ··	00:20	12:40	12:45	12:49
56°	22:54	·· ··	00:21	12:35	12:43	12:49
54°	22:59	·· ··	00:22	12:30	12:40	12:50
52°	23:02	·· ··	00:23	12:25	12:38	12:50
50°	23:05	·· ··	00:24	12:21	12:37	12:51
45°	23:13	·· ··	00:25	12:12	12:33	12:51
N 40°	23:18	·· ··	00:27	12:04	12:29	12:52
35°	23:24	·· ··	00:28	11:57	12:26	12:53
30°	23:28	·· ··	00:29	11:52	12:23	12:53
20°	23:36	·· ··	00:31	11:41	12:19	12:54
N 10°	23:42	·· ··	00:33	11:32	12:15	12:55
0°	23:49	·· ··	00:34	11:24	12:11	12:55
S 10°	23:55	·· ··	00:36	11:15	12:07	12:56
20°	·· ··	00:02	00:38	11:06	12:03	12:57
30°	·· ··	00:09	00:40	10:55	11:58	12:58
35°	·· ··	00:14	00:41	10:49	11:55	12:58
40°	·· ··	00:18	00:42	10:42	11:52	12:59
45°	00:02	00:24	00:44	10:33	11:48	12:59
S 50°	00:14	00:31	00:45	10:23	11:43	13:00
52°	00:19	00:34	00:46	10:18	11:41	13:00
54°	00:26	00:37	00:47	10:13	11:39	13:00
56°	00:32	00:41	00:48	10:07	11:36	13:01
58°	00:40	00:45	00:49	10:01	11:33	13:01
S 60°	00:49	00:50	00:50	09:53	11:30	13:02

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 64-42%
30	11:32	11:22	11:49	05:12	17:36	
01	11:11	11:00	11:49	06:00	18:23	
02	10:48	10:37	11:49	06:45	19:07	



December 03, 04, 05 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°50.4	224°06.8	S09°34.8	276°20.5	N12°43.9	282°28.7	N13°19.3	63°29.2	N00°48.0
1	86°52.9	239°07.7	35.1	291°22.1	43.6	297°31.1	19.2	78°31.7	48.0
2	101°55.4	254°08.6	35.3	306°23.7	43.4	312°33.5	19.2	93°34.2	48.0
3	116°57.8	269°09.5	·· 35.6	321°25.3	·· 43.1	327°35.9	·· 19.2	108°36.7	·· 47.9
4	132°00.3	284°10.5	35.8	336°26.9	42.9	342°38.2	19.2	123°39.2	47.9
5	147°02.8	299°11.4	36.1	351°28.5	42.6	357°40.6	19.2	138°41.7	47.9
6	162°05.2	314°12.3	S09°36.4	6°30.0	N12°42.3	12°43.0	N13°19.1	153°44.2	N00°47.9
7	177°07.7	329°13.2	36.6	21°31.6	42.1	27°45.4	19.1	168°46.7	47.9
8	192°10.2	344°14.1	36.9	36°33.2	41.8	42°47.8	19.1	183°49.2	47.9
9	207°12.6	359°15.0	·· 37.1	51°34.8	·· 41.6	57°50.2	·· 19.1	198°51.7	·· 47.9
10	222°15.1	14°15.9	37.4	66°36.4	41.3	72°52.5	19.1	213°54.2	47.9
11	237°17.5	29°16.8	37.6	81°38.0	41.1	87°54.9	19.1	228°56.7	47.9
12	252°20.0	44°17.7	S09°37.9	96°39.6	N12°40.8	102°57.3	N13°19.0	243°59.2	N00°47.9
13	267°22.5	59°18.5	38.2	111°41.1	40.5	117°59.7	19.0	259°01.7	47.9
14	282°24.9	74°19.4	38.4	126°42.7	40.3	133°02.1	19.0	274°04.2	47.9
15	297°27.4	89°20.3	·· 38.7	141°44.3	·· 40.0	148°04.5	·· 19.0	289°06.7	·· 47.9
16	312°29.9	104°21.2	39.0	156°45.9	39.8	163°06.9	19.0	304°09.2	47.9
17	327°32.3	119°22.1	39.2	171°47.5	39.5	178°09.3	19.0	319°11.7	47.9
18	342°34.8	134°23.0	S09°39.5	186°49.1	N12°39.2	193°11.6	N13°18.9	334°14.2	N00°47.9
19	357°37.3	149°23.8	39.8	201°50.7	39.0	208°14.0	18.9	349°16.7	47.9
20	12°39.7	164°24.7	40.0	216°52.3	38.7	223°16.4	18.9	4°19.2	47.9
21	27°42.2	179°25.6	·· 40.3	231°53.9	·· 38.5	238°18.8	·· 18.9	19°21.7	·· 47.9
22	42°44.6	194°26.5	40.6	246°55.5	38.2	253°21.2	18.9	34°24.2	47.9
23	57°47.1	209°27.3	40.9	261°57.1	38.0	268°23.6	18.9	49°26.7	47.9
Mer.pass. 19:09		ν 0.9′	d 0.2′	m -4.88	ν 1.6′	d 0.3′	m 0.43	ν 2.4′	d 0.0′ m -2.21	ν 2.5′	d 0.0′ m 0.62

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	72°49.6	224°28.2	S09°41.1	276°58.7	N12°37.7	283°26.0	N13°18.8	64°29.1	N00°47.9
1	87°52.0	239°29.1	41.4	292°00.3	37.5	298°28.4	18.8	79°31.6	47.9
2	102°54.5	254°29.9	41.7	307°01.9	37.2	313°30.8	18.8	94°34.1	47.9
3	117°57.0	269°30.8	·· 42.0	322°03.5	·· 36.9	328°33.1	·· 18.8	109°36.6	·· 47.9
4	132°59.4	284°31.7	42.2	337°05.1	36.7	343°35.5	18.8	124°39.1	47.9
5	148°01.9	299°32.5	42.5	352°06.7	36.4	358°37.9	18.8	139°41.6	47.8
6	163°04.4	314°33.4	S09°42.8	7°08.3	N12°36.2	13°40.3	N13°18.8	154°44.1	N00°47.8
7	178°06.8	329°34.2	43.1	22°09.9	35.9	28°42.7	18.7	169°46.6	47.8
8	193°09.3	344°35.1	43.4	37°11.5	35.7	43°45.1	18.7	184°49.1	47.8
9	208°11.8	359°35.9	·· 43.7	52°13.1	·· 35.4	58°47.5	·· 18.7	199°51.6	·· 47.8
10	223°14.2	14°36.8	44.0	67°14.7	35.2	73°49.9	18.7	214°54.1	47.8
11	238°16.7	29°37.6	44.2	82°16.3	34.9	88°52.3	18.7	229°56.6	47.8
12	253°19.1	44°38.5	S09°44.5	97°17.9	N12°34.7	103°54.7	N13°18.7	244°59.1	N00°47.8
13	268°21.6	59°39.3	44.8	112°19.5	34.4	118°57.1	18.7	260°01.6	47.8
14	283°24.1	74°40.1	45.1	127°21.1	34.2	133°59.5	18.6	275°04.1	47.8
15	298°26.5	89°41.0	·· 45.4	142°22.7	·· 33.9	149°01.9	·· 18.6	290°06.6	·· 47.8
16	313°29.0	104°41.8	45.7	157°24.3	33.7	164°04.2	18.6	305°09.1	47.8
17	328°31.5	119°42.6	46.0	172°25.9	33.4	179°06.6	18.6	320°11.6	47.8
18	343°33.9	134°43.5	S09°46.3	187°27.5	N12°33.1	194°09.0	N13°18.6	335°14.1	N00°47.8
19	358°36.4	149°44.3	46.6	202°29.1	32.9	209°11.4	18.6	350°16.6	47.8
20	13°38.9	164°45.1	46.9	217°30.7	32.6	224°13.8	18.6	5°19.1	47.8
21	28°41.3	179°46.0	·· 47.2	232°32.3	·· 32.4	239°16.2	·· 18.5	20°21.6	·· 47.8
22	43°43.8	194°46.8	47.5	247°33.9	32.1	254°18.6	18.5	35°24.0	47.8
23	58°46.3	209°47.6	47.8	262°35.6	31.9	269°21.0	18.5	50°26.5	47.8
Mer.pass. 19:06		ν 0.9′	d 0.3′	m -4.87	ν 1.6′	d 0.3′	m 0.41	ν 2.4′	d 0.0′ m -2.21	ν 2.5′	d 0.0′ m 0.62

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	73°48.7	224°48.4	S09°48.1	277°37.2	N12°31.6	284°23.4	N13°18.5	65°29.0	N00°47.8
1	88°51.2	239°49.3	48.4	292°38.8	31.4	299°25.8	18.5	80°31.5	47.8
2	103°53.6	254°50.1	48.7	307°40.4	31.1	314°28.2	18.5	95°34.0	47.8
3	118°56.1	269°50.9	·· 49.0	322°42.0	·· 30.9	329°30.6	·· 18.5	110°36.5	·· 47.8
4	133°58.6	284°51.7	49.3	337°43.6	30.6	344°33.0	18.5	125°39.0	47.8
5	149°01.0	299°52.5	49.6	352°45.2	30.4	359°35.4	18.4	140°41.5	47.8
6	164°03.5	314°53.3	S09°49.9	7°46.9	N12°30.1	14°37.8	N13°18.4	155°44.0	N00°47.8
7	179°06.0	329°54.1	50.2	22°48.5	29.9	29°40.2	18.4	170°46.5	47.8
8	194°08.4	344°54.9	50.6	37°50.1	29.7	44°42.6	18.4	185°49.0	47.8
9	209°10.9	359°55.7	·· 50.9	52°51.7	·· 29.4	59°45.0	·· 18.4	200°51.5	·· 47.8
10	224°13.4	14°56.5	51.2	67°53.3	29.2	74°47.4	18.4	215°54.0	47.8
11	239°15.8	29°57.3	51.5	82°54.9	28.9	89°49.8	18.4	230°56.5	47.8
12	254°18.3	44°58.1	S09°51.8	97°56.6	N12°28.7	104°52.2	N13°18.4	245°58.9	N00°47.8
13	269°20.7	59°58.9	52.1	112°58.2	28.4	119°54.6	18.4	261°01.4	47.8
14	284°23.2	74°59.7	52.4	127°59.8	28.2	134°57.0	18.3	276°03.9	47.8
15	299°25.7	90°00.5	·· 52.8	143°01.4	·· 27.9	149°59.4	·· 18.3	291°06.4	·· 47.8
16	314°28.1	105°01.3	53.1	158°03.0	27.7	165°01.8	18.3	306°08.9	47.8
17	329°30.6	120°02.1	53.4	173°04.7	27.4	180°04.2	18.3	321°11.4	47.8
18	344°33.1	135°02.9	S09°53.7	188°06.3	N12°27.2	195°06.6	N13°18.3	336°13.9	N00°47.8
19	359°35.5	150°03.7	54.1	203°07.9	26.9	210°09.0	18.3	351°16.4	47.8
20	14°38.0	165°04.4	54.4	218°09.5	26.7	225°11.4	18.3	6°18.9	47.8
21	29°40.5	180°05.2	·· 54.7	233°11.2	·· 26.4	240°13.8	·· 18.3	21°21.4	·· 47.8
22	44°42.9	195°06.0	55.0	248°12.8	26.2	255°16.2	18.3	36°23.8	47.8
23	59°45.4	210°06.8	55.4	263°14.4	26.0	270°18.6	18.2	51°26.3	47.8
Mer.pass. 19:02		ν 0.8′	d 0.3′	m -4.86	ν 1.6′	d 0.2′	m 0.40	ν 2.4′	d 0.0′ m -2.22	ν 2.5′	d 0.0′ m 0.63

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°44.4	89°22.8
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.1	46°01.5
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.0
Betelgeuse	270°50.1	7°24.7
Canopus	263°51.2	-52°42.4
Sirius	258°24.5	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°13.7	-59°35.5
Suhail	222°45.0	-43°32.3
Miaplacidus	221°37.5	-69°49.4
Alphard	217°46.1	-8°46.5
Regulus	207°32.7	11°50.0
Dubhe	193°39.2	61°36.0
Denebola	182°23.5	14°25.2
Gienah	175°42.1	-17°41.4
Acrux	172°58.6	-63°14.7
Gacrux	171°50.1	-57°15.6
Alioth	166°11.9	55°48.5
Spica	158°20.9	-11°18.1
Alkaid	152°51.2	49°10.5
Hadar	148°34.3	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.7	-60°56.6
Kochab	137°20.9	74°02.4
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.3	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.7	-56°39.0
Deneb	49°25.0	45°22.8
Enif	33°37.4	10°00.1
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.7	28°14.0
Markab	13°28.3	15°21.2

Dec 03 Thu	SHA	Mer.pass
Venus	152°16.4	09:03
Mars	204°30.1	05:34
Jupiter	210°38.3	05:09
Saturn	351°38.7	19:43

Dec 04 Fri	SHA	Mer.pass
Venus	151°38.6	09:02
Mars	204°09.1	05:32
Jupiter	210°36.4	05:05
Saturn	351°39.6	19:39

Dec 05 Sat	SHA	Mer.pass
Venus	150°59.7	09:00
Mars	203°48.5	05:29
Jupiter	210°34.7	05:02
Saturn	351°40.3	19:35

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°36.3	S22°04.0	251°08.0	14.6′	S03°43.3	15.0′	56.7′
1	197°36.0	04.3	265°41.5	14.6′	03°58.3	14.9′	56.7′
2	212°35.8	04.7	280°15.1	14.6′	04°13.2	14.9′	56.6′
3	227°35.5	·· 05.0	294°48.8	14.6′	04°28.1	14.8′	56.6′
4	242°35.3	05.4	309°22.4	14.6′	04°42.9	14.8′	56.6′
5	257°35.1	05.7	323°56.0	14.6′	04°57.7	14.8′	56.6′
6	272°34.8	S22°06.1	338°29.6	14.6′	S05°12.5	14.8′	56.5′
7	287°34.6	06.4	353°03.2	14.6′	05°27.3	14.7′	56.5′
8	302°34.3	06.8	7°36.9	14.6′	05°42.0	14.7′	56.5′
9	317°34.1	·· 07.1	22°10.5	14.6′	05°56.7	14.6′	56.5′
10	332°33.8	07.5	36°44.1	14.6′	06°11.3	14.6′	56.4′
11	347°33.6	07.8	51°17.7	14.6′	06°25.9	14.5′	56.4′
12	2°33.3	S22°08.2	65°51.4	14.6′	S06°40.4	14.6′	56.4′
13	17°33.1	08.5	80°25.0	14.6′	06°55.0	14.4′	56.4′
14	32°32.8	08.9	94°58.6	14.6′	07°09.4	14.5′	56.3′
15	47°32.6	·· 09.2	109°32.2	14.6′	07°23.9	14.4′	56.3′
16	62°32.3	09.6	124°05.8	14.6′	07°38.3	14.3′	56.3′
17	77°32.1	09.9	138°39.4	14.6′	07°52.6	14.3′	56.2′
18	92°31.8	S22°10.3	153°13.0	14.6′	S08°06.9	14.2′	56.2′
19	107°31.6	10.6	167°46.6	14.6′	08°21.1	14.2′	56.2′
20	122°31.3	11.0	182°20.1	14.6′	08°35.3	14.2′	56.2′
21	137°31.1	·· 11.3	196°53.7	14.5′	08°49.5	14.1′	56.1′
22	152°30.8	11.6	211°27.2	14.5′	09°03.6	14.1′	56.1′
23	167°30.6	12.0	226°00.7	14.5′	09°17.7	14.0′	56.1′
	SD = 16.2′	d = 0.4′	SD = 15.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°30.3	S22°12.3	240°34.2	14.5′	S09°31.7	13.9′	56.1′
1	197°30.1	12.7	255°07.7	14.5′	09°45.6	13.9′	56.0′
2	212°29.8	13.0	269°41.2	14.5′	09°59.5	13.9′	56.0′
3	227°29.6	·· 13.3	284°14.7	14.4′	10°13.4	13.8′	56.0′
4	242°29.3	13.7	298°48.1	14.4′	10°27.2	13.7′	56.0′
5	257°29.1	14.0	313°21.5	14.4′	10°40.9	13.7′	56.0′
6	272°28.8	S22°14.3	327°54.9	14.4′	S10°54.6	13.7′	55.9′
7	287°28.6	14.7	342°28.3	14.3′	11°08.3	13.5′	55.9′
8	302°28.3	15.0	357°01.6	14.3′	11°21.8	13.6′	55.9′
9	317°28.1	·· 15.3	11°34.9	14.3′	11°35.4	13.4′	55.9′
10	332°27.8	15.7	26°08.2	14.3′	11°48.8	13.4′	55.8′
11	347°27.6	16.0	40°41.5	14.2′	12°02.2	13.4′	55.8′
12	2°27.3	S22°16.3	55°14.8	14.2′	S12°15.6	13.2′	55.8′
13	17°27.1	16.7	69°48.0	14.2′	12°28.8	13.2′	55.8′
14	32°26.8	17.0	84°21.2	14.2′	12°42.0	13.2′	55.7′
15	47°26.6	·· 17.3	98°54.3	14.1′	12°55.2	13.1′	55.7′
16	62°26.3	17.7	113°27.5	14.1′	13°08.3	13.0′	55.7′
17	77°26.0	18.0	128°00.6	14.1′	13°21.3	13.0′	55.7′
18	92°25.8	S22°18.3	142°33.6	14.0′	S13°34.3	12.8′	55.7′
19	107°25.5	18.6	157°06.6	14.0′	13°47.1	12.9′	55.6′
20	122°25.3	19.0	171°39.6	14.0′	14°00.0	12.7′	55.6′
21	137°25.0	·· 19.3	186°12.6	13.9′	14°12.7	12.7′	55.6′
22	152°24.8	19.6	200°45.5	13.9′	14°25.4	12.6′	55.6′
23	167°24.5	19.9	215°18.4	13.9′	14°38.0	12.5′	55.5′
	SD = 16.2′	d = 0.3′	SD = 15.3′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°24.3	S22°20.3	229°51.3	13.8′	S14°50.5	12.5′	55.5′
1	197°24.0	20.6	244°24.1	13.8′	15°03.0	12.4′	55.5′
2	212°23.7	20.9	258°56.9	13.7′	15°15.4	12.3′	55.5′
3	227°23.5	·· 21.2	273°29.6	13.7′	15°27.7	12.3′	55.5′
4	242°23.2	21.5	288°02.3	13.7′	15°40.0	12.2′	55.4′
5	257°23.0	21.9	302°35.0	13.6′	15°52.2	12.1′	55.4′
6	272°22.7	S22°22.2	317°07.6	13.6′	S16°04.3	12.0′	55.4′
7	287°22.5	22.5	331°40.2	13.5′	16°16.3	11.9′	55.4′
8	302°22.2	22.8	346°12.7	13.5′	16°28.2	11.9′	55.4′
9	317°21.9	·· 23.1	0°45.2	13.5′	16°40.1	11.8′	55.3′
10	332°21.7	23.4	15°17.7	13.4′	16°51.9	11.7′	55.3′
11	347°21.4	23.8	29°50.1	13.4′	17°03.6	11.6′	55.3′
12	2°21.2	S22°24.1	44°22.5	13.3′	S17°15.2	11.5′	55.3′
13	17°20.9	24.4	58°54.8	13.3′	17°26.7	11.5′	55.3′
14	32°20.6	24.7	73°27.1	13.2′	17°38.2	11.4′	55.2′
15	47°20.4	·· 25.0	87°59.3	13.2′	17°49.6	11.2′	55.2′
16	62°20.1	25.3	102°31.5	13.1′	18°00.8	11.2′	55.2′
17	77°19.9	25.6	117°03.6	13.1′	18°12.0	11.2′	55.2′
18	92°19.6	S22°25.9	131°35.7	13.0′	S18°23.2	11.0′	55.2′
19	107°19.3	26.2	146°07.7	13.0′	18°34.2	10.9′	55.1′
20	122°19.1	26.5	160°39.7	12.9′	18°45.1	10.9′	55.1′
21	137°18.8	·· 26.8	175°11.7	12.9′	18°56.0	10.7′	55.1′
22	152°18.6	27.2	189°43.6	12.8′	19°06.7	10.7′	55.1′
23	167°18.3	27.5	204°15.4	12.8′	19°17.4	10.6′	55.1′
	SD = 16.2′	d = 0.3′	SD = 15.1′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	07:59	10:04	▬	▬	13:36	15:41
N 70°	07:42	09:21	▬	▬	14:19	15:58
68°	07:28	08:52	10:55	12:44	14:48	16:12
66°	07:16	08:30	09:57	13:43	15:10	16:24
64°	07:06	08:12	09:24	14:16	15:28	16:34
62°	06:58	07:58	09:00	14:40	15:42	16:42
60°	06:50	07:46	08:41	14:59	15:54	16:50
N 58°	06:43	07:35	08:25	15:15	16:05	16:57
56°	06:37	07:26	08:12	15:29	16:14	17:03
54°	06:32	07:17	08:00	15:40	16:23	17:08
52°	06:27	07:10	07:50	15:50	16:30	17:13
50°	06:22	07:03	07:40	16:00	16:37	17:18
45°	06:11	06:48	07:21	16:19	16:52	17:29
N 40°	06:02	06:35	07:05	16:35	17:05	17:39
35°	05:53	06:24	06:52	16:48	17:16	17:47
30°	05:45	06:14	06:40	17:00	17:26	17:55
20°	05:29	05:57	06:20	17:20	17:44	18:11
N 10°	05:14	05:40	06:03	17:37	18:00	18:26
0°	04:58	05:24	05:46	17:54	18:16	18:42
S 10°	04:40	05:07	05:30	18:11	18:33	19:00
20°	04:19	04:48	05:12	18:29	18:53	19:22
30°	03:51	04:24	04:51	18:49	19:17	19:49
35°	03:34	04:10	04:39	19:02	19:31	20:07
40°	03:12	03:53	04:25	19:16	19:48	20:29
45°	02:44	03:32	04:08	19:33	20:09	20:57
S 50°	02:03	03:04	03:47	19:54	20:37	21:38
52°	01:40	02:50	03:37	20:04	20:51	22:02
54°	01:07	02:34	03:26	20:15	21:07	22:36
56°	////	02:15	03:13	20:28	21:27	////
58°	////	01:50	02:58	20:44	21:52	////
S 60°	////	01:14	02:39	21:02	22:29	////

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	02:14	04:27	07:14	12:10	11:30	10:18
N 70°	02:08	04:09	06:25	12:20	11:51	11:08
68°	02:03	03:54	05:55	12:28	12:07	11:40
66°	01:58	03:43	05:32	12:34	12:21	12:04
64°	01:55	03:33	05:14	12:40	12:32	12:23
62°	01:51	03:25	05:00	12:45	12:41	12:38
60°	01:49	03:18	04:48	12:49	12:50	12:51
N 58°	01:46	03:12	04:38	12:53	12:57	13:03
56°	01:44	03:06	04:29	12:56	13:03	13:12
54°	01:42	03:01	04:21	12:59	13:09	13:21
52°	01:40	02:57	04:13	13:02	13:14	13:29
50°	01:39	02:53	04:07	13:04	13:19	13:36
45°	01:35	02:45	03:53	13:10	13:29	13:51
N 40°	01:33	02:37	03:42	13:15	13:38	14:04
35°	01:30	02:31	03:33	13:19	13:45	14:15
30°	01:28	02:26	03:24	13:22	13:52	14:24
20°	01:24	02:17	03:10	13:28	14:03	14:40
N 10°	01:21	02:09	02:58	13:34	14:13	14:54
0°	01:18	02:02	02:46	13:39	14:23	15:08
S 10°	01:15	01:54	02:35	13:44	14:32	15:21
20°	01:12	01:47	02:22	13:50	14:42	15:36
30°	01:09	01:38	02:09	13:56	14:54	15:52
35°	01:07	01:33	02:01	14:00	15:01	16:02
40°	01:05	01:27	01:52	14:04	15:09	16:13
45°	01:02	01:21	01:41	14:09	15:18	16:26
S 50°	00:59	01:13	01:29	14:15	15:29	16:42
52°	00:58	01:09	01:23	14:17	15:34	16:50
54°	00:56	01:06	01:16	14:20	15:39	16:59
56°	00:54	01:01	01:09	14:23	15:46	17:08
58°	00:53	00:56	01:01	14:27	15:53	17:19
S 60°	00:51	00:51	00:52	14:31	16:01	17:31

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 24-26 32-15%
03	10:25	10:13	11:50	07:29	19:50	
04	10:01	09:49	11:50	08:12	20:34	
05	09:37	09:25	11:51	08:57	21:20	

December 06, 07, 08 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	74°47.9	225°07.6	S09°55.7	278°16.1	N12°25.7	285°21.0	N13°18.2	66°28.8	N00°47.8
1	89°50.3	240°08.3	56.0	293°17.7	25.5	300°23.5	18.2	81°31.3	47.8
2	104°52.8	255°09.1	56.3	308°19.3	25.2	315°25.9	18.2	96°33.8	47.8
3	119°55.2	270°09.9	·· 56.7	323°20.9	·· 25.0	330°28.3	·· 18.2	111°36.3	·· 47.8
4	134°57.7	285°10.6	57.0	338°22.6	24.7	345°30.7	18.2	126°38.8	47.8
5	150°00.2	300°11.4	57.3	353°24.2	24.5	0°33.1	18.2	141°41.3	47.8
6	165°02.6	315°12.2	S09°57.7	8°25.8	N12°24.3	15°35.5	N13°18.2	156°43.8	N00°47.8
7	180°05.1	330°12.9	58.0	23°27.5	24.0	30°37.9	18.2	171°46.2	47.8
8	195°07.6	345°13.7	58.4	38°29.1	23.8	45°40.3	18.2	186°48.7	47.8
9	210°10.0	0°14.4	·· 58.7	53°30.7	·· 23.5	60°42.7	·· 18.1	201°51.2	·· 47.8
10	225°12.5	15°15.2	59.0	68°32.4	23.3	75°45.1	18.1	216°53.7	47.8
11	240°15.0	30°16.0	59.4	83°34.0	23.0	90°47.5	18.1	231°56.2	47.8
12	255°17.4	45°16.7	S09°59.7	98°35.6	N12°22.8	105°49.9	N13°18.1	246°58.7	N00°47.8
13	270°19.9	60°17.5	10°00.1	113°37.3	22.6	120°52.3	18.1	262°01.2	47.8
14	285°22.4	75°18.2	00.4	128°38.9	22.3	135°54.8	18.1	277°03.7	47.8
15	300°24.8	90°19.0	·· 00.7	143°40.5	·· 22.1	150°57.2	·· 18.1	292°06.1	·· 47.8
16	315°27.3	105°19.7	01.1	158°42.2	21.8	165°59.6	18.1	307°08.6	47.8
17	330°29.7	120°20.4	01.4	173°43.8	21.6	181°02.0	18.1	322°11.1	47.8
18	345°32.2	135°21.2	S10°01.8	188°45.5	N12°21.4	196°04.4	N13°18.1	337°13.6	N00°47.8
19	0°34.7	150°21.9	02.1	203°47.1	21.1	211°06.8	18.1	352°16.1	47.8
20	15°37.1	165°22.7	02.5	218°48.7	20.9	226°09.2	18.1	7°18.6	47.8
21	30°39.6	180°23.4	·· 02.8	233°50.4	·· 20.6	241°11.6	·· 18.1	22°21.1	·· 47.8
22	45°42.1	195°24.1	03.2	248°52.0	20.4	256°14.0	18.0	37°23.5	47.8
23	60°44.5	210°24.9	03.5	263°53.7	20.2	271°16.5	18.0	52°26.0	47.8
Mer.pass. 18:58		ν 0.8′	d 0.3′	m -4.86	ν 1.6′	d 0.2′	m 0.38	ν 2.4′	d 0.0′ m -2.23	ν 2.5′	d 0.0′ m 0.63

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	75°47.0	225°25.6	S10°03.9	278°55.3	N12°19.9	286°18.9	N13°18.0	67°28.5	N00°47.8
1	90°49.5	240°26.3	04.2	293°57.0	19.7	301°21.3	18.0	82°31.0	47.8
2	105°51.9	255°27.1	04.6	308°58.6	19.4	316°23.7	18.0	97°33.5	47.8
3	120°54.4	270°27.8	·· 05.0	324°00.3	·· 19.2	331°26.1	·· 18.0	112°36.0	·· 47.8
4	135°56.9	285°28.5	05.3	339°01.9	19.0	346°28.5	18.0	127°38.5	47.8
5	150°59.3	300°29.2	05.7	354°03.5	18.7	1°30.9	18.0	142°40.9	47.8
6	166°01.8	315°29.9	S10°06.0	9°05.2	N12°18.5	16°33.3	N13°18.0	157°43.4	N00°47.8
7	181°04.2	330°30.7	06.4	24°06.8	18.3	31°35.8	18.0	172°45.9	47.9
8	196°06.7	345°31.4	06.7	39°08.5	18.0	46°38.2	18.0	187°48.4	47.9
9	211°09.2	0°32.1	·· 07.1	54°10.1	·· 17.8	61°40.6	·· 18.0	202°50.9	·· 47.9
10	226°11.6	15°32.8	07.5	69°11.8	17.5	76°43.0	18.0	217°53.4	47.9
11	241°14.1	30°33.5	07.8	84°13.4	17.3	91°45.4	18.0	232°55.8	47.9
12	256°16.6	45°34.2	S10°08.2	99°15.1	N12°17.1	106°47.8	N13°17.9	247°58.3	N00°47.9
13	271°19.0	60°34.9	08.6	114°16.8	16.8	121°50.3	17.9	263°00.8	47.9
14	286°21.5	75°35.6	08.9	129°18.4	16.6	136°52.7	17.9	278°03.3	47.9
15	301°24.0	90°36.3	·· 09.3	144°20.1	·· 16.4	151°55.1	·· 17.9	293°05.8	·· 47.9
16	316°26.4	105°37.0	09.7	159°21.7	16.1	166°57.5	17.9	308°08.3	47.9
17	331°28.9	120°37.7	10.0	174°23.4	15.9	181°59.9	17.9	323°10.7	47.9
18	346°31.3	135°38.4	S10°10.4	189°25.0	N12°15.7	197°02.3	N13°17.9	338°13.2	N00°47.9
19	1°33.8	150°39.1	10.8	204°26.7	15.4	212°04.8	17.9	353°15.7	47.9
20	16°36.3	165°39.8	11.2	219°28.3	15.2	227°07.2	17.9	8°18.2	47.9
21	31°38.7	180°40.5	·· 11.5	234°30.0	·· 15.0	242°09.6	·· 17.9	23°20.7	·· 47.9
22	46°41.2	195°41.2	11.9	249°31.7	14.7	257°12.0	17.9	38°23.1	47.9
23	61°43.7	210°41.9	12.3	264°33.3	14.5	272°14.4	17.9	53°25.6	47.9
Mer.pass. 18:54		ν 0.7′	d 0.4′	m -4.85	ν 1.6′	d 0.2′	m 0.36	ν 2.4′	d 0.0′ m -2.23	ν 2.5′	d 0.0′ m 0.63

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	76°46.1	225°42.6	S10°12.7	279°35.0	N12°14.3	287°16.9	N13°17.9	68°28.1	N00°47.9
1	91°48.6	240°43.3	13.0	294°36.6	14.0	302°19.3	17.9	83°30.6	47.9
2	106°51.1	255°44.0	13.4	309°38.3	13.8	317°21.7	17.9	98°33.1	47.9
3	121°53.5	270°44.7	·· 13.8	324°40.0	·· 13.6	332°24.1	·· 17.9	113°35.5	·· 47.9
4	136°56.0	285°45.3	14.2	339°41.6	13.3	347°26.6	17.9	128°38.0	47.9
5	151°58.5	300°46.0	14.6	354°43.3	13.1	2°29.0	17.9	143°40.5	47.9
6	167°00.9	315°46.7	S10°14.9	9°45.0	N12°12.9	17°31.4	N13°17.9	158°43.0	N00°47.9
7	182°03.4	330°47.4	15.3	24°46.6	12.7	32°33.8	17.9	173°45.5	47.9
8	197°05.8	345°48.0	15.7	39°48.3	12.4	47°36.2	17.9	188°47.9	47.9
9	212°08.3	0°48.7	·· 16.1	54°50.0	·· 12.2	62°38.7	·· 17.9	203°50.4	·· 48.0
10	227°10.8	15°49.4	16.5	69°51.6	12.0	77°41.1	17.8	218°52.9	48.0
11	242°13.2	30°50.1	16.9	84°53.3	11.7	92°43.5	17.8	233°55.4	48.0
12	257°15.7	45°50.7	S10°17.2	99°55.0	N12°11.5	107°45.9	N13°17.8	248°57.9	N00°48.0
13	272°18.2	60°51.4	17.6	114°56.6	11.3	122°48.4	17.8	264°00.3	48.0
14	287°20.6	75°52.1	18.0	129°58.3	11.0	137°50.8	17.8	279°02.8	48.0
15	302°23.1	90°52.7	·· 18.4	145°00.0	·· 10.8	152°53.2	·· 17.8	294°05.3	·· 48.0
16	317°25.6	105°53.4	18.8	160°01.6	10.6	167°55.6	17.8	309°07.8	48.0
17	332°28.0	120°54.0	19.2	175°03.3	10.4	182°58.1	17.8	324°10.3	48.0
18	347°30.5	135°54.7	S10°19.6	190°05.0	N12°10.1	198°00.5	N13°17.8	339°12.7	N00°48.0
19	2°33.0	150°55.4	20.0	205°06.7	09.9	213°02.9	17.8	354°15.2	48.0
20	17°35.4	165°56.0	20.4	220°08.3	09.7	228°05.3	17.8	9°17.7	48.0
21	32°37.9	180°56.7	·· 20.8	235°10.0	·· 09.5	243°07.8	·· 17.8	24°20.2	·· 48.0
22	47°40.3	195°57.3	21.2	250°11.7	09.2	258°10.2	17.8	39°22.6	48.0
23	62°42.8	210°58.0	21.6	265°13.4	09.0	273°12.6	17.8	54°25.1	48.0
Mer.pass. 18:50		ν 0.7′	d 0.4′	m -4.84	ν 1.7′	d 0.2′	m 0.34	ν 2.4′	d 0.0′ m -2.24	ν 2.5′	d 0.0′ m 0.64

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.0	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.7	-57°06.1
Hamal	327°49.2	23°35.5
Polaris	312°44.6	89°22.8
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.1	46°01.5
Bellatrix	278°20.9	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.1
Betelgeuse	270°50.1	7°24.7
Canopus	263°51.2	-52°42.5
Sirius	258°24.5	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°13.7	-59°35.5
Suhail	222°44.9	-43°32.3
Miaplacidus	221°37.5	-69°49.4
Alphard	217°46.1	-8°46.5
Regulus	207°32.7	11°50.0
Dubhe	193°39.1	61°36.0
Denebola	182°23.4	14°25.2
Gienah	175°42.1	-17°41.4
Acrux	172°58.6	-63°14.7
Gacrux	171°50.1	-57°15.6
Alioth	166°11.9	55°48.5
Spica	158°20.8	-11°18.1
Alkaid	152°51.1	49°10.5
Hadar	148°34.2	-60°30.0
Menkent	147°56.1	-36°30.0
Arcturus	145°46.8	19°02.4
Rigil Kent.	139°38.7	-60°56.6
Kochab	137°20.9	74°02.4
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.3	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.7	-56°39.0
Deneb	49°25.0	45°22.8
Enif	33°37.4	10°00.1
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.7	28°14.0
Markab	13°28.3	15°21.2

Dec 06 Sun	**SHA**	**Mer.pass**
Venus	150°19.7	08:59
Mars	203°28.2	05:26
Jupiter	210°33.2	04:58
Saturn	351°41.0	19:31

Dec 07 Mon	**SHA**	**Mer.pass**
Venus	149°38.6	08:58
Mars	203°08.3	05:24
Jupiter	210°31.9	04:54
Saturn	351°41.5	19:27

Dec 08 Tue	**SHA**	**Mer.pass**
Venus	148°56.5	08:57
Mars	202°48.8	05:21
Jupiter	210°30.7	04:50
Saturn	351°42.0	19:23

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°18.0	S22°27.8	218°47.2	12.8′	S19°28.0	10.5′	55.1′
1	197°17.8	28.1	233°19.0	12.7′	19°38.5	10.4′	55.0′
2	212°17.5	28.4	247°50.7	12.7′	19°48.9	10.3′	55.0′
3	227°17.2	·· 28.7	262°22.3	12.6′	19°59.2	10.2′	55.0′
4	242°17.0	29.0	276°53.9	12.6′	20°09.4	10.1′	55.0′
5	257°16.7	29.3	291°25.5	12.5′	20°19.5	10.0′	55.0′
6	272°16.4	S22°29.6	305°57.0	12.4′	S20°29.5	9.9′	55.0′
7	287°16.2	29.9	320°28.4	12.4′	20°39.4	9.8′	54.9′
8	302°15.9	30.2	334°59.8	12.3′	20°49.2	9.8′	54.9′
9	317°15.7	·· 30.5	349°31.2	12.3′	20°59.0	9.6′	54.9′
10	332°15.4	30.8	4°02.5	12.2′	21°08.6	9.5′	54.9′
11	347°15.1	31.1	18°33.7	12.2′	21°18.1	9.4′	54.9′
12	2°14.9	S22°31.3	33°04.9	12.1′	S21°27.5	9.3′	54.9′
13	17°14.6	31.6	47°36.1	12.1′	21°36.8	9.2′	54.8′
14	32°14.3	31.9	62°07.2	12.0′	21°46.0	9.2′	54.8′
15	47°14.1	·· 32.2	76°38.2	12.0′	21°55.2	9.0′	54.8′
16	62°13.8	32.5	91°09.2	11.9′	22°04.2	8.9′	54.8′
17	77°13.5	32.8	105°40.1	11.9′	22°13.1	8.7′	54.8′
18	92°13.3	S22°33.1	120°11.0	11.8′	S22°21.8	8.7′	54.8′
19	107°13.0	33.4	134°41.8	11.8′	22°30.5	8.6′	54.7′
20	122°12.7	33.7	149°12.6	11.7′	22°39.1	8.5′	54.7′
21	137°12.5	·· 34.0	163°43.4	11.7′	22°47.6	8.3′	54.7′
22	152°12.2	34.3	178°14.0	11.6′	22°55.9	8.3′	54.7′
23	167°11.9	34.5	192°44.7	11.6′	23°04.2	8.1′	54.7′
	SD = 16.2′	d = 0.3′	SD = 15.0′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°11.7	S22°34.8	207°15.3	11.5′	S23°12.3	8.1′	54.7′
1	197°11.4	35.1	221°45.8	11.5′	23°20.4	7.9′	54.7′
2	212°11.1	35.4	236°16.3	11.4′	23°28.3	7.8′	54.6′
3	227°10.9	·· 35.7	250°46.7	11.4′	23°36.1	7.7′	54.6′
4	242°10.6	36.0	265°17.1	11.3′	23°43.8	7.5′	54.6′
5	257°10.3	36.2	279°47.5	11.3′	23°51.3	7.5′	54.6′
6	272°10.1	S22°36.5	294°17.7	11.2′	S23°58.8	7.3′	54.6′
7	287°09.8	36.8	308°48.0	11.2′	24°06.1	7.3′	54.6′
8	302°09.5	37.1	323°18.2	11.2′	24°13.4	7.1′	54.6′
9	317°09.2	·· 37.4	337°48.3	11.1′	24°20.5	7.0′	54.5′
10	332°09.0	37.6	352°18.4	11.1′	24°27.5	6.9′	54.5′
11	347°08.7	37.9	6°48.5	11.0′	24°34.4	6.7′	54.5′
12	2°08.4	S22°38.2	21°18.5	11.0′	S24°41.1	6.7′	54.5′
13	17°08.2	38.5	35°48.5	10.9′	24°47.8	6.5′	54.5′
14	32°07.9	38.7	50°18.4	10.9′	24°54.3	6.4′	54.5′
15	47°07.6	·· 39.0	64°48.3	10.8′	25°00.7	6.2′	54.5′
16	62°07.3	39.3	79°18.1	10.8′	25°06.9	6.2′	54.5′
17	77°07.1	39.6	93°47.9	10.8′	25°13.1	6.0′	54.4′
18	92°06.8	S22°39.8	108°17.7	10.7′	S25°19.1	5.9′	54.4′
19	107°06.5	40.1	122°47.4	10.7′	25°25.0	5.8′	54.4′
20	122°06.3	40.4	137°17.1	10.6′	25°30.8	5.7′	54.4′
21	137°06.0	·· 40.6	151°46.7	10.6′	25°36.5	5.5′	54.4′
22	152°05.7	40.9	166°16.3	10.6′	25°42.0	5.4′	54.4′
23	167°05.4	41.2	180°45.9	10.5′	25°47.4	5.3′	54.4′
	SD = 16.2′	d = 0.3′	SD = 14.9′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	182°05.2	S22°41.5	195°15.4	10.5′	S25°52.7	5.1′	54.4′
1	197°04.9	41.7	209°44.9	10.5′	25°57.8	5.1′	54.3′
2	212°04.6	42.0	224°14.3	10.4′	26°02.9	4.9′	54.3′
3	227°04.3	·· 42.2	238°43.8	10.4′	26°07.8	4.7′	54.3′
4	242°04.1	42.5	253°13.2	10.4′	26°12.5	4.7′	54.3′
5	257°03.8	42.8	267°42.5	10.3′	26°17.2	4.5′	54.3′
6	272°03.5	S22°43.0	282°11.8	10.3′	S26°21.7	4.4′	54.3′
7	287°03.2	43.3	296°41.1	10.3′	26°26.1	4.2′	54.3′
8	302°03.0	43.6	311°10.4	10.2′	26°30.3	4.2′	54.3′
9	317°02.7	·· 43.8	325°39.6	10.2′	26°34.5	4.0′	54.3′
10	332°02.4	44.1	340°08.8	10.2′	26°38.5	3.8′	54.3′
11	347°02.1	44.3	354°38.0	10.2′	26°42.3	3.8′	54.2′
12	2°01.9	S22°44.6	9°07.1	10.1′	S26°46.1	3.6′	54.2′
13	17°01.6	44.9	23°36.3	10.1′	26°49.7	3.4′	54.2′
14	32°01.3	45.1	38°05.4	10.1′	26°53.1	3.4′	54.2′
15	47°01.0	·· 45.4	52°34.5	10.1′	26°56.5	3.2′	54.2′
16	62°00.8	45.6	67°03.5	10.0′	26°59.7	3.0′	54.2′
17	77°00.5	45.9	81°32.6	10.0′	27°02.7	3.0′	54.2′
18	92°00.2	S22°46.1	96°01.6	10.0′	S27°05.7	2.8′	54.2′
19	106°59.9	46.4	110°30.6	10.0′	27°08.5	2.7′	54.2′
20	121°59.7	46.6	124°59.6	10.0′	27°11.2	2.5′	54.2′
21	136°59.4	·· 46.9	139°28.6	10.0′	27°13.7	2.4′	54.1′
22	151°59.1	47.1	153°57.5	9.9′	27°16.1	2.3′	54.1′
23	166°58.8	47.4	168°26.5	9.9′	27°18.4	2.1′	54.1′
	SD = 16.2′	d = 0.3′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:06	10:17	▬	▬	13:25	15:37
N 70°	07:48	09:29	▬	▬	14:13	15:55
68°	07:33	08:59	11:19	12:23	14:44	16:09
66°	07:21	08:36	10:07	13:36	15:07	16:21
64°	07:11	08:18	09:31	14:11	15:25	16:32
62°	07:02	08:03	09:06	14:37	15:40	16:40
60°	06:54	07:50	08:46	14:57	15:52	16:48
N 58°	06:47	07:39	08:30	15:13	16:03	16:55
56°	06:41	07:29	08:16	15:27	16:13	17:02
54°	06:35	07:21	08:04	15:39	16:22	17:07
52°	06:30	07:13	07:53	15:49	16:29	17:13
50°	06:25	07:06	07:44	15:59	16:37	17:18
45°	06:14	06:51	07:24	16:18	16:52	17:29
N 40°	06:04	06:38	07:08	16:35	17:05	17:39
35°	05:55	06:27	06:55	16:48	17:16	17:48
30°	05:47	06:17	06:43	17:00	17:26	17:56
20°	05:31	05:58	06:22	17:20	17:44	18:12
N 10°	05:16	05:42	06:05	17:38	18:01	18:27
0°	04:59	05:25	05:48	17:55	18:18	18:44
S 10°	04:41	05:08	05:31	18:12	18:35	19:02
20°	04:19	04:48	05:13	18:30	18:55	19:24
30°	03:51	04:24	04:51	18:52	19:19	19:52
35°	03:33	04:10	04:39	19:04	19:34	20:10
40°	03:11	03:52	04:24	19:19	19:51	20:32
45°	02:42	03:31	04:07	19:36	20:13	21:01
S 50°	02:00	03:02	03:46	19:58	20:41	21:44
52°	01:36	02:48	03:36	20:08	20:55	22:09
54°	01:00	02:32	03:24	20:20	21:12	22:45
56°	////	02:11	03:11	20:33	21:33	////
58°	////	01:45	02:55	20:49	21:59	////
S 60°	////	01:06	02:36	21:08	22:39	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	08:28	▬	▬	10:44	▬	▬
66°	07:34	▬	▬	11:38	▬	▬
64°	07:02	09:04	▬	12:11	11:50	▬
62°	06:39	08:21	10:05	12:36	12:34	12:35
60°	06:20	07:52	09:20	12:55	13:03	13:20
N 58°	06:04	07:30	08:51	13:11	13:25	13:49
56°	05:51	07:13	08:28	13:25	13:44	14:12
54°	05:40	06:58	08:10	13:37	13:59	14:30
52°	05:30	06:45	07:55	13:48	14:12	14:46
50°	05:21	06:33	07:41	13:57	14:24	15:00
45°	05:02	06:10	07:14	14:17	14:49	15:28
N 40°	04:47	05:51	06:52	14:33	15:08	15:50
35°	04:34	05:35	06:34	14:47	15:25	16:08
30°	04:23	05:21	06:19	14:59	15:39	16:24
20°	04:04	04:58	05:53	15:20	16:03	16:50
N 10°	03:47	04:38	05:31	15:38	16:24	17:13
0°	03:32	04:20	05:10	15:55	16:44	17:35
S 10°	03:17	04:02	04:49	16:12	17:04	17:56
20°	03:01	03:42	04:27	16:30	17:25	18:19
30°	02:42	03:19	04:02	16:51	17:49	18:46
35°	02:31	03:06	03:47	17:03	18:04	19:02
40°	02:19	02:51	03:29	17:18	18:21	19:20
45°	02:05	02:33	03:08	17:35	18:41	19:42
S 50°	01:47	02:11	02:42	17:56	19:06	20:11
52°	01:39	02:01	02:30	18:06	19:19	20:25
54°	01:30	01:49	02:15	18:17	19:33	20:41
56°	01:20	01:35	01:58	18:30	19:49	21:00
58°	01:08	01:20	01:38	18:46	20:09	21:24
S 60°	00:55	01:01	01:13	19:04	20:34	21:55

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 27-29 9-1%
06	09:12	08:59	11:51	09:43	22:07	
07	08:47	08:34	11:51	10:32	22:57	
08	08:21	08:07	11:52	11:22	23:48	

December 09, 10, 11 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°45.3	225°58.6	S10°22.0	280°15.0	N12°08.8	288°15.1	N13°17.8	69°27.6	N00°48.0
1	92°47.7	240°59.3	22.4	295°16.7	08.5	303°17.5	17.8	84°30.1	48.0
2	107°50.2	255°59.9	22.8	310°18.4	08.3	318°19.9	17.8	99°32.5	48.0
3	122°52.7	271°00.5	·· 23.2	325°20.1	·· 08.1	333°22.3	·· 17.8	114°35.0	·· 48.1
4	137°55.1	286°01.2	23.6	340°21.8	07.9	348°24.8	17.8	129°37.5	48.1
5	152°57.6	301°01.8	24.0	355°23.4	07.6	3°27.2	17.8	144°40.0	48.1
6	168°00.1	316°02.5	S10°24.4	10°25.1	N12°07.4	18°29.6	N13°17.8	159°42.5	N00°48.1
7	183°02.5	331°03.1	24.8	25°26.8	07.2	33°32.1	17.8	174°44.9	48.1
8	198°05.0	346°03.7	25.2	40°28.5	07.0	48°34.5	17.8	189°47.4	48.1
9	213°07.5	1°04.4	·· 25.6	55°30.2	·· 06.8	63°36.9	·· 17.8	204°49.9	·· 48.1
10	228°09.9	16°05.0	26.0	70°31.9	06.5	78°39.4	17.8	219°52.4	48.1
11	243°12.4	31°05.6	26.4	85°33.5	06.3	93°41.8	17.8	234°54.8	48.1
12	258°14.8	46°06.2	S10°26.8	100°35.2	N12°06.1	108°44.2	N13°17.8	249°57.3	N00°48.1
13	273°17.3	61°06.9	27.2	115°36.9	05.9	123°46.7	17.8	264°59.8	48.1
14	288°19.8	76°07.5	27.6	130°38.6	05.6	138°49.1	17.8	280°02.3	48.1
15	303°22.2	91°08.1	·· 28.0	145°40.3	·· 05.4	153°51.5	·· 17.8	295°04.7	·· 48.1
16	318°24.7	106°08.7	28.5	160°42.0	05.2	168°54.0	17.8	310°07.2	48.1
17	333°27.2	121°09.4	28.9	175°43.7	05.0	183°56.4	17.8	325°09.7	48.1
18	348°29.6	136°10.0	S10°29.3	190°45.4	N12°04.8	198°58.8	N13°17.8	340°12.1	N00°48.2
19	3°32.1	151°10.6	29.7	205°47.0	04.5	214°01.3	17.8	355°14.6	48.2
20	18°34.6	166°11.2	30.1	220°48.7	04.3	229°03.7	17.8	10°17.1	48.2
21	33°37.0	181°11.8	·· 30.5	235°50.4	·· 04.1	244°06.1	·· 17.8	25°19.6	·· 48.2
22	48°39.5	196°12.4	30.9	250°52.1	03.9	259°08.6	17.8	40°22.0	48.2
23	63°42.0	211°13.0	31.4	265°53.8	03.7	274°11.0	17.8	55°24.5	48.2
Mer.pass. 18:46		ν 0.6′	d 0.4′	m -4.83	ν 1.7′	d 0.2′	m 0.33	ν 2.4′	d 0.0′ m -2.25	ν 2.5′	d 0.0′ m 0.64

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°44.4	226°13.6	S10°31.8	280°55.5	N12°03.4	289°13.4	N13°17.8	70°27.0	N00°48.2
1	93°46.9	241°14.3	32.2	295°57.2	03.2	304°15.9	17.8	85°29.5	48.2
2	108°49.3	256°14.9	32.6	310°58.9	03.0	319°18.3	17.8	100°31.9	48.2
3	123°51.8	271°15.5	·· 33.0	326°00.6	·· 02.8	334°20.8	·· 17.8	115°34.4	·· 48.2
4	138°54.3	286°16.1	33.5	341°02.3	02.6	349°23.2	17.8	130°36.9	48.2
5	153°56.7	301°16.7	33.9	356°04.0	02.3	4°25.6	17.8	145°39.3	48.2
6	168°59.2	316°17.3	S10°34.3	11°05.7	N12°02.1	19°28.1	N13°17.8	160°41.8	N00°48.3
7	184°01.7	331°17.9	34.7	26°07.4	01.9	34°30.5	17.8	175°44.3	48.3
8	199°04.1	346°18.4	35.2	41°09.1	01.7	49°32.9	17.8	190°46.8	48.3
9	214°06.6	1°19.0	·· 35.6	56°10.8	·· 01.5	64°35.4	·· 17.8	205°49.2	·· 48.3
10	229°09.1	16°19.6	36.0	71°12.5	01.3	79°37.8	17.8	220°51.7	48.3
11	244°11.5	31°20.2	36.4	86°14.2	01.0	94°40.3	17.8	235°54.2	48.3
12	259°14.0	46°20.8	S10°36.9	101°15.9	N12°00.8	109°42.7	N13°17.8	250°56.6	N00°48.3
13	274°16.5	61°21.4	37.3	116°17.6	00.6	124°45.1	17.8	265°59.1	48.3
14	289°18.9	76°22.0	37.7	131°19.3	00.4	139°47.6	17.8	281°01.6	48.3
15	304°21.4	91°22.6	·· 38.2	146°21.0	·· 00.2	154°50.0	·· 17.8	296°04.1	·· 48.3
16	319°23.8	106°23.1	38.6	161°22.7	12°00.0	169°52.5	17.8	311°06.5	48.3
17	334°26.3	121°23.7	39.0	176°24.4	11°59.7	184°54.9	17.8	326°09.0	48.3
18	349°28.8	136°24.3	S10°39.5	191°26.1	N11°59.5	199°57.4	N13°17.9	341°11.5	N00°48.4
19	4°31.2	151°24.9	39.9	206°27.8	59.3	214°59.8	17.9	356°13.9	48.4
20	19°33.7	166°25.5	40.3	221°29.6	59.1	230°02.2	17.9	11°16.4	48.4
21	34°36.2	181°26.0	·· 40.8	236°31.3	·· 58.9	245°04.7	·· 17.9	26°18.9	·· 48.4
22	49°38.6	196°26.6	41.2	251°33.0	58.7	260°07.1	17.9	41°21.3	48.4
23	64°41.1	211°27.2	41.6	266°34.7	58.5	275°09.6	17.9	56°23.8	48.4
Mer.pass. 18:42		ν 0.6′	d 0.4′	m -4.82	ν 1.7′	d 0.2′	m 0.31	ν 2.4′	d 0.0′ m -2.26	ν 2.5′	d 0.0′ m 0.65

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	79°43.6	226°27.7	S10°42.1	281°36.4	N11°58.2	290°12.0	N13°17.9	71°26.3	N00°48.4
1	94°46.0	241°28.3	42.5	296°38.1	58.0	305°14.5	17.9	86°28.7	48.4
2	109°48.5	256°28.9	43.0	311°39.8	57.8	320°16.9	17.9	101°31.2	48.4
3	124°50.9	271°29.4	·· 43.4	326°41.5	·· 57.6	335°19.3	·· 17.9	116°33.7	·· 48.4
4	139°53.4	286°30.0	43.8	341°43.2	57.4	350°21.8	17.9	131°36.1	48.5
5	154°55.9	301°30.6	44.3	356°45.0	57.2	5°24.2	17.9	146°38.6	48.5
6	169°58.3	316°31.1	S10°44.7	11°46.7	N11°57.0	20°26.7	N13°17.9	161°41.1	N00°48.5
7	185°00.8	331°31.7	45.2	26°48.4	56.8	35°29.1	17.9	176°43.5	48.5
8	200°03.3	346°32.2	45.6	41°50.1	56.6	50°31.6	17.9	191°46.0	48.5
9	215°05.7	1°32.8	·· 46.1	56°51.8	·· 56.3	65°34.0	·· 17.9	206°48.5	·· 48.5
10	230°08.2	16°33.3	46.5	71°53.6	56.1	80°36.5	17.9	221°50.9	48.5
11	245°10.7	31°33.9	47.0	86°55.3	55.9	95°38.9	17.9	236°53.4	48.5
12	260°13.1	46°34.5	S10°47.4	101°57.0	N11°55.7	110°41.4	N13°17.9	251°55.9	N00°48.5
13	275°15.6	61°35.0	47.9	116°58.7	55.5	125°43.8	17.9	266°58.3	48.5
14	290°18.1	76°35.5	48.3	132°00.4	55.3	140°46.3	17.9	282°00.8	48.6
15	305°20.5	91°36.1	·· 48.8	147°02.2	·· 55.1	155°48.7	·· 17.9	297°03.3	·· 48.6
16	320°23.0	106°36.6	49.2	162°03.9	54.9	170°51.2	18.0	312°05.7	48.6
17	335°25.4	121°37.2	49.7	177°05.6	54.7	185°53.6	18.0	327°08.2	48.6
18	350°27.9	136°37.7	S10°50.1	192°07.3	N11°54.5	200°56.1	N13°18.0	342°10.7	N00°48.6
19	5°30.4	151°38.3	50.6	207°09.1	54.3	215°58.5	18.0	357°13.1	48.6
20	20°32.8	166°38.8	51.0	222°10.8	54.1	231°01.0	18.0	12°15.6	48.6
21	35°35.3	181°39.3	·· 51.5	237°12.5	·· 53.8	246°03.4	·· 18.0	27°18.1	·· 48.6
22	50°37.8	196°39.9	51.9	252°14.2	53.6	261°05.9	18.0	42°20.5	48.6
23	65°40.2	211°40.4	52.4	267°16.0	53.4	276°08.3	18.0	57°23.0	48.7
Mer.pass. 18:38		ν 0.6′	d 0.4′	m -4.81	ν 1.7′	d 0.2′	m 0.29	ν 2.4′	d 0.0′ m -2.26	ν 2.5′	d 0.0′ m 0.65

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.0	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.7	-57°06.2
Hamal	327°49.1	23°35.6
Polaris	312°44.9	89°22.8
Acamar	315°10.2	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.1	46°01.5
Bellatrix	278°20.8	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.2	-52°42.5
Sirius	258°24.5	-16°45.1
Adhara	255°04.3	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°13.6	-59°35.5
Suhail	222°44.9	-43°32.3
Miaplacidus	221°37.4	-69°49.4
Alphard	217°46.1	-8°46.5
Regulus	207°32.7	11°50.0
Dubhe	193°39.1	61°36.0
Denebola	182°23.4	14°25.2
Gienah	175°42.1	-17°41.4
Acrux	172°58.5	-63°14.7
Gacrux	171°50.1	-57°15.6
Alioth	166°11.9	55°48.5
Spica	158°20.8	-11°18.1
Alkaid	152°51.1	49°10.5
Hadar	148°34.2	-60°30.0
Menkent	147°56.0	-36°30.0
Arcturus	145°46.7	19°02.4
Rigil Kent.	139°38.6	-60°56.6
Kochab	137°20.9	74°02.4
Zuben'ubi	136°54.6	-16°09.2
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.6	-69°04.5
Sabik	102°01.3	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.7	-56°39.0
Deneb	49°25.0	45°22.8
Enif	33°37.4	10°00.1
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.7	28°14.0
Markab	13°28.3	15°21.2

Dec 09 Wed	SHA	Mer.pass
Venus	148°13.3	08:56
Mars	202°29.8	05:18
Jupiter	210°29.8	04:46
Saturn	351°42.3	19:19

Dec 10 Thu	SHA	Mer.pass
Venus	147°29.2	08:55
Mars	202°11.1	05:16
Jupiter	210°29.0	04:42
Saturn	351°42.6	19:15

Dec 11 Fri	SHA	Mer.pass
Venus	146°44.2	08:54
Mars	201°52.8	05:13
Jupiter	210°28.5	04:38
Saturn	351°42.7	19:11

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = +0.1331 sec ΔT = TT-UT1 = +69.0509 sec

2026 December 09 to Dec. 11 UT

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°58.6	S22°47.6	182°55.4	9.9′	S27°20.5	2.0′	54.1′
1	196°58.3	47.9	197°24.3	9.9′	27°22.5	1.9′	54.1′
2	211°58.0	48.1	211°53.2	9.9′	27°24.4	1.7′	54.1′
3	226°57.7	·· 48.4	226°22.1	9.9′	27°26.1	1.6′	54.1′
4	241°57.4	48.6	240°51.0	9.9′	27°27.7	1.5′	54.1′
5	256°57.2	48.9	255°19.9	9.9′	27°29.2	1.3′	54.1′
6	271°56.9	S22°49.1	269°48.8	9.9′	S27°30.5	1.2′	54.1′
7	286°56.6	49.4	284°17.7	9.9′	27°31.7	1.0′	54.1′
8	301°56.3	49.6	298°46.6	9.9′	27°32.7	1.0′	54.1′
9	316°56.0	·· 49.8	313°15.5	9.9′	27°33.7	0.8′	54.1′
10	331°55.8	50.1	327°44.3	9.9′	27°34.5	0.6′	54.0′
11	346°55.5	50.3	342°13.2	9.9′	27°35.1	0.5′	54.0′
12	1°55.2	S22°50.6	356°42.1	9.9′	S27°35.6	0.4′	54.0′
13	16°54.9	50.8	11°11.0	9.9′	27°36.0	0.2′	54.0′
14	31°54.6	51.0	25°39.9	9.9′	27°36.2	0.2′	54.0′
15	46°54.4	·· 51.3	40°08.8	9.9′	27°36.4	0.1′	54.0′
16	61°54.1	51.5	54°37.7	9.9′	27°36.3	0.1′	54.0′
17	76°53.8	51.7	69°06.6	9.9′	27°36.2	0.3′	54.0′
18	91°53.5	S22°52.0	83°35.6	9.9′	S27°35.9	0.5′	54.0′
19	106°53.2	52.2	98°04.5	10.0′	27°35.4	0.5′	54.0′
20	121°53.0	52.4	112°33.5	10.0′	27°34.9	0.7′	54.0′
21	136°52.7	·· 52.7	127°02.4	10.0′	27°34.2	0.8′	54.0′
22	151°52.4	52.9	141°31.4	10.0′	27°33.4	1.0′	54.0′
23	166°52.1	53.1	156°00.4	10.0′	27°32.4	1.1′	54.0′
	SD = 16.2′	d = 0.2′		SD = 14.8′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°51.8	S22°53.4	170°29.4	10.0′	S27°31.3	1.2′	54.0′
1	196°51.5	53.6	184°58.5	10.1′	27°30.1	1.4′	54.0′
2	211°51.3	53.8	199°27.5	10.1′	27°28.7	1.5′	54.0′
3	226°51.0	·· 54.0	213°56.6	10.1′	27°27.2	1.6′	53.9′
4	241°50.7	54.3	228°25.7	10.1′	27°25.6	1.8′	53.9′
5	256°50.4	54.5	242°54.9	10.2′	27°23.8	1.9′	53.9′
6	271°50.1	S22°54.7	257°24.0	10.2′	S27°21.9	2.0′	53.9′
7	286°49.8	55.0	271°53.2	10.2′	27°19.9	2.2′	53.9′
8	301°49.6	55.2	286°22.4	10.2′	27°17.7	2.3′	53.9′
9	316°49.3	·· 55.4	300°51.6	10.3′	27°15.4	2.4′	53.9′
10	331°49.0	55.6	315°20.9	10.3′	27°13.0	2.6′	53.9′
11	346°48.7	55.8	329°50.2	10.3′	27°10.4	2.6′	53.9′
12	1°48.4	S22°56.1	344°19.5	10.4′	S27°07.8	2.8′	53.9′
13	16°48.1	56.3	358°48.9	10.4′	27°05.0	3.0′	53.9′
14	31°47.8	56.5	13°18.3	10.4′	27°02.0	3.0′	53.9′
15	46°47.6	·· 56.7	27°47.7	10.5′	26°59.0	3.2′	53.9′
16	61°47.3	56.9	42°17.1	10.5′	26°55.8	3.4′	53.9′
17	76°47.0	57.2	56°46.6	10.5′	26°52.4	3.4′	53.9′
18	91°46.7	S22°57.4	71°16.2	10.6′	S26°49.0	3.6′	53.9′
19	106°46.4	57.6	85°45.7	10.6′	26°45.4	3.7′	53.9′
20	121°46.1	57.8	100°15.4	10.7′	26°41.7	3.8′	53.9′
21	136°45.8	·· 58.0	114°45.0	10.7′	26°37.9	4.0′	53.9′
22	151°45.6	58.2	129°14.7	10.7′	26°33.9	4.1′	53.9′
23	166°45.3	58.4	143°44.4	10.8′	26°29.8	4.2′	53.9′
	SD = 16.2′	d = 0.2′		SD = 14.7′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°45.0	S22°58.6	158°14.2	10.8′	S26°25.6	4.3′	53.9′
1	196°44.7	58.9	172°44.1	10.9′	26°21.3	4.5′	53.9′
2	211°44.4	59.1	187°13.9	10.9′	26°16.8	4.5′	53.9′
3	226°44.1	·· 59.3	201°43.8	11.0′	26°12.3	4.7′	53.9′
4	241°43.8	59.5	216°13.8	11.0′	26°07.6	4.8′	53.9′
5	256°43.6	59.7	230°43.8	11.1′	26°02.8	5.0′	53.9′
6	271°43.3	S22°59.9	245°13.9	11.1′	S25°57.8	5.0′	53.9′
7	286°43.0	23°00.1	259°44.0	11.2′	25°52.8	5.2′	53.9′
8	301°42.7	00.3	274°14.1	11.2′	25°47.6	5.3′	53.9′
9	316°42.4	·· 00.5	288°44.3	11.3′	25°42.3	5.4′	53.9′
10	331°42.1	00.7	303°14.6	11.3′	25°36.9	5.6′	53.9′
11	346°41.8	00.9	317°44.9	11.4′	25°31.3	5.6′	53.9′
12	1°41.5	S23°01.1	332°15.2	11.4′	S25°25.7	5.8′	53.9′
13	16°41.2	01.3	346°45.6	11.5′	25°19.9	5.8′	53.9′
14	31°41.0	01.5	1°16.1	11.5′	25°14.1	6.0′	53.9′
15	46°40.7	·· 01.7	15°46.6	11.6′	25°08.1	6.2′	53.9′
16	61°40.4	01.9	30°17.2	11.6′	25°01.9	6.2′	53.9′
17	76°40.1	02.1	44°47.8	11.7′	24°55.7	6.3′	53.9′
18	91°39.8	S23°02.3	59°18.5	11.7′	S24°49.4	6.5′	53.9′
19	106°39.5	02.5	73°49.2	11.8′	24°42.9	6.5′	53.9′
20	121°39.2	02.7	88°20.0	11.8′	24°36.4	6.7′	53.9′
21	136°38.9	·· 02.9	102°50.8	11.9′	24°29.7	6.8′	53.9′
22	151°38.6	03.1	117°21.7	12.0′	24°22.9	6.9′	53.9′
23	166°38.3	03.3	131°52.7	12.0′	24°16.0	7.0′	53.9′
	SD = 16.2′	d = 0.2′		SD = 14.7′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:12	10:29	▬	▬	13:16	15:33
N 70°	07:53	09:37	▬	▬	14:08	15:52
68°	07:38	09:05	▬	▬	14:40	16:07
66°	07:26	08:41	10:16	13:30	15:04	16:20
64°	07:15	08:23	09:38	14:08	15:23	16:30
62°	07:06	08:07	09:11	14:34	15:38	16:39
60°	06:58	07:54	08:51	14:55	15:51	16:47
N 58°	06:51	07:43	08:34	15:11	16:02	16:55
56°	06:44	07:33	08:20	15:25	16:12	17:01
54°	06:38	07:24	08:08	15:38	16:21	17:07
52°	06:33	07:16	07:57	15:48	16:29	17:12
50°	06:28	07:09	07:47	15:58	16:36	17:18
45°	06:16	06:54	07:27	16:18	16:52	17:29
N 40°	06:06	06:40	07:11	16:35	17:05	17:39
35°	05:57	06:29	06:57	16:48	17:17	17:48
30°	05:49	06:19	06:45	17:01	17:27	17:57
20°	05:33	06:00	06:24	17:21	17:45	18:13
N 10°	05:17	05:43	06:06	17:39	18:02	18:28
0°	05:00	05:27	05:49	17:56	18:19	18:45
S 10°	04:42	05:09	05:32	18:14	18:37	19:04
20°	04:20	04:49	05:13	18:32	18:57	19:26
30°	03:51	04:25	04:52	18:54	19:21	19:54
35°	03:33	04:10	04:39	19:07	19:36	20:13
40°	03:11	03:52	04:25	19:21	19:54	20:35
45°	02:41	03:30	04:07	19:39	20:16	21:05
S 50°	01:58	03:01	03:45	20:01	20:45	21:49
52°	01:32	02:47	03:35	20:11	20:59	22:15
54°	00:53	02:30	03:23	20:23	21:17	22:54
56°	////	02:09	03:09	20:37	21:38	////
58°	////	01:41	02:53	20:53	22:06	////
S 60°	////	00:59	02:34	21:13	22:49	////

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	13:01	▬	▬	14:57
62°	11:35	12:04	12:06	12:52	14:10	15:51
60°	10:31	11:14	11:34	13:56	15:00	16:23
N 58°	09:57	10:42	11:10	14:30	15:31	16:47
56°	09:32	10:19	10:50	14:55	15:54	17:06
54°	09:12	10:00	10:34	15:15	16:13	17:22
52°	08:55	09:44	10:20	15:32	16:29	17:36
50°	08:41	09:30	10:07	15:46	16:43	17:48
45°	08:12	09:01	09:42	16:15	17:11	18:12
N 40°	07:49	08:39	09:21	16:38	17:33	18:32
35°	07:30	08:20	09:04	16:57	17:51	18:49
30°	07:14	08:04	08:50	17:13	18:07	19:03
20°	06:47	07:37	08:25	17:41	18:33	19:27
N 10°	06:23	07:14	08:03	18:04	18:56	19:47
0°	06:01	06:53	07:43	18:26	19:17	20:06
S 10°	05:39	06:31	07:23	18:48	19:38	20:26
20°	05:16	06:08	07:01	19:12	20:01	20:46
30°	04:49	05:41	06:36	19:39	20:27	21:09
35°	04:33	05:25	06:21	19:55	20:42	21:23
40°	04:14	05:06	06:03	20:14	21:00	21:39
45°	03:52	04:44	05:42	20:36	21:21	21:58
S 50°	03:23	04:15	05:16	21:05	21:48	22:21
52°	03:09	04:01	05:03	21:19	22:01	22:32
54°	02:53	03:44	04:48	21:36	22:16	22:45
56°	02:34	03:25	04:31	21:55	22:34	22:59
58°	02:10	03:01	04:10	22:20	22:55	23:16
S 60°	01:38	02:28	03:43	22:52	23:23	23:37

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 0-2 0-4%
09	07:54	07:41	11:52	12:14	–:–	
10	07:27	07:14	11:53	13:05	00:39	
11	07:00	06:46	11:53	13:55	01:30	

No IERS EOP prediction data available

https://pypi.org/project/skyalmanac/

December 12, 13, 14 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	80°42.7	226°40.9	S10°52.8	282°17.7	N11°53.2	291°10.8	N13°18.0	72°25.5	N00°48.7
1	95°45.2	241°41.5	53.3	297°19.4	53.0	306°13.2	18.0	87°27.9	48.7
2	110°47.6	256°42.0	53.7	312°21.2	52.8	321°15.7	18.0	102°30.4	48.7
3	125°50.1	271°42.5	·· 54.2	327°22.9	·· 52.6	336°18.1	·· 18.0	117°32.9	·· 48.7
4	140°52.6	286°43.0	54.7	342°24.6	52.4	351°20.6	18.0	132°35.3	48.7
5	155°55.0	301°43.6	55.1	357°26.4	52.2	6°23.0	18.0	147°37.8	48.7
6	170°57.5	316°44.1	S10°55.6	12°28.1	N11°52.0	21°25.5	N13°18.0	162°40.2	N00°48.7
7	185°59.9	331°44.6	56.0	27°29.8	51.8	36°27.9	18.1	177°42.7	48.8
8	201°02.4	346°45.1	56.5	42°31.6	51.6	51°30.4	18.1	192°45.2	48.8
9	216°04.9	1°45.7	·· 57.0	57°33.3	·· 51.4	66°32.9	·· 18.1	207°47.6	·· 48.8
10	231°07.3	16°46.2	57.4	72°35.0	51.2	81°35.3	18.1	222°50.1	48.8
11	246°09.8	31°46.7	57.9	87°36.8	51.0	96°37.8	18.1	237°52.6	48.8
12	261°12.3	46°47.2	S10°58.4	102°38.5	N11°50.8	111°40.2	N13°18.1	252°55.0	N00°48.8
13	276°14.7	61°47.7	58.8	117°40.3	50.6	126°42.7	18.1	267°57.5	48.8
14	291°17.2	76°48.2	59.3	132°42.0	50.4	141°45.1	18.1	282°59.9	48.8
15	306°19.7	91°48.7	10°59.8	147°43.7	·· 50.2	156°47.6	·· 18.1	298°02.4	·· 48.9
16	321°22.1	106°49.2	11°00.2	162°45.5	50.0	171°50.1	18.1	313°04.9	48.9
17	336°24.6	121°49.7	00.7	177°47.2	49.8	186°52.5	18.1	328°07.3	48.9
18	351°27.1	136°50.2	S11°01.2	192°49.0	N11°49.6	201°55.0	N13°18.1	343°09.8	N00°48.9
19	6°29.5	151°50.8	01.6	207°50.7	49.4	216°57.4	18.2	358°12.2	48.9
20	21°32.0	166°51.3	02.1	222°52.5	49.2	231°59.9	18.2	13°14.7	48.9
21	36°34.4	181°51.8	·· 02.6	237°54.2	·· 49.0	247°02.3	·· 18.2	28°17.2	·· 48.9
22	51°36.9	196°52.3	03.1	252°55.9	48.8	262°04.8	18.2	43°19.6	48.9
23	66°39.4	211°52.7	03.5	267°57.7	48.6	277°07.3	18.2	58°22.1	49.0
Mer.pass. 18:34		ν 0.5′	d 0.5′	m -4.80	ν 1.7′	d 0.2′	m 0.27	ν 2.5′	d 0.0′ m -2.27	ν 2.5′	d 0.0′ m 0.66

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	81°41.8	226°53.2	S11°04.0	282°59.4	N11°48.4	292°09.7	N13°18.2	73°24.5	N00°49.0
1	96°44.3	241°53.7	04.5	298°01.2	48.2	307°12.2	18.2	88°27.0	49.0
2	111°46.8	256°54.2	05.0	313°02.9	48.0	322°14.6	18.2	103°29.5	49.0
3	126°49.2	271°54.7	·· 05.4	328°04.7	·· 47.8	337°17.1	·· 18.2	118°31.9	·· 49.0
4	141°51.7	286°55.2	05.9	343°06.4	47.6	352°19.6	18.2	133°34.4	49.0
5	156°54.2	301°55.7	06.4	358°08.2	47.4	7°22.0	18.3	148°36.8	49.0
6	171°56.6	316°56.2	S11°06.9	13°09.9	N11°47.2	22°24.5	N13°18.3	163°39.3	N00°49.1
7	186°59.1	331°56.7	07.3	28°11.7	47.0	37°27.0	18.3	178°41.8	49.1
8	202°01.6	346°57.2	07.8	43°13.5	46.8	52°29.4	18.3	193°44.2	49.1
9	217°04.0	1°57.6	·· 08.3	58°15.2	·· 46.6	67°31.9	·· 18.3	208°46.7	·· 49.1
10	232°06.5	16°58.1	08.8	73°17.0	46.4	82°34.3	18.3	223°49.1	49.1
11	247°08.9	31°58.6	09.3	88°18.7	46.2	97°36.8	18.3	238°51.6	49.1
12	262°11.4	46°59.1	S11°09.7	103°20.5	N11°46.0	112°39.3	N13°18.3	253°54.1	N00°49.1
13	277°13.9	61°59.6	10.2	118°22.2	45.8	127°41.7	18.3	268°56.5	49.2
14	292°16.3	77°00.0	10.7	133°24.0	45.6	142°44.2	18.3	283°59.0	49.2
15	307°18.8	92°00.5	·· 11.2	148°25.7	·· 45.4	157°46.7	·· 18.4	299°01.4	·· 49.2
16	322°21.3	107°01.0	11.7	163°27.5	45.2	172°49.1	18.4	314°03.9	49.2
17	337°23.7	122°01.4	12.2	178°29.3	45.0	187°51.6	18.4	329°06.3	49.2
18	352°26.2	137°01.9	S11°12.6	193°31.0	N11°44.8	202°54.1	N13°18.4	344°08.8	N00°49.2
19	7°28.7	152°02.4	13.1	208°32.8	44.7	217°56.5	18.4	359°11.3	49.2
20	22°31.1	167°02.9	13.6	223°34.6	44.5	232°59.0	18.4	14°13.7	49.3
21	37°33.6	182°03.3	·· 14.1	238°36.3	·· 44.3	248°01.5	·· 18.4	29°16.2	·· 49.3
22	52°36.0	197°03.8	14.6	253°38.1	44.1	263°03.9	18.4	44°18.6	49.3
23	67°38.5	212°04.2	15.1	268°39.9	43.9	278°06.4	18.5	59°21.1	49.3
Mer.pass. 18:30		ν 0.5′	d 0.5′	m -4.79	ν 1.7′	d 0.2′	m 0.25	ν 2.5′	d 0.0′ m -2.28	ν 2.5′	d 0.0′ m 0.66

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	82°41.0	227°04.7	S11°15.6	283°41.6	N11°43.7	293°08.9	N13°18.5	74°23.5	N00°49.3
1	97°43.4	242°05.2	16.1	298°43.4	43.5	308°11.3	18.5	89°26.0	49.3
2	112°45.9	257°05.6	16.5	313°45.2	43.3	323°13.8	18.5	104°28.4	49.3
3	127°48.4	272°06.1	·· 17.0	328°46.9	·· 43.1	338°16.3	·· 18.5	119°30.9	·· 49.4
4	142°50.8	287°06.5	17.5	343°48.7	42.9	353°18.7	18.5	134°33.4	49.4
5	157°53.3	302°07.0	18.0	358°50.5	42.7	8°21.2	18.5	149°35.8	49.4
6	172°55.8	317°07.4	S11°18.5	13°52.2	N11°42.5	23°23.7	N13°18.5	164°38.3	N00°49.4
7	187°58.2	332°07.9	19.0	28°54.0	42.4	38°26.1	18.6	179°40.7	49.4
8	203°00.7	347°08.3	19.5	43°55.8	42.2	53°28.6	18.6	194°43.2	49.4
9	218°03.2	2°08.8	·· 20.0	58°57.5	·· 42.0	68°31.1	·· 18.6	209°45.6	·· 49.5
10	233°05.6	17°09.2	20.5	73°59.3	41.8	83°33.6	18.6	224°48.1	49.5
11	248°08.1	32°09.7	21.0	89°01.1	41.6	98°36.0	18.6	239°50.5	49.5
12	263°10.5	47°10.1	S11°21.5	104°02.9	N11°41.4	113°38.5	N13°18.6	254°53.0	N00°49.5
13	278°13.0	62°10.6	22.0	119°04.6	41.2	128°41.0	18.6	269°55.4	49.5
14	293°15.5	77°11.0	22.5	134°06.4	41.0	143°43.4	18.7	284°57.9	49.5
15	308°17.9	92°11.4	·· 23.0	149°08.2	·· 40.9	158°45.9	·· 18.7	300°00.4	·· 49.5
16	323°20.4	107°11.9	23.5	164°10.0	40.7	173°48.4	18.7	315°02.8	49.6
17	338°22.9	122°12.3	24.0	179°11.8	40.5	188°50.9	18.7	330°05.3	49.6
18	353°25.3	137°12.8	S11°24.5	194°13.5	N11°40.3	203°53.3	N13°18.7	345°07.7	N00°49.6
19	8°27.8	152°13.2	25.0	209°15.3	40.1	218°55.8	18.7	0°10.2	49.6
20	23°30.3	167°13.6	25.5	224°17.1	39.9	233°58.3	18.7	15°12.6	49.6
21	38°32.7	182°14.1	·· 26.0	239°18.9	·· 39.7	249°00.8	·· 18.8	30°15.1	·· 49.6
22	53°35.2	197°14.5	26.5	254°20.7	39.6	264°03.2	18.8	45°17.5	49.7
23	68°37.7	212°14.9	27.0	269°22.5	39.4	279°05.7	18.8	60°20.0	49.7
Mer.pass. 18:26		ν 0.5′	d 0.5′	m -4.78	ν 1.8′	d 0.2′	m 0.23	ν 2.5′	d 0.0′ m -2.29	ν 2.5′	d 0.0′ m 0.67

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.0	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.7	-57°06.2
Hamal	327°49.1	23°35.6
Polaris	312°45.4	89°22.8
Acamar	315°10.2	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.5
Sirius	258°24.5	-16°45.2
Adhara	255°04.3	-29°00.4
Procyon	244°48.9	5°09.3
Pollux	243°15.1	27°57.5
Avior	234°13.6	-59°35.5
Suhail	222°44.9	-43°32.3
Miaplacidus	221°37.4	-69°49.4
Alphard	217°46.0	-8°46.5
Regulus	207°32.6	11°50.0
Dubhe	193°39.0	61°36.0
Denebola	182°23.4	14°25.2
Gienah	175°42.0	-17°41.4
Acrux	172°58.5	-63°14.7
Gacrux	171°50.0	-57°15.6
Alioth	166°11.8	55°48.5
Spica	158°20.8	-11°18.1
Alkaid	152°51.1	49°10.5
Hadar	148°34.2	-60°30.0
Menkent	147°56.0	-36°30.0
Arcturus	145°46.7	19°02.4
Rigil Kent.	139°38.6	-60°56.6
Kochab	137°20.9	74°02.4
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.3	-26°29.4
Atria	107°07.6	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.4
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.1
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.7	-56°39.0
Deneb	49°25.0	45°22.8
Enif	33°37.4	10°00.0
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.8	-29°28.9
Scheat	13°43.7	28°14.0
Markab	13°28.3	15°21.2

Dec 12 Sat	SHA	Mer.pass
Venus	145°58.2	08:53
Mars	201°35.0	05:10
Jupiter	210°28.1	04:35
Saturn	351°42.8	19:07

Dec 13 Sun	SHA	Mer.pass
Venus	145°11.4	08:52
Mars	201°17.6	05:07
Jupiter	210°27.9	04:31
Saturn	351°42.7	19:03

Dec 14 Mon	SHA	Mer.pass
Venus	144°23.7	08:51
Mars	201°00.6	05:05
Jupiter	210°27.9	04:27
Saturn	351°42.6	18:59

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°38.1	S23°03.5	146°23.7	12.1′	S24°09.0	7.1′	53.9′
1	196°37.8	03.7	160°54.7	12.1′	24°01.9	7.2′	53.9′
2	211°37.5	03.8	175°25.9	12.2′	23°54.7	7.3′	53.9′
3	226°37.2	·· 04.0	189°57.0	12.2′	23°47.4	7.4′	53.9′
4	241°36.9	04.2	204°28.3	12.3′	23°40.0	7.6′	53.9′
5	256°36.6	04.4	218°59.6	12.4′	23°32.4	7.6′	53.9′
6	271°36.3	S23°04.6	233°30.9	12.4′	S23°24.8	7.7′	53.9′
7	286°36.0	04.8	248°02.3	12.5′	23°17.1	7.9′	53.9′
8	301°35.7	05.0	262°33.8	12.5′	23°09.2	7.9′	53.9′
9	316°35.4	·· 05.2	277°05.3	12.6′	23°01.3	8.1′	53.9′
10	331°35.1	05.3	291°36.9	12.6′	22°53.2	8.1′	54.0′
11	346°34.8	05.5	306°08.6	12.7′	22°45.1	8.2′	54.0′
12	1°34.6	S23°05.7	320°40.3	12.8′	S22°36.9	8.4′	54.0′
13	16°34.3	05.9	335°12.0	12.8′	22°28.5	8.4′	54.0′
14	31°34.0	06.1	349°43.9	12.9′	22°20.1	8.6′	54.0′
15	46°33.7	·· 06.3	4°15.7	12.9′	22°11.5	8.6′	54.0′
16	61°33.4	06.4	18°47.7	13.0′	22°02.9	8.7′	54.0′
17	76°33.1	06.6	33°19.7	13.1′	21°54.2	8.9′	54.0′
18	91°32.8	S23°06.8	47°51.7	13.1′	S21°45.3	8.9′	54.0′
19	106°32.5	07.0	62°23.8	13.2′	21°36.4	9.0′	54.0′
20	121°32.2	07.1	76°56.0	13.2′	21°27.4	9.1′	54.0′
21	136°31.9	·· 07.3	91°28.2	13.3′	21°18.3	9.2′	54.0′
22	151°31.6	07.5	106°00.5	13.3′	21°09.1	9.3′	54.0′
23	166°31.3	07.7	120°32.8	13.4′	20°59.8	9.4′	54.0′
	SD = 16.2′	d = 0.2′	SD = 14.7′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°31.0	S23°07.8	135°05.2	13.5′	S20°50.4	9.4′	54.0′
1	196°30.7	08.0	149°37.7	13.5′	20°41.0	9.6′	54.1′
2	211°30.4	08.2	164°10.2	13.6′	20°31.4	9.6′	54.1′
3	226°30.2	·· 08.3	178°42.7	13.6′	20°21.8	9.8′	54.1′
4	241°29.9	08.5	193°15.4	13.7′	20°12.0	9.8′	54.1′
5	256°29.6	08.7	207°48.0	13.7′	20°02.2	9.9′	54.1′
6	271°29.3	S23°08.9	222°20.8	13.8′	S19°52.3	10.0′	54.1′
7	286°29.0	09.0	236°53.5	13.8′	19°42.3	10.0′	54.1′
8	301°28.7	09.2	251°26.4	13.9′	19°32.3	10.2′	54.1′
9	316°28.4	·· 09.4	265°59.3	13.9′	19°22.1	10.2′	54.1′
10	331°28.1	09.5	280°32.2	14.0′	19°11.9	10.4′	54.1′
11	346°27.8	09.7	295°05.2	14.0′	19°01.5	10.4′	54.1′
12	1°27.5	S23°09.8	309°38.3	14.1′	S18°51.1	10.4′	54.2′
13	16°27.2	10.0	324°11.4	14.2′	18°40.7	10.6′	54.2′
14	31°26.9	10.2	338°44.5	14.2′	18°30.1	10.7′	54.2′
15	46°26.6	·· 10.3	353°17.7	14.3′	18°19.4	10.7′	54.2′
16	61°26.3	10.5	7°51.0	14.3′	18°08.7	10.8′	54.2′
17	76°26.0	10.7	22°24.3	14.4′	17°57.9	10.8′	54.2′
18	91°25.7	S23°10.8	36°57.6	14.4′	S17°47.1	11.0′	54.2′
19	106°25.4	11.0	51°31.0	14.5′	17°36.1	11.0′	54.2′
20	121°25.1	11.1	66°04.5	14.5′	17°25.1	11.1′	54.3′
21	136°24.8	·· 11.3	80°38.0	14.5′	17°14.0	11.2′	54.3′
22	151°24.5	11.4	95°11.5	14.6′	17°02.8	11.2′	54.3′
23	166°24.2	11.6	109°45.1	14.6′	16°51.6	11.3′	54.3′
	SD = 16.2′	d = 0.2′	SD = 14.7′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°23.9	S23°11.7	124°18.8	14.7′	S16°40.3	11.4′	54.3′
1	196°23.6	11.9	138°52.4	14.7′	16°28.9	11.5′	54.3′
2	211°23.3	12.0	153°26.2	14.8′	16°17.4	11.5′	54.3′
3	226°23.0	·· 12.2	167°59.9	14.8′	16°05.9	11.6′	54.3′
4	241°22.7	12.3	182°33.7	14.9′	15°54.3	11.7′	54.4′
5	256°22.5	12.5	197°07.6	14.9′	15°42.6	11.7′	54.4′
6	271°22.2	S23°12.6	211°41.5	14.9′	S15°30.9	11.8′	54.4′
7	286°21.9	12.8	226°15.4	15.0′	15°19.1	11.9′	54.4′
8	301°21.6	12.9	240°49.4	15.0′	15°07.2	11.9′	54.4′
9	316°21.3	·· 13.1	255°23.4	15.1′	14°55.3	12.0′	54.4′
10	331°21.0	13.2	269°57.5	15.1′	14°43.3	12.1′	54.5′
11	346°20.7	13.4	284°31.6	15.1′	14°31.2	12.1′	54.5′
12	1°20.4	S23°13.5	299°05.7	15.2′	S14°19.1	12.2′	54.5′
13	16°20.1	13.7	313°39.9	15.2′	14°06.9	12.2′	54.5′
14	31°19.8	13.8	328°14.1	15.2′	13°54.7	12.4′	54.5′
15	46°19.5	·· 14.0	342°48.3	15.3′	13°42.3	12.3′	54.5′
16	61°19.2	14.1	357°22.6	15.3′	13°30.0	12.5′	54.6′
17	76°18.9	14.2	11°56.9	15.3′	13°17.5	12.4′	54.6′
18	91°18.6	S23°14.4	26°31.2	15.4′	S13°05.1	12.6′	54.6′
19	106°18.3	14.5	41°05.6	15.4′	12°52.5	12.6′	54.6′
20	121°18.0	14.6	55°39.9	15.4′	12°39.9	12.7′	54.6′
21	136°17.7	·· 14.8	70°14.4	15.5′	12°27.2	12.7′	54.7′
22	151°17.4	14.9	84°48.8	15.5′	12°14.5	12.8′	54.7′
23	166°17.1	15.1	99°23.3	15.5′	12°01.7	12.8′	54.7′
	SD = 16.2′	d = 0.2′	SD = 14.8′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:17	10:41	▬	▬	13:08	15:31
N 70°	07:58	09:44	▬	▬	14:04	15:50
68°	07:42	09:10	▬	▬	14:38	16:06
66°	07:30	08:46	10:23	13:25	15:02	16:19
64°	07:19	08:27	09:43	14:05	15:21	16:29
62°	07:09	08:11	09:16	14:32	15:37	16:39
60°	07:01	07:58	08:55	14:53	15:50	16:47
N 58°	06:54	07:46	08:38	15:10	16:02	16:54
56°	06:47	07:36	08:23	15:25	16:12	17:01
54°	06:41	07:27	08:11	15:37	16:21	17:07
52°	06:36	07:19	08:00	15:48	16:29	17:13
50°	06:30	07:12	07:50	15:58	16:36	17:18
45°	06:19	06:56	07:30	16:18	16:52	17:29
N 40°	06:09	06:43	07:13	16:35	17:06	17:40
35°	05:59	06:31	06:59	16:49	17:17	17:49
30°	05:51	06:21	06:47	17:01	17:28	17:57
20°	05:35	06:02	06:26	17:22	17:46	18:14
N 10°	05:19	05:45	06:08	17:41	18:03	18:30
0°	05:02	05:28	05:50	17:58	18:20	18:47
S 10°	04:43	05:10	05:33	18:15	18:38	19:05
20°	04:21	04:50	05:14	18:34	18:59	19:28
30°	03:52	04:25	04:53	18:56	19:23	19:57
35°	03:34	04:10	04:40	19:09	19:38	20:15
40°	03:11	03:52	04:25	19:24	19:56	20:38
45°	02:41	03:30	04:07	19:41	20:19	21:08
S 50°	01:56	03:01	03:45	20:04	20:48	21:53
52°	01:30	02:46	03:34	20:14	21:03	22:20
54°	00:48	02:28	03:22	20:27	21:20	23:02
56°	////	02:07	03:08	20:41	21:42	////
58°	////	01:38	02:52	20:57	22:11	////
S 60°	////	00:53	02:32	21:17	22:58	////

Lat.	**Moonrise** Sat	Sun	Mon	**Moonset** Sat	Sun	Mon
N 72°	▬	▬	13:29	▬	▬	19:17
N 70°	▬	13:55	13:02	▬	17:18	19:42
68°	▬	13:12	12:41	▬	18:00	20:01
66°	13:14	12:43	12:24	16:23	18:29	20:16
64°	12:33	12:20	12:11	17:03	18:50	20:28
62°	12:05	12:02	11:59	17:31	19:07	20:39
60°	11:43	11:47	11:49	17:52	19:21	20:48
N 58°	11:25	11:35	11:41	18:09	19:33	20:55
56°	11:10	11:24	11:33	18:24	19:43	21:02
54°	10:57	11:14	11:26	18:36	19:52	21:08
52°	10:46	11:05	11:20	18:47	20:00	21:13
50°	10:36	10:57	11:15	18:57	20:08	21:18
45°	10:14	10:41	11:03	19:17	20:23	21:29
N 40°	09:57	10:27	10:52	19:34	20:36	21:37
35°	09:42	10:15	10:44	19:47	20:46	21:45
30°	09:30	10:05	10:36	19:59	20:56	21:51
20°	09:08	09:47	10:23	20:20	21:12	22:02
N 10°	08:49	09:32	10:11	20:37	21:25	22:12
0°	08:31	09:17	10:01	20:54	21:38	22:21
S 10°	08:13	09:02	09:50	21:10	21:51	22:30
20°	07:54	08:47	09:38	21:27	22:05	22:39
30°	07:32	08:28	09:24	21:47	22:20	22:50
35°	07:19	08:18	09:17	21:58	22:29	22:56
40°	07:04	08:06	09:08	22:11	22:39	23:03
45°	06:46	07:51	08:57	22:27	22:51	23:11
S 50°	06:23	07:34	08:44	22:46	23:05	23:21
52°	06:13	07:25	08:38	22:55	23:12	23:25
54°	06:00	07:16	08:32	23:05	23:19	23:30
56°	05:46	07:05	08:24	23:16	23:27	23:36
58°	05:30	06:53	08:16	23:29	23:36	23:42
S 60°	05:10	06:39	08:06	23:44	23:47	23:48

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 3-5 8-21%
12	06:32	06:18	11:54	14:42	02:19	
13	06:04	05:50	11:54	15:28	03:05	
14	05:36	05:21	11:55	16:11	03:49	

December 15, 16, 17 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	83°40.1	227°15.3	S11°27.5	284°24.2	N11°39.2	294°08.2	N13°18.8	75°22.4	N00°49.7
1	98°42.6	242°15.8	28.0	299°26.0	39.0	309°10.7	18.8	90°24.9	49.7
2	113°45.0	257°16.2	28.5	314°27.8	38.8	324°13.1	18.8	105°27.3	49.7
3	128°47.5	272°16.6	·· 29.0	329°29.6	·· 38.6	339°15.6	·· 18.8	120°29.8	·· 49.8
4	143°50.0	287°17.0	29.5	344°31.4	38.5	354°18.1	18.9	135°32.2	49.8
5	158°52.4	302°17.4	30.0	359°33.2	38.3	9°20.6	18.9	150°34.7	49.8
6	173°54.9	317°17.9	S11°30.5	14°35.0	N11°38.1	24°23.1	N13°18.9	165°37.1	N00°49.8
7	188°57.4	332°18.3	31.0	29°36.8	37.9	39°25.5	18.9	180°39.6	49.8
8	203°59.8	347°18.7	31.5	44°38.5	37.7	54°28.0	18.9	195°42.0	49.8
9	219°02.3	2°19.1	·· 32.1	59°40.3	·· 37.5	69°30.5	·· 18.9	210°44.5	·· 49.9
10	234°04.8	17°19.5	32.6	74°42.1	37.4	84°33.0	19.0	225°46.9	49.9
11	249°07.2	32°19.9	33.1	89°43.9	37.2	99°35.4	19.0	240°49.4	49.9
12	264°09.7	47°20.3	S11°33.6	104°45.7	N11°37.0	114°37.9	N13°19.0	255°51.8	N00°49.9
13	279°12.1	62°20.8	34.1	119°47.5	36.8	129°40.4	19.0	270°54.3	49.9
14	294°14.6	77°21.2	34.6	134°49.3	36.6	144°42.9	19.0	285°56.7	49.9
15	309°17.1	92°21.6	·· 35.1	149°51.1	·· 36.5	159°45.4	·· 19.0	300°59.2	·· 50.0
16	324°19.5	107°22.0	35.6	164°52.9	36.3	174°47.8	19.1	316°01.6	50.0
17	339°22.0	122°22.4	36.1	179°54.7	36.1	189°50.3	19.1	331°04.1	50.0
18	354°24.5	137°22.8	S11°36.7	194°56.5	N11°35.9	204°52.8	N13°19.1	346°06.5	N00°50.0
19	9°26.9	152°23.2	37.2	209°58.3	35.7	219°55.3	19.1	1°09.0	50.0
20	24°29.4	167°23.6	37.7	225°00.1	35.6	234°57.8	19.1	16°11.4	50.1
21	39°31.9	182°24.0	·· 38.2	240°01.9	·· 35.4	250°00.3	·· 19.1	31°13.9	·· 50.1
22	54°34.3	197°24.4	38.7	255°03.7	35.2	265°02.7	19.2	46°16.3	50.1
23	69°36.8	212°24.8	39.2	270°05.5	35.0	280°05.2	19.2	61°18.8	50.1
Mer.pass. 18:22		ν 0.4′	d 0.5′	m -4.77	ν 1.8′	d 0.2′	m 0.21	ν 2.5′	d 0.0′ m -2.29	ν 2.5′	d 0.0′ m 0.67

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	84°39.3	227°25.2	S11°39.8	285°07.3	N11°34.9	295°07.7	N13°19.2	76°21.2	N00°50.1
1	99°41.7	242°25.6	40.3	300°09.1	34.7	310°10.2	19.2	91°23.7	50.1
2	114°44.2	257°25.9	40.8	315°10.9	34.5	325°12.7	19.2	106°26.1	50.2
3	129°46.6	272°26.3	·· 41.3	330°12.7	·· 34.3	340°15.2	·· 19.3	121°28.5	·· 50.2
4	144°49.1	287°26.7	41.8	345°14.5	34.2	355°17.6	19.3	136°31.0	50.2
5	159°51.6	302°27.1	42.4	0°16.3	34.0	10°20.1	19.3	151°33.4	50.2
6	174°54.0	317°27.5	S11°42.9	15°18.2	N11°33.8	25°22.6	N13°19.3	166°35.9	N00°50.2
7	189°56.5	332°27.9	43.4	30°20.0	33.6	40°25.1	19.3	181°38.3	50.3
8	204°59.0	347°28.3	43.9	45°21.8	33.5	55°27.6	19.4	196°40.8	50.3
9	220°01.4	2°28.6	·· 44.4	60°23.6	·· 33.3	70°30.1	·· 19.4	211°43.2	·· 50.3
10	235°03.9	17°29.0	45.0	75°25.4	33.1	85°32.6	19.4	226°45.7	50.3
11	250°06.4	32°29.4	45.5	90°27.2	32.9	100°35.1	19.4	241°48.1	50.3
12	265°08.8	47°29.8	S11°46.0	105°29.0	N11°32.8	115°37.5	N13°19.4	256°50.6	N00°50.4
13	280°11.3	62°30.2	46.5	120°30.8	32.6	130°40.0	19.4	271°53.0	50.4
14	295°13.8	77°30.5	47.1	135°32.7	32.4	145°42.5	19.5	286°55.4	50.4
15	310°16.2	92°30.9	·· 47.6	150°34.5	·· 32.3	160°45.0	·· 19.5	301°57.9	·· 50.4
16	325°18.7	107°31.3	48.1	165°36.3	32.1	175°47.5	19.5	317°00.3	50.4
17	340°21.1	122°31.6	48.6	180°38.1	31.9	190°50.0	19.5	332°02.8	50.5
18	355°23.6	137°32.0	S11°49.2	195°39.9	N11°31.7	205°52.5	N13°19.5	347°05.2	N00°50.5
19	10°26.1	152°32.4	49.7	210°41.7	31.6	220°55.0	19.6	2°07.7	50.5
20	25°28.5	167°32.7	50.2	225°43.6	31.4	235°57.5	19.6	17°10.1	50.5
21	40°31.0	182°33.1	·· 50.7	240°45.4	·· 31.2	250°59.9	·· 19.6	32°12.6	·· 50.5
22	55°33.5	197°33.5	51.3	255°47.2	31.1	266°02.4	19.6	47°15.0	50.6
23	70°35.9	212°33.8	51.8	270°49.0	30.9	281°04.9	19.7	62°17.4	50.6
Mer.pass. 18:18		ν 0.4′	d 0.5′	m -4.76	ν 1.8′	d 0.2′	m 0.20	ν 2.5′	d 0.0′ m -2.30	ν 2.4′	d 0.0′ m 0.67

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	85°38.4	227°34.2	S11°52.3	285°50.9	N11°30.7	296°07.4	N13°19.7	77°19.9	N00°50.6
1	100°40.9	242°34.6	52.9	300°52.7	30.6	311°09.9	19.7	92°22.3	50.6
2	115°43.3	257°34.9	53.4	315°54.5	30.4	326°12.4	19.7	107°24.8	50.6
3	130°45.8	272°35.3	·· 53.9	330°56.3	·· 30.2	341°14.9	·· 19.7	122°27.2	·· 50.7
4	145°48.2	287°35.6	54.5	345°58.2	30.0	356°17.4	19.8	137°29.7	50.7
5	160°50.7	302°36.0	55.0	1°00.0	29.9	11°19.9	19.8	152°32.1	50.7
6	175°53.2	317°36.3	S11°55.5	16°01.8	N11°29.7	26°22.4	N13°19.8	167°34.5	N00°50.7
7	190°55.6	332°36.7	56.1	31°03.6	29.5	41°24.9	19.8	182°37.0	50.8
8	205°58.1	347°37.0	56.6	46°05.5	29.4	56°27.4	19.8	197°39.4	50.8
9	221°00.6	2°37.4	·· 57.1	61°07.3	·· 29.2	71°29.9	·· 19.9	212°41.9	·· 50.8
10	236°03.0	17°37.7	57.7	76°09.1	29.1	86°32.4	19.9	227°44.3	50.8
11	251°05.5	32°38.1	58.2	91°11.0	28.9	101°34.8	19.9	242°46.8	50.8
12	266°08.0	47°38.4	S11°58.7	106°12.8	N11°28.7	116°37.3	N13°19.9	257°49.2	N00°50.9
13	281°10.4	62°38.8	59.3	121°14.6	28.6	131°39.8	20.0	272°51.6	50.9
14	296°12.9	77°39.1	11°59.8	136°16.5	28.4	146°42.3	20.0	287°54.1	50.9
15	311°15.4	92°39.5	12°00.3	151°18.3	·· 28.2	161°44.8	·· 20.0	302°56.5	·· 50.9
16	326°17.8	107°39.8	00.9	166°20.1	28.1	176°47.3	20.0	317°59.0	50.9
17	341°20.3	122°40.1	01.4	181°22.0	27.9	191°49.8	20.0	333°01.4	51.0
18	356°22.7	137°40.5	S12°02.0	196°23.8	N11°27.7	206°52.3	N13°20.1	348°03.8	N00°51.0
19	11°25.2	152°40.8	02.5	211°25.7	27.6	221°54.8	20.1	3°06.3	51.0
20	26°27.7	167°41.1	03.0	226°27.5	27.4	236°57.3	20.1	18°08.7	51.0
21	41°30.1	182°41.5	·· 03.6	241°29.3	·· 27.3	251°59.8	·· 20.1	33°11.2	·· 51.1
22	56°32.6	197°41.8	04.1	256°31.2	27.1	267°02.3	20.2	48°13.6	51.1
23	71°35.1	212°42.1	04.7	271°33.0	26.9	282°04.8	20.2	63°16.0	51.1
Mer.pass. 18:14		ν 0.4′	d 0.5′	m -4.75	ν 1.8′	d 0.2′	m 0.18	ν 2.5′	d 0.0′ m -2.31	ν 2.4′	d 0.0′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.0	56°41.5
Diphda	348°45.6	-17°50.3
Achernar	335°18.7	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°46.2	89°22.8
Acamar	315°10.2	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.5
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.5
Sirius	258°24.5	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.9	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°13.6	-59°35.6
Suhail	222°44.8	-43°32.3
Miaplacidus	221°37.3	-69°49.4
Alphard	217°46.0	-8°46.5
Regulus	207°32.6	11°50.0
Dubhe	193°39.0	61°36.0
Denebola	182°23.3	14°25.1
Gienah	175°42.0	-17°41.4
Acrux	172°58.4	-63°14.7
Gacrux	171°50.0	-57°15.6
Alioth	166°11.8	55°48.5
Spica	158°20.8	-11°18.1
Alkaid	152°51.0	49°10.4
Hadar	148°34.1	-60°30.0
Menkent	147°56.0	-36°30.0
Arcturus	145°46.7	19°02.4
Rigil Kent.	139°38.6	-60°56.6
Kochab	137°20.8	74°02.4
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.2	-26°29.4
Atria	107°07.6	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.1
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.7	-56°39.0
Deneb	49°25.0	45°22.8
Enif	33°37.4	10°00.0
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.8	-29°28.9
Scheat	13°43.7	28°14.0
Markab	13°28.4	15°21.2

Dec 15 Tue	SHA	Mer.pass
Venus	143°35.2	08:51
Mars	200°44.1	05:02
Jupiter	210°28.1	04:23
Saturn	351°42.3	18:55

Dec 16 Wed	SHA	Mer.pass
Venus	142°45.9	08:50
Mars	200°28.1	04:59
Jupiter	210°28.5	04:19
Saturn	351°41.9	18:52

Dec 17 Thu	SHA	Mer.pass
Venus	141°55.8	08:50
Mars	200°12.5	04:56
Jupiter	210°29.0	04:15
Saturn	351°41.5	18:48

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°16.8	S23°15.2	113°57.8	15.5′	S11°48.9	12.9′	54.7′
1	196°16.5	15.3	128°32.3	15.6′	11°36.0	12.9′	54.7′
2	211°16.2	15.5	143°06.9	15.6′	11°23.1	13.0′	54.8′
3	226°15.9	·· 15.6	157°41.5	15.6′	11°10.1	13.0′	54.8′
4	241°15.6	15.7	172°16.1	15.6′	10°57.1	13.1′	54.8′
5	256°15.3	15.8	186°50.7	15.6′	10°44.0	13.2′	54.8′
6	271°15.0	S23°16.0	201°25.3	15.7′	S10°30.8	13.2′	54.8′
7	286°14.7	16.1	216°00.0	15.7′	10°17.6	13.2′	54.9′
8	301°14.4	16.2	230°34.7	15.7′	10°04.4	13.3′	54.9′
9	316°14.1	·· 16.4	245°09.4	15.7′	09°51.1	13.3′	54.9′
10	331°13.8	16.5	259°44.1	15.7′	09°37.8	13.4′	54.9′
11	346°13.5	16.6	274°18.8	15.7′	09°24.4	13.5′	54.9′
12	1°13.2	S23°16.7	288°53.6	15.8′	S09°10.9	13.4′	55.0′
13	16°12.9	16.9	303°28.3	15.8′	08°57.5	13.6′	55.0′
14	31°12.6	17.0	318°03.1	15.8′	08°43.9	13.5′	55.0′
15	46°12.3	·· 17.1	332°37.9	15.8′	08°30.4	13.6′	55.0′
16	61°12.0	17.2	347°12.7	15.8′	08°16.8	13.7′	55.1′
17	76°11.7	17.3	1°47.5	15.8′	08°03.1	13.7′	55.1′
18	91°11.4	S23°17.5	16°22.3	15.8′	S07°49.4	13.7′	55.1′
19	106°11.0	17.6	30°57.1	15.8′	07°35.7	13.8′	55.1′
20	121°10.7	17.7	45°31.9	15.8′	07°21.9	13.8′	55.2′
21	136°10.4	·· 17.8	60°06.7	15.8′	07°08.1	13.9′	55.2′
22	151°10.1	17.9	74°41.6	15.8′	06°54.2	13.9′	55.2′
23	166°09.8	18.1	89°16.4	15.8′	06°40.3	13.9′	55.2′
	SD = 16.2′	d = 0.1′	SD = 14.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°09.5	S23°18.2	103°51.2	15.8′	S06°26.4	14.0′	55.3′
1	196°09.2	18.3	118°26.1	15.8′	06°12.4	14.0′	55.3′
2	211°08.9	18.4	133°00.9	15.8′	05°58.4	14.1′	55.3′
3	226°08.6	·· 18.5	147°35.7	15.8′	05°44.3	14.1′	55.3′
4	241°08.3	18.6	162°10.6	15.8′	05°30.2	14.1′	55.4′
5	256°08.0	18.7	176°45.4	15.8′	05°16.1	14.1′	55.4′
6	271°07.7	S23°18.8	191°20.2	15.8′	S05°02.0	14.2′	55.4′
7	286°07.4	19.0	205°55.0	15.8′	04°47.8	14.2′	55.5′
8	301°07.1	19.1	220°29.8	15.8′	04°33.6	14.3′	55.5′
9	316°06.8	·· 19.2	235°04.6	15.8′	04°19.3	14.3′	55.5′
10	331°06.5	19.3	249°39.4	15.8′	04°05.0	14.3′	55.5′
11	346°06.2	19.4	264°14.2	15.8′	03°50.7	14.3′	55.6′
12	1°05.9	S23°19.5	278°48.9	15.7′	S03°36.4	14.4′	55.6′
13	16°05.6	19.6	293°23.7	15.7′	03°22.0	14.4′	55.6′
14	31°05.3	19.7	307°58.4	15.7′	03°07.6	14.4′	55.7′
15	46°05.0	·· 19.8	322°33.1	15.7′	02°53.2	14.5′	55.7′
16	61°04.7	19.9	337°07.8	15.7′	02°38.7	14.4′	55.7′
17	76°04.4	20.0	351°42.5	15.7′	02°24.3	14.5′	55.7′
18	91°04.1	S23°20.1	6°17.2	15.6′	S02°09.8	14.6′	55.8′
19	106°03.8	20.2	20°51.8	15.6′	01°55.2	14.5′	55.8′
20	121°03.5	20.3	35°26.4	15.6′	01°40.7	14.6′	55.8′
21	136°03.2	·· 20.4	50°01.0	15.6′	01°26.1	14.6′	55.9′
22	151°02.9	20.5	64°35.6	15.5′	01°11.5	14.6′	55.9′
23	166°02.6	20.6	79°10.1	15.5′	00°56.9	14.6′	55.9′
	SD = 16.2′	d = 0.1′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	181°02.3	S23°20.7	93°44.7	15.5′	S00°42.3	14.7′	56.0′
1	196°01.9	20.8	108°19.1	15.5′	00°27.6	14.7′	56.0′
2	211°01.6	20.9	122°53.6	15.4′	S00°12.9	14.7′	56.0′
3	226°01.3	·· 21.0	137°28.0	15.4′	N00°01.8	14.7′	56.1′
4	241°01.0	21.1	152°02.4	15.4′	00°16.5	14.7′	56.1′
5	256°00.7	21.2	166°36.8	15.3′	00°31.2	14.7′	56.1′
6	271°00.4	S23°21.2	181°11.1	15.3′	N00°45.9	14.8′	56.2′
7	286°00.1	21.3	195°45.4	15.2′	01°00.7	14.7′	56.2′
8	300°59.8	21.4	210°19.6	15.2′	01°15.4	14.8′	56.2′
9	315°59.5	·· 21.5	224°53.8	15.2′	01°30.2	14.8′	56.3′
10	330°59.2	21.6	239°28.0	15.1′	01°45.0	14.8′	56.3′
11	345°58.9	21.7	254°02.1	15.1′	01°59.8	14.8′	56.3′
12	0°58.6	S23°21.8	268°36.2	15.0′	N02°14.6	14.9′	56.4′
13	15°58.3	21.9	283°10.2	15.0′	02°29.5	14.8′	56.4′
14	30°58.0	21.9	297°44.2	14.9′	02°44.3	14.8′	56.4′
15	45°57.7	·· 22.0	312°18.1	14.9′	02°59.1	14.9′	56.5′
16	60°57.4	22.1	326°52.0	14.8′	03°14.0	14.8′	56.5′
17	75°57.1	22.2	341°25.9	14.8′	03°28.8	14.9′	56.5′
18	90°56.8	S23°22.3	355°59.7	14.7′	N03°43.7	14.9′	56.6′
19	105°56.5	22.3	10°33.4	14.7′	03°58.6	14.8′	56.6′
20	120°56.1	22.4	25°07.1	14.6′	04°13.4	14.9′	56.7′
21	135°55.8	·· 22.5	39°40.7	14.6′	04°28.3	14.8′	56.7′
22	150°55.5	22.6	54°14.3	14.5′	04°43.1	14.9′	56.7′
23	165°55.2	22.7	68°47.8	14.4′	04°58.0	14.9′	56.8′
	SD = 16.2′	d = 0.1′	SD = 15.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:21	10:49	▬	▬	13:02	15:30
N 70°	08:02	09:49	▬	▬	14:02	15:50
68°	07:46	09:15	▬	▬	14:36	16:05
66°	07:33	08:50	10:29	13:22	15:01	16:18
64°	07:22	08:30	09:47	14:04	15:21	16:29
62°	07:12	08:14	09:20	14:32	15:37	16:39
60°	07:04	08:01	08:58	14:53	15:50	16:47
N 58°	06:56	07:49	08:41	15:10	16:02	16:55
56°	06:50	07:39	08:26	15:25	16:12	17:01
54°	06:44	07:30	08:14	15:38	16:21	17:08
52°	06:38	07:22	08:02	15:49	16:30	17:13
50°	06:33	07:14	07:53	15:58	16:37	17:18
45°	06:21	06:58	07:32	16:19	16:53	17:30
N 40°	06:11	06:45	07:15	16:36	17:06	17:40
35°	06:01	06:33	07:01	16:50	17:18	17:50
30°	05:53	06:22	06:49	17:02	17:29	17:59
20°	05:36	06:04	06:28	17:23	17:47	18:15
N 10°	05:20	05:46	06:09	17:42	18:05	18:31
0°	05:03	05:29	05:52	17:59	18:22	18:48
S 10°	04:44	05:11	05:34	18:17	18:40	19:07
20°	04:22	04:51	05:15	18:36	19:00	19:30
30°	03:53	04:26	04:54	18:58	19:25	19:59
35°	03:34	04:11	04:41	19:11	19:40	20:17
40°	03:11	03:53	04:26	19:26	19:59	20:40
45°	02:41	03:30	04:08	19:44	20:21	21:11
S 50°	01:56	03:01	03:45	20:06	20:51	21:56
52°	01:28	02:46	03:34	20:17	21:06	22:24
54°	00:44	02:28	03:22	20:29	21:24	23:09
56°	////	02:06	03:08	20:43	21:46	////
58°	////	01:37	02:51	21:00	22:15	////
S 60°	////	00:48	02:31	21:20	23:05	////

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	12:44	12:11	11:40	21:30	23:33	·· ··
N 70°	12:31	12:06	11:43	21:41	23:34	·· ··
68°	12:20	12:02	11:45	21:50	23:35	·· ··
66°	12:11	11:58	11:47	21:57	23:36	·· ··
64°	12:03	11:55	11:48	22:03	23:37	·· ··
62°	11:56	11:53	11:50	22:08	23:37	·· ··
60°	11:50	11:51	11:51	22:13	23:38	·· ··
N 58°	11:45	11:49	11:52	22:17	23:38	·· ··
56°	11:41	11:47	11:53	22:20	23:39	·· ··
54°	11:36	11:45	11:54	22:23	23:39	·· ··
52°	11:33	11:44	11:55	22:26	23:40	·· ··
50°	11:29	11:42	11:56	22:29	23:40	·· ··
45°	11:22	11:40	11:57	22:34	23:41	·· ··
N 40°	11:15	11:37	11:59	22:39	23:41	·· ··
35°	11:10	11:35	12:00	22:43	23:42	·· ··
30°	11:05	11:33	12:01	22:46	23:42	·· ··
20°	10:57	11:30	12:03	22:52	23:43	·· ··
N 10°	10:50	11:27	12:05	22:58	23:44	·· ··
0°	10:43	11:24	12:06	23:03	23:44	·· ··
S 10°	10:36	11:21	12:08	23:07	23:45	·· ··
20°	10:28	11:19	12:10	23:12	23:45	·· ··
30°	10:20	11:15	12:12	23:18	23:46	·· ··
35°	10:15	11:13	12:13	23:22	23:46	·· ··
40°	10:09	11:11	12:14	23:25	23:47	·· ··
45°	10:03	11:09	12:16	23:30	23:47	·· ··
S 50°	09:55	11:06	12:18	23:35	23:48	·· ··
52°	09:51	11:04	12:19	23:37	23:48	23:59
54°	09:47	11:03	12:20	23:39	23:48	23:57
56°	09:43	11:01	12:21	23:42	23:48	23:55
58°	09:38	10:59	12:22	23:45	23:49	23:52
S 60°	09:32	10:57	12:23	23:49	23:49	23:49

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 29-48%
15	05:07	04:53	11:55	16:53	04:32	
16	04:38	04:24	11:56	17:34	05:13	
17	04:09	03:54	11:56	18:17	05:55	

December 18, 19, 20 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	86°37.5	227°42.5	S12°05.2	286°34.9	N11°26.8	297°07.3	N13°20.2	78°18.5	N00°51.1
1	101°40.0	242°42.8	05.7	301°36.7	26.6	312°09.8	20.2	93°20.9	51.1
2	116°42.5	257°43.1	06.3	316°38.6	26.4	327°12.3	20.3	108°23.3	51.2
3	131°44.9	272°43.5	·· 06.8	331°40.4	·· 26.3	342°14.8	·· 20.3	123°25.8	·· 51.2
4	146°47.4	287°43.8	07.4	346°42.2	26.1	357°17.3	20.3	138°28.2	51.2
5	161°49.9	302°44.1	07.9	1°44.1	26.0	12°19.8	20.3	153°30.7	51.2
6	176°52.3	317°44.4	S12°08.5	16°45.9	N11°25.8	27°22.3	N13°20.4	168°33.1	N00°51.3
7	191°54.8	332°44.7	09.0	31°47.8	25.7	42°24.8	20.4	183°35.5	51.3
8	206°57.2	347°45.1	09.5	46°49.6	25.5	57°27.3	20.4	198°38.0	51.3
9	221°59.7	2°45.4	·· 10.1	61°51.5	·· 25.3	72°29.8	·· 20.4	213°40.4	·· 51.3
10	237°02.2	17°45.7	10.6	76°53.3	25.2	87°32.3	20.5	228°42.9	51.3
11	252°04.6	32°46.0	11.2	91°55.2	25.0	102°34.8	20.5	243°45.3	51.4
12	267°07.1	47°46.3	S12°11.7	106°57.0	N11°24.9	117°37.3	N13°20.5	258°47.7	N00°51.4
13	282°09.6	62°46.6	12.3	121°58.9	24.7	132°39.8	20.5	273°50.2	51.4
14	297°12.0	77°47.0	12.8	137°00.8	24.6	147°42.3	20.6	288°52.6	51.4
15	312°14.5	92°47.3	·· 13.4	152°02.6	·· 24.4	162°44.8	·· 20.6	303°55.0	·· 51.5
16	327°17.0	107°47.6	13.9	167°04.5	24.2	177°47.4	20.6	318°57.5	51.5
17	342°19.4	122°47.9	14.5	182°06.3	24.1	192°49.9	20.6	333°59.9	51.5
18	357°21.9	137°48.2	S12°15.0	197°08.2	N11°23.9	207°52.4	N13°20.7	349°02.3	N00°51.5
19	12°24.3	152°48.5	15.6	212°10.0	23.8	222°54.9	20.7	4°04.8	51.6
20	27°26.8	167°48.8	16.1	227°11.9	23.6	237°57.4	20.7	19°07.2	51.6
21	42°29.3	182°49.1	·· 16.7	242°13.8	·· 23.5	252°59.9	·· 20.7	34°09.6	·· 51.6
22	57°31.7	197°49.4	17.2	257°15.6	23.3	268°02.4	20.8	49°12.1	51.6
23	72°34.2	212°49.7	17.8	272°17.5	23.2	283°04.9	20.8	64°14.5	51.7
Mer.pass. 18:11		ν 0.3′	d 0.5′	m -4.74	ν 1.8′	d 0.2′	m 0.16	ν 2.5′	d 0.0′ m -2.31	ν 2.4′	d 0.0′ m 0.68

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	87°36.7	227°50.0	S12°18.3	287°19.3	N11°23.0	298°07.4	N13°20.8	79°17.0	N00°51.7
1	102°39.1	242°50.3	18.9	302°21.2	22.9	313°09.9	20.8	94°19.4	51.7
2	117°41.6	257°50.6	19.4	317°23.1	22.7	328°12.4	20.9	109°21.8	51.7
3	132°44.1	272°50.9	·· 20.0	332°24.9	·· 22.6	343°14.9	·· 20.9	124°24.3	·· 51.8
4	147°46.5	287°51.2	20.5	347°26.8	22.4	358°17.4	20.9	139°26.7	51.8
5	162°49.0	302°51.5	21.1	2°28.7	22.3	13°19.9	20.9	154°29.1	51.8
6	177°51.5	317°51.8	S12°21.6	17°30.5	N11°22.1	28°22.5	N13°21.0	169°31.6	N00°51.8
7	192°53.9	332°52.1	22.2	32°32.4	22.0	43°25.0	21.0	184°34.0	51.9
8	207°56.4	347°52.4	22.8	47°34.3	21.8	58°27.5	21.0	199°36.4	51.9
9	222°58.8	2°52.6	·· 23.3	62°36.2	·· 21.7	73°30.0	·· 21.1	214°38.9	·· 51.9
10	238°01.3	17°52.9	23.9	77°38.0	21.5	88°32.5	21.1	229°41.3	51.9
11	253°03.8	32°53.2	24.4	92°39.9	21.4	103°35.0	21.1	244°43.7	52.0
12	268°06.2	47°53.5	S12°25.0	107°41.8	N11°21.2	118°37.5	N13°21.1	259°46.2	N00°52.0
13	283°08.7	62°53.8	25.5	122°43.6	21.1	133°40.0	21.2	274°48.6	52.0
14	298°11.2	77°54.1	26.1	137°45.5	20.9	148°42.5	21.2	289°51.0	52.0
15	313°13.6	92°54.3	·· 26.7	152°47.4	·· 20.8	163°45.1	·· 21.2	304°53.5	·· 52.1
16	328°16.1	107°54.6	27.2	167°49.3	20.6	178°47.6	21.2	319°55.9	52.1
17	343°18.6	122°54.9	27.8	182°51.2	20.5	193°50.1	21.3	334°58.3	52.1
18	358°21.0	137°55.2	S12°28.3	197°53.0	N11°20.3	208°52.6	N13°21.3	350°00.7	N00°52.1
19	13°23.5	152°55.5	28.9	212°54.9	20.2	223°55.1	21.3	5°03.2	52.2
20	28°26.0	167°55.7	29.4	227°56.8	20.0	238°57.6	21.4	20°05.6	52.2
21	43°28.4	182°56.0	·· 30.0	242°58.7	·· 19.9	254°00.1	·· 21.4	35°08.0	·· 52.2
22	58°30.9	197°56.3	30.6	258°00.6	19.7	269°02.6	21.4	50°10.5	52.2
23	73°33.3	212°56.5	31.1	273°02.4	19.6	284°05.2	21.5	65°12.9	52.3
Mer.pass. 18:07		ν 0.3′	d 0.6′	m -4.73	ν 1.9′	d 0.2′	m 0.14	ν 2.5′	d 0.0′ m -2.32	ν 2.4′	d 0.0′ m 0.69

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	88°35.8	227°56.8	S12°31.7	288°04.3	N11°19.5	299°07.7	N13°21.5	80°15.3	N00°52.3
1	103°38.3	242°57.1	32.2	303°06.2	19.3	314°10.2	21.5	95°17.8	52.3
2	118°40.7	257°57.3	32.8	318°08.1	19.2	329°12.7	21.5	110°20.2	52.3
3	133°43.2	272°57.6	·· 33.4	333°10.0	·· 19.0	344°15.2	·· 21.6	125°22.6	·· 52.4
4	148°45.7	287°57.9	33.9	348°11.9	18.9	359°17.7	21.6	140°25.1	52.4
5	163°48.1	302°58.1	34.5	3°13.7	18.7	14°20.3	21.6	155°27.5	52.4
6	178°50.6	317°58.4	S12°35.1	18°15.6	N11°18.6	29°22.8	N13°21.7	170°29.9	N00°52.4
7	193°53.1	332°58.7	35.6	33°17.5	18.5	44°25.3	21.7	185°32.3	52.5
8	208°55.5	347°58.9	36.2	48°19.4	18.3	59°27.8	21.7	200°34.8	52.5
9	223°58.0	2°59.2	·· 36.8	63°21.3	·· 18.2	74°30.3	·· 21.7	215°37.2	·· 52.5
10	239°00.4	17°59.4	37.3	78°23.2	18.0	89°32.9	21.8	230°39.6	52.5
11	254°02.9	32°59.7	37.9	93°25.1	17.9	104°35.4	21.8	245°42.1	52.6
12	269°05.4	47°59.9	S12°38.4	108°27.0	N11°17.7	119°37.9	N13°21.8	260°44.5	N00°52.6
13	284°07.8	63°00.2	39.0	123°28.9	17.6	134°40.4	21.9	275°46.9	52.6
14	299°10.3	78°00.5	39.6	138°30.8	17.5	149°42.9	21.9	290°49.3	52.7
15	314°12.8	93°00.7	·· 40.1	153°32.7	·· 17.3	164°45.4	·· 21.9	305°51.8	·· 52.7
16	329°15.2	108°01.0	40.7	168°34.6	17.2	179°48.0	22.0	320°54.2	52.7
17	344°17.7	123°01.2	41.3	183°36.5	17.1	194°50.5	22.0	335°56.6	52.7
18	359°20.2	138°01.4	S12°41.8	198°38.4	N11°16.9	209°53.0	N13°22.0	350°59.1	N00°52.8
19	14°22.6	153°01.7	42.4	213°40.3	16.8	224°55.5	22.1	6°01.5	52.8
20	29°25.1	168°01.9	43.0	228°42.2	16.6	239°58.1	22.1	21°03.9	52.8
21	44°27.6	183°02.2	·· 43.6	243°44.1	·· 16.5	255°00.6	·· 22.1	36°06.3	·· 52.8
22	59°30.0	198°02.4	44.1	258°46.0	16.4	270°03.1	22.1	51°08.8	52.9
23	74°32.5	213°02.7	44.7	273°47.9	16.2	285°05.6	22.2	66°11.2	52.9
Mer.pass. 18:03		ν 0.3′	d 0.6′	m -4.71	ν 1.9′	d 0.1′	m 0.12	ν 2.5′	d 0.0′ m -2.33	ν 2.4′	d 0.0′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.0	56°41.5
Diphda	348°45.6	-17°50.4
Achernar	335°18.7	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°46.9	89°22.9
Acamar	315°10.2	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.5	28°37.8
Alnilam	275°35.8	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.5
Sirius	258°24.5	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.9	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°13.5	-59°35.6
Suhail	222°44.8	-43°32.3
Miaplacidus	221°37.3	-69°49.4
Alphard	217°46.0	-8°46.5
Regulus	207°32.6	11°50.0
Dubhe	193°39.0	61°36.0
Denebola	182°23.3	14°25.1
Gienah	175°42.0	-17°41.4
Acrux	172°58.4	-63°14.7
Gacrux	171°50.0	-57°15.6
Alioth	166°11.8	55°48.5
Spica	158°20.8	-11°18.1
Alkaid	152°51.0	49°10.4
Hadar	148°34.1	-60°30.0
Menkent	147°56.0	-36°30.0
Arcturus	145°46.7	19°02.4
Rigil Kent.	139°38.5	-60°56.6
Kochab	137°20.8	74°02.4
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.2	-26°29.4
Atria	107°07.6	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.1
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.6
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°39.0
Deneb	49°25.1	45°22.8
Enif	33°37.4	10°00.0
Al Na'ir	27°31.1	-46°50.0
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.7	28°14.0
Markab	13°28.4	15°21.2

Dec 18 Fri	SHA	Mer.pass
Venus	141°04.9	08:49
Mars	199°57.3	04:53
Jupiter	210°29.8	04:11
Saturn	351°40.9	18:44

Dec 19 Sat	SHA	Mer.pass
Venus	140°13.3	08:48
Mars	199°42.7	04:50
Jupiter	210°30.7	04:07
Saturn	351°40.3	18:40

Dec 20 Sun	SHA	Mer.pass
Venus	139°21.0	08:48
Mars	199°28.5	04:47
Jupiter	210°31.9	04:03
Saturn	351°39.5	18:36

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°54.9	S23°22.7	83°21.2	14.4′	N05°12.9	14.8′	56.8′
1	195°54.6	22.8	97°54.6	14.3′	05°27.7	14.9′	56.8′
2	210°54.3	22.9	112°27.9	14.3′	05°42.6	14.8′	56.9′
3	225°54.0	·· 23.0	127°01.2	14.2′	05°57.4	14.9′	56.9′
4	240°53.7	23.0	141°34.4	14.1′	06°12.3	14.8′	56.9′
5	255°53.4	23.1	156°07.5	14.1′	06°27.1	14.9′	57.0′
6	270°53.1	S23°23.2	170°40.6	14.0′	N06°42.0	14.8′	57.0′
7	285°52.8	23.2	185°13.5	13.9′	06°56.8	14.8′	57.1′
8	300°52.5	23.3	199°46.5	13.8′	07°11.6	14.8′	57.1′
9	315°52.2	·· 23.4	214°19.3	13.8′	07°26.4	14.8′	57.1′
10	330°51.9	23.5	228°52.1	13.7′	07°41.2	14.8′	57.2′
11	345°51.6	23.5	243°24.8	13.6′	07°56.0	14.7′	57.2′
12	0°51.2	S23°23.6	257°57.4	13.5′	N08°10.7	14.8′	57.3′
13	15°50.9	23.6	272°29.9	13.5′	08°25.5	14.7′	57.3′
14	30°50.6	23.7	287°02.3	13.4′	08°40.2	14.7′	57.3′
15	45°50.3	·· 23.8	301°34.7	13.3′	08°54.9	14.7′	57.4′
16	60°50.0	23.8	316°07.0	13.2′	09°09.6	14.7′	57.4′
17	75°49.7	23.9	330°39.2	13.1′	09°24.3	14.6′	57.5′
18	90°49.4	S23°24.0	345°11.3	13.0′	N09°38.9	14.7′	57.5′
19	105°49.1	24.0	359°43.4	12.9′	09°53.6	14.6′	57.5′
20	120°48.8	24.1	14°15.3	12.8′	10°08.2	14.5′	57.6′
21	135°48.5	·· 24.1	28°47.1	12.8′	10°22.7	14.6′	57.6′
22	150°48.2	24.2	43°18.9	12.7′	10°37.3	14.5′	57.7′
23	165°47.9	24.3	57°50.6	12.6′	10°51.8	14.5′	57.7′
	SD = 16.2′	d = 0.1′	SD = 15.5′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°47.6	S23°24.3	72°22.1	12.5′	N11°06.3	14.4′	57.7′
1	195°47.2	24.4	86°53.6	12.4′	11°20.7	14.4′	57.8′
2	210°46.9	24.4	101°25.0	12.3′	11°35.1	14.4′	57.8′
3	225°46.6	·· 24.5	115°56.3	12.2′	11°49.5	14.4′	57.9′
4	240°46.3	24.5	130°27.4	12.1′	12°03.9	14.3′	57.9′
5	255°46.0	24.6	144°58.5	12.0′	12°18.2	14.3′	57.9′
6	270°45.7	S23°24.6	159°29.5	11.9′	N12°32.5	14.2′	58.0′
7	285°45.4	24.7	174°00.3	11.8′	12°46.7	14.2′	58.0′
8	300°45.1	24.7	188°31.1	11.7′	13°00.9	14.1′	58.1′
9	315°44.8	·· 24.8	203°01.8	11.5′	13°15.0	14.1′	58.1′
10	330°44.5	24.8	217°32.3	11.4′	13°29.1	14.1′	58.1′
11	345°44.2	24.9	232°02.7	11.3′	13°43.2	14.0′	58.2′
12	0°43.9	S23°24.9	246°33.1	11.2′	N13°57.2	14.0′	58.2′
13	15°43.6	25.0	261°03.3	11.1′	14°11.2	13.9′	58.3′
14	30°43.2	25.0	275°33.4	11.0′	14°25.1	13.8′	58.3′
15	45°42.9	·· 25.1	290°03.3	10.9′	14°38.9	13.8′	58.3′
16	60°42.6	25.1	304°33.2	10.7′	14°52.7	13.8′	58.4′
17	75°42.3	25.2	319°03.0	10.6′	15°06.5	13.6′	58.4′
18	90°42.0	S23°25.2	333°32.6	10.5′	N15°20.1	13.7′	58.5′
19	105°41.7	25.2	348°02.1	10.4′	15°33.8	13.5′	58.5′
20	120°41.4	25.3	2°31.5	10.3′	15°47.3	13.5′	58.6′
21	135°41.1	·· 25.3	17°00.7	10.1′	16°00.8	13.4′	58.6′
22	150°40.8	25.4	31°29.9	10.0′	16°14.2	13.4′	58.6′
23	165°40.5	25.4	45°58.9	9.9′	16°27.6	13.3′	58.7′
	SD = 16.2′	d = 0.1′	SD = 15.7′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°40.2	S23°25.4	60°27.8	9.8′	N16°40.9	13.2′	58.7′
1	195°39.9	25.5	74°56.6	9.6′	16°54.1	13.2′	58.8′
2	210°39.5	25.5	89°25.2	9.5′	17°07.3	13.0′	58.8′
3	225°39.2	·· 25.5	103°53.7	9.4′	17°20.3	13.0′	58.8′
4	240°38.9	25.6	118°22.1	9.2′	17°33.3	12.9′	58.9′
5	255°38.6	25.6	132°50.3	9.1′	17°46.2	12.9′	58.9′
6	270°38.3	S23°25.6	147°18.4	9.0′	N17°59.1	12.7′	59.0′
7	285°38.0	25.7	161°46.4	8.8′	18°11.8	12.7′	59.0′
8	300°37.7	25.7	176°14.3	8.7′	18°24.5	12.6′	59.0′
9	315°37.4	·· 25.7	190°42.0	8.6′	18°37.1	12.5′	59.1′
10	330°37.1	25.8	205°09.5	8.4′	18°49.6	12.4′	59.1′
11	345°36.8	25.8	219°37.0	8.3′	19°02.0	12.3′	59.2′
12	0°36.5	S23°25.8	234°04.3	8.2′	N19°14.3	12.2′	59.2′
13	15°36.1	25.8	248°31.4	8.0′	19°26.5	12.1′	59.2′
14	30°35.8	25.9	262°58.5	7.9′	19°38.6	12.0′	59.3′
15	45°35.5	·· 25.9	277°25.4	7.7′	19°50.6	11.9′	59.3′
16	60°35.2	25.9	291°52.1	7.6′	20°02.5	11.8′	59.4′
17	75°34.9	25.9	306°18.7	7.5′	20°14.3	11.8′	59.4′
18	90°34.6	S23°26.0	320°45.2	7.3′	N20°26.1	11.5′	59.4′
19	105°34.3	26.0	335°11.5	7.2′	20°37.6	11.5′	59.5′
20	120°34.0	26.0	349°37.7	7.0′	20°49.1	11.4′	59.5′
21	135°33.7	·· 26.0	4°03.7	6.9′	21°00.5	11.3′	59.6′
22	150°33.4	26.0	18°29.6	6.8′	21°11.8	11.1′	59.6′
23	165°33.1	26.1	32°55.4	6.6′	21°22.9	11.0′	59.6′
	SD = 16.2′	d = 0.0′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:24	10:56	▬	▬	12:58	15:30
N 70°	08:04	09:53	▬	▬	14:01	15:50
68°	07:48	09:18	▬	▬	14:36	16:06
66°	07:35	08:52	10:33	13:21	15:02	16:19
64°	07:24	08:33	09:51	14:03	15:21	16:30
62°	07:14	08:17	09:22	14:32	15:38	16:40
60°	07:06	08:03	09:01	14:53	15:51	16:48
N 58°	06:59	07:51	08:43	15:11	16:03	16:56
56°	06:52	07:41	08:28	15:26	16:13	17:02
54°	06:46	07:32	08:16	15:38	16:22	17:09
52°	06:40	07:24	08:05	15:49	16:30	17:14
50°	06:35	07:16	07:55	15:59	16:38	17:19
45°	06:23	07:00	07:34	16:20	16:54	17:31
N 40°	06:12	06:47	07:17	16:37	17:08	17:42
35°	06:03	06:35	07:03	16:51	17:19	17:51
30°	05:54	06:24	06:51	17:04	17:30	18:00
20°	05:38	06:05	06:29	17:25	17:49	18:16
N 10°	05:22	05:48	06:11	17:43	18:06	18:33
0°	05:05	05:31	05:53	18:01	18:23	18:50
S 10°	04:46	05:13	05:36	18:18	18:41	19:09
20°	04:23	04:52	05:17	18:37	19:02	19:31
30°	03:54	04:27	04:55	18:59	19:27	20:00
35°	03:35	04:12	04:42	19:13	19:42	20:19
40°	03:12	03:54	04:27	19:28	20:00	20:42
45°	02:41	03:31	04:09	19:46	20:23	21:13
S 50°	01:56	03:01	03:46	20:08	20:53	21:59
52°	01:28	02:46	03:35	20:19	21:08	22:26
54°	00:41	02:28	03:23	20:31	21:26	23:13
56°	////	02:06	03:09	20:46	21:48	////
58°	////	01:36	02:52	21:02	22:18	////
S 60°	////	00:46	02:31	21:23	23:09	////

Lat.	**Moonrise** Fri	Sat	Sun	**Moonset** Fri	Sat	Sun
N 72°	11:06	10:21	▭	01:38	04:00	▭
N 70°	11:18	10:46	09:47	01:30	03:38	06:22
68°	11:27	11:05	10:31	01:24	03:21	05:40
66°	11:34	11:20	11:01	01:18	03:08	05:12
64°	11:41	11:33	11:23	01:13	02:56	04:50
62°	11:47	11:44	11:41	01:09	02:47	04:33
60°	11:52	11:53	11:57	01:06	02:39	04:19
N 58°	11:56	12:01	12:09	01:03	02:32	04:07
56°	12:00	12:08	12:21	01:00	02:26	03:57
54°	12:03	12:15	12:31	00:58	02:20	03:48
52°	12:07	12:21	12:39	00:55	02:15	03:40
50°	12:10	12:26	12:47	00:53	02:11	03:33
45°	12:16	12:38	13:04	00:49	02:01	03:17
N 40°	12:21	12:47	13:18	00:46	01:53	03:05
35°	12:26	12:56	13:30	00:42	01:46	02:54
30°	12:30	13:03	13:41	00:40	01:40	02:45
20°	12:38	13:16	13:59	00:35	01:30	02:29
N 10°	12:44	13:27	14:15	00:31	01:21	02:15
0°	12:50	13:38	14:30	00:27	01:12	02:02
S 10°	12:56	13:48	14:45	00:23	01:04	01:49
20°	13:03	14:00	15:01	00:19	00:55	01:35
30°	13:11	14:13	15:20	00:14	00:45	01:20
35°	13:15	14:21	15:31	00:12	00:39	01:11
40°	13:20	14:30	15:44	00:09	00:32	01:00
45°	13:26	14:40	15:59	00:05	00:25	00:48
S 50°	13:33	14:53	16:18	00:01	00:16	00:34
52°	13:36	14:59	16:27	·· ··	00:12	00:27
54°	13:40	15:05	16:37	·· ··	00:07	00:20
56°	13:44	15:13	16:48	·· ··	00:02	00:12
58°	13:49	15:21	17:01	23:56	·· ··	00:02
S 60°	13:54	15:31	17:16	23:50	23:52	23:56

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 9-11 58-78%
18	03:40	03:25	11:57	19:01	06:38	
19	03:10	02:55	11:57	19:50	07:25	
20	02:41	02:26	11:58	20:43	08:16	

December 21, 22, 23 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	89°34.9	228°02.9	S12°45.3	288°49.8	N11°16.1	300°08.1	N13°22.2	81°13.6	N00°52.9
1	104°37.4	243°03.1	45.8	303°51.7	16.0	315°10.7	22.2	96°16.0	53.0
2	119°39.9	258°03.4	46.4	318°53.6	15.8	330°13.2	22.3	111°18.5	53.0
3	134°42.3	273°03.6	·· 47.0	333°55.5	·· 15.7	345°15.7	·· 22.3	126°20.9	·· 53.0
4	149°44.8	288°03.8	47.5	348°57.4	15.6	0°18.2	22.3	141°23.3	53.0
5	164°47.3	303°04.1	48.1	3°59.3	15.4	15°20.8	22.4	156°25.7	53.1
6	179°49.7	318°04.3	S12°48.7	19°01.2	N11°15.3	30°23.3	N13°22.4	171°28.2	N00°53.1
7	194°52.2	333°04.5	49.3	34°03.1	15.2	45°25.8	22.4	186°30.6	53.1
8	209°54.7	348°04.8	49.8	49°05.0	15.0	60°28.3	22.5	201°33.0	53.2
9	224°57.1	3°05.0	·· 50.4	64°07.0	·· 14.9	75°30.9	·· 22.5	216°35.4	·· 53.2
10	239°59.6	18°05.2	51.0	79°08.9	14.8	90°33.4	22.5	231°37.9	53.2
11	255°02.1	33°05.5	51.5	94°10.8	14.6	105°35.9	22.6	246°40.3	53.2
12	270°04.5	48°05.7	S12°52.1	109°12.7	N11°14.5	120°38.4	N13°22.6	261°42.7	N00°53.3
13	285°07.0	63°05.9	52.7	124°14.6	14.4	135°41.0	22.6	276°45.1	53.3
14	300°09.4	78°06.1	53.3	139°16.5	14.2	150°43.5	22.7	291°47.6	53.3
15	315°11.9	93°06.4	·· 53.8	154°18.5	·· 14.1	165°46.0	·· 22.7	306°50.0	·· 53.4
16	330°14.4	108°06.6	54.4	169°20.4	14.0	180°48.6	22.7	321°52.4	53.4
17	345°16.8	123°06.8	55.0	184°22.3	13.8	195°51.1	22.8	336°54.8	53.4
18	0°19.3	138°07.0	S12°55.6	199°24.2	N11°13.7	210°53.6	N13°22.8	351°57.3	N00°53.4
19	15°21.8	153°07.2	56.1	214°26.1	13.6	225°56.1	22.8	6°59.7	53.5
20	30°24.2	168°07.4	56.7	229°28.1	13.5	240°58.7	22.9	22°02.1	53.5
21	45°26.7	183°07.7	·· 57.3	244°30.0	·· 13.3	256°01.2	·· 22.9	37°04.5	·· 53.5
22	60°29.2	198°07.9	57.9	259°31.9	13.2	271°03.7	22.9	52°07.0	53.6
23	75°31.6	213°08.1	58.4	274°33.8	13.1	286°06.3	23.0	67°09.4	53.6
Mer.pass. 17:59		ν 0.2′	d 0.6′	m -4.70	ν 1.9′	d 0.1′	m 0.10	ν 2.5′	d 0.0′ m -2.34	ν 2.4′	d 0.0′ m 0.69

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	90°34.1	228°08.3	S12°59.0	289°35.8	N11°12.9	301°08.8	N13°23.0	82°11.8	N00°53.6
1	105°36.6	243°08.5	12°59.6	304°37.7	12.8	316°11.3	23.0	97°14.2	53.6
2	120°39.0	258°08.7	13°00.2	319°39.6	12.7	331°13.9	23.1	112°16.6	53.7
3	135°41.5	273°08.9	·· 00.8	334°41.5	·· 12.6	346°16.4	·· 23.1	127°19.1	·· 53.7
4	150°43.9	288°09.1	01.3	349°43.5	12.4	1°18.9	23.2	142°21.5	53.7
5	165°46.4	303°09.3	01.9	4°45.4	12.3	16°21.5	23.2	157°23.9	53.8
6	180°48.9	318°09.5	S13°02.5	19°47.3	N11°12.2	31°24.0	N13°23.2	172°26.3	N00°53.8
7	195°51.3	333°09.7	03.1	34°49.3	12.1	46°26.5	23.3	187°28.8	53.8
8	210°53.8	348°09.9	03.7	49°51.2	11.9	61°29.1	23.3	202°31.2	53.9
9	225°56.3	3°10.1	·· 04.2	64°53.1	·· 11.8	76°31.6	·· 23.3	217°33.6	·· 53.9
10	240°58.7	18°10.3	04.8	79°55.1	11.7	91°34.1	23.4	232°36.0	53.9
11	256°01.2	33°10.5	05.4	94°57.0	11.6	106°36.7	23.4	247°38.4	54.0
12	271°03.7	48°10.7	S13°06.0	109°58.9	N11°11.4	121°39.2	N13°23.4	262°40.9	N00°54.0
13	286°06.1	63°10.9	06.6	125°00.9	11.3	136°41.7	23.5	277°43.3	54.0
14	301°08.6	78°11.1	07.1	140°02.8	11.2	151°44.3	23.5	292°45.7	54.0
15	316°11.1	93°11.3	·· 07.7	155°04.7	·· 11.1	166°46.8	·· 23.5	307°48.1	·· 54.1
16	331°13.5	108°11.5	08.3	170°06.7	11.0	181°49.3	23.6	322°50.5	54.1
17	346°16.0	123°11.7	08.9	185°08.6	10.8	196°51.9	23.6	337°53.0	54.1
18	1°18.4	138°11.9	S13°09.5	200°10.6	N11°10.7	211°54.4	N13°23.7	352°55.4	N00°54.2
19	16°20.9	153°12.1	10.0	215°12.5	10.6	226°56.9	23.7	7°57.8	54.2
20	31°23.4	168°12.3	10.6	230°14.4	10.5	241°59.5	23.7	23°00.2	54.2
21	46°25.8	183°12.5	·· 11.2	245°16.4	·· 10.4	257°02.0	·· 23.8	38°02.6	·· 54.3
22	61°28.3	198°12.6	11.8	260°18.3	10.2	272°04.6	23.8	53°05.0	54.3
23	76°30.8	213°12.8	12.4	275°20.3	10.1	287°07.1	23.8	68°07.5	54.3
Mer.pass. 17:55		ν 0.2′	d 0.6′	m -4.69	ν 1.9′	d 0.1′	m 0.08	ν 2.5′	d 0.0′ m -2.34	ν 2.4′	d 0.0′ m 0.70

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°33.2	228°13.0	S13°13.0	290°22.2	N11°10.0	302°09.6	N13°23.9	83°09.9	N00°54.4
1	106°35.7	243°13.2	13.5	305°24.2	09.9	317°12.2	23.9	98°12.3	54.4
2	121°38.2	258°13.4	14.1	320°26.1	09.8	332°14.7	24.0	113°14.7	54.4
3	136°40.6	273°13.5	·· 14.7	335°28.1	·· 09.6	347°17.3	·· 24.0	128°17.1	·· 54.4
4	151°43.1	288°13.7	15.3	350°30.0	09.5	2°19.8	24.0	143°19.6	54.5
5	166°45.6	303°13.9	15.9	5°32.0	09.4	17°22.3	24.1	158°22.0	54.5
6	181°48.0	318°14.1	S13°16.5	20°33.9	N11°09.3	32°24.9	N13°24.1	173°24.4	N00°54.5
7	196°50.5	333°14.3	17.0	35°35.9	09.2	47°27.4	24.1	188°26.8	54.6
8	211°52.9	348°14.4	17.6	50°37.8	09.1	62°30.0	24.2	203°29.2	54.6
9	226°55.4	3°14.6	·· 18.2	65°39.8	·· 08.9	77°32.5	·· 24.2	218°31.6	·· 54.6
10	241°57.9	18°14.8	18.8	80°41.7	08.8	92°35.0	24.3	233°34.1	54.7
11	257°00.3	33°14.9	19.4	95°43.7	08.7	107°37.6	24.3	248°36.5	54.7
12	272°02.8	48°15.1	S13°20.0	110°45.7	N11°08.6	122°40.1	N13°24.3	263°38.9	N00°54.7
13	287°05.3	63°15.3	20.6	125°47.6	08.5	137°42.7	24.4	278°41.3	54.8
14	302°07.7	78°15.4	21.1	140°49.6	08.4	152°45.2	24.4	293°43.7	54.8
15	317°10.2	93°15.6	·· 21.7	155°51.5	·· 08.3	167°47.8	·· 24.5	308°46.1	·· 54.8
16	332°12.7	108°15.8	22.3	170°53.5	08.2	182°50.3	24.5	323°48.5	54.9
17	347°15.1	123°15.9	22.9	185°55.5	08.0	197°52.8	24.5	338°51.0	54.9
18	2°17.6	138°16.1	S13°23.5	200°57.4	N11°07.9	212°55.4	N13°24.6	353°53.4	N00°54.9
19	17°20.1	153°16.3	24.1	215°59.4	07.8	227°57.9	24.6	8°55.8	55.0
20	32°22.5	168°16.4	24.7	231°01.4	07.7	243°00.5	24.6	23°58.2	55.0
21	47°25.0	183°16.6	·· 25.3	246°03.3	·· 07.6	258°03.0	·· 24.7	39°00.6	·· 55.0
22	62°27.4	198°16.7	25.9	261°05.3	07.5	273°05.6	24.7	54°03.0	55.1
23	77°29.9	213°16.9	26.4	276°07.3	07.4	288°08.1	24.8	69°05.5	55.1
Mer.pass. 17:51		ν 0.2′	d 0.6′	m -4.68	ν 1.9′	d 0.1′	m 0.05	ν 2.5′	d 0.0′ m -2.35	ν 2.4′	d 0.0′ m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.1	56°41.5
Diphda	348°45.6	-17°50.4
Achernar	335°18.8	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°47.5	89°22.9
Acamar	315°10.2	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.8	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.5
Sirius	258°24.5	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.8	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°13.5	-59°35.6
Suhail	222°44.8	-43°32.3
Miaplacidus	221°37.3	-69°49.4
Alphard	217°46.0	-8°46.5
Regulus	207°32.6	11°50.0
Dubhe	193°38.9	61°36.0
Denebola	182°23.3	14°25.1
Gienah	175°42.0	-17°41.5
Acrux	172°58.3	-63°14.7
Gacrux	171°49.9	-57°15.6
Alioth	166°11.7	55°48.5
Spica	158°20.7	-11°18.1
Alkaid	152°51.0	49°10.4
Hadar	148°34.0	-60°30.0
Menkent	147°55.9	-36°30.0
Arcturus	145°46.7	19°02.4
Rigil Kent.	139°38.5	-60°56.6
Kochab	137°20.7	74°02.3
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.2	-26°29.4
Atria	107°07.5	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.1
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°39.0
Deneb	49°25.1	45°22.8
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°50.0
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.7	28°14.0
Markab	13°28.4	15°21.2

Dec 21 Mon	SHA	Mer.pass
Venus	138°28.0	08:48
Mars	199°14.8	04:44
Jupiter	210°33.2	03:59
Saturn	351°38.7	18:32

Dec 22 Tue	SHA	Mer.pass
Venus	137°34.2	08:47
Mars	199°01.7	04:41
Jupiter	210°34.7	03:55
Saturn	351°37.7	18:28

Dec 23 Wed	SHA	Mer.pass
Venus	136°39.8	08:47
Mars	198°49.0	04:38
Jupiter	210°36.4	03:51
Saturn	351°36.7	18:24

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°32.7	S23°26.1	47°21.0	6.5′	N21°33.9	10.9′	59.7′
1	195°32.4	26.1	61°46.5	6.3′	21°44.8	10.8′	59.7′
2	210°32.1	26.1	76°11.8	6.2′	21°55.6	10.7′	59.7′
3	225°31.8	·· 26.1	90°37.0	6.0′	22°06.3	10.5′	59.8′
4	240°31.5	26.1	105°02.0	5.9′	22°16.8	10.4′	59.8′
5	255°31.2	26.1	119°26.9	5.8′	22°27.2	10.3′	59.9′
6	270°30.9	S23°26.2	133°51.7	5.6′	N22°37.5	10.1′	59.9′
7	285°30.6	26.2	148°16.3	5.5′	22°47.6	10.0′	59.9′
8	300°30.3	26.2	162°40.8	5.3′	22°57.6	9.8′	60.0′
9	315°30.0	·· 26.2	177°05.1	5.2′	23°07.4	9.7′	60.0′
10	330°29.7	26.2	191°29.3	5.1′	23°17.1	9.6′	60.0′
11	345°29.3	26.2	205°53.4	4.9′	23°26.7	9.4′	60.1′
12	0°29.0	S23°26.2	220°17.3	4.8′	N23°36.1	9.3′	60.1′
13	15°28.7	26.2	234°41.1	4.6′	23°45.4	9.1′	60.1′
14	30°28.4	26.2	249°04.7	4.5′	23°54.5	9.0′	60.2′
15	45°28.1	·· 26.2	263°28.2	4.4′	24°03.5	8.8′	60.2′
16	60°27.8	26.2	277°51.6	4.2′	24°12.3	8.7′	60.2′
17	75°27.5	26.2	292°14.8	4.1′	24°21.0	8.5′	60.3′
18	90°27.2	S23°26.2	306°37.9	4.0′	N24°29.5	8.3′	60.3′
19	105°26.9	26.2	321°00.9	3.8′	24°37.8	8.2′	60.3′
20	120°26.6	26.2	335°23.7	3.7′	24°46.0	8.0′	60.4′
21	135°26.2	·· 26.2	349°46.4	3.6′	24°54.0	7.8′	60.4′
22	150°25.9	26.2	4°09.0	3.4′	25°01.8	7.7′	60.4′
23	165°25.6	26.2	18°31.4	3.3′	25°09.5	7.5′	60.5′
	SD = 16.3′	d = 0.0′	SD = 16.3′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°25.3	S23°26.2	32°53.7	3.2′	N25°17.0	7.3′	60.5′
1	195°25.0	26.2	47°15.9	3.1′	25°24.3	7.2′	60.5′
2	210°24.7	26.2	61°38.0	2.9′	25°31.5	6.9′	60.5′
3	225°24.4	·· 26.2	76°00.0	2.8′	25°38.4	6.8′	60.6′
4	240°24.1	26.2	90°21.8	2.7′	25°45.2	6.6′	60.6′
5	255°23.8	26.2	104°43.5	2.6′	25°51.8	6.5′	60.6′
6	270°23.5	S23°26.2	119°05.1	2.5′	N25°58.3	6.2′	60.7′
7	285°23.1	26.2	133°26.6	2.4′	26°04.5	6.1′	60.7′
8	300°22.8	26.2	147°47.9	2.3′	26°10.6	5.8′	60.7′
9	315°22.5	·· 26.2	162°09.2	2.2′	26°16.4	5.7′	60.7′
10	330°22.2	26.2	176°30.4	2.1′	26°22.1	5.5′	60.8′
11	345°21.9	26.2	190°51.4	2.0′	26°27.6	5.3′	60.8′
12	0°21.6	S23°26.2	205°12.4	1.9′	N26°32.9	5.0′	60.8′
13	15°21.3	26.1	219°33.2	1.8′	26°37.9	4.9′	60.8′
14	30°21.0	26.1	233°54.0	1.7′	26°42.8	4.7′	60.9′
15	45°20.7	·· 26.1	248°14.6	1.6′	26°47.5	4.5′	60.9′
16	60°20.4	26.1	262°35.2	1.5′	26°52.0	4.3′	60.9′
17	75°20.1	26.1	276°55.7	1.4′	26°56.3	4.1′	60.9′
18	90°19.7	S23°26.1	291°16.1	1.3′	N27°00.4	3.8′	61.0′
19	105°19.4	26.0	305°36.4	1.2′	27°04.2	3.7′	61.0′
20	120°19.1	26.0	319°56.6	1.2′	27°07.9	3.4′	61.0′
21	135°18.8	·· 26.0	334°16.8	1.1′	27°11.3	3.3′	61.0′
22	150°18.5	26.0	348°36.9	1.0′	27°14.6	3.0′	61.0′
23	165°18.2	26.0	2°56.9	1.0′	27°17.6	2.8′	61.1′
	SD = 16.3′	d = 0.0′	SD = 16.5′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	180°17.9	S23°25.9	17°16.9	0.9′	N27°20.4	2.7′	61.1′
1	195°17.6	25.9	31°36.7	0.8′	27°23.1	2.3′	61.1′
2	210°17.3	25.9	45°56.6	0.8′	27°25.4	2.2′	61.1′
3	225°17.0	·· 25.9	60°16.4	0.7′	27°27.6	2.0′	61.1′
4	240°16.6	25.8	74°36.1	0.7′	27°29.6	1.7′	61.2′
5	255°16.3	25.8	88°55.7	0.6′	27°31.3	1.6′	61.2′
6	270°16.0	S23°25.8	103°15.4	0.6′	N27°32.9	1.3′	61.2′
7	285°15.7	25.8	117°35.0	0.5′	27°34.2	1.1′	61.2′
8	300°15.4	25.7	131°54.5	0.5′	27°35.3	0.8′	61.2′
9	315°15.1	·· 25.7	146°14.0	0.5′	27°36.1	0.7′	61.2′
10	330°14.8	25.7	160°33.5	0.5′	27°36.8	0.4′	61.2′
11	345°14.5	25.7	174°53.0	0.4′	27°37.2	0.2′	61.3′
12	0°14.2	S23°25.6	189°12.4	0.4′	N27°37.4	0.0′	61.3′
13	15°13.9	25.6	203°31.8	0.4′	27°37.4	0.2′	61.3′
14	30°13.5	25.6	217°51.2	0.4′	27°37.2	0.5′	61.3′
15	45°13.2	·· 25.5	232°10.6	0.4′	27°36.7	0.7′	61.3′
16	60°12.9	25.5	246°30.0	0.4′	27°36.0	0.9′	61.3′
17	75°12.6	25.4	260°49.3	0.4′	27°35.1	1.1′	61.3′
18	90°12.3	S23°25.4	275°08.7	0.4′	N27°34.0	1.4′	61.3′
19	105°12.0	25.4	289°28.1	0.4′	27°32.6	1.5′	61.3′
20	120°11.7	25.3	303°47.5	0.4′	27°31.1	1.8′	61.4′
21	135°11.4	·· 25.3	318°06.9	0.4′	27°29.3	2.0′	61.4′
22	150°11.1	25.3	332°26.3	0.4′	27°27.3	2.3′	61.4′
23	165°10.8	25.2	346°45.7	0.4′	27°25.0	2.4′	61.4′
	SD = 16.3′	d = 0.0′	SD = 16.7′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:26	10:58	▬	▬	12:59	15:31
N 70°	08:06	09:55	▬	▬	14:02	15:51
68°	07:50	09:20	▬	▬	14:38	16:07
66°	07:37	08:54	10:35	13:22	15:03	16:20
64°	07:26	08:34	09:53	14:05	15:23	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:08	08:05	09:02	14:55	15:52	16:49
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:53	07:43	08:30	15:27	16:14	17:04
54°	06:47	07:34	08:17	15:40	16:24	17:10
52°	06:42	07:25	08:06	15:51	16:32	17:16
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:24	07:02	07:36	16:22	16:55	17:33
N 40°	06:14	06:48	07:19	16:38	17:09	17:43
35°	06:05	06:36	07:05	16:53	17:21	17:53
30°	05:56	06:26	06:52	17:05	17:31	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:49	06:12	17:45	18:08	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
S 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:54	05:18	18:39	19:03	19:33
30°	03:55	04:29	04:56	19:01	19:28	20:02
35°	03:37	04:13	04:43	19:14	19:44	20:21
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:43	03:32	04:10	19:47	20:25	21:14
S 50°	01:57	03:03	03:47	20:10	20:54	22:00
52°	01:29	02:47	03:36	20:21	21:10	22:28
54°	00:42	02:29	03:24	20:33	21:28	23:15
56°	////	02:07	03:10	20:47	21:50	////
58°	////	01:37	02:53	21:04	22:20	////
S 60°	////	00:46	02:32	21:25	23:11	////

Lat.	**Moonrise** Mon	Tue	Wed	**Moonset** Mon	Tue	Wed
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	10:19	▭	▭	07:51	▭	▭
64°	11:09	▭	▭	07:02	▭	▭
62°	11:40	11:44	12:13	06:31	08:38	10:29
60°	12:04	12:23	13:10	06:08	07:59	09:33
N 58°	12:24	12:50	13:43	05:49	07:32	09:00
56°	12:40	13:12	14:08	05:34	07:11	08:35
54°	12:53	13:30	14:28	05:21	06:54	08:15
52°	13:06	13:45	14:44	05:09	06:39	07:58
50°	13:16	13:58	14:59	04:59	06:26	07:44
45°	13:39	14:26	15:28	04:38	05:59	07:15
N 40°	13:57	14:47	15:51	04:20	05:38	06:52
35°	14:13	15:05	16:10	04:06	05:21	06:33
30°	14:26	15:21	16:26	03:53	05:05	06:17
20°	14:49	15:47	16:53	03:32	04:40	05:49
N 10°	15:09	16:10	17:17	03:14	04:18	05:26
0°	15:28	16:32	17:39	02:57	03:58	05:04
S 10°	15:47	16:53	18:01	02:40	03:37	04:42
20°	16:07	17:17	18:25	02:22	03:16	04:18
30°	16:31	17:44	18:53	02:01	02:50	03:50
35°	16:45	18:00	19:09	01:49	02:36	03:34
40°	17:01	18:18	19:28	01:35	02:19	03:15
45°	17:21	18:41	19:51	01:18	01:58	02:52
S 50°	17:46	19:10	20:21	00:58	01:33	02:23
52°	17:57	19:24	20:35	00:49	01:20	02:08
54°	18:11	19:40	20:52	00:38	01:06	01:52
56°	18:27	20:00	21:12	00:26	00:50	01:32
58°	18:46	20:25	21:37	00:12	00:30	01:07
S 60°	19:09	20:58	22:11	·· ··	00:06	00:34

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 12-14 87-98%
21	02:11	01:56	11:58	21:43	09:12	
22	01:41	01:26	11:59	22:48	10:15	
23	01:12	00:57	11:59	23:55	11:21	

December 24, 25, 26 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	92°32.4	228°17.0	S13°27.0	291°09.2	N11°07.3	303°10.7	N13°24.8	84°07.9	N00°55.1
1	107°34.8	243°17.2	27.6	306°11.2	07.2	318°13.2	24.8	99°10.3	55.2
2	122°37.3	258°17.4	28.2	321°13.2	07.1	333°15.8	24.9	114°12.7	55.2
3	137°39.8	273°17.5	·· 28.8	336°15.1	·· 06.9	348°18.3	·· 24.9	129°15.1	·· 55.2
4	152°42.2	288°17.7	29.4	351°17.1	06.8	3°20.8	25.0	144°17.5	55.3
5	167°44.7	303°17.8	30.0	6°19.1	06.7	18°23.4	25.0	159°19.9	55.3
6	182°47.2	318°18.0	S13°30.6	21°21.1	N11°06.6	33°25.9	N13°25.1	174°22.3	N00°55.3
7	197°49.6	333°18.1	31.2	36°23.0	06.5	48°28.5	25.1	189°24.8	55.4
8	212°52.1	348°18.2	31.7	51°25.0	06.4	63°31.0	25.1	204°27.2	55.4
9	227°54.6	3°18.4	·· 32.3	66°27.0	·· 06.3	78°33.6	·· 25.2	219°29.6	·· 55.4
10	242°57.0	18°18.5	32.9	81°29.0	06.2	93°36.1	25.2	234°32.0	55.5
11	257°59.5	33°18.7	33.5	96°31.0	06.1	108°38.7	25.3	249°34.4	55.5
12	273°01.9	48°18.8	S13°34.1	111°32.9	N11°06.0	123°41.2	N13°25.3	264°36.8	N00°55.5
13	288°04.4	63°19.0	34.7	126°34.9	05.9	138°43.8	25.3	279°39.2	55.6
14	303°06.9	78°19.1	35.3	141°36.9	05.8	153°46.3	25.4	294°41.6	55.6
15	318°09.3	93°19.2	·· 35.9	156°38.9	·· 05.7	168°48.9	·· 25.4	309°44.1	·· 55.6
16	333°11.8	108°19.4	36.5	171°40.9	05.6	183°51.4	25.5	324°46.5	55.7
17	348°14.3	123°19.5	37.1	186°42.8	05.5	198°54.0	25.5	339°48.9	55.7
18	3°16.7	138°19.6	S13°37.7	201°44.8	N11°05.4	213°56.6	N13°25.5	354°51.3	N00°55.7
19	18°19.2	153°19.8	38.3	216°46.8	05.3	228°59.1	25.6	9°53.7	55.8
20	33°21.7	168°19.9	38.9	231°48.8	05.2	244°01.7	25.6	24°56.1	55.8
21	48°24.1	183°20.0	·· 39.4	246°50.8	·· 05.1	259°04.2	·· 25.7	39°58.5	·· 55.8
22	63°26.6	198°20.2	40.0	261°52.8	05.0	274°06.8	25.7	55°00.9	55.9
23	78°29.1	213°20.3	40.6	276°54.8	04.9	289°09.3	25.8	70°03.3	55.9
Mer.pass. 17:47		ν 0.2′	d 0.6′	m -4.67	ν 2.0′	d 0.1′	m 0.03	ν 2.5′	d 0.0′ m -2.36	ν 2.4′	d 0.0′ m 0.70

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	93°31.5	228°20.4	S13°41.2	291°56.8	N11°04.8	304°11.9	N13°25.8	85°05.8	N00°55.9
1	108°34.0	243°20.6	41.8	306°58.8	04.7	319°14.4	25.8	100°08.2	56.0
2	123°36.4	258°20.7	42.4	322°00.7	04.6	334°17.0	25.9	115°10.6	56.0
3	138°38.9	273°20.8	·· 43.0	337°02.7	·· 04.5	349°19.5	·· 25.9	130°13.0	·· 56.0
4	153°41.4	288°20.9	43.6	352°04.7	04.4	4°22.1	26.0	145°15.4	56.1
5	168°43.8	303°21.1	44.2	7°06.7	04.3	19°24.6	26.0	160°17.8	56.1
6	183°46.3	318°21.2	S13°44.8	22°08.7	N11°04.2	34°27.2	N13°26.1	175°20.2	N00°56.2
7	198°48.8	333°21.3	45.4	37°10.7	04.1	49°29.8	26.1	190°22.6	56.2
8	213°51.2	348°21.4	46.0	52°12.7	04.0	64°32.3	26.1	205°25.0	56.2
9	228°53.7	3°21.5	·· 46.6	67°14.7	·· 03.9	79°34.9	·· 26.2	220°27.4	·· 56.3
10	243°56.2	18°21.6	47.2	82°16.7	03.8	94°37.4	26.2	235°29.8	56.3
11	258°58.6	33°21.8	47.8	97°18.7	03.7	109°40.0	26.3	250°32.2	56.3
12	274°01.1	48°21.9	S13°48.4	112°20.7	N11°03.6	124°42.5	N13°26.3	265°34.7	N00°56.4
13	289°03.6	63°22.0	49.0	127°22.7	03.5	139°45.1	26.4	280°37.1	56.4
14	304°06.0	78°22.1	49.5	142°24.7	03.4	154°47.7	26.4	295°39.5	56.4
15	319°08.5	93°22.2	·· 50.1	157°26.7	·· 03.3	169°50.2	·· 26.5	310°41.9	·· 56.5
16	334°10.9	108°22.3	50.7	172°28.8	03.2	184°52.8	26.5	325°44.3	56.5
17	349°13.4	123°22.4	51.3	187°30.8	03.1	199°55.3	26.5	340°46.7	56.5
18	4°15.9	138°22.5	S13°51.9	202°32.8	N11°03.0	214°57.9	N13°26.6	355°49.1	N00°56.6
19	19°18.3	153°22.6	52.5	217°34.8	02.9	230°00.5	26.6	10°51.5	56.6
20	34°20.8	168°22.8	53.1	232°36.8	02.8	245°03.0	26.7	25°53.9	56.7
21	49°23.3	183°22.9	·· 53.7	247°38.8	·· 02.8	260°05.6	·· 26.7	40°56.3	·· 56.7
22	64°25.7	198°23.0	54.3	262°40.8	02.7	275°08.1	26.8	55°58.7	56.7
23	79°28.2	213°23.1	54.9	277°42.8	02.6	290°10.7	26.8	71°01.1	56.8
Mer.pass. 17:43		ν 0.1′	d 0.6′	m -4.66	ν 2.0′	d 0.1′	m 0.01	ν 2.6′	d 0.0′ m -2.36	ν 2.4′	d 0.0′ m 0.71

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	94°30.7	228°23.2	S13°55.5	292°44.8	N11°02.5	305°13.3	N13°26.9	86°03.5	N00°56.8
1	109°33.1	243°23.3	56.1	307°46.9	02.4	320°15.8	26.9	101°05.9	56.8
2	124°35.6	258°23.4	56.7	322°48.9	02.3	335°18.4	27.0	116°08.3	56.9
3	139°38.0	273°23.5	·· 57.3	337°50.9	·· 02.2	350°21.0	·· 27.0	131°10.8	·· 56.9
4	154°40.5	288°23.6	57.9	352°52.9	02.1	5°23.5	27.0	146°13.2	56.9
5	169°43.0	303°23.7	58.5	7°54.9	02.0	20°26.1	27.1	161°15.6	57.0
6	184°45.4	318°23.8	S13°59.1	22°56.9	N11°01.9	35°28.6	N13°27.1	176°18.0	N00°57.0
7	199°47.9	333°23.8	13°59.7	37°59.0	01.9	50°31.2	27.2	191°20.4	57.1
8	214°50.4	348°23.9	14°00.3	53°01.0	01.8	65°33.8	27.2	206°22.8	57.1
9	229°52.8	3°24.0	·· 00.9	68°03.0	·· 01.7	80°36.3	·· 27.3	221°25.2	·· 57.1
10	244°55.3	18°24.1	01.5	83°05.0	01.6	95°38.9	27.3	236°27.6	57.2
11	259°57.8	33°24.2	02.1	98°07.1	01.5	110°41.5	27.4	251°30.0	57.2
12	275°00.2	48°24.3	S14°02.7	113°09.1	N11°01.4	125°44.0	N13°27.4	266°32.4	N00°57.2
13	290°02.7	63°24.4	03.3	128°11.1	01.3	140°46.6	27.5	281°34.8	57.3
14	305°05.2	78°24.5	03.9	143°13.1	01.3	155°49.2	27.5	296°37.2	57.3
15	320°07.6	93°24.6	·· 04.5	158°15.2	·· 01.2	170°51.7	·· 27.6	311°39.6	·· 57.4
16	335°10.1	108°24.6	05.1	173°17.2	01.1	185°54.3	27.6	326°42.0	57.4
17	350°12.5	123°24.7	05.7	188°19.2	01.0	200°56.9	27.7	341°44.4	57.4
18	5°15.0	138°24.8	S14°06.3	203°21.3	N11°00.9	215°59.4	N13°27.7	356°46.8	N00°57.5
19	20°17.5	153°24.9	06.9	218°23.3	00.8	231°02.0	27.7	11°49.2	57.5
20	35°19.9	168°25.0	07.5	233°25.3	00.8	246°04.6	27.8	26°51.6	57.5
21	50°22.4	183°25.0	·· 08.1	248°27.4	·· 00.7	261°07.1	·· 27.8	41°54.0	·· 57.6
22	65°24.9	198°25.1	08.7	263°29.4	00.6	276°09.7	27.9	56°56.4	57.6
23	80°27.3	213°25.2	09.3	278°31.4	00.5	291°12.3	27.9	71°58.8	57.7
Mer.pass. 17:39		ν 0.1′	d 0.6′	m -4.65	ν 2.0′	d 0.1′	m -0.01	ν 2.6′	d 0.0′ m -2.37	ν 2.4′	d 0.0′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.1	56°41.5
Diphda	348°45.6	-17°50.4
Achernar	335°18.8	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°48.0	89°22.9
Acamar	315°10.3	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.2
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.6
Sirius	258°24.5	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.8	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°13.5	-59°35.6
Suhail	222°44.8	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°45.9	-8°46.6
Regulus	207°32.5	11°50.0
Dubhe	193°38.9	61°36.0
Denebola	182°23.3	14°25.1
Gienah	175°41.9	-17°41.5
Acrux	172°58.3	-63°14.7
Gacrux	171°49.9	-57°15.6
Alioth	166°11.7	55°48.4
Spica	158°20.7	-11°18.1
Alkaid	152°51.0	49°10.4
Hadar	148°34.0	-60°30.0
Menkent	147°55.9	-36°30.0
Arcturus	145°46.6	19°02.4
Rigil Kent.	139°38.4	-60°56.6
Kochab	137°20.7	74°02.3
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.7	26°37.3
Antares	112°14.2	-26°29.4
Atria	107°07.5	-69°04.4
Sabik	102°01.3	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.1
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°39.0
Deneb	49°25.1	45°22.8
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°50.0
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.7	28°14.0
Markab	13°28.4	15°21.2

Dec 24 Thu	SHA	Mer.pass
Venus	135°44.7	08:47
Mars	198°36.9	04:35
Jupiter	210°38.3	03:47
Saturn	351°35.5	18:21

Dec 25 Fri	SHA	Mer.pass
Venus	134°48.9	08:47
Mars	198°25.2	04:32
Jupiter	210°40.4	03:43
Saturn	351°34.2	18:17

Dec 26 Sat	SHA	Mer.pass
Venus	133°52.5	08:46
Mars	198°14.2	04:28
Jupiter	210°42.6	03:38
Saturn	351°32.9	18:13

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h — Sun — Moon

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°10.5	S23°25.2	1°05.1	0.5′	N27°22.6	2.7′	61.4′
1	195°10.1	25.1	15°24.6	0.5′	27°19.9	2.9′	61.4′
2	210°09.8	25.1	29°44.1	0.5′	27°17.0	3.1′	61.4′
3	225°09.5	·· 25.0	44°03.7	0.6′	27°13.9	3.4′	61.4′
4	240°09.2	25.0	58°23.2	0.6′	27°10.5	3.5′	61.4′
5	255°08.9	25.0	72°42.9	0.7′	27°07.0	3.8′	61.4′
6	270°08.6	S23°24.9	87°02.5	0.7′	N27°03.2	4.0′	61.4′
7	285°08.3	24.9	101°22.2	0.8′	26°59.2	4.2′	61.4′
8	300°08.0	24.8	115°42.0	0.8′	26°55.0	4.4′	61.4′
9	315°07.7	·· 24.8	130°01.8	0.9′	26°50.6	4.6′	61.4′
10	330°07.4	24.7	144°21.7	0.9′	26°46.0	4.9′	61.4′
11	345°07.0	24.7	158°41.6	1.0′	26°41.1	5.0′	61.4′
12	0°06.7	S23°24.6	173°01.6	1.1′	N26°36.1	5.3′	61.4′
13	15°06.4	24.6	187°21.7	1.1′	26°30.8	5.4′	61.4′
14	30°06.1	24.5	201°41.8	1.2′	26°25.4	5.7′	61.4′
15	45°05.8	·· 24.5	216°02.0	1.3′	26°19.7	5.9′	61.4′
16	60°05.5	24.4	230°22.3	1.4′	26°13.8	6.1′	61.4′
17	75°05.2	24.3	244°42.6	1.4′	26°07.7	6.3′	61.4′
18	90°04.9	S23°24.3	259°03.1	1.5′	N26°01.4	6.5′	61.4′
19	105°04.6	24.2	273°23.6	1.6′	25°54.9	6.7′	61.4′
20	120°04.3	24.2	287°44.2	1.7′	25°48.2	6.8′	61.4′
21	135°04.0	·· 24.1	302°04.9	1.8′	25°41.4	7.1′	61.4′
22	150°03.6	24.1	316°25.7	1.9′	25°34.3	7.3′	61.3′
23	165°03.3	24.0	330°46.6	2.0′	25°27.0	7.5′	61.3′
	SD = 16.3′	d = 0.0′		SD = 16.7′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°03.0	S23°23.9	345°07.6	2.1′	N25°19.5	7.6′	61.3′
1	195°02.7	23.9	359°28.7	2.2′	25°11.9	7.9′	61.3′
2	210°02.4	23.8	13°49.9	2.3′	25°04.0	8.0′	61.3′
3	225°02.1	·· 23.8	28°11.2	2.4′	24°56.0	8.3′	61.3′
4	240°01.8	23.7	42°32.6	2.5′	24°47.7	8.4′	61.3′
5	255°01.5	23.6	56°54.1	2.6′	24°39.3	8.5′	61.3′
6	270°01.2	S23°23.6	71°15.8	2.7′	N24°30.8	8.8′	61.3′
7	285°00.9	23.5	85°37.5	2.9′	24°22.0	9.0′	61.3′
8	300°00.6	23.4	99°59.4	3.0′	24°13.0	9.1′	61.2′
9	315°00.2	·· 23.4	114°21.3	3.1′	24°03.9	9.3′	61.2′
10	329°59.9	23.3	128°43.4	3.2′	23°54.6	9.4′	61.2′
11	344°59.6	23.2	143°05.6	3.3′	23°45.2	9.7′	61.2′
12	359°59.3	S23°23.1	157°28.0	3.4′	N23°35.5	9.7′	61.2′
13	14°59.0	23.1	171°50.4	3.6′	23°25.8	10.0′	61.2′
14	29°58.7	23.0	186°13.0	3.7′	23°15.8	10.1′	61.1′
15	44°58.4	·· 22.9	200°35.7	3.8′	23°05.7	10.3′	61.1′
16	59°58.1	22.9	214°58.5	3.9′	22°55.4	10.4′	61.1′
17	74°57.8	22.8	229°21.5	4.1′	22°45.0	10.6′	61.1′
18	89°57.5	S23°22.7	243°44.5	4.2′	N22°34.4	10.8′	61.1′
19	104°57.2	22.6	258°07.7	4.3′	22°23.6	10.9′	61.1′
20	119°56.9	22.6	272°31.1	4.5′	22°12.7	11.0′	61.0′
21	134°56.5	·· 22.5	286°54.5	4.6′	22°01.7	11.2′	61.0′
22	149°56.2	22.4	301°18.1	4.7′	21°50.5	11.3′	61.0′
23	164°55.9	22.3	315°41.9	4.9′	21°39.2	11.5′	61.0′
	SD = 16.3′	d = 0.1′		SD = 16.7′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.6	S23°22.2	330°05.7	5.0′	N21°27.7	11.6′	61.0′
1	194°55.3	22.2	344°29.7	5.1′	21°16.1	11.8′	60.9′
2	209°55.0	22.1	358°53.8	5.3′	21°04.3	11.8′	60.9′
3	224°54.7	·· 22.0	13°18.1	5.4′	20°52.5	12.1′	60.9′
4	239°54.4	21.9	27°42.5	5.5′	20°40.4	12.1′	60.9′
5	254°54.1	21.8	42°07.0	5.7′	20°28.3	12.3′	60.8′
6	269°53.8	S23°21.7	56°31.7	5.8′	N20°16.0	12.4′	60.8′
7	284°53.5	21.7	70°56.4	5.9′	20°03.6	12.5′	60.8′
8	299°53.2	21.6	85°21.4	6.1′	19°51.1	12.6′	60.8′
9	314°52.9	·· 21.5	99°46.4	6.2′	19°38.5	12.7′	60.7′
10	329°52.5	21.4	114°11.6	6.3′	19°25.8	12.9′	60.7′
11	344°52.2	21.3	128°36.9	6.5′	19°12.9	13.0′	60.7′
12	359°51.9	S23°21.2	143°02.4	6.6′	N18°59.9	13.1′	60.7′
13	14°51.6	21.1	157°28.0	6.7′	18°46.8	13.2′	60.6′
14	29°51.3	21.0	171°53.7	6.9′	18°33.6	13.3′	60.6′
15	44°51.0	·· 20.9	186°19.5	7.0′	18°20.3	13.4′	60.6′
16	59°50.7	20.8	200°45.5	7.1′	18°06.9	13.5′	60.5′
17	74°50.4	20.7	215°11.6	7.2′	17°53.4	13.6′	60.5′
18	89°50.1	S23°20.6	229°37.9	7.4′	N17°39.8	13.6′	60.5′
19	104°49.8	20.6	244°04.3	7.5′	17°26.2	13.8′	60.5′
20	119°49.5	20.5	258°30.8	7.6′	17°12.4	13.9′	60.4′
21	134°49.2	·· 20.4	272°57.4	7.8′	16°58.5	14.0′	60.4′
22	149°48.9	20.3	287°24.2	7.9′	16°44.5	14.0′	60.4′
23	164°48.5	20.2	301°51.0	8.0′	16°30.5	14.2′	60.3′
	SD = 16.3′	d = 0.1′		SD = 16.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:27	10:57	▬	▬	13:03	15:33
N 70°	08:07	09:55	▬	▬	14:05	15:53
68°	07:51	09:20	▬	▬	14:40	16:09
66°	07:38	08:55	10:35	13:25	15:05	16:22
64°	07:27	08:35	09:53	14:07	15:25	16:33
62°	07:17	08:19	09:25	14:35	15:41	16:43
60°	07:09	08:06	09:03	14:57	15:54	16:51
N 58°	07:01	07:54	08:46	15:14	16:06	16:59
56°	06:55	07:44	08:31	15:29	16:16	17:06
54°	06:48	07:35	08:19	15:42	16:25	17:12
52°	06:43	07:27	08:07	15:53	16:34	17:17
50°	06:37	07:19	07:58	16:03	16:41	17:23
45°	06:26	07:03	07:37	16:23	16:57	17:34
N 40°	06:15	06:49	07:20	16:40	17:11	17:45
35°	06:06	06:38	07:06	16:54	17:22	17:54
30°	05:57	06:27	06:53	17:07	17:33	18:03
20°	05:41	06:08	06:32	17:28	17:52	18:19
N 10°	05:25	05:51	06:14	17:46	18:09	18:36
0°	05:08	05:34	05:56	18:04	18:26	18:53
S 10°	04:49	05:16	05:39	18:21	18:44	19:12
20°	04:26	04:55	05:20	18:40	19:05	19:34
30°	03:57	04:30	04:58	19:02	19:30	20:03
35°	03:38	04:15	04:45	19:15	19:45	20:22
40°	03:15	03:57	04:30	19:30	20:03	20:45
45°	02:44	03:34	04:12	19:48	20:26	21:15
S 50°	01:59	03:04	03:49	20:11	20:55	22:01
52°	01:31	02:49	03:38	20:22	21:11	22:29
54°	00:45	02:31	03:26	20:34	21:28	23:14
56°	////	02:09	03:12	20:48	21:51	////
58°	////	01:39	02:55	21:05	22:20	////
S 60°	////	00:49	02:34	21:25	23:10	////

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	16:29	▭	▭	13:01
68°	▭	▭	17:11	▭	▭	12:17
66°	▭	14:49	17:39	▭	12:34	11:48
64°	▭	15:41	18:01	▭	11:41	11:25
62°	14:01	16:13	18:17	11:04	11:08	11:07
60°	14:42	16:37	18:31	10:23	10:44	10:52
N 58°	15:09	16:56	18:43	09:55	10:24	10:39
56°	15:31	17:11	18:54	09:33	10:08	10:28
54°	15:49	17:25	19:03	09:15	09:54	10:18
52°	16:04	17:36	19:11	09:00	09:41	10:09
50°	16:17	17:47	19:18	08:46	09:31	10:01
45°	16:44	18:08	19:33	08:19	09:08	09:44
N 40°	17:05	18:26	19:46	07:57	08:49	09:30
35°	17:23	18:40	19:57	07:39	08:34	09:18
30°	17:38	18:53	20:06	07:23	08:20	09:08
20°	18:04	19:14	20:22	06:56	07:57	08:50
N 10°	18:26	19:33	20:36	06:33	07:37	08:34
0°	18:47	19:50	20:48	06:12	07:17	08:19
S 10°	19:07	20:07	21:01	05:50	06:58	08:03
20°	19:29	20:26	21:15	05:27	06:38	07:47
30°	19:55	20:47	21:30	04:59	06:14	07:28
35°	20:10	20:59	21:39	04:43	05:59	07:17
40°	20:27	21:13	21:50	04:24	05:43	07:04
45°	20:48	21:30	22:01	04:02	05:23	06:49
S 50°	21:13	21:50	22:16	03:33	04:58	06:30
52°	21:26	22:00	22:22	03:18	04:46	06:21
54°	21:40	22:10	22:30	03:02	04:32	06:11
56°	21:57	22:23	22:38	02:42	04:16	06:00
58°	22:17	22:37	22:47	02:17	03:57	05:46
S 60°	22:41	22:53	22:58	01:43	03:33	05:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 15-17 100-94%
24	00:42	00:27	12:00	–:–	12:29	
25	00:12	00:03	12:00	01:02	13:34	
26	00:18	00:32	12:01	02:05	14:34	

December 27, 28, 29 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	95°29.8	228°25.3	S14°09.9	293°33.5	N11°00.4	306°14.8	N13°28.0	87°01.2	N00°57.7
1	110°32.3	243°25.3	10.5	308°35.5	00.4	321°17.4	28.0	102°03.6	57.7
2	125°34.7	258°25.4	11.1	323°37.5	00.3	336°20.0	28.1	117°06.0	57.8
3	140°37.2	273°25.5	·· 11.7	338°39.6	·· 00.2	351°22.6	·· 28.1	132°08.4	·· 57.8
4	155°39.7	288°25.6	12.3	353°41.6	00.1	6°25.1	28.2	147°10.8	57.9
5	170°42.1	303°25.6	12.9	8°43.7	00.0	21°27.7	28.2	162°13.2	57.9
6	185°44.6	318°25.7	S14°13.5	23°45.7	N11°00.0	36°30.3	N13°28.3	177°15.6	N00°57.9
7	200°47.0	333°25.8	14.1	38°47.8	10°59.9	51°32.8	28.3	192°18.0	58.0
8	215°49.5	348°25.8	14.7	53°49.8	59.8	66°35.4	28.4	207°20.4	58.0
9	230°52.0	3°25.9	·· 15.3	68°51.8	·· 59.7	81°38.0	·· 28.4	222°22.8	·· 58.0
10	245°54.4	18°26.0	15.9	83°53.9	59.6	96°40.6	28.5	237°25.2	58.1
11	260°56.9	33°26.0	16.5	98°55.9	59.6	111°43.1	28.5	252°27.6	58.1
12	275°59.4	48°26.1	S14°17.1	113°58.0	N10°59.5	126°45.7	N13°28.6	267°30.0	N00°58.2
13	291°01.8	63°26.2	17.7	129°00.0	59.4	141°48.3	28.6	282°32.4	58.2
14	306°04.3	78°26.2	18.3	144°02.1	59.3	156°50.9	28.7	297°34.8	58.2
15	321°06.8	93°26.3	·· 18.9	159°04.1	·· 59.3	171°53.4	·· 28.7	312°37.2	·· 58.3
16	336°09.2	108°26.3	19.5	174°06.2	59.2	186°56.0	28.8	327°39.6	58.3
17	351°11.7	123°26.4	20.1	189°08.3	59.1	201°58.6	28.8	342°42.0	58.4
18	6°14.2	138°26.4	S14°20.7	204°10.3	N10°59.1	217°01.2	N13°28.9	357°44.4	N00°58.4
19	21°16.6	153°26.5	21.3	219°12.4	59.0	232°03.7	28.9	12°46.8	58.4
20	36°19.1	168°26.6	21.9	234°14.4	58.9	247°06.3	29.0	27°49.2	58.5
21	51°21.5	183°26.6	·· 22.5	249°16.5	·· 58.8	262°08.9	·· 29.0	42°51.6	·· 58.5
22	66°24.0	198°26.7	23.1	264°18.5	58.8	277°11.5	29.1	57°54.0	58.6
23	81°26.5	213°26.7	23.7	279°20.6	58.7	292°14.0	29.1	72°56.4	58.6
Mer.pass. 17:35		ν 0.1′	d 0.6′	m -4.64	ν 2.0′	d 0.1′	m -0.03	ν 2.6′	d 0.0′ m -2.38	ν 2.4′	d 0.0′ m 0.71

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	96°28.9	228°26.8	S14°24.3	294°22.7	N10°58.6	307°16.6	N13°29.2	87°58.8	N00°58.6
1	111°31.4	243°26.8	24.9	309°24.7	58.6	322°19.2	29.2	103°01.2	58.7
2	126°33.9	258°26.9	25.5	324°26.8	58.5	337°21.8	29.3	118°03.6	58.7
3	141°36.3	273°26.9	·· 26.1	339°28.9	·· 58.4	352°24.3	·· 29.3	133°06.0	·· 58.8
4	156°38.8	288°26.9	26.7	354°30.9	58.3	7°26.9	29.4	148°08.4	58.8
5	171°41.3	303°27.0	27.3	9°33.0	58.3	22°29.5	29.4	163°10.8	58.8
6	186°43.7	318°27.0	S14°27.9	24°35.0	N10°58.2	37°32.1	N13°29.5	178°13.2	N00°58.9
7	201°46.2	333°27.1	28.5	39°37.1	58.1	52°34.7	29.5	193°15.6	58.9
8	216°48.6	348°27.1	29.1	54°39.2	58.1	67°37.2	29.6	208°18.0	59.0
9	231°51.1	3°27.2	·· 29.7	69°41.3	·· 58.0	82°39.8	·· 29.6	223°20.4	·· 59.0
10	246°53.6	18°27.2	30.3	84°43.3	57.9	97°42.4	29.7	238°22.8	59.0
11	261°56.0	33°27.2	30.9	99°45.4	57.9	112°45.0	29.7	253°25.2	59.1
12	276°58.5	48°27.3	S14°31.5	114°47.5	N10°57.8	127°47.6	N13°29.8	268°27.6	N00°59.1
13	292°01.0	63°27.3	32.1	129°49.5	57.7	142°50.1	29.8	283°30.0	59.2
14	307°03.4	78°27.3	32.7	144°51.6	57.7	157°52.7	29.9	298°32.4	59.2
15	322°05.9	93°27.4	·· 33.3	159°53.7	·· 57.6	172°55.3	·· 29.9	313°34.8	·· 59.2
16	337°08.4	108°27.4	33.9	174°55.8	57.5	187°57.9	30.0	328°37.2	59.3
17	352°10.8	123°27.4	34.5	189°57.9	57.5	203°00.5	30.1	343°39.6	59.3
18	7°13.3	138°27.5	S14°35.1	204°59.9	N10°57.4	218°03.1	N13°30.1	358°41.9	N00°59.4
19	22°15.8	153°27.5	35.7	220°02.0	57.4	233°05.6	30.2	13°44.3	59.4
20	37°18.2	168°27.5	36.3	235°04.1	57.3	248°08.2	30.2	28°46.7	59.4
21	52°20.7	183°27.6	·· 36.9	250°06.2	·· 57.2	263°10.8	·· 30.3	43°49.1	·· 59.5
22	67°23.1	198°27.6	37.5	265°08.3	57.2	278°13.4	30.3	58°51.5	59.5
23	82°25.6	213°27.6	38.1	280°10.3	57.1	293°16.0	30.4	73°53.9	59.6
Mer.pass. 17:31		ν 0.0′	d 0.6′	m -4.63	ν 2.1′	d 0.1′	m -0.05	ν 2.6′	d 0.1′ m -2.38	ν 2.4′	d 0.0′ m 0.72

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	97°28.1	228°27.6	S14°38.7	295°12.4	N10°57.0	308°18.6	N13°30.4	88°56.3	N00°59.6
1	112°30.5	243°27.7	39.3	310°14.5	57.0	323°21.1	30.5	103°58.7	59.7
2	127°33.0	258°27.7	39.9	325°16.6	56.9	338°23.7	30.5	119°01.1	59.7
3	142°35.5	273°27.7	·· 40.5	340°18.7	·· 56.9	353°26.3	·· 30.6	134°03.5	·· 59.7
4	157°37.9	288°27.7	41.1	355°20.8	56.8	8°28.9	30.6	149°05.9	59.8
5	172°40.4	303°27.7	41.7	10°22.9	56.8	23°31.5	30.7	164°08.3	59.8
6	187°42.9	318°27.8	S14°42.3	25°25.0	N10°56.7	38°34.1	N13°30.7	179°10.7	N00°59.9
7	202°45.3	333°27.8	43.0	40°27.1	56.6	53°36.7	30.8	194°13.1	00°59.9
8	217°47.8	348°27.8	43.6	55°29.2	56.6	68°39.2	30.9	209°15.5	01°00.0
9	232°50.3	3°27.8	·· 44.2	70°31.2	·· 56.5	83°41.8	·· 30.9	224°17.8	·· 00.0
10	247°52.7	18°27.8	44.8	85°33.3	56.5	98°44.4	31.0	239°20.2	00.0
11	262°55.2	33°27.8	45.4	100°35.4	56.4	113°47.0	31.0	254°22.6	00.1
12	277°57.6	48°27.8	S14°46.0	115°37.5	N10°56.4	128°49.6	N13°31.1	269°25.0	N01°00.1
13	293°00.1	63°27.9	46.6	130°39.6	56.3	143°52.2	31.1	284°27.4	00.2
14	308°02.6	78°27.9	47.2	145°41.7	56.2	158°54.8	31.2	299°29.8	00.2
15	323°05.0	93°27.9	·· 47.8	160°43.8	·· 56.2	173°57.4	·· 31.2	314°32.2	·· 00.2
16	338°07.5	108°27.9	48.4	175°45.9	56.1	189°00.0	31.3	329°34.6	00.3
17	353°10.0	123°27.9	49.0	190°48.0	56.1	204°02.5	31.3	344°37.0	00.3
18	8°12.4	138°27.9	S14°49.6	205°50.1	N10°56.0	219°05.1	N13°31.4	359°39.4	N01°00.4
19	23°14.9	153°27.9	50.2	220°52.3	56.0	234°07.7	31.5	14°41.8	00.4
20	38°17.4	168°27.9	50.8	235°54.4	55.9	249°10.3	31.5	29°44.2	00.5
21	53°19.8	183°27.9	·· 51.4	250°56.5	·· 55.9	264°12.9	·· 31.6	44°46.5	·· 00.5
22	68°22.3	198°27.9	52.0	265°58.6	55.8	279°15.5	31.6	59°48.9	00.5
23	83°24.7	213°27.9	52.6	281°00.7	55.8	294°18.1	31.7	74°51.3	00.6
Mer.pass. 17:27		ν 0.0′	d 0.6′	m -4.61	ν 2.1′	d 0.1′	m -0.07	ν 2.6′	d 0.1′ m -2.39	ν 2.4′	d 0.0′ m 0.72

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.5	-42°09.7
Schedar	349°29.1	56°41.5
Diphda	348°45.6	-17°50.4
Achernar	335°18.8	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°49.0	89°22.9
Acamar	315°10.3	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.6
Sirius	258°24.4	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.8	5°09.3
Pollux	243°15.0	27°57.5
Avior	234°13.5	-59°35.6
Suhail	222°44.7	-43°32.4
Miaplacidus	221°37.2	-69°49.5
Alphard	217°45.9	-8°46.6
Regulus	207°32.5	11°50.0
Dubhe	193°38.8	61°36.0
Denebola	182°23.2	14°25.1
Gienah	175°41.9	-17°41.5
Acrux	172°58.2	-63°14.7
Gacrux	171°49.8	-57°15.6
Alioth	166°11.6	55°48.4
Spica	158°20.7	-11°18.1
Alkaid	152°50.9	49°10.4
Hadar	148°33.9	-60°30.0
Menkent	147°55.9	-36°30.0
Arcturus	145°46.6	19°02.3
Rigil Kent.	139°38.4	-60°56.6
Kochab	137°20.6	74°02.3
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.2	-26°29.4
Atria	107°07.4	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.0
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°39.0
Deneb	49°25.1	45°22.8
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°50.0
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.7	28°14.0
Markab	13°28.4	15°21.2

Dec 27 Sun	SHA	Mer.pass
Venus	132°55.5	08:46
Mars	198°03.7	04:25
Jupiter	210°45.0	03:34
Saturn	351°31.4	18:09

Dec 28 Mon	SHA	Mer.pass
Venus	131°57.8	08:46
Mars	197°53.7	04:22
Jupiter	210°47.7	03:30
Saturn	351°29.9	18:05

Dec 29 Tue	SHA	Mer.pass
Venus	130°59.6	08:46
Mars	197°44.4	04:19
Jupiter	210°50.5	03:26
Saturn	351°28.2	18:01

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°48.2	S23°20.1	316°18.1	8.1′	N16°16.3	14.2′	60.3′
1	194°47.9	20.0	330°45.2	8.3′	16°02.1	14.3′	60.3′
2	209°47.6	19.9	345°12.5	8.4′	15°47.8	14.4′	60.2′
3	224°47.3	·· 19.8	359°39.8	8.5′	15°33.4	14.4′	60.2′
4	239°47.0	19.7	14°07.4	8.6′	15°19.0	14.6′	60.2′
5	254°46.7	19.6	28°35.0	8.8′	15°04.4	14.6′	60.1′
6	269°46.4	S23°19.4	43°02.7	8.9′	N14°49.8	14.6′	60.1′
7	284°46.1	19.3	57°30.6	9.0′	14°35.2	14.8′	60.1′
8	299°45.8	19.2	71°58.6	9.1′	14°20.4	14.8′	60.0′
9	314°45.5	·· 19.1	86°26.7	9.2′	14°05.6	14.8′	60.0′
10	329°45.2	19.0	100°54.9	9.3′	13°50.8	14.9′	60.0′
11	344°44.9	18.9	115°23.3	9.5′	13°35.9	15.0′	59.9′
12	359°44.6	S23°18.8	129°51.7	9.6′	N13°20.9	15.1′	59.9′
13	14°44.3	18.7	144°20.3	9.7′	13°05.8	15.1′	59.9′
14	29°43.9	18.6	158°49.0	9.8′	12°50.7	15.1′	59.8′
15	44°43.6	·· 18.5	173°17.7	9.9′	12°35.6	15.2′	59.8′
16	59°43.3	18.4	187°46.6	10.0′	12°20.4	15.2′	59.8′
17	74°43.0	18.2	202°15.7	10.1′	12°05.2	15.3′	59.7′
18	89°42.7	S23°18.1	216°44.8	10.2′	N11°49.9	15.4′	59.7′
19	104°42.4	18.0	231°14.0	10.3′	11°34.5	15.4′	59.6′
20	119°42.1	17.9	245°43.3	10.4′	11°19.1	15.4′	59.6′
21	134°41.8	·· 17.8	260°12.7	10.5′	11°03.7	15.4′	59.6′
22	149°41.5	17.7	274°42.3	10.6′	10°48.3	15.5′	59.5′
23	164°41.2	17.5	289°11.9	10.7′	10°32.8	15.6′	59.5′
	SD = 16.3′	d = 0.1′	SD = 16.4′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°40.9	S23°17.4	303°41.6	10.8′	N10°17.2	15.5′	59.5′
1	194°40.6	17.3	318°11.4	10.9′	10°01.7	15.6′	59.4′
2	209°40.3	17.2	332°41.3	11.0′	09°46.1	15.7′	59.4′
3	224°40.0	·· 17.1	347°11.4	11.1′	09°30.4	15.6′	59.3′
4	239°39.7	16.9	1°41.5	11.2′	09°14.8	15.7′	59.3′
5	254°39.4	16.8	16°11.7	11.3′	08°59.1	15.7′	59.3′
6	269°39.1	S23°16.7	30°42.0	11.4′	N08°43.4	15.8′	59.2′
7	284°38.8	16.6	45°12.3	11.5′	08°27.6	15.7′	59.2′
8	299°38.4	16.4	59°42.8	11.6′	08°11.9	15.8′	59.2′
9	314°38.1	·· 16.3	74°13.4	11.6′	07°56.1	15.8′	59.1′
10	329°37.8	16.2	88°44.0	11.7′	07°40.3	15.8′	59.1′
11	344°37.5	16.1	103°14.7	11.8′	07°24.5	15.9′	59.0′
12	359°37.2	S23°15.9	117°45.5	11.9′	N07°08.6	15.8′	59.0′
13	14°36.9	15.8	132°16.4	12.0′	06°52.8	15.9′	59.0′
14	29°36.6	15.7	146°47.4	12.0′	06°36.9	15.8′	58.9′
15	44°36.3	·· 15.5	161°18.4	12.1′	06°21.1	15.9′	58.9′
16	59°36.0	15.4	175°49.5	12.2′	06°05.2	15.9′	58.8′
17	74°35.7	15.3	190°20.7	12.3′	05°49.3	15.9′	58.8′
18	89°35.4	S23°15.1	204°52.0	12.3′	N05°33.4	15.9′	58.8′
19	104°35.1	15.0	219°23.3	12.4′	05°17.5	15.9′	58.7′
20	119°34.8	14.9	233°54.7	12.5′	05°01.6	15.9′	58.7′
21	134°34.5	·· 14.7	248°26.2	12.5′	04°45.7	15.9′	58.6′
22	149°34.2	14.6	262°57.7	12.6′	04°29.8	15.9′	58.6′
23	164°33.9	14.4	277°29.3	12.7′	04°13.9	15.9′	58.6′
	SD = 16.3′	d = 0.1′	SD = 16.2′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°33.6	S23°14.3	292°01.0	12.7′	N03°58.0	15.9′	58.5′
1	194°33.3	14.2	306°32.7	12.8′	03°42.1	15.9′	58.5′
2	209°33.0	14.0	321°04.5	12.9′	03°26.2	15.9′	58.4′
3	224°32.7	·· 13.9	335°36.4	12.9′	03°10.3	15.9′	58.4′
4	239°32.4	13.7	350°08.3	13.0′	02°54.4	15.9′	58.4′
5	254°32.1	13.6	4°40.3	13.0′	02°38.5	15.8′	58.3′
6	269°31.8	S23°13.5	19°12.3	13.1′	N02°22.7	15.9′	58.3′
7	284°31.4	13.3	33°44.4	13.1′	02°06.8	15.8′	58.3′
8	299°31.1	13.2	48°16.5	13.2′	01°51.0	15.8′	58.2′
9	314°30.8	·· 13.0	62°48.7	13.2′	01°35.2	15.9′	58.2′
10	329°30.5	12.9	77°20.9	13.3′	01°19.3	15.7′	58.1′
11	344°30.2	12.7	91°53.2	13.3′	01°03.6	15.8′	58.1′
12	359°29.9	S23°12.6	106°25.6	13.4′	N00°47.8	15.8′	58.1′
13	14°29.6	12.4	120°57.9	13.4′	00°32.0	15.7′	58.0′
14	29°29.3	12.3	135°30.4	13.5′	00°16.3	15.8′	58.0′
15	44°29.0	·· 12.1	150°02.8	13.5′	N00°00.5	15.7′	57.9′
16	59°28.7	12.0	164°35.3	13.5′	S00°15.2	15.6′	57.9′
17	74°28.4	11.8	179°07.9	13.6′	00°30.8	15.7′	57.9′
18	89°28.1	S23°11.7	193°40.5	13.6′	S00°46.5	15.6′	57.8′
19	104°27.8	11.5	208°13.1	13.7′	01°02.1	15.6′	57.8′
20	119°27.5	11.4	222°45.7	13.7′	01°17.7	15.6′	57.7′
21	134°27.2	·· 11.2	237°18.4	13.7′	01°33.3	15.5′	57.7′
22	149°26.9	11.1	251°51.2	13.8′	01°48.8	15.6′	57.7′
23	164°26.6	10.9	266°23.9	13.8′	02°04.4	15.5′	57.6′
	SD = 16.3′	d = 0.1′	SD = 16.0′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:26	10:53	▬	▬	13:11	15:37
N 70°	08:07	09:54	▬	▬	14:09	15:56
68°	07:51	09:20	▬	▬	14:44	16:12
66°	07:38	08:55	10:33	13:30	15:08	16:25
64°	07:27	08:35	09:52	14:11	15:28	16:36
62°	07:18	08:20	09:25	14:38	15:44	16:45
60°	07:09	08:06	09:03	15:00	15:57	16:54
N 58°	07:02	07:55	08:46	15:17	16:09	17:01
56°	06:55	07:44	08:32	15:32	16:19	17:08
54°	06:49	07:35	08:19	15:44	16:28	17:14
52°	06:44	07:27	08:08	15:55	16:36	17:20
50°	06:38	07:20	07:58	16:05	16:43	17:25
45°	06:27	07:04	07:38	16:25	16:59	17:36
N 40°	06:16	06:50	07:21	16:42	17:13	17:47
35°	06:07	06:39	07:07	16:56	17:24	17:56
30°	05:58	06:28	06:55	17:08	17:35	18:05
20°	05:42	06:10	06:34	17:30	17:54	18:21
N 10°	05:26	05:52	06:15	17:48	18:11	18:37
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	04:50	05:17	05:40	18:23	18:46	19:13
20°	04:28	04:57	05:21	18:42	19:06	19:35
30°	03:59	04:32	05:00	19:03	19:31	20:04
35°	03:40	04:17	04:47	19:16	19:46	20:23
40°	03:17	03:59	04:32	19:31	20:04	20:46
45°	02:47	03:36	04:14	19:49	20:26	21:16
S 50°	02:02	03:07	03:51	20:11	20:56	22:01
52°	01:34	02:52	03:41	20:22	21:11	22:28
54°	00:50	02:34	03:28	20:34	21:28	23:11
56°	////	02:12	03:14	20:48	21:50	////
58°	////	01:43	02:58	21:05	22:19	////
S 60°	////	00:55	02:37	21:25	23:07	////

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	19:02	21:31	23:45	12:24	11:38	11:04
N 70°	19:22	21:38	23:42	12:01	11:28	11:02
68°	19:38	21:44	23:39	11:43	11:20	11:01
66°	19:51	21:48	23:37	11:28	11:13	11:01
64°	20:02	21:52	23:35	11:16	11:07	11:00
62°	20:11	21:55	23:33	11:05	11:02	10:59
60°	20:19	21:58	23:32	10:56	10:58	10:59
N 58°	20:25	22:00	23:30	10:48	10:54	10:58
56°	20:31	22:03	23:29	10:41	10:50	10:58
54°	20:36	22:05	23:28	10:35	10:47	10:57
52°	20:41	22:06	23:27	10:29	10:44	10:57
50°	20:45	22:08	23:26	10:24	10:42	10:57
45°	20:55	22:11	23:25	10:13	10:36	10:56
N 40°	21:02	22:14	23:23	10:03	10:31	10:55
35°	21:09	22:17	23:22	09:55	10:27	10:55
30°	21:15	22:19	23:21	09:48	10:23	10:54
20°	21:24	22:23	23:19	09:36	10:16	10:53
N 10°	21:33	22:26	23:17	09:24	10:10	10:52
0°	21:41	22:30	23:15	09:14	10:05	10:52
S 10°	21:49	22:33	23:14	09:04	09:59	10:51
20°	21:58	22:36	23:12	08:52	09:53	10:50
30°	22:07	22:40	23:10	08:39	09:46	10:49
35°	22:13	22:42	23:09	08:32	09:42	10:48
40°	22:19	22:45	23:08	08:23	09:37	10:48
45°	22:26	22:48	23:07	08:13	09:32	10:47
S 50°	22:35	22:51	23:05	08:00	09:25	10:46
52°	22:39	22:53	23:05	07:54	09:22	10:45
54°	22:44	22:54	23:04	07:48	09:19	10:45
56°	22:48	22:56	23:03	07:40	09:15	10:44
58°	22:54	22:58	23:02	07:32	09:11	10:44
S 60°	23:00	23:01	23:01	07:23	09:06	10:43

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 88-69%
27	00:47	01:02	12:01	03:01	15:28	
28	01:16	01:31	12:02	03:53	16:17	
29	01:46	02:00	12:02	04:41	17:04	



December 30, 31, 01 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	98°27.2	228°27.9	S14°53.2	296°02.8	N10°55.7	309°20.7	N13°31.7	89°53.7	N01°00.6
1	113°29.7	243°27.9	53.8	311°04.9	55.7	324°23.3	31.8	104°56.1	00.7
2	128°32.1	258°27.9	54.4	326°07.0	55.6	339°25.9	31.9	119°58.5	00.7
3	143°34.6	273°27.9	·· 55.0	341°09.1	·· 55.6	354°28.5	·· 31.9	135°00.9	·· 00.8
4	158°37.1	288°27.9	55.6	356°11.2	55.5	9°31.1	32.0	150°03.3	00.8
5	173°39.5	303°27.9	56.2	11°13.4	55.5	24°33.7	32.0	165°05.7	00.9
6	188°42.0	318°27.9	S14°56.8	26°15.5	N10°55.4	39°36.2	N13°32.1	180°08.0	N01°00.9
7	203°44.5	333°27.9	57.4	41°17.6	55.4	54°38.8	32.1	195°10.4	00.9
8	218°46.9	348°27.9	58.0	56°19.7	55.3	69°41.4	32.2	210°12.8	01.0
9	233°49.4	3°27.9	·· 58.6	71°21.8	·· 55.3	84°44.0	·· 32.2	225°15.2	·· 01.0
10	248°51.9	18°27.9	59.2	86°24.0	55.2	99°46.6	32.3	240°17.6	01.1
11	263°54.3	33°27.8	14°59.8	101°26.1	55.2	114°49.2	32.4	255°20.0	01.1
12	278°56.8	48°27.8	S15°00.4	116°28.2	N10°55.2	129°51.8	N13°32.4	270°22.4	N01°01.2
13	293°59.2	63°27.8	01.0	131°30.3	55.1	144°54.4	32.5	285°24.8	01.2
14	309°01.7	78°27.8	01.6	146°32.4	55.1	159°57.0	32.5	300°27.1	01.2
15	324°04.2	93°27.8	·· 02.2	161°34.6	·· 55.0	174°59.6	·· 32.6	315°29.5	·· 01.3
16	339°06.6	108°27.8	02.8	176°36.7	55.0	190°02.2	32.6	330°31.9	01.3
17	354°09.1	123°27.8	03.4	191°38.8	54.9	205°04.8	32.7	345°34.3	01.4
18	9°11.6	138°27.7	S15°04.0	206°41.0	N10°54.9	220°07.4	N13°32.8	0°36.7	N01°01.4
19	24°14.0	153°27.7	04.6	221°43.1	54.9	235°10.0	32.8	15°39.1	01.5
20	39°16.5	168°27.7	05.2	236°45.2	54.8	250°12.6	32.9	30°41.5	01.5
21	54°19.0	183°27.7	·· 05.8	251°47.4	·· 54.8	265°15.2	·· 32.9	45°43.9	·· 01.6
22	69°21.4	198°27.7	06.4	266°49.5	54.7	280°17.8	33.0	60°46.2	01.6
23	84°23.9	213°27.6	07.0	281°51.6	54.7	295°20.4	33.1	75°48.6	01.7
Mer.pass. 17:23		ν -0.0′	d 0.6′	ν 2.1′	d 0.0′	ν 2.6′	d 0.1′	ν 2.4′	d 0.0′
		m -4.60		m -0.10		m -2.40		m 0.72	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	99°26.4	228°27.6	S15°07.6	296°53.8	N10°54.6	310°23.0	N13°33.1	90°51.0	N01°01.7
1	114°28.8	243°27.6	08.2	311°55.9	54.6	325°25.6	33.2	105°53.4	01.7
2	129°31.3	258°27.6	08.8	326°58.0	54.6	340°28.2	33.2	120°55.8	01.8
3	144°33.7	273°27.5	·· 09.4	342°00.2	·· 54.5	355°30.8	·· 33.3	135°58.2	·· 01.8
4	159°36.2	288°27.5	10.0	357°02.3	54.5	10°33.4	33.3	151°00.6	01.9
5	174°38.7	303°27.5	10.6	12°04.4	54.5	25°36.0	33.4	166°02.9	01.9
6	189°41.1	318°27.4	S15°11.2	27°06.6	N10°54.4	40°38.6	N13°33.5	181°05.3	N01°02.0
7	204°43.6	333°27.4	11.8	42°08.7	54.4	55°41.2	33.5	196°07.7	02.0
8	219°46.1	348°27.4	12.4	57°10.9	54.3	70°43.8	33.6	211°10.1	02.1
9	234°48.5	3°27.3	·· 13.0	72°13.0	·· 54.3	85°46.4	·· 33.6	226°12.5	·· 02.1
10	249°51.0	18°27.3	13.6	87°15.2	54.3	100°49.0	33.7	241°14.9	02.1
11	264°53.5	33°27.3	14.2	102°17.3	54.2	115°51.6	33.8	256°17.2	02.2
12	279°55.9	48°27.2	S15°14.8	117°19.5	N10°54.2	130°54.2	N13°33.8	271°19.6	N01°02.2
13	294°58.4	63°27.2	15.4	132°21.6	54.2	145°56.8	33.9	286°22.0	02.3
14	310°00.8	78°27.2	16.0	147°23.8	54.1	160°59.4	33.9	301°24.4	02.3
15	325°03.3	93°27.1	·· 16.6	162°25.9	·· 54.1	176°02.0	·· 34.0	316°26.8	·· 02.4
16	340°05.8	108°27.1	17.2	177°28.1	54.1	191°04.6	34.1	331°29.2	02.4
17	355°08.2	123°27.0	17.8	192°30.2	54.0	206°07.2	34.1	346°31.5	02.5
18	10°10.7	138°27.0	S15°18.4	207°32.4	N10°54.0	221°09.8	N13°34.2	1°33.9	N01°02.5
19	25°13.2	153°27.0	19.0	222°34.5	54.0	236°12.5	34.2	16°36.3	02.6
20	40°15.6	168°26.9	19.6	237°36.7	53.9	251°15.1	34.3	31°38.7	02.6
21	55°18.1	183°26.9	·· 20.2	252°38.8	·· 53.9	266°17.7	·· 34.4	46°41.1	·· 02.7
22	70°20.6	198°26.8	20.8	267°41.0	53.9	281°20.3	34.4	61°43.4	02.7
23	85°23.0	213°26.8	21.4	282°43.2	53.9	296°22.9	34.5	76°45.8	02.8
Mer.pass. 17:19		ν -0.0′	d 0.6′	ν 2.1′	d 0.0′	ν 2.6′	d 0.1′	ν 2.4′	d 0.0′
		m -4.59		m -0.12		m -2.40		m 0.73	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°25.5	228°26.7	S15°22.0	297°45.3	N10°53.8	311°25.5	N13°34.5	91°48.2	N01°02.8
1	115°28.0	243°26.7	22.6	312°47.5	53.8	326°28.1	34.6	106°50.6	02.8
2	130°30.4	258°26.6	23.2	327°49.7	53.8	341°30.7	34.7	121°53.0	02.9
3	145°32.9	273°26.6	·· 23.8	342°51.8	·· 53.7	356°33.3	·· 34.7	136°55.4	·· 02.9
4	160°35.3	288°26.5	24.4	357°54.0	53.7	11°35.9	34.8	151°57.7	03.0
5	175°37.8	303°26.5	25.0	12°56.2	53.7	26°38.5	34.9	167°00.1	03.0
6	190°40.3	318°26.4	S15°25.6	27°58.3	N10°53.7	41°41.1	N13°34.9	182°02.5	N01°03.1
7	205°42.7	333°26.4	26.2	43°00.5	53.6	56°43.7	35.0	197°04.9	03.1
8	220°45.2	348°26.3	26.8	58°02.7	53.6	71°46.4	35.0	212°07.3	03.2
9	235°47.7	3°26.3	·· 27.4	73°04.8	·· 53.6	86°49.0	·· 35.1	227°09.6	·· 03.2
10	250°50.1	18°26.2	28.0	88°07.0	53.6	101°51.6	35.2	242°12.0	03.3
11	265°52.6	33°26.1	28.6	103°09.2	53.5	116°54.2	35.2	257°14.4	03.3
12	280°55.1	48°26.1	S15°29.2	118°11.3	N10°53.5	131°56.8	N13°35.3	272°16.8	N01°03.4
13	295°57.5	63°26.0	29.8	133°13.5	53.5	146°59.4	35.4	287°19.2	03.4
14	311°00.0	78°26.0	30.4	148°15.7	53.5	162°02.0	35.4	302°21.5	03.5
15	326°02.5	93°25.9	·· 31.0	163°17.9	·· 53.5	177°04.6	·· 35.5	317°23.9	·· 03.5
16	341°04.9	108°25.8	31.6	178°20.1	53.4	192°07.2	35.5	332°26.3	03.6
17	356°07.4	123°25.8	32.2	193°22.2	53.4	207°09.9	35.6	347°28.7	03.6
18	11°09.8	138°25.7	S15°32.8	208°24.4	N10°53.4	222°12.5	N13°35.7	2°31.1	N01°03.6
19	26°12.3	153°25.6	33.4	223°26.6	53.4	237°15.1	35.7	17°33.4	03.7
20	41°14.8	168°25.6	34.0	238°28.8	53.3	252°17.7	35.8	32°35.8	03.7
21	56°17.2	183°25.5	·· 34.6	253°31.0	·· 53.3	267°20.3	·· 35.9	47°38.2	·· 03.8
22	71°19.7	198°25.4	35.2	268°33.2	53.3	282°22.9	35.9	62°40.6	03.8
23	86°22.2	213°25.4	35.8	283°35.3	53.3	297°25.5	36.0	77°42.9	03.9
Mer.pass. 17:15		ν -0.0′	d 0.6′	ν 2.2′	d 0.0′	ν 2.6′	d 0.1′	ν 2.4′	d 0.0′
		m -4.58		m -0.14		m -2.41		m 0.73	

Stars

	SHA	Dec
Alpheratz	357°33.1	29°14.6
Ankaa	353°05.6	-42°09.7
Schedar	349°29.1	56°41.5
Diphda	348°45.6	-17°50.4
Achernar	335°18.8	-57°06.2
Hamal	327°49.2	23°35.6
Polaris	312°50.1	89°22.9
Acamar	315°10.3	-40°11.9
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.6
Aldebaran	290°37.4	16°33.8
Rigel	281°02.0	-8°10.3
Capella	280°19.0	46°01.5
Bellatrix	278°20.8	6°22.4
Elnath	277°59.4	28°37.8
Alnilam	275°35.7	-1°11.1
Betelgeuse	270°50.0	7°24.7
Canopus	263°51.1	-52°42.6
Sirius	258°24.4	-16°45.2
Adhara	255°04.2	-29°00.5
Procyon	244°48.8	5°09.3
Pollux	243°14.9	27°57.5
Avior	234°13.5	-59°35.6
Suhail	222°44.7	-43°32.4
Miaplacidus	221°37.1	-69°49.5
Alphard	217°45.9	-8°46.6
Regulus	207°32.5	11°50.0
Dubhe	193°38.8	61°36.0
Denebola	182°23.2	14°25.1
Gienah	175°41.9	-17°41.5
Acrux	172°58.2	-63°14.7
Gacrux	171°49.8	-57°15.6
Alioth	166°11.6	55°48.4
Spica	158°20.6	-11°18.1
Alkaid	152°50.9	49°10.4
Hadar	148°33.9	-60°30.0
Menkent	147°55.8	-36°30.0
Arcturus	145°46.6	19°02.3
Rigil Kent.	139°38.4	-60°56.6
Kochab	137°20.6	74°02.3
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.6	26°37.3
Antares	112°14.1	-26°29.4
Atria	107°07.4	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.6	-37°07.3
Rasalhague	95°57.4	12°32.4
Eltanin	90°42.0	51°29.0
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.6	38°48.5
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.4
Peacock	53°03.7	-56°39.0
Deneb	49°25.1	45°22.7
Enif	33°37.4	10°00.0
Al Na'ir	27°31.2	-46°50.0
Fomalhaut	15°12.9	-29°28.9
Scheat	13°43.8	28°14.0
Markab	13°28.4	15°21.2

Dec 30 Wed	SHA	Mer.pass
Venus	130°00.7	08:46
Mars	197°35.6	04:15
Jupiter	210°53.5	03:22
Saturn	351°26.5	17:58

Dec 31 Thu	SHA	Mer.pass
Venus	129°01.3	08:46
Mars	197°27.4	04:12
Jupiter	210°56.6	03:18
Saturn	351°24.7	17:54

Jan 01 Fri	SHA	Mer.pass
Venus	128°01.2	08:46
Mars	197°19.8	04:08
Jupiter	211°00.0	03:14
Saturn	351°22.7	17:50

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°26.3	S23°10.7	280°56.7	13.8′	S02°19.9	15.4′	57.6′
1	194°26.0	10.6	295°29.5	13.8′	02°35.3	15.4′	57.6′
2	209°25.7	10.4	310°02.4	13.9′	02°50.7	15.4′	57.5′
3	224°25.4	·· 10.3	324°35.2	13.9′	03°06.1	15.4′	57.5′
4	239°25.1	10.1	339°08.1	13.9′	03°21.5	15.3′	57.4′
5	254°24.8	09.9	353°41.1	13.9′	03°36.8	15.3′	57.4′
6	269°24.5	S23°09.8	8°14.0	14.0′	S03°52.1	15.2′	57.4′
7	284°24.2	09.6	22°47.0	14.0′	04°07.3	15.3′	57.3′
8	299°23.9	09.4	37°19.9	14.0′	04°22.6	15.1′	57.3′
9	314°23.6	·· 09.3	51°53.0	14.0′	04°37.7	15.2′	57.3′
10	329°23.3	09.1	66°26.0	14.0′	04°52.9	15.0′	57.2′
11	344°23.0	08.9	80°59.0	14.1′	05°07.9	15.1′	57.2′
12	359°22.7	S23°08.8	95°32.1	14.1′	S05°23.0	15.0′	57.1′
13	14°22.4	08.6	110°05.1	14.1′	05°38.0	15.0′	57.1′
14	29°22.1	08.4	124°38.2	14.1′	05°53.0	14.9′	57.1′
15	44°21.8	·· 08.3	139°11.3	14.1′	06°07.9	14.9′	57.0′
16	59°21.5	08.1	153°44.4	14.1′	06°22.8	14.8′	57.0′
17	74°21.2	07.9	168°17.5	14.1′	06°37.6	14.8′	57.0′
18	89°20.9	S23°07.7	182°50.6	14.1′	S06°52.4	14.7′	56.9′
19	104°20.6	07.6	197°23.7	14.1′	07°07.1	14.7′	56.9′
20	119°20.3	07.4	211°56.9	14.1′	07°21.8	14.6′	56.9′
21	134°20.0	·· 07.2	226°30.0	14.1′	07°36.4	14.6′	56.8′
22	149°19.7	07.0	241°03.1	14.1′	07°51.0	14.5′	56.8′
23	164°19.4	06.9	255°36.3	14.1′	08°05.5	14.5′	56.8′
	SD = 16.3′	d = 0.2′	SD = 15.7′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°19.1	S23°06.7	270°09.4	14.1′	S08°20.0	14.4′	56.7′
1	194°18.8	06.5	284°42.5	14.1′	08°34.4	14.4′	56.7′
2	209°18.5	06.3	299°15.7	14.1′	08°48.8	14.3′	56.6′
3	224°18.2	·· 06.2	313°48.8	14.1′	09°03.1	14.2′	56.6′
4	239°17.9	06.0	328°21.9	14.1′	09°17.3	14.2′	56.6′
5	254°17.6	05.8	342°55.1	14.1′	09°31.5	14.2′	56.5′
6	269°17.3	S23°05.6	357°28.2	14.1′	S09°45.7	14.1′	56.5′
7	284°17.0	05.4	12°01.3	14.1′	09°59.8	14.0′	56.5′
8	299°16.7	05.2	26°34.4	14.1′	10°13.8	14.0′	56.4′
9	314°16.4	·· 05.1	41°07.5	14.1′	10°27.8	13.9′	56.4′
10	329°16.1	04.9	55°40.6	14.1′	10°41.7	13.8′	56.4′
11	344°15.8	04.7	70°13.6	14.1′	10°55.5	13.8′	56.3′
12	359°15.5	S23°04.5	84°46.7	14.0′	S11°09.3	13.7′	56.3′
13	14°15.2	04.3	99°19.7	14.0′	11°23.0	13.7′	56.3′
14	29°14.9	04.1	113°52.8	14.0′	11°36.7	13.5′	56.3′
15	44°14.6	·· 03.9	128°25.8	14.0′	11°50.2	13.6′	56.2′
16	59°14.3	03.7	142°58.8	14.0′	12°03.8	13.4′	56.2′
17	74°14.0	03.6	157°31.8	14.0′	12°17.2	13.4′	56.2′
18	89°13.7	S23°03.4	172°04.7	13.9′	S12°30.6	13.3′	56.1′
19	104°13.4	03.2	186°37.7	13.9′	12°43.9	13.3′	56.1′
20	119°13.1	03.0	201°10.6	13.9′	12°57.2	13.2′	56.1′
21	134°12.8	·· 02.8	215°43.5	13.9′	13°10.4	13.1′	56.0′
22	149°12.5	02.6	230°16.4	13.9′	13°23.5	13.0′	56.0′
23	164°12.2	02.4	244°49.2	13.8′	13°36.5	13.0′	56.0′
	SD = 16.3′	d = 0.2′	SD = 15.5′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	179°11.9	S23°02.2	259°22.1	13.8′	S13°49.5	12.9′	55.9′
1	194°11.6	02.0	273°54.9	13.8′	14°02.4	12.8′	55.9′
2	209°11.3	01.8	288°27.6	13.8′	14°15.2	12.8′	55.9′
3	224°11.1	·· 01.6	303°00.4	13.7′	14°28.0	12.6′	55.9′
4	239°10.8	01.4	317°33.1	13.7′	14°40.6	12.6′	55.8′
5	254°10.5	01.2	332°05.8	13.7′	14°53.2	12.6′	55.8′
6	269°10.2	S23°01.0	346°38.5	13.6′	S15°05.8	12.4′	55.8′
7	284°09.9	00.8	1°11.1	13.6′	15°18.2	12.4′	55.7′
8	299°09.6	00.6	15°43.8	13.6′	15°30.6	12.3′	55.7′
9	314°09.3	·· 00.4	30°16.3	13.5′	15°42.9	12.2′	55.7′
10	329°09.0	00.2	44°48.9	13.5′	15°55.1	12.1′	55.7′
11	344°08.7	23°00.0	59°21.4	13.5′	16°07.2	12.1′	55.6′
12	359°08.4	S22°59.8	73°53.9	13.4′	S16°19.3	11.9′	55.6′
13	14°08.1	59.6	88°26.3	13.4′	16°31.2	11.9′	55.6′
14	29°07.8	59.3	102°58.7	13.4′	16°43.1	11.8′	55.5′
15	44°07.5	·· 59.1	117°31.1	13.3′	16°54.9	11.7′	55.5′
16	59°07.2	58.9	132°03.5	13.3′	17°06.6	11.7′	55.5′
17	74°06.9	58.7	146°35.8	13.3′	17°18.3	11.5′	55.5′
18	89°06.6	S22°58.5	161°08.0	13.2′	S17°29.8	11.5′	55.4′
19	104°06.3	58.3	175°40.3	13.2′	17°41.3	11.3′	55.4′
20	119°06.0	58.1	190°12.5	13.2′	17°52.6	11.3′	55.4′
21	134°05.7	·· 57.9	204°44.6	13.1′	18°03.9	11.2′	55.4′
22	149°05.4	57.7	219°16.7	13.1′	18°15.1	11.1′	55.3′
23	164°05.2	57.4	233°48.8	13.0′	18°26.2	11.0′	55.3′
	SD = 16.3′	d = 0.2′	SD = 15.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	08:25	10:46	▬	▬	13:20	15:41
N 70°	08:06	09:51	▬	▬	14:15	16:01
68°	07:50	09:18	▬	▬	14:48	16:16
66°	07:38	08:54	10:30	13:37	15:13	16:29
64°	07:27	08:35	09:51	14:16	15:32	16:39
62°	07:18	08:19	09:24	14:43	15:47	16:49
60°	07:09	08:06	09:03	15:03	16:00	16:57
N 58°	07:02	07:54	08:46	15:20	16:12	17:04
56°	06:56	07:44	08:31	15:35	16:22	17:11
54°	06:50	07:36	08:19	15:47	16:31	17:17
52°	06:44	07:28	08:08	15:58	16:39	17:22
50°	06:39	07:20	07:59	16:08	16:46	17:27
45°	06:27	07:05	07:38	16:28	17:02	17:39
N 40°	06:17	06:51	07:22	16:44	17:15	17:49
35°	06:08	06:40	07:08	16:58	17:26	17:58
30°	05:59	06:29	06:56	17:10	17:37	18:07
20°	05:43	06:11	06:35	17:31	17:55	18:23
N 10°	05:27	05:54	06:16	17:50	18:12	18:39
0°	05:11	05:37	05:59	18:07	18:29	18:55
S 10°	04:52	05:19	05:42	18:24	18:47	19:14
20°	04:30	04:59	05:23	18:43	19:07	19:36
30°	04:01	04:34	05:01	19:04	19:32	20:05
35°	03:43	04:19	04:49	19:17	19:47	20:23
40°	03:20	04:01	04:34	19:32	20:05	20:46
45°	02:50	03:39	04:16	19:50	20:27	21:16
S 50°	02:05	03:10	03:54	20:12	20:56	22:00
52°	01:39	02:55	03:43	20:22	21:10	22:26
54°	00:57	02:38	03:31	20:34	21:28	23:07
56°	////	02:16	03:17	20:48	21:49	////
58°	////	01:48	03:01	21:04	22:17	////
S 60°	////	01:02	02:41	21:24	23:01	////

Lat.	**Moonrise** Wed	Thu	Fri	**Moonset** Wed	Thu	Fri
N 72°	·· ··	01:59	04:31	10:31	09:53	08:56
N 70°	·· ··	01:44	03:55	10:38	10:10	09:33
68°	·· ··	01:33	03:31	10:44	10:24	09:59
66°	·· ··	01:23	03:12	10:48	10:35	10:20
64°	·· ··	01:15	02:57	10:52	10:45	10:36
62°	·· ··	01:09	02:44	10:56	10:53	10:50
60°	·· ··	01:03	02:34	10:59	11:00	11:01
N 58°	·· ··	00:58	02:24	11:02	11:06	11:11
56°	·· ··	00:53	02:16	11:05	11:12	11:20
54°	·· ··	00:49	02:09	11:07	11:17	11:28
52°	·· ··	00:46	02:03	11:09	11:21	11:35
50°	·· ··	00:42	01:57	11:11	11:25	11:42
45°	·· ··	00:35	01:45	11:15	11:34	11:56
N 40°	·· ··	00:30	01:35	11:18	11:42	12:07
35°	·· ··	00:25	01:26	11:21	11:48	12:17
30°	·· ··	00:20	01:19	11:24	11:54	12:26
20°	·· ··	00:13	01:06	11:29	12:04	12:40
N 10°	·· ··	00:06	00:55	11:33	12:13	12:54
0°	·· ··	00:00	00:44	11:37	12:21	13:06
S 10°	23:54	·· ··	00:34	11:41	12:29	13:18
20°	23:47	·· ··	00:23	11:45	12:38	13:32
30°	23:40	·· ··	00:11	11:49	12:48	13:47
35°	23:36	·· ··	00:03	11:52	12:54	13:56
40°	23:31	23:55	·· ··	11:55	13:01	14:06
45°	23:26	23:46	·· ··	11:59	13:09	14:18
S 50°	23:20	23:35	23:53	12:03	13:18	14:33
52°	23:17	23:30	23:45	12:05	13:23	14:40
54°	23:13	23:24	23:37	12:07	13:28	14:47
56°	23:10	23:18	23:27	12:10	13:33	14:56
58°	23:06	23:10	23:17	12:12	13:39	15:06
S 60°	23:02	23:03	23:05	12:15	13:46	15:17

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 21-23 58-38%
30	02:15	02:29	12:02	05:26	17:48	
31	02:44	02:58	12:03	06:10	18:33	
01	03:12	03:26	12:03	06:55	19:18	



Conversion of Arc to Time

0° - 59°		
°	h	m
0	0	00
1	0	04
2	0	08
3	0	12
4	0	16
5	0	20
6	0	24
7	0	28
8	0	32
9	0	36
10	0	40
11	0	44
12	0	48
13	0	52
14	0	56
15	1	00
16	1	04
17	1	08
18	1	12
19	1	16
20	1	20
21	1	24
22	1	28
23	1	32
24	1	36
25	1	40
26	1	44
27	1	48
28	1	52
29	1	56
30	2	00
31	2	04
32	2	08
33	2	12
34	2	16
35	2	20
36	2	24
37	2	28
38	2	32
39	2	36
40	2	40
41	2	44
42	2	48
43	2	52
44	2	56
45	3	00
46	3	04
47	3	08
48	3	12
49	3	16
50	3	20
51	3	24
52	3	28
53	3	32
54	3	36
55	3	40
56	3	44
57	3	48
58	3	52
59	3	56
60	4	00

60° - 119°		
°	h	m
60	4	00
61	4	04
62	4	08
63	4	12
64	4	16
65	4	20
66	4	24
67	4	28
68	4	32
69	4	36
70	4	40
71	4	44
72	4	48
73	4	52
74	4	56
75	5	00
76	5	04
77	5	08
78	5	12
79	5	16
80	5	20
81	5	24
82	5	28
83	5	32
84	5	36
85	5	40
86	5	44
87	5	48
88	5	52
89	5	56
90	6	00
91	6	04
92	6	08
93	6	12
94	6	16
95	6	20
96	6	24
97	6	28
98	6	32
99	6	36
100	6	40
101	6	44
102	6	48
103	6	52
104	6	56
105	7	00
106	7	04
107	7	08
108	7	12
109	7	16
110	7	20
111	7	24
112	7	28
113	7	32
114	7	36
115	7	40
116	7	44
117	7	48
118	7	52
119	7	56
120	8	00

120° - 179°		
°	h	m
120	8	00
121	8	04
122	8	08
123	8	12
124	8	16
125	8	20
126	8	24
127	8	28
128	8	32
129	8	36
130	8	40
131	8	44
132	8	48
133	8	52
134	8	56
135	9	00
136	9	04
137	9	08
138	9	12
139	9	16
140	9	20
141	9	24
142	9	28
143	9	32
144	9	36
145	9	40
146	9	44
147	9	48
148	9	52
149	9	56
150	10	00
151	10	04
152	10	08
153	10	12
154	10	16
155	10	20
156	10	24
157	10	28
158	10	32
159	10	36
160	10	40
161	10	44
162	10	48
163	10	52
164	10	56
165	11	00
166	11	04
167	11	08
168	11	12
169	11	16
170	11	20
171	11	24
172	11	28
173	11	32
174	11	36
175	11	40
176	11	44
177	11	48
178	11	52
179	11	56
180	12	00

180° - 239°		
°	h	m
180	12	00
181	12	04
182	12	08
183	12	12
184	12	16
185	12	20
186	12	24
187	12	28
188	12	32
189	12	36
190	12	40
191	12	44
192	12	48
193	12	52
194	12	56
195	13	00
196	13	04
197	13	08
198	13	12
199	13	16
200	13	20
201	13	24
202	13	28
203	13	32
204	13	36
205	13	40
206	13	44
207	13	48
208	13	52
209	13	56
210	14	00
211	14	04
212	14	08
213	14	12
214	14	16
215	14	20
216	14	24
217	14	28
218	14	32
219	14	36
220	14	40
221	14	44
222	14	48
223	14	52
224	14	56
225	15	00
226	15	04
227	15	08
228	15	12
229	15	16
230	15	20
231	15	24
232	15	28
233	15	32
234	15	36
235	15	40
236	15	44
237	15	48
238	15	52
239	15	56
240	16	00

240° - 299°		
°	h	m
240	16	00
241	16	04
242	16	08
243	16	12
244	16	16
245	16	20
246	16	24
247	16	28
248	16	32
249	16	36
250	16	40
251	16	44
252	16	48
253	16	52
254	16	56
255	17	00
256	17	04
257	17	08
258	17	12
259	17	16
260	17	20
261	17	24
262	17	28
263	17	32
264	17	36
265	17	40
266	17	44
267	17	48
268	17	52
269	17	56
270	18	00
271	18	04
272	18	08
273	18	12
274	18	16
275	18	20
276	18	24
277	18	28
278	18	32
279	18	36
280	18	40
281	18	44
282	18	48
283	18	52
284	18	56
285	19	00
286	19	04
287	19	08
288	19	12
289	19	16
290	19	20
291	19	24
292	19	28
293	19	32
294	19	36
295	19	40
296	19	44
297	19	48
298	19	52
299	19	56
300	20	00

300° - 360°		
°	h	m
300	20	00
301	20	04
302	20	08
303	20	12
304	20	16
305	20	20
306	20	24
307	20	28
308	20	32
309	20	36
310	20	40
311	20	44
312	20	48
313	20	52
314	20	56
315	21	00
316	21	04
317	21	08
318	21	12
319	21	16
320	21	20
321	21	24
322	21	28
323	21	32
324	21	36
325	21	40
326	21	44
327	21	48
328	21	52
329	21	56
330	22	00
331	22	04
332	22	08
333	22	12
334	22	16
335	22	20
336	22	24
337	22	28
338	22	32
339	22	36
340	22	40
341	22	44
342	22	48
343	22	52
344	22	56
345	23	00
346	23	04
347	23	08
348	23	12
349	23	16
350	23	20
351	23	24
352	23	28
353	23	32
354	23	36
355	23	40
356	23	44
357	23	48
358	23	52
359	23	56
360	24	00

0' - 59'		
'	m	s
0	0	00
1	0	04
2	0	08
3	0	12
4	0	16
5	0	20
6	0	24
7	0	28
8	0	32
9	0	36
10	0	40
11	0	44
12	0	48
13	0	52
14	0	56
15	1	00
16	1	04
17	1	08
18	1	12
19	1	16
20	1	20
21	1	24
22	1	28
23	1	32
24	1	36
25	1	40
26	1	44
27	1	48
28	1	52
29	1	56
30	2	00
31	2	04
32	2	08
33	2	12
34	2	16
35	2	20
36	2	24
37	2	28
38	2	32
39	2	36
40	2	40
41	2	44
42	2	48
43	2	52
44	2	56
45	3	00
46	3	04
47	3	08
48	3	12
49	3	16
50	3	20
51	3	24
52	3	28
53	3	32
54	3	36
55	3	40
56	3	44
57	3	48
58	3	52
59	3	56
60	4	00

0" - 59"	
"	s
0	0.00
1	0.07
2	0.13
3	0.20
4	0.27
5	0.33
6	0.40
7	0.47
8	0.53
9	0.60
10	0.67
11	0.73
12	0.80
13	0.87
14	0.93
15	1.00
16	1.07
17	1.13
18	1.20
19	1.27
20	1.33
21	1.40
22	1.47
23	1.53
24	1.60
25	1.67
26	1.73
27	1.80
28	1.87
29	1.93
30	2.00
31	2.07
32	2.13
33	2.20
34	2.27
35	2.33
36	2.40
37	2.47
38	2.53
39	2.60
40	2.67
41	2.73
42	2.80
43	2.87
44	2.93
45	3.00
46	3.07
47	3.13
48	3.20
49	3.27
50	3.33
51	3.40
52	3.47
53	3.53
54	3.60
55	3.67
56	3.73
57	3.80
58	3.87
59	3.93
60	4.00

h= hours of time **m**= minutes of time **s** = seconds of time **'** = minutes of arc **"** = seconds of arc

Increments and Corrections

m 0	Sun Plan.	Aries	Moon	v and d corr		
0	0°00.0	0°00.0	0°00.0	0.0 - 0.0	6.0 - 0.1	12.0 - 0.1
1	0°00.3	0°00.3	0°00.2	0.1 - 0.0	6.1 - 0.1	12.1 - 0.1
2	0°00.5	0°00.5	0°00.5	0.2 - 0.0	6.2 - 0.1	12.2 - 0.1
3	0°00.8	0°00.8	0°00.7	0.3 - 0.0	6.3 - 0.1	12.3 - 0.1
4	0°01.0	0°01.0	0°01.0	0.4 - 0.0	6.4 - 0.1	12.4 - 0.1
5	0°01.3	0°01.3	0°01.2	0.5 - 0.0	6.5 - 0.1	12.5 - 0.1
6	0°01.5	0°01.5	0°01.4	0.6 - 0.0	6.6 - 0.1	12.6 - 0.1
7	0°01.8	0°01.8	0°01.7	0.7 - 0.0	6.7 - 0.1	12.7 - 0.1
8	0°02.0	0°02.0	0°01.9	0.8 - 0.0	6.8 - 0.1	12.8 - 0.1
9	0°02.3	0°02.3	0°02.1	0.9 - 0.0	6.9 - 0.1	12.9 - 0.1
10	0°02.5	0°02.5	0°02.4	1.0 - 0.0	7.0 - 0.1	13.0 - 0.1
11	0°02.8	0°02.8	0°02.6	1.1 - 0.0	7.1 - 0.1	13.1 - 0.1
12	0°03.0	0°03.0	0°02.9	1.2 - 0.0	7.2 - 0.1	13.2 - 0.1
13	0°03.3	0°03.3	0°03.1	1.3 - 0.0	7.3 - 0.1	13.3 - 0.1
14	0°03.5	0°03.5	0°03.3	1.4 - 0.0	7.4 - 0.1	13.4 - 0.1
15	0°03.8	0°03.8	0°03.6	1.5 - 0.0	7.5 - 0.1	13.5 - 0.1
16	0°04.0	0°04.0	0°03.8	1.6 - 0.0	7.6 - 0.1	13.6 - 0.1
17	0°04.3	0°04.3	0°04.1	1.7 - 0.0	7.7 - 0.1	13.7 - 0.1
18	0°04.5	0°04.5	0°04.3	1.8 - 0.0	7.8 - 0.1	13.8 - 0.1
19	0°04.8	0°04.8	0°04.5	1.9 - 0.0	7.9 - 0.1	13.9 - 0.1
20	0°05.0	0°05.0	0°04.8	2.0 - 0.0	8.0 - 0.1	14.0 - 0.1
21	0°05.3	0°05.3	0°05.0	2.1 - 0.0	8.1 - 0.1	14.1 - 0.1
22	0°05.5	0°05.5	0°05.2	2.2 - 0.0	8.2 - 0.1	14.2 - 0.1
23	0°05.8	0°05.8	0°05.5	2.3 - 0.0	8.3 - 0.1	14.3 - 0.1
24	0°06.0	0°06.0	0°05.7	2.4 - 0.0	8.4 - 0.1	14.4 - 0.1
25	0°06.3	0°06.3	0°06.0	2.5 - 0.0	8.5 - 0.1	14.5 - 0.1
26	0°06.5	0°06.5	0°06.2	2.6 - 0.0	8.6 - 0.1	14.6 - 0.1
27	0°06.8	0°06.8	0°06.4	2.7 - 0.0	8.7 - 0.1	14.7 - 0.1
28	0°07.0	0°07.0	0°06.7	2.8 - 0.0	8.8 - 0.1	14.8 - 0.1
29	0°07.3	0°07.3	0°06.9	2.9 - 0.0	8.9 - 0.1	14.9 - 0.1
30	0°07.5	0°07.5	0°07.2	3.0 - 0.0	9.0 - 0.1	15.0 - 0.1
31	0°07.8	0°07.8	0°07.4	3.1 - 0.0	9.1 - 0.1	15.1 - 0.1
32	0°08.0	0°08.0	0°07.6	3.2 - 0.0	9.2 - 0.1	15.2 - 0.1
33	0°08.3	0°08.3	0°07.9	3.3 - 0.0	9.3 - 0.1	15.3 - 0.1
34	0°08.5	0°08.5	0°08.1	3.4 - 0.0	9.4 - 0.1	15.4 - 0.1
35	0°08.8	0°08.8	0°08.4	3.5 - 0.0	9.5 - 0.1	15.5 - 0.1
36	0°09.0	0°09.0	0°08.6	3.6 - 0.0	9.6 - 0.1	15.6 - 0.1
37	0°09.3	0°09.3	0°08.8	3.7 - 0.0	9.7 - 0.1	15.7 - 0.1
38	0°09.5	0°09.5	0°09.1	3.8 - 0.0	9.8 - 0.1	15.8 - 0.1
39	0°09.8	0°09.8	0°09.3	3.9 - 0.0	9.9 - 0.1	15.9 - 0.1
40	0°10.0	0°10.0	0°09.5	4.0 - 0.0	10.0 - 0.1	16.0 - 0.1
41	0°10.3	0°10.3	0°09.8	4.1 - 0.0	10.1 - 0.1	16.1 - 0.1
42	0°10.5	0°10.5	0°10.0	4.2 - 0.0	10.2 - 0.1	16.2 - 0.1
43	0°10.8	0°10.8	0°10.3	4.3 - 0.0	10.3 - 0.1	16.3 - 0.1
44	0°11.0	0°11.0	0°10.5	4.4 - 0.0	10.4 - 0.1	16.4 - 0.1
45	0°11.3	0°11.3	0°10.7	4.5 - 0.0	10.5 - 0.1	16.5 - 0.1
46	0°11.5	0°11.5	0°11.0	4.6 - 0.0	10.6 - 0.1	16.6 - 0.1
47	0°11.8	0°11.8	0°11.2	4.7 - 0.0	10.7 - 0.1	16.7 - 0.1
48	0°12.0	0°12.0	0°11.5	4.8 - 0.0	10.8 - 0.1	16.8 - 0.1
49	0°12.3	0°12.3	0°11.7	4.9 - 0.0	10.9 - 0.1	16.9 - 0.1
50	0°12.5	0°12.5	0°11.9	5.0 - 0.0	11.0 - 0.1	17.0 - 0.1
51	0°12.8	0°12.8	0°12.2	5.1 - 0.0	11.1 - 0.1	17.1 - 0.1
52	0°13.0	0°13.0	0°12.4	5.2 - 0.0	11.2 - 0.1	17.2 - 0.1
53	0°13.3	0°13.3	0°12.6	5.3 - 0.0	11.3 - 0.1	17.3 - 0.1
54	0°13.5	0°13.5	0°12.9	5.4 - 0.0	11.4 - 0.1	17.4 - 0.1
55	0°13.8	0°13.8	0°13.1	5.5 - 0.0	11.5 - 0.1	17.5 - 0.1
56	0°14.0	0°14.0	0°13.4	5.6 - 0.0	11.6 - 0.1	17.6 - 0.1
57	0°14.2	0°14.3	0°13.6	5.7 - 0.0	11.7 - 0.1	17.7 - 0.1
58	0°14.5	0°14.5	0°13.8	5.8 - 0.0	11.8 - 0.1	17.8 - 0.1
59	0°14.7	0°14.8	0°14.1	5.9 - 0.0	11.9 - 0.1	17.9 - 0.1

m 1	Sun Plan.	Aries	Moon	v and d corr		
0	0°15.0	0°15.0	0°14.3	0.0 - 0.0	6.0 - 0.2	12.0 - 0.3
1	0°15.3	0°15.3	0°14.6	0.1 - 0.0	6.1 - 0.2	12.1 - 0.3
2	0°15.5	0°15.5	0°14.8	0.2 - 0.0	6.2 - 0.2	12.2 - 0.3
3	0°15.8	0°15.8	0°15.0	0.3 - 0.0	6.3 - 0.2	12.3 - 0.3
4	0°16.0	0°16.0	0°15.3	0.4 - 0.0	6.4 - 0.2	12.4 - 0.3
5	0°16.3	0°16.3	0°15.5	0.5 - 0.0	6.5 - 0.2	12.5 - 0.3
6	0°16.5	0°16.5	0°15.7	0.6 - 0.0	6.6 - 0.2	12.6 - 0.3
7	0°16.8	0°16.8	0°16.0	0.7 - 0.0	6.7 - 0.2	12.7 - 0.3
8	0°17.0	0°17.0	0°16.2	0.8 - 0.0	6.8 - 0.2	12.8 - 0.3
9	0°17.3	0°17.3	0°16.5	0.9 - 0.0	6.9 - 0.2	12.9 - 0.3
10	0°17.5	0°17.5	0°16.7	1.0 - 0.0	7.0 - 0.2	13.0 - 0.3
11	0°17.8	0°17.8	0°16.9	1.1 - 0.0	7.1 - 0.2	13.1 - 0.3
12	0°18.0	0°18.0	0°17.2	1.2 - 0.0	7.2 - 0.2	13.2 - 0.3
13	0°18.3	0°18.3	0°17.4	1.3 - 0.0	7.3 - 0.2	13.3 - 0.3
14	0°18.5	0°18.6	0°17.7	1.4 - 0.0	7.4 - 0.2	13.4 - 0.3
15	0°18.8	0°18.8	0°17.9	1.5 - 0.0	7.5 - 0.2	13.5 - 0.3
16	0°19.0	0°19.1	0°18.1	1.6 - 0.0	7.6 - 0.2	13.6 - 0.3
17	0°19.3	0°19.3	0°18.4	1.7 - 0.0	7.7 - 0.2	13.7 - 0.3
18	0°19.5	0°19.6	0°18.6	1.8 - 0.0	7.8 - 0.2	13.8 - 0.3
19	0°19.8	0°19.8	0°18.9	1.9 - 0.0	7.9 - 0.2	13.9 - 0.3
20	0°20.0	0°20.1	0°19.1	2.0 - 0.1	8.0 - 0.2	14.0 - 0.4
21	0°20.3	0°20.3	0°19.3	2.1 - 0.1	8.1 - 0.2	14.1 - 0.4
22	0°20.5	0°20.6	0°19.6	2.2 - 0.1	8.2 - 0.2	14.2 - 0.4
23	0°20.8	0°20.8	0°19.8	2.3 - 0.1	8.3 - 0.2	14.3 - 0.4
24	0°21.0	0°21.1	0°20.0	2.4 - 0.1	8.4 - 0.2	14.4 - 0.4
25	0°21.3	0°21.3	0°20.3	2.5 - 0.1	8.5 - 0.2	14.5 - 0.4
26	0°21.5	0°21.6	0°20.5	2.6 - 0.1	8.6 - 0.2	14.6 - 0.4
27	0°21.8	0°21.8	0°20.8	2.7 - 0.1	8.7 - 0.2	14.7 - 0.4
28	0°22.0	0°22.1	0°21.0	2.8 - 0.1	8.8 - 0.2	14.8 - 0.4
29	0°22.3	0°22.3	0°21.2	2.9 - 0.1	8.9 - 0.2	14.9 - 0.4
30	0°22.5	0°22.6	0°21.5	3.0 - 0.1	9.0 - 0.2	15.0 - 0.4
31	0°22.8	0°22.8	0°21.7	3.1 - 0.1	9.1 - 0.2	15.1 - 0.4
32	0°23.0	0°23.1	0°22.0	3.2 - 0.1	9.2 - 0.2	15.2 - 0.4
33	0°23.3	0°23.3	0°22.2	3.3 - 0.1	9.3 - 0.2	15.3 - 0.4
34	0°23.5	0°23.6	0°22.4	3.4 - 0.1	9.4 - 0.2	15.4 - 0.4
35	0°23.8	0°23.8	0°22.7	3.5 - 0.1	9.5 - 0.2	15.5 - 0.4
36	0°24.0	0°24.1	0°22.9	3.6 - 0.1	9.6 - 0.2	15.6 - 0.4
37	0°24.3	0°24.3	0°23.1	3.7 - 0.1	9.7 - 0.2	15.7 - 0.4
38	0°24.5	0°24.6	0°23.4	3.8 - 0.1	9.8 - 0.2	15.8 - 0.4
39	0°24.8	0°24.8	0°23.6	3.9 - 0.1	9.9 - 0.2	15.9 - 0.4
40	0°25.0	0°25.1	0°23.9	4.0 - 0.1	10.0 - 0.3	16.0 - 0.4
41	0°25.3	0°25.3	0°24.1	4.1 - 0.1	10.1 - 0.3	16.1 - 0.4
42	0°25.5	0°25.6	0°24.3	4.2 - 0.1	10.2 - 0.3	16.2 - 0.4
43	0°25.8	0°25.8	0°24.6	4.3 - 0.1	10.3 - 0.3	16.3 - 0.4
44	0°26.0	0°26.1	0°24.8	4.4 - 0.1	10.4 - 0.3	16.4 - 0.4
45	0°26.3	0°26.3	0°25.1	4.5 - 0.1	10.5 - 0.3	16.5 - 0.4
46	0°26.5	0°26.6	0°25.3	4.6 - 0.1	10.6 - 0.3	16.6 - 0.4
47	0°26.8	0°26.8	0°25.5	4.7 - 0.1	10.7 - 0.3	16.7 - 0.4
48	0°27.0	0°27.1	0°25.8	4.8 - 0.1	10.8 - 0.3	16.8 - 0.4
49	0°27.3	0°27.3	0°26.0	4.9 - 0.1	10.9 - 0.3	16.9 - 0.4
50	0°27.5	0°27.6	0°26.2	5.0 - 0.1	11.0 - 0.3	17.0 - 0.4
51	0°27.8	0°27.8	0°26.5	5.1 - 0.1	11.1 - 0.3	17.1 - 0.4
52	0°28.0	0°28.1	0°26.7	5.2 - 0.1	11.2 - 0.3	17.2 - 0.4
53	0°28.3	0°28.3	0°27.0	5.3 - 0.1	11.3 - 0.3	17.3 - 0.4
54	0°28.5	0°28.6	0°27.2	5.4 - 0.1	11.4 - 0.3	17.4 - 0.4
55	0°28.7	0°28.8	0°27.4	5.5 - 0.1	11.5 - 0.3	17.5 - 0.4
56	0°29.0	0°29.1	0°27.7	5.6 - 0.1	11.6 - 0.3	17.6 - 0.4
57	0°29.3	0°29.3	0°27.9	5.7 - 0.1	11.7 - 0.3	17.7 - 0.4
58	0°29.5	0°29.6	0°28.2	5.8 - 0.1	11.8 - 0.3	17.8 - 0.4
59	0°29.7	0°29.8	0°28.4	5.9 - 0.1	11.9 - 0.3	17.9 - 0.4

m 2	Sun Plan.	Aries	Moon	v and d corr		
0	0°30.0	0°30.1	0°28.6	0.0 - 0.0	6.0 - 0.3	12.0 - 0.5
1	0°30.3	0°30.3	0°28.9	0.1 - 0.0	6.1 - 0.3	12.1 - 0.5
2	0°30.5	0°30.6	0°29.1	0.2 - 0.0	6.2 - 0.3	12.2 - 0.5
3	0°30.7	0°30.8	0°29.3	0.3 - 0.0	6.3 - 0.3	12.3 - 0.5
4	0°31.0	0°31.1	0°29.6	0.4 - 0.0	6.4 - 0.3	12.4 - 0.5
5	0°31.3	0°31.3	0°29.8	0.5 - 0.0	6.5 - 0.3	12.5 - 0.5
6	0°31.5	0°31.6	0°30.1	0.6 - 0.0	6.6 - 0.3	12.6 - 0.5
7	0°31.8	0°31.8	0°30.3	0.7 - 0.0	6.7 - 0.3	12.7 - 0.5
8	0°32.0	0°32.1	0°30.5	0.8 - 0.0	6.8 - 0.3	12.8 - 0.5
9	0°32.3	0°32.3	0°30.8	0.9 - 0.0	6.9 - 0.3	12.9 - 0.5
10	0°32.5	0°32.6	0°31.0	1.0 - 0.0	7.0 - 0.3	13.0 - 0.5
11	0°32.8	0°32.8	0°31.3	1.1 - 0.0	7.1 - 0.3	13.1 - 0.5
12	0°33.0	0°33.1	0°31.5	1.2 - 0.1	7.2 - 0.3	13.2 - 0.5
13	0°33.3	0°33.3	0°31.7	1.3 - 0.1	7.3 - 0.3	13.3 - 0.6
14	0°33.5	0°33.6	0°32.0	1.4 - 0.1	7.4 - 0.3	13.4 - 0.6
15	0°33.8	0°33.8	0°32.2	1.5 - 0.1	7.5 - 0.3	13.5 - 0.6
16	0°34.0	0°34.1	0°32.5	1.6 - 0.1	7.6 - 0.3	13.6 - 0.6
17	0°34.3	0°34.3	0°32.7	1.7 - 0.1	7.7 - 0.3	13.7 - 0.6
18	0°34.5	0°34.6	0°32.9	1.8 - 0.1	7.8 - 0.3	13.8 - 0.6
19	0°34.8	0°34.8	0°33.2	1.9 - 0.1	7.9 - 0.3	13.9 - 0.6
20	0°35.0	0°35.1	0°33.4	2.0 - 0.1	8.0 - 0.3	14.0 - 0.6
21	0°35.3	0°35.3	0°33.6	2.1 - 0.1	8.1 - 0.3	14.1 - 0.6
22	0°35.5	0°35.6	0°33.9	2.2 - 0.1	8.2 - 0.3	14.2 - 0.6
23	0°35.8	0°35.8	0°34.1	2.3 - 0.1	8.3 - 0.3	14.3 - 0.6
24	0°36.0	0°36.1	0°34.4	2.4 - 0.1	8.4 - 0.3	14.4 - 0.6
25	0°36.3	0°36.3	0°34.6	2.5 - 0.1	8.5 - 0.4	14.5 - 0.6
26	0°36.5	0°36.6	0°34.8	2.6 - 0.1	8.6 - 0.4	14.6 - 0.6
27	0°36.8	0°36.9	0°35.1	2.7 - 0.1	8.7 - 0.4	14.7 - 0.6
28	0°37.0	0°37.1	0°35.3	2.8 - 0.1	8.8 - 0.4	14.8 - 0.6
29	0°37.3	0°37.4	0°35.6	2.9 - 0.1	8.9 - 0.4	14.9 - 0.6
30	0°37.5	0°37.6	0°35.8	3.0 - 0.1	9.0 - 0.4	15.0 - 0.6
31	0°37.8	0°37.9	0°36.0	3.1 - 0.1	9.1 - 0.4	15.1 - 0.6
32	0°38.0	0°38.1	0°36.3	3.2 - 0.1	9.2 - 0.4	15.2 - 0.6
33	0°38.3	0°38.4	0°36.5	3.3 - 0.1	9.3 - 0.4	15.3 - 0.6
34	0°38.5	0°38.6	0°36.7	3.4 - 0.1	9.4 - 0.4	15.4 - 0.6
35	0°38.8	0°38.9	0°37.0	3.5 - 0.1	9.5 - 0.4	15.5 - 0.6
36	0°39.0	0°39.1	0°37.2	3.6 - 0.1	9.6 - 0.4	15.6 - 0.6
37	0°39.3	0°39.4	0°37.5	3.7 - 0.2	9.7 - 0.4	15.7 - 0.7
38	0°39.5	0°39.6	0°37.7	3.8 - 0.2	9.8 - 0.4	15.8 - 0.7
39	0°39.8	0°39.9	0°37.9	3.9 - 0.2	9.9 - 0.4	15.9 - 0.7
40	0°40.0	0°40.1	0°38.2	4.0 - 0.2	10.0 - 0.4	16.0 - 0.7
41	0°40.3	0°40.4	0°38.4	4.1 - 0.2	10.1 - 0.4	16.1 - 0.7
42	0°40.5	0°40.6	0°38.7	4.2 - 0.2	10.2 - 0.4	16.2 - 0.7
43	0°40.8	0°40.9	0°38.9	4.3 - 0.2	10.3 - 0.4	16.3 - 0.7
44	0°41.0	0°41.1	0°39.1	4.4 - 0.2	10.4 - 0.4	16.4 - 0.7
45	0°41.3	0°41.4	0°39.4	4.5 - 0.2	10.5 - 0.4	16.5 - 0.7
46	0°41.5	0°41.6	0°39.6	4.6 - 0.2	10.6 - 0.4	16.6 - 0.7
47	0°41.8	0°41.9	0°39.8	4.7 - 0.2	10.7 - 0.4	16.7 - 0.7
48	0°42.0	0°42.1	0°40.1	4.8 - 0.2	10.8 - 0.5	16.8 - 0.7
49	0°42.3	0°42.4	0°40.3	4.9 - 0.2	10.9 - 0.5	16.9 - 0.7
50	0°42.5	0°42.6	0°40.6	5.0 - 0.2	11.0 - 0.5	17.0 - 0.7
51	0°42.8	0°42.9	0°40.8	5.1 - 0.2	11.1 - 0.5	17.1 - 0.7
52	0°43.0	0°43.1	0°41.0	5.2 - 0.2	11.2 - 0.5	17.2 - 0.7
53	0°43.3	0°43.4	0°41.3	5.3 - 0.2	11.3 - 0.5	17.3 - 0.7
54	0°43.5	0°43.6	0°41.5	5.4 - 0.2	11.4 - 0.5	17.4 - 0.7
55	0°43.8	0°43.9	0°41.8	5.5 - 0.2	11.5 - 0.5	17.5 - 0.7
56	0°44.0	0°44.1	0°42.0	5.6 - 0.2	11.6 - 0.5	17.6 - 0.7
57	0°44.3	0°44.4	0°42.2	5.7 - 0.2	11.7 - 0.5	17.7 - 0.7
58	0°44.5	0°44.6	0°42.5	5.8 - 0.2	11.8 - 0.5	17.8 - 0.7
59	0°44.8	0°44.9	0°42.7	5.9 - 0.2	11.9 - 0.5	17.9 - 0.7

Increments and Corrections

m 3	Sun Plan.	Aries	Moon	v and d corr		
0	0°45.0	0°45.1	0°43.0	0.0 - 0.0	6.0 - 0.3	12.0 - 0.7
1	0°45.3	0°45.4	0°43.2	0.1 - 0.0	6.1 - 0.4	12.1 - 0.7
2	0°45.5	0°45.6	0°43.4	0.2 - 0.0	6.2 - 0.4	12.2 - 0.7
3	0°45.8	0°45.9	0°43.7	0.3 - 0.0	6.3 - 0.4	12.3 - 0.7
4	0°46.0	0°46.1	0°43.9	0.4 - 0.0	6.4 - 0.4	12.4 - 0.7
5	0°46.3	0°46.4	0°44.1	0.5 - 0.0	6.5 - 0.4	12.5 - 0.7
6	0°46.5	0°46.6	0°44.4	0.6 - 0.0	6.6 - 0.4	12.6 - 0.7
7	0°46.8	0°46.9	0°44.6	0.7 - 0.0	6.7 - 0.4	12.7 - 0.7
8	0°47.0	0°47.1	0°44.9	0.8 - 0.0	6.8 - 0.4	12.8 - 0.7
9	0°47.3	0°47.4	0°45.1	0.9 - 0.1	6.9 - 0.4	12.9 - 0.8
10	0°47.5	0°47.6	0°45.3	1.0 - 0.1	7.0 - 0.4	13.0 - 0.8
11	0°47.8	0°47.9	0°45.6	1.1 - 0.1	7.1 - 0.4	13.1 - 0.8
12	0°48.0	0°48.1	0°45.8	1.2 - 0.1	7.2 - 0.4	13.2 - 0.8
13	0°48.3	0°48.4	0°46.1	1.3 - 0.1	7.3 - 0.4	13.3 - 0.8
14	0°48.5	0°48.6	0°46.3	1.4 - 0.1	7.4 - 0.4	13.4 - 0.8
15	0°48.8	0°48.9	0°46.5	1.5 - 0.1	7.5 - 0.4	13.5 - 0.8
16	0°49.0	0°49.1	0°46.8	1.6 - 0.1	7.6 - 0.4	13.6 - 0.8
17	0°49.3	0°49.4	0°47.0	1.7 - 0.1	7.7 - 0.4	13.7 - 0.8
18	0°49.5	0°49.6	0°47.2	1.8 - 0.1	7.8 - 0.5	13.8 - 0.8
19	0°49.8	0°49.9	0°47.5	1.9 - 0.1	7.9 - 0.5	13.9 - 0.8
20	0°50.0	0°50.1	0°47.7	2.0 - 0.1	8.0 - 0.5	14.0 - 0.8
21	0°50.3	0°50.4	0°48.0	2.1 - 0.1	8.1 - 0.5	14.1 - 0.8
22	0°50.5	0°50.6	0°48.2	2.2 - 0.1	8.2 - 0.5	14.2 - 0.8
23	0°50.8	0°50.9	0°48.4	2.3 - 0.1	8.3 - 0.5	14.3 - 0.8
24	0°51.0	0°51.1	0°48.7	2.4 - 0.1	8.4 - 0.5	14.4 - 0.8
25	0°51.3	0°51.4	0°48.9	2.5 - 0.1	8.5 - 0.5	14.5 - 0.8
26	0°51.5	0°51.6	0°49.2	2.6 - 0.2	8.6 - 0.5	14.6 - 0.9
27	0°51.8	0°51.9	0°49.4	2.7 - 0.2	8.7 - 0.5	14.7 - 0.9
28	0°52.0	0°52.1	0°49.6	2.8 - 0.2	8.8 - 0.5	14.8 - 0.9
29	0°52.3	0°52.4	0°49.9	2.9 - 0.2	8.9 - 0.5	14.9 - 0.9
30	0°52.5	0°52.6	0°50.1	3.0 - 0.2	9.0 - 0.5	15.0 - 0.9
31	0°52.8	0°52.9	0°50.3	3.1 - 0.2	9.1 - 0.5	15.1 - 0.9
32	0°53.0	0°53.1	0°50.6	3.2 - 0.2	9.2 - 0.5	15.2 - 0.9
33	0°53.3	0°53.4	0°50.8	3.3 - 0.2	9.3 - 0.5	15.3 - 0.9
34	0°53.5	0°53.6	0°51.1	3.4 - 0.2	9.4 - 0.5	15.4 - 0.9
35	0°53.8	0°53.9	0°51.3	3.5 - 0.2	9.5 - 0.6	15.5 - 0.9
36	0°54.0	0°54.1	0°51.5	3.6 - 0.2	9.6 - 0.6	15.6 - 0.9
37	0°54.3	0°54.4	0°51.8	3.7 - 0.2	9.7 - 0.6	15.7 - 0.9
38	0°54.5	0°54.6	0°52.0	3.8 - 0.2	9.8 - 0.6	15.8 - 0.9
39	0°54.8	0°54.9	0°52.3	3.9 - 0.2	9.9 - 0.6	15.9 - 0.9
40	0°55.0	0°55.2	0°52.5	4.0 - 0.2	10.0 - 0.6	16.0 - 0.9
41	0°55.3	0°55.4	0°52.7	4.1 - 0.2	10.1 - 0.6	16.1 - 0.9
42	0°55.5	0°55.7	0°53.0	4.2 - 0.2	10.2 - 0.6	16.2 - 0.9
43	0°55.8	0°55.9	0°53.2	4.3 - 0.3	10.3 - 0.6	16.3 - 1.0
44	0°56.0	0°56.2	0°53.4	4.4 - 0.3	10.4 - 0.6	16.4 - 1.0
45	0°56.3	0°56.4	0°53.7	4.5 - 0.3	10.5 - 0.6	16.5 - 1.0
46	0°56.5	0°56.7	0°53.9	4.6 - 0.3	10.6 - 0.6	16.6 - 1.0
47	0°56.8	0°56.9	0°54.2	4.7 - 0.3	10.7 - 0.6	16.7 - 1.0
48	0°57.0	0°57.2	0°54.4	4.8 - 0.3	10.8 - 0.6	16.8 - 1.0
49	0°57.3	0°57.4	0°54.6	4.9 - 0.3	10.9 - 0.6	16.9 - 1.0
50	0°57.5	0°57.7	0°54.9	5.0 - 0.3	11.0 - 0.6	17.0 - 1.0
51	0°57.7	0°57.9	0°55.1	5.1 - 0.3	11.1 - 0.6	17.1 - 1.0
52	0°58.0	0°58.2	0°55.4	5.2 - 0.3	11.2 - 0.7	17.2 - 1.0
53	0°58.3	0°58.4	0°55.6	5.3 - 0.3	11.3 - 0.7	17.3 - 1.0
54	0°58.5	0°58.7	0°55.8	5.4 - 0.3	11.4 - 0.7	17.4 - 1.0
55	0°58.8	0°58.9	0°56.1	5.5 - 0.3	11.5 - 0.7	17.5 - 1.0
56	0°59.0	0°59.2	0°56.3	5.6 - 0.3	11.6 - 0.7	17.6 - 1.0
57	0°59.3	0°59.4	0°56.6	5.7 - 0.3	11.7 - 0.7	17.7 - 1.0
58	0°59.5	0°59.7	0°56.8	5.8 - 0.3	11.8 - 0.7	17.8 - 1.0
59	0°59.8	0°59.9	0°57.0	5.9 - 0.3	11.9 - 0.7	17.9 - 1.0

m 4	Sun Plan.	Aries	Moon	v and d corr		
0	1°00.0	1°00.2	0°57.3	0.0 - 0.0	6.0 - 0.4	12.0 - 0.9
1	1°00.2	1°00.4	0°57.5	0.1 - 0.0	6.1 - 0.5	12.1 - 0.9
2	1°00.5	1°00.7	0°57.7	0.2 - 0.0	6.2 - 0.5	12.2 - 0.9
3	1°00.7	1°00.9	0°58.0	0.3 - 0.0	6.3 - 0.5	12.3 - 0.9
4	1°01.0	1°01.2	0°58.2	0.4 - 0.0	6.4 - 0.5	12.4 - 0.9
5	1°01.2	1°01.4	0°58.5	0.5 - 0.0	6.5 - 0.5	12.5 - 0.9
6	1°01.5	1°01.7	0°58.7	0.6 - 0.0	6.6 - 0.5	12.6 - 0.9
7	1°01.7	1°01.9	0°58.9	0.7 - 0.1	6.7 - 0.5	12.7 - 1.0
8	1°02.0	1°02.2	0°59.2	0.8 - 0.1	6.8 - 0.5	12.8 - 1.0
9	1°02.3	1°02.4	0°59.4	0.9 - 0.1	6.9 - 0.5	12.9 - 1.0
10	1°02.5	1°02.7	0°59.7	1.0 - 0.1	7.0 - 0.5	13.0 - 1.0
11	1°02.8	1°02.9	0°59.9	1.1 - 0.1	7.1 - 0.5	13.1 - 1.0
12	1°03.0	1°03.2	1°00.1	1.2 - 0.1	7.2 - 0.5	13.2 - 1.0
13	1°03.3	1°03.4	1°00.4	1.3 - 0.1	7.3 - 0.5	13.3 - 1.0
14	1°03.5	1°03.7	1°00.6	1.4 - 0.1	7.4 - 0.6	13.4 - 1.0
15	1°03.8	1°03.9	1°00.8	1.5 - 0.1	7.5 - 0.6	13.5 - 1.0
16	1°04.0	1°04.2	1°01.1	1.6 - 0.1	7.6 - 0.6	13.6 - 1.0
17	1°04.2	1°04.4	1°01.3	1.7 - 0.1	7.7 - 0.6	13.7 - 1.0
18	1°04.5	1°04.7	1°01.6	1.8 - 0.1	7.8 - 0.6	13.8 - 1.0
19	1°04.7	1°04.9	1°01.8	1.9 - 0.1	7.9 - 0.6	13.9 - 1.0
20	1°05.0	1°05.2	1°02.0	2.0 - 0.1	8.0 - 0.6	14.0 - 1.1
21	1°05.2	1°05.4	1°02.3	2.1 - 0.2	8.1 - 0.6	14.1 - 1.1
22	1°05.5	1°05.7	1°02.5	2.2 - 0.2	8.2 - 0.6	14.2 - 1.1
23	1°05.8	1°05.9	1°02.8	2.3 - 0.2	8.3 - 0.6	14.3 - 1.1
24	1°06.0	1°06.2	1°03.0	2.4 - 0.2	8.4 - 0.6	14.4 - 1.1
25	1°06.3	1°06.4	1°03.2	2.5 - 0.2	8.5 - 0.6	14.5 - 1.1
26	1°06.5	1°06.7	1°03.5	2.6 - 0.2	8.6 - 0.6	14.6 - 1.1
27	1°06.8	1°06.9	1°03.7	2.7 - 0.2	8.7 - 0.7	14.7 - 1.1
28	1°07.0	1°07.2	1°03.9	2.8 - 0.2	8.8 - 0.7	14.8 - 1.1
29	1°07.3	1°07.4	1°04.2	2.9 - 0.2	8.9 - 0.7	14.9 - 1.1
30	1°07.5	1°07.7	1°04.4	3.0 - 0.2	9.0 - 0.7	15.0 - 1.1
31	1°07.7	1°07.9	1°04.7	3.1 - 0.2	9.1 - 0.7	15.1 - 1.1
32	1°08.0	1°08.2	1°04.9	3.2 - 0.2	9.2 - 0.7	15.2 - 1.1
33	1°08.2	1°08.4	1°05.1	3.3 - 0.2	9.3 - 0.7	15.3 - 1.1
34	1°08.5	1°08.7	1°05.4	3.4 - 0.3	9.4 - 0.7	15.4 - 1.2
35	1°08.7	1°08.9	1°05.6	3.5 - 0.3	9.5 - 0.7	15.5 - 1.2
36	1°09.0	1°09.2	1°05.9	3.6 - 0.3	9.6 - 0.7	15.6 - 1.2
37	1°09.3	1°09.4	1°06.1	3.7 - 0.3	9.7 - 0.7	15.7 - 1.2
38	1°09.5	1°09.7	1°06.3	3.8 - 0.3	9.8 - 0.7	15.8 - 1.2
39	1°09.8	1°09.9	1°06.6	3.9 - 0.3	9.9 - 0.7	15.9 - 1.2
40	1°10.0	1°10.2	1°06.8	4.0 - 0.3	10.0 - 0.8	16.0 - 1.2
41	1°10.3	1°10.4	1°07.0	4.1 - 0.3	10.1 - 0.8	16.1 - 1.2
42	1°10.5	1°10.7	1°07.3	4.2 - 0.3	10.2 - 0.8	16.2 - 1.2
43	1°10.8	1°10.9	1°07.5	4.3 - 0.3	10.3 - 0.8	16.3 - 1.2
44	1°11.0	1°11.2	1°07.8	4.4 - 0.3	10.4 - 0.8	16.4 - 1.2
45	1°11.3	1°11.4	1°08.0	4.5 - 0.3	10.5 - 0.8	16.5 - 1.2
46	1°11.5	1°11.7	1°08.2	4.6 - 0.3	10.6 - 0.8	16.6 - 1.2
47	1°11.7	1°11.9	1°08.5	4.7 - 0.4	10.7 - 0.8	16.7 - 1.3
48	1°12.0	1°12.2	1°08.7	4.8 - 0.4	10.8 - 0.8	16.8 - 1.3
49	1°12.2	1°12.4	1°09.0	4.9 - 0.4	10.9 - 0.8	16.9 - 1.3
50	1°12.5	1°12.7	1°09.2	5.0 - 0.4	11.0 - 0.8	17.0 - 1.3
51	1°12.7	1°12.9	1°09.4	5.1 - 0.4	11.1 - 0.8	17.1 - 1.3
52	1°13.0	1°13.2	1°09.7	5.2 - 0.4	11.2 - 0.8	17.2 - 1.3
53	1°13.2	1°13.5	1°09.9	5.3 - 0.4	11.3 - 0.8	17.3 - 1.3
54	1°13.5	1°13.7	1°10.2	5.4 - 0.4	11.4 - 0.9	17.4 - 1.3
55	1°13.8	1°14.0	1°10.4	5.5 - 0.4	11.5 - 0.9	17.5 - 1.3
56	1°14.0	1°14.2	1°10.6	5.6 - 0.4	11.6 - 0.9	17.6 - 1.3
57	1°14.3	1°14.5	1°10.9	5.7 - 0.4	11.7 - 0.9	17.7 - 1.3
58	1°14.5	1°14.7	1°11.1	5.8 - 0.4	11.8 - 0.9	17.8 - 1.3
59	1°14.8	1°15.0	1°11.3	5.9 - 0.4	11.9 - 0.9	17.9 - 1.3

m 5	Sun Plan.	Aries	Moon	v and d corr		
0	1°15.0	1°15.2	1°11.6	0.0 - 0.0	6.0 - 0.5	12.0 - 1.1
1	1°15.3	1°15.5	1°11.8	0.1 - 0.0	6.1 - 0.6	12.1 - 1.1
2	1°15.5	1°15.7	1°12.1	0.2 - 0.0	6.2 - 0.6	12.2 - 1.1
3	1°15.7	1°16.0	1°12.3	0.3 - 0.0	6.3 - 0.6	12.3 - 1.1
4	1°16.0	1°16.2	1°12.5	0.4 - 0.0	6.4 - 0.6	12.4 - 1.1
5	1°16.2	1°16.5	1°12.8	0.5 - 0.0	6.5 - 0.6	12.5 - 1.1
6	1°16.5	1°16.7	1°13.0	0.6 - 0.1	6.6 - 0.6	12.6 - 1.2
7	1°16.7	1°17.0	1°13.3	0.7 - 0.1	6.7 - 0.6	12.7 - 1.2
8	1°17.0	1°17.2	1°13.5	0.8 - 0.1	6.8 - 0.6	12.8 - 1.2
9	1°17.3	1°17.5	1°13.7	0.9 - 0.1	6.9 - 0.6	12.9 - 1.2
10	1°17.5	1°17.7	1°14.0	1.0 - 0.1	7.0 - 0.6	13.0 - 1.2
11	1°17.8	1°18.0	1°14.2	1.1 - 0.1	7.1 - 0.7	13.1 - 1.2
12	1°18.0	1°18.2	1°14.4	1.2 - 0.1	7.2 - 0.7	13.2 - 1.2
13	1°18.3	1°18.5	1°14.7	1.3 - 0.1	7.3 - 0.7	13.3 - 1.2
14	1°18.5	1°18.7	1°14.9	1.4 - 0.1	7.4 - 0.7	13.4 - 1.2
15	1°18.8	1°19.0	1°15.2	1.5 - 0.1	7.5 - 0.7	13.5 - 1.2
16	1°19.0	1°19.2	1°15.4	1.6 - 0.1	7.6 - 0.7	13.6 - 1.2
17	1°19.3	1°19.5	1°15.6	1.7 - 0.2	7.7 - 0.7	13.7 - 1.3
18	1°19.5	1°19.7	1°15.9	1.8 - 0.2	7.8 - 0.7	13.8 - 1.3
19	1°19.7	1°20.0	1°16.1	1.9 - 0.2	7.9 - 0.7	13.9 - 1.3
20	1°20.0	1°20.2	1°16.4	2.0 - 0.2	8.0 - 0.7	14.0 - 1.3
21	1°20.2	1°20.5	1°16.6	2.1 - 0.2	8.1 - 0.7	14.1 - 1.3
22	1°20.5	1°20.7	1°16.8	2.2 - 0.2	8.2 - 0.8	14.2 - 1.3
23	1°20.8	1°21.0	1°17.1	2.3 - 0.2	8.3 - 0.8	14.3 - 1.3
24	1°21.0	1°21.2	1°17.3	2.4 - 0.2	8.4 - 0.8	14.4 - 1.3
25	1°21.3	1°21.5	1°17.5	2.5 - 0.2	8.5 - 0.8	14.5 - 1.3
26	1°21.5	1°21.7	1°17.8	2.6 - 0.2	8.6 - 0.8	14.6 - 1.3
27	1°21.8	1°22.0	1°18.0	2.7 - 0.2	8.7 - 0.8	14.7 - 1.3
28	1°22.0	1°22.2	1°18.3	2.8 - 0.3	8.8 - 0.8	14.8 - 1.4
29	1°22.3	1°22.5	1°18.5	2.9 - 0.3	8.9 - 0.8	14.9 - 1.4
30	1°22.5	1°22.7	1°18.7	3.0 - 0.3	9.0 - 0.8	15.0 - 1.4
31	1°22.8	1°23.0	1°19.0	3.1 - 0.3	9.1 - 0.8	15.1 - 1.4
32	1°23.0	1°23.2	1°19.2	3.2 - 0.3	9.2 - 0.8	15.2 - 1.4
33	1°23.2	1°23.5	1°19.5	3.3 - 0.3	9.3 - 0.9	15.3 - 1.4
34	1°23.5	1°23.7	1°19.7	3.4 - 0.3	9.4 - 0.9	15.4 - 1.4
35	1°23.7	1°24.0	1°19.9	3.5 - 0.3	9.5 - 0.9	15.5 - 1.4
36	1°24.0	1°24.2	1°20.2	3.6 - 0.3	9.6 - 0.9	15.6 - 1.4
37	1°24.3	1°24.5	1°20.4	3.7 - 0.3	9.7 - 0.9	15.7 - 1.4
38	1°24.5	1°24.7	1°20.7	3.8 - 0.3	9.8 - 0.9	15.8 - 1.4
39	1°24.8	1°25.0	1°20.9	3.9 - 0.4	9.9 - 0.9	15.9 - 1.5
40	1°25.0	1°25.2	1°21.1	4.0 - 0.4	10.0 - 0.9	16.0 - 1.5
41	1°25.3	1°25.5	1°21.4	4.1 - 0.4	10.1 - 0.9	16.1 - 1.5
42	1°25.5	1°25.7	1°21.6	4.2 - 0.4	10.2 - 0.9	16.2 - 1.5
43	1°25.8	1°26.0	1°21.8	4.3 - 0.4	10.3 - 0.9	16.3 - 1.5
44	1°26.0	1°26.2	1°22.1	4.4 - 0.4	10.4 - 1.0	16.4 - 1.5
45	1°26.3	1°26.5	1°22.3	4.5 - 0.4	10.5 - 1.0	16.5 - 1.5
46	1°26.5	1°26.7	1°22.6	4.6 - 0.4	10.6 - 1.0	16.6 - 1.5
47	1°26.8	1°27.0	1°22.8	4.7 - 0.4	10.7 - 1.0	16.7 - 1.5
48	1°27.0	1°27.2	1°23.0	4.8 - 0.4	10.8 - 1.0	16.8 - 1.5
49	1°27.2	1°27.5	1°23.3	4.9 - 0.4	10.9 - 1.0	16.9 - 1.5
50	1°27.5	1°27.7	1°23.5	5.0 - 0.5	11.0 - 1.0	17.0 - 1.6
51	1°27.7	1°28.0	1°23.8	5.1 - 0.5	11.1 - 1.0	17.1 - 1.6
52	1°28.0	1°28.2	1°24.0	5.2 - 0.5	11.2 - 1.0	17.2 - 1.6
53	1°28.2	1°28.5	1°24.2	5.3 - 0.5	11.3 - 1.0	17.3 - 1.6
54	1°28.5	1°28.7	1°24.5	5.4 - 0.5	11.4 - 1.0	17.4 - 1.6
55	1°28.8	1°29.0	1°24.7	5.5 - 0.5	11.5 - 1.1	17.5 - 1.6
56	1°29.0	1°29.2	1°24.9	5.6 - 0.5	11.6 - 1.1	17.6 - 1.6
57	1°29.3	1°29.5	1°25.2	5.7 - 0.5	11.7 - 1.1	17.7 - 1.6
58	1°29.5	1°29.7	1°25.4	5.8 - 0.5	11.8 - 1.1	17.8 - 1.6
59	1°29.8	1°30.0	1°25.7	5.9 - 0.5	11.9 - 1.1	17.9 - 1.6

Increments and Corrections

m 6	Sun Plan.	Aries	Moon	v and d corr		
0	1°30.0	1°30.2	1°25.9	0.0 - 0.0	6.0 - 0.7	12.0 - 1.3
1	1°30.3	1°30.5	1°26.1	0.1 - 0.0	6.1 - 0.7	12.1 - 1.3
2	1°30.5	1°30.7	1°26.4	0.2 - 0.0	6.2 - 0.7	12.2 - 1.3
3	1°30.7	1°31.0	1°26.6	0.3 - 0.0	6.3 - 0.7	12.3 - 1.3
4	1°31.0	1°31.2	1°26.9	0.4 - 0.0	6.4 - 0.7	12.4 - 1.3
5	1°31.2	1°31.5	1°27.1	0.5 - 0.1	6.5 - 0.7	12.5 - 1.4
6	1°31.5	1°31.8	1°27.3	0.6 - 0.1	6.6 - 0.7	12.6 - 1.4
7	1°31.7	1°32.0	1°27.6	0.7 - 0.1	6.7 - 0.7	12.7 - 1.4
8	1°32.0	1°32.3	1°27.8	0.8 - 0.1	6.8 - 0.7	12.8 - 1.4
9	1°32.3	1°32.5	1°28.0	0.9 - 0.1	6.9 - 0.7	12.9 - 1.4
10	1°32.5	1°32.8	1°28.3	1.0 - 0.1	7.0 - 0.8	13.0 - 1.4
11	1°32.8	1°33.0	1°28.5	1.1 - 0.1	7.1 - 0.8	13.1 - 1.4
12	1°33.0	1°33.3	1°28.8	1.2 - 0.1	7.2 - 0.8	13.2 - 1.4
13	1°33.3	1°33.5	1°29.0	1.3 - 0.1	7.3 - 0.8	13.3 - 1.4
14	1°33.5	1°33.8	1°29.2	1.4 - 0.2	7.4 - 0.8	13.4 - 1.5
15	1°33.8	1°34.0	1°29.5	1.5 - 0.2	7.5 - 0.8	13.5 - 1.5
16	1°34.0	1°34.3	1°29.7	1.6 - 0.2	7.6 - 0.8	13.6 - 1.5
17	1°34.3	1°34.5	1°30.0	1.7 - 0.2	7.7 - 0.8	13.7 - 1.5
18	1°34.5	1°34.8	1°30.2	1.8 - 0.2	7.8 - 0.8	13.8 - 1.5
19	1°34.8	1°35.0	1°30.4	1.9 - 0.2	7.9 - 0.9	13.9 - 1.5
20	1°35.0	1°35.3	1°30.7	2.0 - 0.2	8.0 - 0.9	14.0 - 1.5
21	1°35.2	1°35.5	1°30.9	2.1 - 0.2	8.1 - 0.9	14.1 - 1.5
22	1°35.5	1°35.8	1°31.1	2.2 - 0.2	8.2 - 0.9	14.2 - 1.5
23	1°35.8	1°36.0	1°31.4	2.3 - 0.2	8.3 - 0.9	14.3 - 1.5
24	1°36.0	1°36.3	1°31.6	2.4 - 0.3	8.4 - 0.9	14.4 - 1.6
25	1°36.3	1°36.5	1°31.9	2.5 - 0.3	8.5 - 0.9	14.5 - 1.6
26	1°36.5	1°36.8	1°32.1	2.6 - 0.3	8.6 - 0.9	14.6 - 1.6
27	1°36.8	1°37.0	1°32.3	2.7 - 0.3	8.7 - 0.9	14.7 - 1.6
28	1°37.0	1°37.3	1°32.6	2.8 - 0.3	8.8 - 1.0	14.8 - 1.6
29	1°37.3	1°37.5	1°32.8	2.9 - 0.3	8.9 - 1.0	14.9 - 1.6
30	1°37.5	1°37.8	1°33.1	3.0 - 0.3	9.0 - 1.0	15.0 - 1.6
31	1°37.8	1°38.0	1°33.3	3.1 - 0.3	9.1 - 1.0	15.1 - 1.6
32	1°38.0	1°38.3	1°33.5	3.2 - 0.3	9.2 - 1.0	15.2 - 1.6
33	1°38.3	1°38.5	1°33.8	3.3 - 0.4	9.3 - 1.0	15.3 - 1.7
34	1°38.5	1°38.8	1°34.0	3.4 - 0.4	9.4 - 1.0	15.4 - 1.7
35	1°38.7	1°39.0	1°34.3	3.5 - 0.4	9.5 - 1.0	15.5 - 1.7
36	1°39.0	1°39.3	1°34.5	3.6 - 0.4	9.6 - 1.0	15.6 - 1.7
37	1°39.3	1°39.5	1°34.7	3.7 - 0.4	9.7 - 1.1	15.7 - 1.7
38	1°39.5	1°39.8	1°35.0	3.8 - 0.4	9.8 - 1.1	15.8 - 1.7
39	1°39.8	1°40.0	1°35.2	3.9 - 0.4	9.9 - 1.1	15.9 - 1.7
40	1°40.0	1°40.3	1°35.4	4.0 - 0.4	10.0 - 1.1	16.0 - 1.7
41	1°40.3	1°40.5	1°35.7	4.1 - 0.4	10.1 - 1.1	16.1 - 1.7
42	1°40.5	1°40.8	1°35.9	4.2 - 0.5	10.2 - 1.1	16.2 - 1.8
43	1°40.8	1°41.0	1°36.2	4.3 - 0.5	10.3 - 1.1	16.3 - 1.8
44	1°41.0	1°41.3	1°36.4	4.4 - 0.5	10.4 - 1.1	16.4 - 1.8
45	1°41.3	1°41.5	1°36.6	4.5 - 0.5	10.5 - 1.1	16.5 - 1.8
46	1°41.5	1°41.8	1°36.9	4.6 - 0.5	10.6 - 1.1	16.6 - 1.8
47	1°41.8	1°42.0	1°37.1	4.7 - 0.5	10.7 - 1.2	16.7 - 1.8
48	1°42.0	1°42.3	1°37.4	4.8 - 0.5	10.8 - 1.2	16.8 - 1.8
49	1°42.3	1°42.5	1°37.6	4.9 - 0.5	10.9 - 1.2	16.9 - 1.8
50	1°42.5	1°42.8	1°37.8	5.0 - 0.5	11.0 - 1.2	17.0 - 1.8
51	1°42.7	1°43.0	1°38.1	5.1 - 0.6	11.1 - 1.2	17.1 - 1.9
52	1°43.0	1°43.3	1°38.3	5.2 - 0.6	11.2 - 1.2	17.2 - 1.9
53	1°43.2	1°43.5	1°38.5	5.3 - 0.6	11.3 - 1.2	17.3 - 1.9
54	1°43.5	1°43.8	1°38.8	5.4 - 0.6	11.4 - 1.2	17.4 - 1.9
55	1°43.8	1°44.0	1°39.0	5.5 - 0.6	11.5 - 1.2	17.5 - 1.9
56	1°44.0	1°44.3	1°39.3	5.6 - 0.6	11.6 - 1.3	17.6 - 1.9
57	1°44.3	1°44.5	1°39.5	5.7 - 0.6	11.7 - 1.3	17.7 - 1.9
58	1°44.5	1°44.8	1°39.7	5.8 - 0.6	11.8 - 1.3	17.8 - 1.9
59	1°44.8	1°45.0	1°40.0	5.9 - 0.6	11.9 - 1.3	17.9 - 1.9

m 7	Sun Plan.	Aries	Moon	v and d corr		
0	1°45.0	1°45.3	1°40.2	0.0 - 0.0	6.0 - 0.8	12.0 - 1.5
1	1°45.3	1°45.5	1°40.5	0.1 - 0.0	6.1 - 0.8	12.1 - 1.5
2	1°45.5	1°45.8	1°40.7	0.2 - 0.0	6.2 - 0.8	12.2 - 1.5
3	1°45.8	1°46.0	1°40.9	0.3 - 0.0	6.3 - 0.8	12.3 - 1.5
4	1°46.0	1°46.3	1°41.2	0.4 - 0.1	6.4 - 0.8	12.4 - 1.6
5	1°46.2	1°46.5	1°41.4	0.5 - 0.1	6.5 - 0.8	12.5 - 1.6
6	1°46.5	1°46.8	1°41.6	0.6 - 0.1	6.6 - 0.8	12.6 - 1.6
7	1°46.7	1°47.0	1°41.9	0.7 - 0.1	6.7 - 0.8	12.7 - 1.6
8	1°47.0	1°47.3	1°42.1	0.8 - 0.1	6.8 - 0.8	12.8 - 1.6
9	1°47.3	1°47.5	1°42.4	0.9 - 0.1	6.9 - 0.9	12.9 - 1.6
10	1°47.5	1°47.8	1°42.6	1.0 - 0.1	7.0 - 0.9	13.0 - 1.6
11	1°47.8	1°48.0	1°42.8	1.1 - 0.1	7.1 - 0.9	13.1 - 1.6
12	1°48.0	1°48.3	1°43.1	1.2 - 0.2	7.2 - 0.9	13.2 - 1.6
13	1°48.3	1°48.5	1°43.3	1.3 - 0.2	7.3 - 0.9	13.3 - 1.7
14	1°48.5	1°48.8	1°43.6	1.4 - 0.2	7.4 - 0.9	13.4 - 1.7
15	1°48.8	1°49.0	1°43.8	1.5 - 0.2	7.5 - 0.9	13.5 - 1.7
16	1°49.0	1°49.3	1°44.0	1.6 - 0.2	7.6 - 0.9	13.6 - 1.7
17	1°49.3	1°49.5	1°44.3	1.7 - 0.2	7.7 - 1.0	13.7 - 1.7
18	1°49.5	1°49.8	1°44.5	1.8 - 0.2	7.8 - 1.0	13.8 - 1.7
19	1°49.8	1°50.0	1°44.8	1.9 - 0.2	7.9 - 1.0	13.9 - 1.7
20	1°50.0	1°50.3	1°45.0	2.0 - 0.3	8.0 - 1.0	14.0 - 1.8
21	1°50.2	1°50.6	1°45.2	2.1 - 0.3	8.1 - 1.0	14.1 - 1.8
22	1°50.5	1°50.8	1°45.5	2.2 - 0.3	8.2 - 1.0	14.2 - 1.8
23	1°50.8	1°51.1	1°45.7	2.3 - 0.3	8.3 - 1.0	14.3 - 1.8
24	1°51.0	1°51.3	1°45.9	2.4 - 0.3	8.4 - 1.1	14.4 - 1.8
25	1°51.3	1°51.6	1°46.2	2.5 - 0.3	8.5 - 1.1	14.5 - 1.8
26	1°51.5	1°51.8	1°46.4	2.6 - 0.3	8.6 - 1.1	14.6 - 1.8
27	1°51.8	1°52.1	1°46.7	2.7 - 0.3	8.7 - 1.1	14.7 - 1.8
28	1°52.0	1°52.3	1°46.9	2.8 - 0.4	8.8 - 1.1	14.8 - 1.9
29	1°52.3	1°52.6	1°47.1	2.9 - 0.4	8.9 - 1.1	14.9 - 1.9
30	1°52.5	1°52.8	1°47.4	3.0 - 0.4	9.0 - 1.1	15.0 - 1.9
31	1°52.7	1°53.1	1°47.6	3.1 - 0.4	9.1 - 1.1	15.1 - 1.9
32	1°53.0	1°53.3	1°47.9	3.2 - 0.4	9.2 - 1.1	15.2 - 1.9
33	1°53.3	1°53.6	1°48.1	3.3 - 0.4	9.3 - 1.2	15.3 - 1.9
34	1°53.5	1°53.8	1°48.3	3.4 - 0.4	9.4 - 1.2	15.4 - 1.9
35	1°53.7	1°54.1	1°48.6	3.5 - 0.4	9.5 - 1.2	15.5 - 1.9
36	1°54.0	1°54.3	1°48.8	3.6 - 0.5	9.6 - 1.2	15.6 - 1.9
37	1°54.2	1°54.6	1°49.0	3.7 - 0.5	9.7 - 1.2	15.7 - 2.0
38	1°54.5	1°54.8	1°49.3	3.8 - 0.5	9.8 - 1.2	15.8 - 2.0
39	1°54.8	1°55.1	1°49.5	3.9 - 0.5	9.9 - 1.2	15.9 - 2.0
40	1°55.0	1°55.3	1°49.8	4.0 - 0.5	10.0 - 1.3	16.0 - 2.0
41	1°55.3	1°55.6	1°50.0	4.1 - 0.5	10.1 - 1.3	16.1 - 2.0
42	1°55.5	1°55.8	1°50.2	4.2 - 0.5	10.2 - 1.3	16.2 - 2.0
43	1°55.8	1°56.1	1°50.5	4.3 - 0.5	10.3 - 1.3	16.3 - 2.0
44	1°56.0	1°56.3	1°50.7	4.4 - 0.6	10.4 - 1.3	16.4 - 2.0
45	1°56.3	1°56.6	1°51.0	4.5 - 0.6	10.5 - 1.3	16.5 - 2.1
46	1°56.5	1°56.8	1°51.2	4.6 - 0.6	10.6 - 1.3	16.6 - 2.1
47	1°56.7	1°57.1	1°51.4	4.7 - 0.6	10.7 - 1.3	16.7 - 2.1
48	1°57.0	1°57.3	1°51.7	4.8 - 0.6	10.8 - 1.4	16.8 - 2.1
49	1°57.3	1°57.6	1°51.9	4.9 - 0.6	10.9 - 1.4	16.9 - 2.1
50	1°57.5	1°57.8	1°52.1	5.0 - 0.6	11.0 - 1.4	17.0 - 2.1
51	1°57.7	1°58.1	1°52.4	5.1 - 0.6	11.1 - 1.4	17.1 - 2.1
52	1°58.0	1°58.3	1°52.6	5.2 - 0.7	11.2 - 1.4	17.2 - 2.1
53	1°58.2	1°58.6	1°52.9	5.3 - 0.7	11.3 - 1.4	17.3 - 2.2
54	1°58.5	1°58.8	1°53.1	5.4 - 0.7	11.4 - 1.4	17.4 - 2.2
55	1°58.8	1°59.1	1°53.3	5.5 - 0.7	11.5 - 1.4	17.5 - 2.2
56	1°59.0	1°59.3	1°53.6	5.6 - 0.7	11.6 - 1.5	17.6 - 2.2
57	1°59.3	1°59.6	1°53.8	5.7 - 0.7	11.7 - 1.5	17.7 - 2.2
58	1°59.5	1°59.8	1°54.1	5.8 - 0.7	11.8 - 1.5	17.8 - 2.2
59	1°59.8	2°00.1	1°54.3	5.9 - 0.7	11.9 - 1.5	17.9 - 2.2

m 8	Sun Plan.	Aries	Moon	v and d corr		
0	2°00.0	2°00.3	1°54.5	0.0 - 0.0	6.0 - 0.8	12.0 - 1.7
1	2°00.3	2°00.6	1°54.8	0.1 - 0.0	6.1 - 0.9	12.1 - 1.7
2	2°00.5	2°00.8	1°55.0	0.2 - 0.0	6.2 - 0.9	12.2 - 1.7
3	2°00.8	2°01.1	1°55.2	0.3 - 0.0	6.3 - 0.9	12.3 - 1.7
4	2°01.0	2°01.3	1°55.5	0.4 - 0.1	6.4 - 0.9	12.4 - 1.8
5	2°01.3	2°01.6	1°55.7	0.5 - 0.1	6.5 - 0.9	12.5 - 1.8
6	2°01.5	2°01.8	1°56.0	0.6 - 0.1	6.6 - 0.9	12.6 - 1.8
7	2°01.8	2°02.1	1°56.2	0.7 - 0.1	6.7 - 0.9	12.7 - 1.8
8	2°02.0	2°02.3	1°56.4	0.8 - 0.1	6.8 - 1.0	12.8 - 1.8
9	2°02.3	2°02.6	1°56.7	0.9 - 0.1	6.9 - 1.0	12.9 - 1.8
10	2°02.5	2°02.8	1°56.9	1.0 - 0.1	7.0 - 1.0	13.0 - 1.8
11	2°02.8	2°03.1	1°57.2	1.1 - 0.2	7.1 - 1.0	13.1 - 1.9
12	2°03.0	2°03.3	1°57.4	1.2 - 0.2	7.2 - 1.0	13.2 - 1.9
13	2°03.3	2°03.6	1°57.6	1.3 - 0.2	7.3 - 1.0	13.3 - 1.9
14	2°03.5	2°03.8	1°57.9	1.4 - 0.2	7.4 - 1.0	13.4 - 1.9
15	2°03.8	2°04.1	1°58.1	1.5 - 0.2	7.5 - 1.1	13.5 - 1.9
16	2°04.0	2°04.3	1°58.4	1.6 - 0.2	7.6 - 1.1	13.6 - 1.9
17	2°04.2	2°04.6	1°58.6	1.7 - 0.2	7.7 - 1.1	13.7 - 1.9
18	2°04.5	2°04.8	1°58.8	1.8 - 0.3	7.8 - 1.1	13.8 - 2.0
19	2°04.7	2°05.1	1°59.1	1.9 - 0.3	7.9 - 1.1	13.9 - 2.0
20	2°05.0	2°05.3	1°59.3	2.0 - 0.3	8.0 - 1.1	14.0 - 2.0
21	2°05.2	2°05.6	1°59.5	2.1 - 0.3	8.1 - 1.1	14.1 - 2.0
22	2°05.5	2°05.8	1°59.8	2.2 - 0.3	8.2 - 1.2	14.2 - 2.0
23	2°05.7	2°06.1	2°00.0	2.3 - 0.3	8.3 - 1.2	14.3 - 2.0
24	2°06.0	2°06.3	2°00.3	2.4 - 0.3	8.4 - 1.2	14.4 - 2.0
25	2°06.2	2°06.6	2°00.5	2.5 - 0.4	8.5 - 1.2	14.5 - 2.1
26	2°06.5	2°06.8	2°00.7	2.6 - 0.4	8.6 - 1.2	14.6 - 2.1
27	2°06.7	2°07.1	2°01.0	2.7 - 0.4	8.7 - 1.2	14.7 - 2.1
28	2°07.0	2°07.3	2°01.2	2.8 - 0.4	8.8 - 1.2	14.8 - 2.1
29	2°07.2	2°07.6	2°01.5	2.9 - 0.4	8.9 - 1.3	14.9 - 2.1
30	2°07.5	2°07.8	2°01.7	3.0 - 0.4	9.0 - 1.3	15.0 - 2.1
31	2°07.8	2°08.1	2°01.9	3.1 - 0.4	9.1 - 1.3	15.1 - 2.1
32	2°08.0	2°08.3	2°02.2	3.2 - 0.5	9.2 - 1.3	15.2 - 2.2
33	2°08.3	2°08.6	2°02.4	3.3 - 0.5	9.3 - 1.3	15.3 - 2.2
34	2°08.5	2°08.9	2°02.6	3.4 - 0.5	9.4 - 1.3	15.4 - 2.2
35	2°08.8	2°09.1	2°02.9	3.5 - 0.5	9.5 - 1.3	15.5 - 2.2
36	2°09.0	2°09.4	2°03.1	3.6 - 0.5	9.6 - 1.4	15.6 - 2.2
37	2°09.3	2°09.6	2°03.4	3.7 - 0.5	9.7 - 1.4	15.7 - 2.2
38	2°09.5	2°09.9	2°03.6	3.8 - 0.5	9.8 - 1.4	15.8 - 2.2
39	2°09.8	2°10.1	2°03.8	3.9 - 0.6	9.9 - 1.4	15.9 - 2.3
40	2°10.0	2°10.4	2°04.1	4.0 - 0.6	10.0 - 1.4	16.0 - 2.3
41	2°10.3	2°10.6	2°04.3	4.1 - 0.6	10.1 - 1.4	16.1 - 2.3
42	2°10.5	2°10.9	2°04.6	4.2 - 0.6	10.2 - 1.4	16.2 - 2.3
43	2°10.8	2°11.1	2°04.8	4.3 - 0.6	10.3 - 1.5	16.3 - 2.3
44	2°11.0	2°11.4	2°05.0	4.4 - 0.6	10.4 - 1.5	16.4 - 2.3
45	2°11.3	2°11.6	2°05.3	4.5 - 0.6	10.5 - 1.5	16.5 - 2.3
46	2°11.5	2°11.9	2°05.5	4.6 - 0.7	10.6 - 1.5	16.6 - 2.4
47	2°11.7	2°12.1	2°05.7	4.7 - 0.7	10.7 - 1.5	16.7 - 2.4
48	2°12.0	2°12.4	2°06.0	4.8 - 0.7	10.8 - 1.5	16.8 - 2.4
49	2°12.2	2°12.6	2°06.2	4.9 - 0.7	10.9 - 1.5	16.9 - 2.4
50	2°12.5	2°12.9	2°06.5	5.0 - 0.7	11.0 - 1.6	17.0 - 2.4
51	2°12.7	2°13.1	2°06.7	5.1 - 0.7	11.1 - 1.6	17.1 - 2.4
52	2°13.0	2°13.4	2°06.9	5.2 - 0.7	11.2 - 1.6	17.2 - 2.4
53	2°13.2	2°13.6	2°07.2	5.3 - 0.8	11.3 - 1.6	17.3 - 2.5
54	2°13.5	2°13.9	2°07.4	5.4 - 0.8	11.4 - 1.6	17.4 - 2.5
55	2°13.7	2°14.1	2°07.7	5.5 - 0.8	11.5 - 1.6	17.5 - 2.5
56	2°14.0	2°14.4	2°07.9	5.6 - 0.8	11.6 - 1.6	17.6 - 2.5
57	2°14.2	2°14.6	2°08.1	5.7 - 0.8	11.7 - 1.7	17.7 - 2.5
58	2°14.5	2°14.9	2°08.4	5.8 - 0.8	11.8 - 1.7	17.8 - 2.5
59	2°14.7	2°15.1	2°08.6	5.9 - 0.8	11.9 - 1.7	17.9 - 2.5

Increments and Corrections

m 9	Sun Plan.	Aries	Moon	v and d corr		
0	2°15.0	2°15.4	2°08.8	0.0 - 0.0	6.0 - 0.9	12.0 - 1.9
1	2°15.3	2°15.6	2°09.1	0.1 - 0.0	6.1 - 1.0	12.1 - 1.9
2	2°15.5	2°15.9	2°09.3	0.2 - 0.0	6.2 - 1.0	12.2 - 1.9
3	2°15.8	2°16.1	2°09.6	0.3 - 0.0	6.3 - 1.0	12.3 - 1.9
4	2°16.0	2°16.4	2°09.8	0.4 - 0.1	6.4 - 1.0	12.4 - 2.0
5	2°16.3	2°16.6	2°10.0	0.5 - 0.1	6.5 - 1.0	12.5 - 2.0
6	2°16.5	2°16.9	2°10.3	0.6 - 0.1	6.6 - 1.0	12.6 - 2.0
7	2°16.8	2°17.1	2°10.5	0.7 - 0.1	6.7 - 1.1	12.7 - 2.0
8	2°17.0	2°17.4	2°10.8	0.8 - 0.1	6.8 - 1.1	12.8 - 2.0
9	2°17.3	2°17.6	2°11.0	0.9 - 0.1	6.9 - 1.1	12.9 - 2.0
10	2°17.5	2°17.9	2°11.2	1.0 - 0.2	7.0 - 1.1	13.0 - 2.1
11	2°17.8	2°18.1	2°11.5	1.1 - 0.2	7.1 - 1.1	13.1 - 2.1
12	2°18.0	2°18.4	2°11.7	1.2 - 0.2	7.2 - 1.1	13.2 - 2.1
13	2°18.3	2°18.6	2°12.0	1.3 - 0.2	7.3 - 1.2	13.3 - 2.1
14	2°18.5	2°18.9	2°12.2	1.4 - 0.2	7.4 - 1.2	13.4 - 2.1
15	2°18.8	2°19.1	2°12.4	1.5 - 0.2	7.5 - 1.2	13.5 - 2.1
16	2°19.0	2°19.4	2°12.7	1.6 - 0.3	7.6 - 1.2	13.6 - 2.2
17	2°19.3	2°19.6	2°12.9	1.7 - 0.3	7.7 - 1.2	13.7 - 2.2
18	2°19.5	2°19.9	2°13.1	1.8 - 0.3	7.8 - 1.2	13.8 - 2.2
19	2°19.7	2°20.1	2°13.4	1.9 - 0.3	7.9 - 1.3	13.9 - 2.2
20	2°20.0	2°20.4	2°13.6	2.0 - 0.3	8.0 - 1.3	14.0 - 2.2
21	2°20.2	2°20.6	2°13.9	2.1 - 0.3	8.1 - 1.3	14.1 - 2.2
22	2°20.5	2°20.9	2°14.1	2.2 - 0.3	8.2 - 1.3	14.2 - 2.2
23	2°20.7	2°21.1	2°14.3	2.3 - 0.4	8.3 - 1.3	14.3 - 2.3
24	2°21.0	2°21.4	2°14.6	2.4 - 0.4	8.4 - 1.3	14.4 - 2.3
25	2°21.2	2°21.6	2°14.8	2.5 - 0.4	8.5 - 1.3	14.5 - 2.3
26	2°21.5	2°21.9	2°15.1	2.6 - 0.4	8.6 - 1.4	14.6 - 2.3
27	2°21.7	2°22.1	2°15.3	2.7 - 0.4	8.7 - 1.4	14.7 - 2.3
28	2°22.0	2°22.4	2°15.5	2.8 - 0.4	8.8 - 1.4	14.8 - 2.3
29	2°22.2	2°22.6	2°15.8	2.9 - 0.5	8.9 - 1.4	14.9 - 2.4
30	2°22.5	2°22.9	2°16.0	3.0 - 0.5	9.0 - 1.4	15.0 - 2.4
31	2°22.8	2°23.1	2°16.2	3.1 - 0.5	9.1 - 1.4	15.1 - 2.4
32	2°23.0	2°23.4	2°16.5	3.2 - 0.5	9.2 - 1.5	15.2 - 2.4
33	2°23.3	2°23.6	2°16.7	3.3 - 0.5	9.3 - 1.5	15.3 - 2.4
34	2°23.5	2°23.9	2°17.0	3.4 - 0.5	9.4 - 1.5	15.4 - 2.4
35	2°23.8	2°24.1	2°17.2	3.5 - 0.6	9.5 - 1.5	15.5 - 2.5
36	2°24.0	2°24.4	2°17.4	3.6 - 0.6	9.6 - 1.5	15.6 - 2.5
37	2°24.3	2°24.6	2°17.7	3.7 - 0.6	9.7 - 1.5	15.7 - 2.5
38	2°24.5	2°24.9	2°17.9	3.8 - 0.6	9.8 - 1.6	15.8 - 2.5
39	2°24.8	2°25.1	2°18.2	3.9 - 0.6	9.9 - 1.6	15.9 - 2.5
40	2°25.0	2°25.4	2°18.4	4.0 - 0.6	10.0 - 1.6	16.0 - 2.5
41	2°25.3	2°25.6	2°18.6	4.1 - 0.6	10.1 - 1.6	16.1 - 2.5
42	2°25.5	2°25.9	2°18.9	4.2 - 0.7	10.2 - 1.6	16.2 - 2.6
43	2°25.8	2°26.1	2°19.1	4.3 - 0.7	10.3 - 1.6	16.3 - 2.6
44	2°26.0	2°26.4	2°19.3	4.4 - 0.7	10.4 - 1.6	16.4 - 2.6
45	2°26.3	2°26.6	2°19.6	4.5 - 0.7	10.5 - 1.7	16.5 - 2.6
46	2°26.5	2°26.9	2°19.8	4.6 - 0.7	10.6 - 1.7	16.6 - 2.6
47	2°26.8	2°27.2	2°20.1	4.7 - 0.7	10.7 - 1.7	16.7 - 2.6
48	2°27.0	2°27.4	2°20.3	4.8 - 0.8	10.8 - 1.7	16.8 - 2.7
49	2°27.2	2°27.7	2°20.5	4.9 - 0.8	10.9 - 1.7	16.9 - 2.7
50	2°27.5	2°27.9	2°20.8	5.0 - 0.8	11.0 - 1.7	17.0 - 2.7
51	2°27.7	2°28.2	2°21.0	5.1 - 0.8	11.1 - 1.8	17.1 - 2.7
52	2°28.0	2°28.4	2°21.3	5.2 - 0.8	11.2 - 1.8	17.2 - 2.7
53	2°28.2	2°28.7	2°21.5	5.3 - 0.8	11.3 - 1.8	17.3 - 2.7
54	2°28.5	2°28.9	2°21.7	5.4 - 0.9	11.4 - 1.8	17.4 - 2.8
55	2°28.7	2°29.2	2°22.0	5.5 - 0.9	11.5 - 1.8	17.5 - 2.8
56	2°29.0	2°29.4	2°22.2	5.6 - 0.9	11.6 - 1.8	17.6 - 2.8
57	2°29.2	2°29.7	2°22.5	5.7 - 0.9	11.7 - 1.9	17.7 - 2.8
58	2°29.5	2°29.9	2°22.7	5.8 - 0.9	11.8 - 1.9	17.8 - 2.8
59	2°29.7	2°30.2	2°22.9	5.9 - 0.9	11.9 - 1.9	17.9 - 2.8

m 10	Sun Plan.	Aries	Moon	v and d corr		
0	2°30.0	2°30.4	2°23.2	0.0 - 0.0	6.0 - 1.0	12.0 - 2.1
1	2°30.3	2°30.7	2°23.4	0.1 - 0.0	6.1 - 1.1	12.1 - 2.1
2	2°30.5	2°30.9	2°23.6	0.2 - 0.0	6.2 - 1.1	12.2 - 2.1
3	2°30.8	2°31.2	2°23.9	0.3 - 0.1	6.3 - 1.1	12.3 - 2.2
4	2°31.0	2°31.4	2°24.1	0.4 - 0.1	6.4 - 1.1	12.4 - 2.2
5	2°31.3	2°31.7	2°24.4	0.5 - 0.1	6.5 - 1.1	12.5 - 2.2
6	2°31.5	2°31.9	2°24.6	0.6 - 0.1	6.6 - 1.2	12.6 - 2.2
7	2°31.8	2°32.2	2°24.8	0.7 - 0.1	6.7 - 1.2	12.7 - 2.2
8	2°32.0	2°32.4	2°25.1	0.8 - 0.1	6.8 - 1.2	12.8 - 2.2
9	2°32.3	2°32.7	2°25.3	0.9 - 0.2	6.9 - 1.2	12.9 - 2.3
10	2°32.5	2°32.9	2°25.6	1.0 - 0.2	7.0 - 1.2	13.0 - 2.3
11	2°32.8	2°33.2	2°25.8	1.1 - 0.2	7.1 - 1.2	13.1 - 2.3
12	2°33.0	2°33.4	2°26.0	1.2 - 0.2	7.2 - 1.3	13.2 - 2.3
13	2°33.3	2°33.7	2°26.3	1.3 - 0.2	7.3 - 1.3	13.3 - 2.3
14	2°33.5	2°33.9	2°26.5	1.4 - 0.2	7.4 - 1.3	13.4 - 2.3
15	2°33.8	2°34.2	2°26.7	1.5 - 0.3	7.5 - 1.3	13.5 - 2.4
16	2°34.0	2°34.4	2°27.0	1.6 - 0.3	7.6 - 1.3	13.6 - 2.4
17	2°34.3	2°34.7	2°27.2	1.7 - 0.3	7.7 - 1.3	13.7 - 2.4
18	2°34.5	2°34.9	2°27.5	1.8 - 0.3	7.8 - 1.4	13.8 - 2.4
19	2°34.8	2°35.2	2°27.7	1.9 - 0.3	7.9 - 1.4	13.9 - 2.4
20	2°35.0	2°35.4	2°27.9	2.0 - 0.3	8.0 - 1.4	14.0 - 2.4
21	2°35.2	2°35.7	2°28.2	2.1 - 0.4	8.1 - 1.4	14.1 - 2.5
22	2°35.5	2°35.9	2°28.4	2.2 - 0.4	8.2 - 1.4	14.2 - 2.5
23	2°35.7	2°36.2	2°28.7	2.3 - 0.4	8.3 - 1.5	14.3 - 2.5
24	2°36.0	2°36.4	2°28.9	2.4 - 0.4	8.4 - 1.5	14.4 - 2.5
25	2°36.2	2°36.7	2°29.1	2.5 - 0.4	8.5 - 1.5	14.5 - 2.5
26	2°36.5	2°36.9	2°29.4	2.6 - 0.5	8.6 - 1.5	14.6 - 2.6
27	2°36.7	2°37.2	2°29.6	2.7 - 0.5	8.7 - 1.5	14.7 - 2.6
28	2°37.0	2°37.4	2°29.8	2.8 - 0.5	8.8 - 1.5	14.8 - 2.6
29	2°37.2	2°37.7	2°30.1	2.9 - 0.5	8.9 - 1.6	14.9 - 2.6
30	2°37.5	2°37.9	2°30.3	3.0 - 0.5	9.0 - 1.6	15.0 - 2.6
31	2°37.8	2°38.2	2°30.6	3.1 - 0.5	9.1 - 1.6	15.1 - 2.6
32	2°38.0	2°38.4	2°30.8	3.2 - 0.6	9.2 - 1.6	15.2 - 2.7
33	2°38.3	2°38.7	2°31.0	3.3 - 0.6	9.3 - 1.6	15.3 - 2.7
34	2°38.5	2°38.9	2°31.3	3.4 - 0.6	9.4 - 1.6	15.4 - 2.7
35	2°38.8	2°39.2	2°31.5	3.5 - 0.6	9.5 - 1.7	15.5 - 2.7
36	2°39.0	2°39.4	2°31.8	3.6 - 0.6	9.6 - 1.7	15.6 - 2.7
37	2°39.3	2°39.7	2°32.0	3.7 - 0.6	9.7 - 1.7	15.7 - 2.7
38	2°39.5	2°39.9	2°32.2	3.8 - 0.7	9.8 - 1.7	15.8 - 2.8
39	2°39.8	2°40.2	2°32.5	3.9 - 0.7	9.9 - 1.7	15.9 - 2.8
40	2°40.0	2°40.4	2°32.7	4.0 - 0.7	10.0 - 1.8	16.0 - 2.8
41	2°40.3	2°40.7	2°32.9	4.1 - 0.7	10.1 - 1.8	16.1 - 2.8
42	2°40.5	2°40.9	2°33.2	4.2 - 0.7	10.2 - 1.8	16.2 - 2.8
43	2°40.8	2°41.2	2°33.4	4.3 - 0.8	10.3 - 1.8	16.3 - 2.9
44	2°41.0	2°41.4	2°33.7	4.4 - 0.8	10.4 - 1.8	16.4 - 2.9
45	2°41.3	2°41.7	2°33.9	4.5 - 0.8	10.5 - 1.8	16.5 - 2.9
46	2°41.5	2°41.9	2°34.1	4.6 - 0.8	10.6 - 1.9	16.6 - 2.9
47	2°41.8	2°42.2	2°34.4	4.7 - 0.8	10.7 - 1.9	16.7 - 2.9
48	2°42.0	2°42.4	2°34.6	4.8 - 0.8	10.8 - 1.9	16.8 - 2.9
49	2°42.3	2°42.7	2°34.9	4.9 - 0.9	10.9 - 1.9	16.9 - 3.0
50	2°42.5	2°42.9	2°35.1	5.0 - 0.9	11.0 - 1.9	17.0 - 3.0
51	2°42.7	2°43.2	2°35.3	5.1 - 0.9	11.1 - 1.9	17.1 - 3.0
52	2°43.0	2°43.4	2°35.6	5.2 - 0.9	11.2 - 2.0	17.2 - 3.0
53	2°43.2	2°43.7	2°35.8	5.3 - 0.9	11.3 - 2.0	17.3 - 3.0
54	2°43.5	2°43.9	2°36.1	5.4 - 0.9	11.4 - 2.0	17.4 - 3.0
55	2°43.7	2°44.2	2°36.3	5.5 - 1.0	11.5 - 2.0	17.5 - 3.1
56	2°44.0	2°44.4	2°36.5	5.6 - 1.0	11.6 - 2.0	17.6 - 3.1
57	2°44.2	2°44.7	2°36.8	5.7 - 1.0	11.7 - 2.0	17.7 - 3.1
58	2°44.5	2°44.9	2°37.0	5.8 - 1.0	11.8 - 2.1	17.8 - 3.1
59	2°44.7	2°45.2	2°37.2	5.9 - 1.0	11.9 - 2.1	17.9 - 3.1

m 11	Sun Plan.	Aries	Moon	v and d corr		
0	2°45.0	2°45.5	2°37.5	0.0 - 0.0	6.0 - 1.2	12.0 - 2.3
1	2°45.3	2°45.7	2°37.7	0.1 - 0.0	6.1 - 1.2	12.1 - 2.3
2	2°45.5	2°46.0	2°38.0	0.2 - 0.0	6.2 - 1.2	12.2 - 2.3
3	2°45.8	2°46.2	2°38.2	0.3 - 0.1	6.3 - 1.2	12.3 - 2.4
4	2°46.0	2°46.5	2°38.4	0.4 - 0.1	6.4 - 1.2	12.4 - 2.4
5	2°46.3	2°46.7	2°38.7	0.5 - 0.1	6.5 - 1.2	12.5 - 2.4
6	2°46.5	2°47.0	2°38.9	0.6 - 0.1	6.6 - 1.3	12.6 - 2.4
7	2°46.8	2°47.2	2°39.2	0.7 - 0.1	6.7 - 1.3	12.7 - 2.4
8	2°47.0	2°47.5	2°39.4	0.8 - 0.2	6.8 - 1.3	12.8 - 2.5
9	2°47.3	2°47.7	2°39.6	0.9 - 0.2	6.9 - 1.3	12.9 - 2.5
10	2°47.5	2°48.0	2°39.9	1.0 - 0.2	7.0 - 1.3	13.0 - 2.5
11	2°47.8	2°48.2	2°40.1	1.1 - 0.2	7.1 - 1.4	13.1 - 2.5
12	2°48.0	2°48.5	2°40.3	1.2 - 0.2	7.2 - 1.4	13.2 - 2.5
13	2°48.3	2°48.7	2°40.6	1.3 - 0.2	7.3 - 1.4	13.3 - 2.5
14	2°48.5	2°49.0	2°40.8	1.4 - 0.3	7.4 - 1.4	13.4 - 2.6
15	2°48.8	2°49.2	2°41.1	1.5 - 0.3	7.5 - 1.4	13.5 - 2.6
16	2°49.0	2°49.5	2°41.3	1.6 - 0.3	7.6 - 1.5	13.6 - 2.6
17	2°49.3	2°49.7	2°41.5	1.7 - 0.3	7.7 - 1.5	13.7 - 2.6
18	2°49.5	2°50.0	2°41.8	1.8 - 0.3	7.8 - 1.5	13.8 - 2.6
19	2°49.8	2°50.2	2°42.0	1.9 - 0.4	7.9 - 1.5	13.9 - 2.7
20	2°50.0	2°50.5	2°42.3	2.0 - 0.4	8.0 - 1.5	14.0 - 2.7
21	2°50.2	2°50.7	2°42.5	2.1 - 0.4	8.1 - 1.6	14.1 - 2.7
22	2°50.5	2°51.0	2°42.7	2.2 - 0.4	8.2 - 1.6	14.2 - 2.7
23	2°50.7	2°51.2	2°43.0	2.3 - 0.4	8.3 - 1.6	14.3 - 2.7
24	2°51.0	2°51.5	2°43.2	2.4 - 0.5	8.4 - 1.6	14.4 - 2.8
25	2°51.2	2°51.7	2°43.4	2.5 - 0.5	8.5 - 1.6	14.5 - 2.8
26	2°51.5	2°52.0	2°43.7	2.6 - 0.5	8.6 - 1.6	14.6 - 2.8
27	2°51.7	2°52.2	2°43.9	2.7 - 0.5	8.7 - 1.7	14.7 - 2.8
28	2°52.0	2°52.5	2°44.2	2.8 - 0.5	8.8 - 1.7	14.8 - 2.8
29	2°52.2	2°52.7	2°44.4	2.9 - 0.6	8.9 - 1.7	14.9 - 2.9
30	2°52.5	2°53.0	2°44.6	3.0 - 0.6	9.0 - 1.7	15.0 - 2.9
31	2°52.8	2°53.2	2°44.9	3.1 - 0.6	9.1 - 1.7	15.1 - 2.9
32	2°53.0	2°53.5	2°45.1	3.2 - 0.6	9.2 - 1.8	15.2 - 2.9
33	2°53.3	2°53.7	2°45.4	3.3 - 0.6	9.3 - 1.8	15.3 - 2.9
34	2°53.5	2°54.0	2°45.6	3.4 - 0.7	9.4 - 1.8	15.4 - 3.0
35	2°53.8	2°54.2	2°45.8	3.5 - 0.7	9.5 - 1.8	15.5 - 3.0
36	2°54.0	2°54.5	2°46.1	3.6 - 0.7	9.6 - 1.8	15.6 - 3.0
37	2°54.3	2°54.7	2°46.3	3.7 - 0.7	9.7 - 1.9	15.7 - 3.0
38	2°54.5	2°55.0	2°46.6	3.8 - 0.7	9.8 - 1.9	15.8 - 3.0
39	2°54.8	2°55.2	2°46.8	3.9 - 0.7	9.9 - 1.9	15.9 - 3.0
40	2°55.0	2°55.5	2°47.0	4.0 - 0.8	10.0 - 1.9	16.0 - 3.1
41	2°55.3	2°55.7	2°47.3	4.1 - 0.8	10.1 - 1.9	16.1 - 3.1
42	2°55.5	2°56.0	2°47.5	4.2 - 0.8	10.2 - 2.0	16.2 - 3.1
43	2°55.8	2°56.2	2°47.7	4.3 - 0.8	10.3 - 2.0	16.3 - 3.1
44	2°56.0	2°56.5	2°48.0	4.4 - 0.8	10.4 - 2.0	16.4 - 3.1
45	2°56.3	2°56.7	2°48.2	4.5 - 0.9	10.5 - 2.0	16.5 - 3.2
46	2°56.5	2°57.0	2°48.5	4.6 - 0.9	10.6 - 2.0	16.6 - 3.2
47	2°56.8	2°57.2	2°48.7	4.7 - 0.9	10.7 - 2.1	16.7 - 3.2
48	2°57.0	2°57.5	2°48.9	4.8 - 0.9	10.8 - 2.1	16.8 - 3.2
49	2°57.3	2°57.7	2°49.2	4.9 - 0.9	10.9 - 2.1	16.9 - 3.2
50	2°57.5	2°58.0	2°49.4	5.0 - 1.0	11.0 - 2.1	17.0 - 3.3
51	2°57.7	2°58.2	2°49.7	5.1 - 1.0	11.1 - 2.1	17.1 - 3.3
52	2°58.0	2°58.5	2°49.9	5.2 - 1.0	11.2 - 2.1	17.2 - 3.3
53	2°58.2	2°58.7	2°50.1	5.3 - 1.0	11.3 - 2.2	17.3 - 3.3
54	2°58.5	2°59.0	2°50.4	5.4 - 1.0	11.4 - 2.2	17.4 - 3.3
55	2°58.7	2°59.2	2°50.6	5.5 - 1.1	11.5 - 2.2	17.5 - 3.4
56	2°59.0	2°59.5	2°50.8	5.6 - 1.1	11.6 - 2.2	17.6 - 3.4
57	2°59.2	2°59.7	2°51.1	5.7 - 1.1	11.7 - 2.2	17.7 - 3.4
58	2°59.5	3°00.0	2°51.3	5.8 - 1.1	11.8 - 2.3	17.8 - 3.4
59	2°59.7	3°00.2	2°51.6	5.9 - 1.1	11.9 - 2.3	17.9 - 3.4

Increments and Corrections

m 12	Sun Plan.	Aries	Moon	v and d corr		
0	3°00.0	3°00.5	2°51.8	0.0 - 0.0	6.0 - 1.3	12.0 - 2.5
1	3°00.3	3°00.7	2°52.0	0.1 - 0.0	6.1 - 1.3	12.1 - 2.5
2	3°00.5	3°01.0	2°52.3	0.2 - 0.0	6.2 - 1.3	12.2 - 2.5
3	3°00.8	3°01.2	2°52.5	0.3 - 0.1	6.3 - 1.3	12.3 - 2.6
4	3°01.0	3°01.5	2°52.8	0.4 - 0.1	6.4 - 1.3	12.4 - 2.6
5	3°01.3	3°01.7	2°53.0	0.5 - 0.1	6.5 - 1.4	12.5 - 2.6
6	3°01.5	3°02.0	2°53.2	0.6 - 0.1	6.6 - 1.4	12.6 - 2.6
7	3°01.8	3°02.2	2°53.5	0.7 - 0.1	6.7 - 1.4	12.7 - 2.6
8	3°02.0	3°02.5	2°53.7	0.8 - 0.2	6.8 - 1.4	12.8 - 2.7
9	3°02.3	3°02.7	2°53.9	0.9 - 0.2	6.9 - 1.4	12.9 - 2.7
10	3°02.5	3°03.0	2°54.2	1.0 - 0.2	7.0 - 1.5	13.0 - 2.7
11	3°02.8	3°03.2	2°54.4	1.1 - 0.2	7.1 - 1.5	13.1 - 2.7
12	3°03.0	3°03.5	2°54.7	1.2 - 0.3	7.2 - 1.5	13.2 - 2.8
13	3°03.3	3°03.8	2°54.9	1.3 - 0.3	7.3 - 1.5	13.3 - 2.8
14	3°03.5	3°04.0	2°55.1	1.4 - 0.3	7.4 - 1.5	13.4 - 2.8
15	3°03.8	3°04.3	2°55.4	1.5 - 0.3	7.5 - 1.6	13.5 - 2.8
16	3°04.0	3°04.5	2°55.6	1.6 - 0.3	7.6 - 1.6	13.6 - 2.8
17	3°04.2	3°04.8	2°55.9	1.7 - 0.4	7.7 - 1.6	13.7 - 2.9
18	3°04.5	3°05.0	2°56.1	1.8 - 0.4	7.8 - 1.6	13.8 - 2.9
19	3°04.7	3°05.3	2°56.3	1.9 - 0.4	7.9 - 1.6	13.9 - 2.9
20	3°05.0	3°05.5	2°56.6	2.0 - 0.4	8.0 - 1.7	14.0 - 2.9
21	3°05.2	3°05.8	2°56.8	2.1 - 0.4	8.1 - 1.7	14.1 - 2.9
22	3°05.5	3°06.0	2°57.0	2.2 - 0.5	8.2 - 1.7	14.2 - 3.0
23	3°05.7	3°06.3	2°57.3	2.3 - 0.5	8.3 - 1.7	14.3 - 3.0
24	3°06.0	3°06.5	2°57.5	2.4 - 0.5	8.4 - 1.8	14.4 - 3.0
25	3°06.2	3°06.8	2°57.8	2.5 - 0.5	8.5 - 1.8	14.5 - 3.0
26	3°06.5	3°07.0	2°58.0	2.6 - 0.5	8.6 - 1.8	14.6 - 3.0
27	3°06.7	3°07.3	2°58.2	2.7 - 0.6	8.7 - 1.8	14.7 - 3.1
28	3°07.0	3°07.5	2°58.5	2.8 - 0.6	8.8 - 1.8	14.8 - 3.1
29	3°07.2	3°07.8	2°58.7	2.9 - 0.6	8.9 - 1.9	14.9 - 3.1
30	3°07.5	3°08.0	2°59.0	3.0 - 0.6	9.0 - 1.9	15.0 - 3.1
31	3°07.8	3°08.3	2°59.2	3.1 - 0.6	9.1 - 1.9	15.1 - 3.1
32	3°08.0	3°08.5	2°59.4	3.2 - 0.7	9.2 - 1.9	15.2 - 3.2
33	3°08.3	3°08.8	2°59.7	3.3 - 0.7	9.3 - 1.9	15.3 - 3.2
34	3°08.5	3°09.0	2°59.9	3.4 - 0.7	9.4 - 2.0	15.4 - 3.2
35	3°08.8	3°09.3	3°00.2	3.5 - 0.7	9.5 - 2.0	15.5 - 3.2
36	3°09.0	3°09.5	3°00.4	3.6 - 0.8	9.6 - 2.0	15.6 - 3.3
37	3°09.3	3°09.8	3°00.6	3.7 - 0.8	9.7 - 2.0	15.7 - 3.3
38	3°09.5	3°10.0	3°00.9	3.8 - 0.8	9.8 - 2.0	15.8 - 3.3
39	3°09.8	3°10.3	3°01.1	3.9 - 0.8	9.9 - 2.1	15.9 - 3.3
40	3°10.0	3°10.5	3°01.3	4.0 - 0.8	10.0 - 2.1	16.0 - 3.3
41	3°10.3	3°10.8	3°01.6	4.1 - 0.9	10.1 - 2.1	16.1 - 3.4
42	3°10.5	3°11.0	3°01.8	4.2 - 0.9	10.2 - 2.1	16.2 - 3.4
43	3°10.8	3°11.3	3°02.1	4.3 - 0.9	10.3 - 2.1	16.3 - 3.4
44	3°11.0	3°11.5	3°02.3	4.4 - 0.9	10.4 - 2.2	16.4 - 3.4
45	3°11.3	3°11.8	3°02.5	4.5 - 0.9	10.5 - 2.2	16.5 - 3.4
46	3°11.5	3°12.0	3°02.8	4.6 - 1.0	10.6 - 2.2	16.6 - 3.5
47	3°11.7	3°12.3	3°03.0	4.7 - 1.0	10.7 - 2.2	16.7 - 3.5
48	3°12.0	3°12.5	3°03.3	4.8 - 1.0	10.8 - 2.3	16.8 - 3.5
49	3°12.2	3°12.8	3°03.5	4.9 - 1.0	10.9 - 2.3	16.9 - 3.5
50	3°12.5	3°13.0	3°03.7	5.0 - 1.0	11.0 - 2.3	17.0 - 3.5
51	3°12.7	3°13.3	3°04.0	5.1 - 1.1	11.1 - 2.3	17.1 - 3.6
52	3°13.0	3°13.5	3°04.2	5.2 - 1.1	11.2 - 2.3	17.2 - 3.6
53	3°13.2	3°13.8	3°04.4	5.3 - 1.1	11.3 - 2.4	17.3 - 3.6
54	3°13.5	3°14.0	3°04.7	5.4 - 1.1	11.4 - 2.4	17.4 - 3.6
55	3°13.7	3°14.3	3°04.9	5.5 - 1.1	11.5 - 2.4	17.5 - 3.6
56	3°14.0	3°14.5	3°05.2	5.6 - 1.2	11.6 - 2.4	17.6 - 3.7
57	3°14.2	3°14.8	3°05.4	5.7 - 1.2	11.7 - 2.4	17.7 - 3.7
58	3°14.5	3°15.0	3°05.6	5.8 - 1.2	11.8 - 2.5	17.8 - 3.7
59	3°14.7	3°15.3	3°05.9	5.9 - 1.2	11.9 - 2.5	17.9 - 3.7

m 13	Sun Plan.	Aries	Moon	v and d corr		
0	3°15.0	3°15.5	3°06.1	0.0 - 0.0	6.0 - 1.4	12.0 - 2.7
1	3°15.3	3°15.8	3°06.4	0.1 - 0.0	6.1 - 1.4	12.1 - 2.7
2	3°15.5	3°16.0	3°06.6	0.2 - 0.0	6.2 - 1.4	12.2 - 2.7
3	3°15.8	3°16.3	3°06.8	0.3 - 0.1	6.3 - 1.4	12.3 - 2.8
4	3°16.0	3°16.5	3°07.1	0.4 - 0.1	6.4 - 1.4	12.4 - 2.8
5	3°16.3	3°16.8	3°07.3	0.5 - 0.1	6.5 - 1.5	12.5 - 2.8
6	3°16.5	3°17.0	3°07.5	0.6 - 0.1	6.6 - 1.5	12.6 - 2.8
7	3°16.8	3°17.3	3°07.8	0.7 - 0.2	6.7 - 1.5	12.7 - 2.9
8	3°17.0	3°17.5	3°08.0	0.8 - 0.2	6.8 - 1.5	12.8 - 2.9
9	3°17.3	3°17.8	3°08.3	0.9 - 0.2	6.9 - 1.6	12.9 - 2.9
10	3°17.5	3°18.0	3°08.5	1.0 - 0.2	7.0 - 1.6	13.0 - 2.9
11	3°17.8	3°18.3	3°08.7	1.1 - 0.2	7.1 - 1.6	13.1 - 2.9
12	3°18.0	3°18.5	3°09.0	1.2 - 0.3	7.2 - 1.6	13.2 - 3.0
13	3°18.3	3°18.8	3°09.2	1.3 - 0.3	7.3 - 1.6	13.3 - 3.0
14	3°18.5	3°19.0	3°09.5	1.4 - 0.3	7.4 - 1.7	13.4 - 3.0
15	3°18.8	3°19.3	3°09.7	1.5 - 0.3	7.5 - 1.7	13.5 - 3.0
16	3°19.0	3°19.5	3°09.9	1.6 - 0.4	7.6 - 1.7	13.6 - 3.1
17	3°19.3	3°19.8	3°10.2	1.7 - 0.4	7.7 - 1.7	13.7 - 3.1
18	3°19.5	3°20.0	3°10.4	1.8 - 0.4	7.8 - 1.8	13.8 - 3.1
19	3°19.7	3°20.3	3°10.7	1.9 - 0.4	7.9 - 1.8	13.9 - 3.1
20	3°20.0	3°20.5	3°10.9	2.0 - 0.5	8.0 - 1.8	14.0 - 3.1
21	3°20.2	3°20.8	3°11.1	2.1 - 0.5	8.1 - 1.8	14.1 - 3.2
22	3°20.5	3°21.0	3°11.4	2.2 - 0.5	8.2 - 1.8	14.2 - 3.2
23	3°20.7	3°21.3	3°11.6	2.3 - 0.5	8.3 - 1.9	14.3 - 3.2
24	3°21.0	3°21.5	3°11.8	2.4 - 0.5	8.4 - 1.9	14.4 - 3.2
25	3°21.2	3°21.8	3°12.1	2.5 - 0.6	8.5 - 1.9	14.5 - 3.3
26	3°21.5	3°22.1	3°12.3	2.6 - 0.6	8.6 - 1.9	14.6 - 3.3
27	3°21.7	3°22.3	3°12.6	2.7 - 0.6	8.7 - 2.0	14.7 - 3.3
28	3°22.0	3°22.6	3°12.8	2.8 - 0.6	8.8 - 2.0	14.8 - 3.3
29	3°22.2	3°22.8	3°13.0	2.9 - 0.7	8.9 - 2.0	14.9 - 3.4
30	3°22.5	3°23.1	3°13.3	3.0 - 0.7	9.0 - 2.0	15.0 - 3.4
31	3°22.8	3°23.3	3°13.5	3.1 - 0.7	9.1 - 2.0	15.1 - 3.4
32	3°23.0	3°23.6	3°13.8	3.2 - 0.7	9.2 - 2.1	15.2 - 3.4
33	3°23.3	3°23.8	3°14.0	3.3 - 0.7	9.3 - 2.1	15.3 - 3.4
34	3°23.5	3°24.1	3°14.2	3.4 - 0.8	9.4 - 2.1	15.4 - 3.5
35	3°23.8	3°24.3	3°14.5	3.5 - 0.8	9.5 - 2.1	15.5 - 3.5
36	3°24.0	3°24.6	3°14.7	3.6 - 0.8	9.6 - 2.2	15.6 - 3.5
37	3°24.3	3°24.8	3°14.9	3.7 - 0.8	9.7 - 2.2	15.7 - 3.5
38	3°24.5	3°25.1	3°15.2	3.8 - 0.9	9.8 - 2.2	15.8 - 3.6
39	3°24.8	3°25.3	3°15.4	3.9 - 0.9	9.9 - 2.2	15.9 - 3.6
40	3°25.0	3°25.6	3°15.7	4.0 - 0.9	10.0 - 2.3	16.0 - 3.6
41	3°25.3	3°25.8	3°15.9	4.1 - 0.9	10.1 - 2.3	16.1 - 3.6
42	3°25.5	3°26.1	3°16.1	4.2 - 0.9	10.2 - 2.3	16.2 - 3.6
43	3°25.8	3°26.3	3°16.4	4.3 - 1.0	10.3 - 2.3	16.3 - 3.7
44	3°26.0	3°26.6	3°16.6	4.4 - 1.0	10.4 - 2.3	16.4 - 3.7
45	3°26.3	3°26.8	3°16.9	4.5 - 1.0	10.5 - 2.4	16.5 - 3.7
46	3°26.5	3°27.1	3°17.1	4.6 - 1.0	10.6 - 2.4	16.6 - 3.7
47	3°26.8	3°27.3	3°17.3	4.7 - 1.1	10.7 - 2.4	16.7 - 3.8
48	3°27.0	3°27.6	3°17.6	4.8 - 1.1	10.8 - 2.4	16.8 - 3.8
49	3°27.2	3°27.8	3°17.8	4.9 - 1.1	10.9 - 2.5	16.9 - 3.8
50	3°27.5	3°28.1	3°18.0	5.0 - 1.1	11.0 - 2.5	17.0 - 3.8
51	3°27.7	3°28.3	3°18.3	5.1 - 1.1	11.1 - 2.5	17.1 - 3.8
52	3°28.0	3°28.6	3°18.5	5.2 - 1.2	11.2 - 2.5	17.2 - 3.9
53	3°28.2	3°28.8	3°18.8	5.3 - 1.2	11.3 - 2.5	17.3 - 3.9
54	3°28.5	3°29.1	3°19.0	5.4 - 1.2	11.4 - 2.6	17.4 - 3.9
55	3°28.7	3°29.3	3°19.2	5.5 - 1.2	11.5 - 2.6	17.5 - 3.9
56	3°29.0	3°29.6	3°19.5	5.6 - 1.3	11.6 - 2.6	17.6 - 4.0
57	3°29.2	3°29.8	3°19.7	5.7 - 1.3	11.7 - 2.6	17.7 - 4.0
58	3°29.5	3°30.1	3°20.0	5.8 - 1.3	11.8 - 2.7	17.8 - 4.0
59	3°29.7	3°30.3	3°20.2	5.9 - 1.3	11.9 - 2.7	17.9 - 4.0

m 14	Sun Plan.	Aries	Moon	v and d corr		
0	3°30.0	3°30.6	3°20.4	0.0 - 0.0	6.0 - 1.4	12.0 - 2.9
1	3°30.3	3°30.8	3°20.7	0.1 - 0.0	6.1 - 1.5	12.1 - 2.9
2	3°30.5	3°31.1	3°20.9	0.2 - 0.0	6.2 - 1.5	12.2 - 2.9
3	3°30.8	3°31.3	3°21.1	0.3 - 0.1	6.3 - 1.5	12.3 - 3.0
4	3°31.0	3°31.6	3°21.4	0.4 - 0.1	6.4 - 1.5	12.4 - 3.0
5	3°31.3	3°31.8	3°21.6	0.5 - 0.1	6.5 - 1.6	12.5 - 3.0
6	3°31.5	3°32.1	3°21.9	0.6 - 0.1	6.6 - 1.6	12.6 - 3.0
7	3°31.8	3°32.3	3°22.1	0.7 - 0.2	6.7 - 1.6	12.7 - 3.1
8	3°32.0	3°32.6	3°22.3	0.8 - 0.2	6.8 - 1.6	12.8 - 3.1
9	3°32.3	3°32.8	3°22.6	0.9 - 0.2	6.9 - 1.7	12.9 - 3.1
10	3°32.5	3°33.1	3°22.8	1.0 - 0.2	7.0 - 1.7	13.0 - 3.1
11	3°32.8	3°33.3	3°23.1	1.1 - 0.3	7.1 - 1.7	13.1 - 3.2
12	3°33.0	3°33.6	3°23.3	1.2 - 0.3	7.2 - 1.7	13.2 - 3.2
13	3°33.3	3°33.8	3°23.5	1.3 - 0.3	7.3 - 1.8	13.3 - 3.2
14	3°33.5	3°34.1	3°23.8	1.4 - 0.3	7.4 - 1.8	13.4 - 3.2
15	3°33.8	3°34.3	3°24.0	1.5 - 0.4	7.5 - 1.8	13.5 - 3.3
16	3°34.0	3°34.6	3°24.3	1.6 - 0.4	7.6 - 1.8	13.6 - 3.3
17	3°34.3	3°34.8	3°24.5	1.7 - 0.4	7.7 - 1.9	13.7 - 3.3
18	3°34.5	3°35.1	3°24.7	1.8 - 0.4	7.8 - 1.9	13.8 - 3.3
19	3°34.8	3°35.3	3°25.0	1.9 - 0.5	7.9 - 1.9	13.9 - 3.4
20	3°35.0	3°35.6	3°25.2	2.0 - 0.5	8.0 - 1.9	14.0 - 3.4
21	3°35.2	3°35.8	3°25.4	2.1 - 0.5	8.1 - 2.0	14.1 - 3.4
22	3°35.5	3°36.1	3°25.7	2.2 - 0.5	8.2 - 2.0	14.2 - 3.4
23	3°35.7	3°36.3	3°25.9	2.3 - 0.6	8.3 - 2.0	14.3 - 3.5
24	3°36.0	3°36.6	3°26.2	2.4 - 0.6	8.4 - 2.0	14.4 - 3.5
25	3°36.2	3°36.8	3°26.4	2.5 - 0.6	8.5 - 2.1	14.5 - 3.5
26	3°36.5	3°37.1	3°26.6	2.6 - 0.6	8.6 - 2.1	14.6 - 3.5
27	3°36.7	3°37.3	3°26.9	2.7 - 0.7	8.7 - 2.1	14.7 - 3.6
28	3°37.0	3°37.6	3°27.1	2.8 - 0.7	8.8 - 2.1	14.8 - 3.6
29	3°37.2	3°37.8	3°27.4	2.9 - 0.7	8.9 - 2.2	14.9 - 3.6
30	3°37.5	3°38.1	3°27.6	3.0 - 0.7	9.0 - 2.2	15.0 - 3.6
31	3°37.8	3°38.3	3°27.8	3.1 - 0.7	9.1 - 2.2	15.1 - 3.6
32	3°38.0	3°38.6	3°28.1	3.2 - 0.8	9.2 - 2.2	15.2 - 3.7
33	3°38.3	3°38.8	3°28.3	3.3 - 0.8	9.3 - 2.2	15.3 - 3.7
34	3°38.5	3°39.1	3°28.5	3.4 - 0.8	9.4 - 2.3	15.4 - 3.7
35	3°38.8	3°39.3	3°28.8	3.5 - 0.8	9.5 - 2.3	15.5 - 3.7
36	3°39.0	3°39.6	3°29.0	3.6 - 0.9	9.6 - 2.3	15.6 - 3.8
37	3°39.3	3°39.8	3°29.3	3.7 - 0.9	9.7 - 2.3	15.7 - 3.8
38	3°39.5	3°40.1	3°29.5	3.8 - 0.9	9.8 - 2.4	15.8 - 3.8
39	3°39.8	3°40.4	3°29.7	3.9 - 0.9	9.9 - 2.4	15.9 - 3.8
40	3°40.0	3°40.6	3°30.0	4.0 - 1.0	10.0 - 2.4	16.0 - 3.9
41	3°40.3	3°40.9	3°30.2	4.1 - 1.0	10.1 - 2.4	16.1 - 3.9
42	3°40.5	3°41.1	3°30.5	4.2 - 1.0	10.2 - 2.5	16.2 - 3.9
43	3°40.8	3°41.4	3°30.7	4.3 - 1.0	10.3 - 2.5	16.3 - 3.9
44	3°41.0	3°41.6	3°30.9	4.4 - 1.1	10.4 - 2.5	16.4 - 4.0
45	3°41.3	3°41.9	3°31.2	4.5 - 1.1	10.5 - 2.5	16.5 - 4.0
46	3°41.5	3°42.1	3°31.4	4.6 - 1.1	10.6 - 2.6	16.6 - 4.0
47	3°41.8	3°42.4	3°31.6	4.7 - 1.1	10.7 - 2.6	16.7 - 4.0
48	3°42.0	3°42.6	3°31.9	4.8 - 1.2	10.8 - 2.6	16.8 - 4.1
49	3°42.3	3°42.9	3°32.1	4.9 - 1.2	10.9 - 2.6	16.9 - 4.1
50	3°42.5	3°43.1	3°32.4	5.0 - 1.2	11.0 - 2.7	17.0 - 4.1
51	3°42.7	3°43.4	3°32.6	5.1 - 1.2	11.1 - 2.7	17.1 - 4.1
52	3°43.0	3°43.6	3°32.8	5.2 - 1.3	11.2 - 2.7	17.2 - 4.2
53	3°43.2	3°43.9	3°33.1	5.3 - 1.3	11.3 - 2.7	17.3 - 4.2
54	3°43.5	3°44.1	3°33.3	5.4 - 1.3	11.4 - 2.8	17.4 - 4.2
55	3°43.7	3°44.4	3°33.6	5.5 - 1.3	11.5 - 2.8	17.5 - 4.2
56	3°44.0	3°44.6	3°33.8	5.6 - 1.4	11.6 - 2.8	17.6 - 4.3
57	3°44.2	3°44.9	3°34.0	5.7 - 1.4	11.7 - 2.8	17.7 - 4.3
58	3°44.5	3°45.1	3°34.3	5.8 - 1.4	11.8 - 2.9	17.8 - 4.3
59	3°44.7	3°45.4	3°34.5	5.9 - 1.4	11.9 - 2.9	17.9 - 4.3

Increments and Corrections

m 15	Sun Plan.	Aries	Moon	v and d corr		
0	3°45.0	3°45.6	3°34.8	0.0 - 0.0	6.0 - 1.6	12.0 - 3.1
1	3°45.2	3°45.9	3°35.0	0.1 - 0.0	6.1 - 1.6	12.1 - 3.1
2	3°45.5	3°46.1	3°35.2	0.2 - 0.1	6.2 - 1.6	12.2 - 3.2
3	3°45.8	3°46.4	3°35.5	0.3 - 0.1	6.3 - 1.6	12.3 - 3.2
4	3°46.0	3°46.6	3°35.7	0.4 - 0.1	6.4 - 1.7	12.4 - 3.2
5	3°46.2	3°46.9	3°35.9	0.5 - 0.1	6.5 - 1.7	12.5 - 3.2
6	3°46.5	3°47.1	3°36.2	0.6 - 0.2	6.6 - 1.7	12.6 - 3.3
7	3°46.8	3°47.4	3°36.4	0.7 - 0.2	6.7 - 1.7	12.7 - 3.3
8	3°47.0	3°47.6	3°36.7	0.8 - 0.2	6.8 - 1.8	12.8 - 3.3
9	3°47.3	3°47.9	3°36.9	0.9 - 0.2	6.9 - 1.8	12.9 - 3.3
10	3°47.5	3°48.1	3°37.1	1.0 - 0.3	7.0 - 1.8	13.0 - 3.4
11	3°47.7	3°48.4	3°37.4	1.1 - 0.3	7.1 - 1.8	13.1 - 3.4
12	3°48.0	3°48.6	3°37.6	1.2 - 0.3	7.2 - 1.9	13.2 - 3.4
13	3°48.3	3°48.9	3°37.9	1.3 - 0.3	7.3 - 1.9	13.3 - 3.4
14	3°48.5	3°49.1	3°38.1	1.4 - 0.4	7.4 - 1.9	13.4 - 3.5
15	3°48.8	3°49.4	3°38.3	1.5 - 0.4	7.5 - 1.9	13.5 - 3.5
16	3°49.0	3°49.6	3°38.6	1.6 - 0.4	7.6 - 2.0	13.6 - 3.5
17	3°49.3	3°49.9	3°38.8	1.7 - 0.4	7.7 - 2.0	13.7 - 3.5
18	3°49.5	3°50.1	3°39.0	1.8 - 0.5	7.8 - 2.0	13.8 - 3.6
19	3°49.8	3°50.4	3°39.3	1.9 - 0.5	7.9 - 2.0	13.9 - 3.6
20	3°50.0	3°50.6	3°39.5	2.0 - 0.5	8.0 - 2.1	14.0 - 3.6
21	3°50.2	3°50.9	3°39.8	2.1 - 0.5	8.1 - 2.1	14.1 - 3.6
22	3°50.5	3°51.1	3°40.0	2.2 - 0.6	8.2 - 2.1	14.2 - 3.7
23	3°50.7	3°51.4	3°40.2	2.3 - 0.6	8.3 - 2.1	14.3 - 3.7
24	3°51.0	3°51.6	3°40.5	2.4 - 0.6	8.4 - 2.2	14.4 - 3.7
25	3°51.2	3°51.9	3°40.7	2.5 - 0.6	8.5 - 2.2	14.5 - 3.7
26	3°51.5	3°52.1	3°41.0	2.6 - 0.7	8.6 - 2.2	14.6 - 3.8
27	3°51.8	3°52.4	3°41.2	2.7 - 0.7	8.7 - 2.2	14.7 - 3.8
28	3°52.0	3°52.6	3°41.4	2.8 - 0.7	8.8 - 2.3	14.8 - 3.8
29	3°52.2	3°52.9	3°41.7	2.9 - 0.7	8.9 - 2.3	14.9 - 3.8
30	3°52.5	3°53.1	3°41.9	3.0 - 0.8	9.0 - 2.3	15.0 - 3.9
31	3°52.8	3°53.4	3°42.1	3.1 - 0.8	9.1 - 2.4	15.1 - 3.9
32	3°53.0	3°53.6	3°42.4	3.2 - 0.8	9.2 - 2.4	15.2 - 3.9
33	3°53.2	3°53.9	3°42.6	3.3 - 0.9	9.3 - 2.4	15.3 - 4.0
34	3°53.5	3°54.1	3°42.9	3.4 - 0.9	9.4 - 2.4	15.4 - 4.0
35	3°53.8	3°54.4	3°43.1	3.5 - 0.9	9.5 - 2.5	15.5 - 4.0
36	3°54.0	3°54.6	3°43.3	3.6 - 0.9	9.6 - 2.5	15.6 - 4.0
37	3°54.3	3°54.9	3°43.6	3.7 - 1.0	9.7 - 2.5	15.7 - 4.1
38	3°54.5	3°55.1	3°43.8	3.8 - 1.0	9.8 - 2.5	15.8 - 4.1
39	3°54.8	3°55.4	3°44.1	3.9 - 1.0	9.9 - 2.6	15.9 - 4.1
40	3°55.0	3°55.6	3°44.3	4.0 - 1.0	10.0 - 2.6	16.0 - 4.1
41	3°55.3	3°55.9	3°44.5	4.1 - 1.1	10.1 - 2.6	16.1 - 4.2
42	3°55.5	3°56.1	3°44.8	4.2 - 1.1	10.2 - 2.6	16.2 - 4.2
43	3°55.7	3°56.4	3°45.0	4.3 - 1.1	10.3 - 2.7	16.3 - 4.2
44	3°56.0	3°56.6	3°45.2	4.4 - 1.1	10.4 - 2.7	16.4 - 4.2
45	3°56.3	3°56.9	3°45.5	4.5 - 1.2	10.5 - 2.7	16.5 - 4.3
46	3°56.5	3°57.1	3°45.7	4.6 - 1.2	10.6 - 2.7	16.6 - 4.3
47	3°56.8	3°57.4	3°46.0	4.7 - 1.2	10.7 - 2.8	16.7 - 4.3
48	3°57.0	3°57.6	3°46.2	4.8 - 1.2	10.8 - 2.8	16.8 - 4.3
49	3°57.3	3°57.9	3°46.4	4.9 - 1.3	10.9 - 2.8	16.9 - 4.4
50	3°57.5	3°58.1	3°46.7	5.0 - 1.3	11.0 - 2.8	17.0 - 4.4
51	3°57.7	3°58.4	3°46.9	5.1 - 1.3	11.1 - 2.9	17.1 - 4.4
52	3°58.0	3°58.7	3°47.2	5.2 - 1.3	11.2 - 2.9	17.2 - 4.4
53	3°58.2	3°58.9	3°47.4	5.3 - 1.4	11.3 - 2.9	17.3 - 4.5
54	3°58.5	3°59.2	3°47.6	5.4 - 1.4	11.4 - 2.9	17.4 - 4.5
55	3°58.7	3°59.4	3°47.9	5.5 - 1.4	11.5 - 3.0	17.5 - 4.5
56	3°59.0	3°59.7	3°48.1	5.6 - 1.4	11.6 - 3.0	17.6 - 4.5
57	3°59.2	3°59.9	3°48.4	5.7 - 1.5	11.7 - 3.0	17.7 - 4.6
58	3°59.5	4°00.2	3°48.6	5.8 - 1.5	11.8 - 3.0	17.8 - 4.6
59	3°59.8	4°00.4	3°48.8	5.9 - 1.5	11.9 - 3.1	17.9 - 4.6

m 16	Sun Plan.	Aries	Moon	v and d corr		
0	4°00.0	4°00.7	3°49.1	0.0 - 0.0	6.0 - 1.7	12.0 - 3.3
1	4°00.2	4°00.9	3°49.3	0.1 - 0.0	6.1 - 1.7	12.1 - 3.3
2	4°00.5	4°01.2	3°49.5	0.2 - 0.1	6.2 - 1.7	12.2 - 3.4
3	4°00.8	4°01.4	3°49.8	0.3 - 0.1	6.3 - 1.7	12.3 - 3.4
4	4°01.0	4°01.7	3°50.0	0.4 - 0.1	6.4 - 1.8	12.4 - 3.4
5	4°01.2	4°01.9	3°50.3	0.5 - 0.1	6.5 - 1.8	12.5 - 3.4
6	4°01.5	4°02.2	3°50.5	0.6 - 0.2	6.6 - 1.8	12.6 - 3.5
7	4°01.8	4°02.4	3°50.7	0.7 - 0.2	6.7 - 1.8	12.7 - 3.5
8	4°02.0	4°02.7	3°51.0	0.8 - 0.2	6.8 - 1.9	12.8 - 3.5
9	4°02.2	4°02.9	3°51.2	0.9 - 0.2	6.9 - 1.9	12.9 - 3.5
10	4°02.5	4°03.2	3°51.5	1.0 - 0.3	7.0 - 1.9	13.0 - 3.6
11	4°02.8	4°03.4	3°51.7	1.1 - 0.3	7.1 - 2.0	13.1 - 3.6
12	4°03.0	4°03.7	3°51.9	1.2 - 0.3	7.2 - 2.0	13.2 - 3.6
13	4°03.2	4°03.9	3°52.2	1.3 - 0.4	7.3 - 2.0	13.3 - 3.7
14	4°03.5	4°04.2	3°52.4	1.4 - 0.4	7.4 - 2.0	13.4 - 3.7
15	4°03.8	4°04.4	3°52.6	1.5 - 0.4	7.5 - 2.1	13.5 - 3.7
16	4°04.0	4°04.7	3°52.9	1.6 - 0.4	7.6 - 2.1	13.6 - 3.7
17	4°04.3	4°04.9	3°53.1	1.7 - 0.5	7.7 - 2.1	13.7 - 3.8
18	4°04.5	4°05.2	3°53.4	1.8 - 0.5	7.8 - 2.1	13.8 - 3.8
19	4°04.7	4°05.4	3°53.6	1.9 - 0.5	7.9 - 2.2	13.9 - 3.8
20	4°05.0	4°05.7	3°53.8	2.0 - 0.6	8.0 - 2.2	14.0 - 3.9
21	4°05.3	4°05.9	3°54.1	2.1 - 0.6	8.1 - 2.2	14.1 - 3.9
22	4°05.5	4°06.2	3°54.3	2.2 - 0.6	8.2 - 2.3	14.2 - 3.9
23	4°05.7	4°06.4	3°54.6	2.3 - 0.6	8.3 - 2.3	14.3 - 3.9
24	4°06.0	4°06.7	3°54.8	2.4 - 0.7	8.4 - 2.3	14.4 - 4.0
25	4°06.3	4°06.9	3°55.0	2.5 - 0.7	8.5 - 2.3	14.5 - 4.0
26	4°06.5	4°07.2	3°55.3	2.6 - 0.7	8.6 - 2.4	14.6 - 4.0
27	4°06.7	4°07.4	3°55.5	2.7 - 0.7	8.7 - 2.4	14.7 - 4.0
28	4°07.0	4°07.7	3°55.7	2.8 - 0.8	8.8 - 2.4	14.8 - 4.1
29	4°07.3	4°07.9	3°56.0	2.9 - 0.8	8.9 - 2.4	14.9 - 4.1
30	4°07.5	4°08.2	3°56.2	3.0 - 0.8	9.0 - 2.5	15.0 - 4.1
31	4°07.7	4°08.4	3°56.5	3.1 - 0.9	9.1 - 2.5	15.1 - 4.2
32	4°08.0	4°08.7	3°56.7	3.2 - 0.9	9.2 - 2.5	15.2 - 4.2
33	4°08.3	4°08.9	3°56.9	3.3 - 0.9	9.3 - 2.6	15.3 - 4.2
34	4°08.5	4°09.2	3°57.2	3.4 - 0.9	9.4 - 2.6	15.4 - 4.2
35	4°08.7	4°09.4	3°57.4	3.5 - 1.0	9.5 - 2.6	15.5 - 4.3
36	4°09.0	4°09.7	3°57.7	3.6 - 1.0	9.6 - 2.6	15.6 - 4.3
37	4°09.3	4°09.9	3°57.9	3.7 - 1.0	9.7 - 2.7	15.7 - 4.3
38	4°09.5	4°10.2	3°58.1	3.8 - 1.0	9.8 - 2.7	15.8 - 4.3
39	4°09.7	4°10.4	3°58.4	3.9 - 1.1	9.9 - 2.7	15.9 - 4.4
40	4°10.0	4°10.7	3°58.6	4.0 - 1.1	10.0 - 2.8	16.0 - 4.4
41	4°10.3	4°10.9	3°58.8	4.1 - 1.1	10.1 - 2.8	16.1 - 4.4
42	4°10.5	4°11.2	3°59.1	4.2 - 1.2	10.2 - 2.8	16.2 - 4.5
43	4°10.7	4°11.4	3°59.3	4.3 - 1.2	10.3 - 2.8	16.3 - 4.5
44	4°11.0	4°11.7	3°59.6	4.4 - 1.2	10.4 - 2.9	16.4 - 4.5
45	4°11.3	4°11.9	3°59.8	4.5 - 1.2	10.5 - 2.9	16.5 - 4.5
46	4°11.5	4°12.2	4°00.0	4.6 - 1.3	10.6 - 2.9	16.6 - 4.6
47	4°11.8	4°12.4	4°00.3	4.7 - 1.3	10.7 - 2.9	16.7 - 4.6
48	4°12.0	4°12.7	4°00.5	4.8 - 1.3	10.8 - 3.0	16.8 - 4.6
49	4°12.2	4°12.9	4°00.8	4.9 - 1.3	10.9 - 3.0	16.9 - 4.6
50	4°12.5	4°13.2	4°01.0	5.0 - 1.4	11.0 - 3.0	17.0 - 4.7
51	4°12.8	4°13.4	4°01.2	5.1 - 1.4	11.1 - 3.1	17.1 - 4.7
52	4°13.0	4°13.7	4°01.5	5.2 - 1.4	11.2 - 3.1	17.2 - 4.7
53	4°13.2	4°13.9	4°01.7	5.3 - 1.5	11.3 - 3.1	17.3 - 4.8
54	4°13.5	4°14.2	4°02.0	5.4 - 1.5	11.4 - 3.1	17.4 - 4.8
55	4°13.8	4°14.4	4°02.2	5.5 - 1.5	11.5 - 3.2	17.5 - 4.8
56	4°14.0	4°14.7	4°02.4	5.6 - 1.5	11.6 - 3.2	17.6 - 4.8
57	4°14.2	4°14.9	4°02.7	5.7 - 1.6	11.7 - 3.2	17.7 - 4.9
58	4°14.5	4°15.2	4°02.9	5.8 - 1.6	11.8 - 3.2	17.8 - 4.9
59	4°14.8	4°15.4	4°03.1	5.9 - 1.6	11.9 - 3.3	17.9 - 4.9

m 17	Sun Plan.	Aries	Moon	v and d corr		
0	4°15.0	4°15.7	4°03.4	0.0 - 0.0	6.0 - 1.8	12.0 - 3.5
1	4°15.2	4°15.9	4°03.6	0.1 - 0.0	6.1 - 1.8	12.1 - 3.5
2	4°15.5	4°16.2	4°03.9	0.2 - 0.1	6.2 - 1.8	12.2 - 3.6
3	4°15.8	4°16.4	4°04.1	0.3 - 0.1	6.3 - 1.8	12.3 - 3.6
4	4°16.0	4°16.7	4°04.3	0.4 - 0.1	6.4 - 1.9	12.4 - 3.6
5	4°16.2	4°17.0	4°04.6	0.5 - 0.1	6.5 - 1.9	12.5 - 3.6
6	4°16.5	4°17.2	4°04.8	0.6 - 0.2	6.6 - 1.9	12.6 - 3.7
7	4°16.8	4°17.5	4°05.1	0.7 - 0.2	6.7 - 2.0	12.7 - 3.7
8	4°17.0	4°17.7	4°05.3	0.8 - 0.2	6.8 - 2.0	12.8 - 3.7
9	4°17.2	4°18.0	4°05.5	0.9 - 0.3	6.9 - 2.0	12.9 - 3.8
10	4°17.5	4°18.2	4°05.8	1.0 - 0.3	7.0 - 2.0	13.0 - 3.8
11	4°17.8	4°18.5	4°06.0	1.1 - 0.3	7.1 - 2.1	13.1 - 3.8
12	4°18.0	4°18.7	4°06.2	1.2 - 0.4	7.2 - 2.1	13.2 - 3.9
13	4°18.2	4°19.0	4°06.5	1.3 - 0.4	7.3 - 2.1	13.3 - 3.9
14	4°18.5	4°19.2	4°06.7	1.4 - 0.4	7.4 - 2.2	13.4 - 3.9
15	4°18.8	4°19.5	4°07.0	1.5 - 0.4	7.5 - 2.2	13.5 - 3.9
16	4°19.0	4°19.7	4°07.2	1.6 - 0.5	7.6 - 2.2	13.6 - 4.0
17	4°19.3	4°20.0	4°07.4	1.7 - 0.5	7.7 - 2.2	13.7 - 4.0
18	4°19.5	4°20.2	4°07.7	1.8 - 0.5	7.8 - 2.3	13.8 - 4.0
19	4°19.7	4°20.5	4°07.9	1.9 - 0.6	7.9 - 2.3	13.9 - 4.1
20	4°20.0	4°20.7	4°08.2	2.0 - 0.6	8.0 - 2.3	14.0 - 4.1
21	4°20.3	4°21.0	4°08.4	2.1 - 0.6	8.1 - 2.4	14.1 - 4.1
22	4°20.5	4°21.2	4°08.6	2.2 - 0.6	8.2 - 2.4	14.2 - 4.1
23	4°20.7	4°21.5	4°08.9	2.3 - 0.7	8.3 - 2.4	14.3 - 4.2
24	4°21.0	4°21.7	4°09.1	2.4 - 0.7	8.4 - 2.5	14.4 - 4.2
25	4°21.3	4°22.0	4°09.3	2.5 - 0.7	8.5 - 2.5	14.5 - 4.2
26	4°21.5	4°22.2	4°09.6	2.6 - 0.8	8.6 - 2.5	14.6 - 4.3
27	4°21.7	4°22.5	4°09.8	2.7 - 0.8	8.7 - 2.5	14.7 - 4.3
28	4°22.0	4°22.7	4°10.1	2.8 - 0.8	8.8 - 2.6	14.8 - 4.3
29	4°22.3	4°23.0	4°10.3	2.9 - 0.8	8.9 - 2.6	14.9 - 4.3
30	4°22.5	4°23.2	4°10.5	3.0 - 0.9	9.0 - 2.6	15.0 - 4.4
31	4°22.7	4°23.5	4°10.8	3.1 - 0.9	9.1 - 2.7	15.1 - 4.4
32	4°23.0	4°23.7	4°11.0	3.2 - 0.9	9.2 - 2.7	15.2 - 4.4
33	4°23.3	4°24.0	4°11.3	3.3 - 1.0	9.3 - 2.7	15.3 - 4.5
34	4°23.5	4°24.2	4°11.5	3.4 - 1.0	9.4 - 2.7	15.4 - 4.5
35	4°23.7	4°24.5	4°11.7	3.5 - 1.0	9.5 - 2.8	15.5 - 4.5
36	4°24.0	4°24.7	4°12.0	3.6 - 1.1	9.6 - 2.8	15.6 - 4.5
37	4°24.3	4°25.0	4°12.2	3.7 - 1.1	9.7 - 2.8	15.7 - 4.6
38	4°24.5	4°25.2	4°12.5	3.8 - 1.1	9.8 - 2.9	15.8 - 4.6
39	4°24.7	4°25.5	4°12.7	3.9 - 1.1	9.9 - 2.9	15.9 - 4.6
40	4°25.0	4°25.7	4°12.9	4.0 - 1.2	10.0 - 2.9	16.0 - 4.7
41	4°25.3	4°26.0	4°13.2	4.1 - 1.2	10.1 - 2.9	16.1 - 4.7
42	4°25.5	4°26.2	4°13.4	4.2 - 1.2	10.2 - 3.0	16.2 - 4.7
43	4°25.7	4°26.5	4°13.6	4.3 - 1.3	10.3 - 3.0	16.3 - 4.8
44	4°26.0	4°26.7	4°13.9	4.4 - 1.3	10.4 - 3.0	16.4 - 4.8
45	4°26.3	4°27.0	4°14.1	4.5 - 1.3	10.5 - 3.1	16.5 - 4.8
46	4°26.5	4°27.2	4°14.4	4.6 - 1.3	10.6 - 3.1	16.6 - 4.8
47	4°26.8	4°27.5	4°14.6	4.7 - 1.4	10.7 - 3.1	16.7 - 4.9
48	4°27.0	4°27.7	4°14.8	4.8 - 1.4	10.8 - 3.2	16.8 - 4.9
49	4°27.2	4°28.0	4°15.1	4.9 - 1.4	10.9 - 3.2	16.9 - 4.9
50	4°27.5	4°28.2	4°15.3	5.0 - 1.5	11.0 - 3.2	17.0 - 5.0
51	4°27.8	4°28.5	4°15.6	5.1 - 1.5	11.1 - 3.2	17.1 - 5.0
52	4°28.0	4°28.7	4°15.8	5.2 - 1.5	11.2 - 3.3	17.2 - 5.0
53	4°28.2	4°29.0	4°16.0	5.3 - 1.5	11.3 - 3.3	17.3 - 5.0
54	4°28.5	4°29.2	4°16.3	5.4 - 1.6	11.4 - 3.3	17.4 - 5.1
55	4°28.8	4°29.5	4°16.5	5.5 - 1.6	11.5 - 3.4	17.5 - 5.1
56	4°29.0	4°29.7	4°16.7	5.6 - 1.6	11.6 - 3.4	17.6 - 5.1
57	4°29.2	4°30.0	4°17.0	5.7 - 1.7	11.7 - 3.4	17.7 - 5.2
58	4°29.5	4°30.2	4°17.2	5.8 - 1.7	11.8 - 3.4	17.8 - 5.2
59	4°29.8	4°30.5	4°17.5	5.9 - 1.7	11.9 - 3.5	17.9 - 5.2

Increments and Corrections

m 18	Sun Plan.	Aries	Moon	v and d corr		
0	4°30.0	4°30.7	4°17.7	0.0 - 0.0	6.0 - 1.9	12.0 - 3.7
1	4°30.2	4°31.0	4°17.9	0.1 - 0.0	6.1 - 1.9	12.1 - 3.7
2	4°30.5	4°31.2	4°18.2	0.2 - 0.1	6.2 - 1.9	12.2 - 3.8
3	4°30.8	4°31.5	4°18.4	0.3 - 0.1	6.3 - 1.9	12.3 - 3.8
4	4°31.0	4°31.7	4°18.7	0.4 - 0.1	6.4 - 2.0	12.4 - 3.8
5	4°31.2	4°32.0	4°18.9	0.5 - 0.2	6.5 - 2.0	12.5 - 3.9
6	4°31.5	4°32.2	4°19.1	0.6 - 0.2	6.6 - 2.0	12.6 - 3.9
7	4°31.8	4°32.5	4°19.4	0.7 - 0.2	6.7 - 2.1	12.7 - 3.9
8	4°32.0	4°32.7	4°19.6	0.8 - 0.2	6.8 - 2.1	12.8 - 3.9
9	4°32.2	4°33.0	4°19.8	0.9 - 0.3	6.9 - 2.1	12.9 - 4.0
10	4°32.5	4°33.2	4°20.1	1.0 - 0.3	7.0 - 2.2	13.0 - 4.0
11	4°32.8	4°33.5	4°20.3	1.1 - 0.3	7.1 - 2.2	13.1 - 4.0
12	4°33.0	4°33.7	4°20.6	1.2 - 0.4	7.2 - 2.2	13.2 - 4.1
13	4°33.2	4°34.0	4°20.8	1.3 - 0.4	7.3 - 2.3	13.3 - 4.1
14	4°33.5	4°34.2	4°21.0	1.4 - 0.4	7.4 - 2.3	13.4 - 4.1
15	4°33.8	4°34.5	4°21.3	1.5 - 0.5	7.5 - 2.3	13.5 - 4.2
16	4°34.0	4°34.7	4°21.5	1.6 - 0.5	7.6 - 2.3	13.6 - 4.2
17	4°34.3	4°35.0	4°21.8	1.7 - 0.5	7.7 - 2.4	13.7 - 4.2
18	4°34.5	4°35.3	4°22.0	1.8 - 0.6	7.8 - 2.4	13.8 - 4.3
19	4°34.8	4°35.5	4°22.2	1.9 - 0.6	7.9 - 2.4	13.9 - 4.3
20	4°35.0	4°35.8	4°22.5	2.0 - 0.6	8.0 - 2.5	14.0 - 4.3
21	4°35.3	4°36.0	4°22.7	2.1 - 0.6	8.1 - 2.5	14.1 - 4.3
22	4°35.5	4°36.3	4°22.9	2.2 - 0.7	8.2 - 2.5	14.2 - 4.4
23	4°35.7	4°36.5	4°23.2	2.3 - 0.7	8.3 - 2.6	14.3 - 4.4
24	4°36.0	4°36.8	4°23.4	2.4 - 0.7	8.4 - 2.6	14.4 - 4.4
25	4°36.3	4°37.0	4°23.7	2.5 - 0.8	8.5 - 2.6	14.5 - 4.5
26	4°36.5	4°37.3	4°23.9	2.6 - 0.8	8.6 - 2.7	14.6 - 4.5
27	4°36.7	4°37.5	4°24.1	2.7 - 0.8	8.7 - 2.7	14.7 - 4.5
28	4°37.0	4°37.8	4°24.4	2.8 - 0.9	8.8 - 2.7	14.8 - 4.6
29	4°37.3	4°38.0	4°24.6	2.9 - 0.9	8.9 - 2.7	14.9 - 4.6
30	4°37.5	4°38.3	4°24.9	3.0 - 0.9	9.0 - 2.8	15.0 - 4.6
31	4°37.7	4°38.5	4°25.1	3.1 - 1.0	9.1 - 2.8	15.1 - 4.7
32	4°38.0	4°38.8	4°25.3	3.2 - 1.0	9.2 - 2.8	15.2 - 4.7
33	4°38.3	4°39.0	4°25.6	3.3 - 1.0	9.3 - 2.9	15.3 - 4.7
34	4°38.5	4°39.3	4°25.8	3.4 - 1.0	9.4 - 2.9	15.4 - 4.7
35	4°38.7	4°39.5	4°26.1	3.5 - 1.1	9.5 - 2.9	15.5 - 4.8
36	4°39.0	4°39.8	4°26.3	3.6 - 1.1	9.6 - 3.0	15.6 - 4.8
37	4°39.3	4°40.0	4°26.5	3.7 - 1.1	9.7 - 3.0	15.7 - 4.8
38	4°39.5	4°40.3	4°26.8	3.8 - 1.2	9.8 - 3.0	15.8 - 4.9
39	4°39.7	4°40.5	4°27.0	3.9 - 1.2	9.9 - 3.1	15.9 - 4.9
40	4°40.0	4°40.8	4°27.2	4.0 - 1.2	10.0 - 3.1	16.0 - 4.9
41	4°40.3	4°41.0	4°27.5	4.1 - 1.3	10.1 - 3.1	16.1 - 5.0
42	4°40.5	4°41.3	4°27.7	4.2 - 1.3	10.2 - 3.1	16.2 - 5.0
43	4°40.7	4°41.5	4°28.0	4.3 - 1.3	10.3 - 3.2	16.3 - 5.0
44	4°41.0	4°41.8	4°28.2	4.4 - 1.4	10.4 - 3.2	16.4 - 5.1
45	4°41.3	4°42.0	4°28.4	4.5 - 1.4	10.5 - 3.2	16.5 - 5.1
46	4°41.5	4°42.3	4°28.7	4.6 - 1.4	10.6 - 3.3	16.6 - 5.1
47	4°41.8	4°42.5	4°28.9	4.7 - 1.4	10.7 - 3.3	16.7 - 5.1
48	4°42.0	4°42.8	4°29.2	4.8 - 1.5	10.8 - 3.3	16.8 - 5.2
49	4°42.3	4°43.0	4°29.4	4.9 - 1.5	10.9 - 3.4	16.9 - 5.2
50	4°42.5	4°43.3	4°29.6	5.0 - 1.5	11.0 - 3.4	17.0 - 5.2
51	4°42.8	4°43.5	4°29.9	5.1 - 1.6	11.1 - 3.4	17.1 - 5.3
52	4°43.0	4°43.8	4°30.1	5.2 - 1.6	11.2 - 3.5	17.2 - 5.3
53	4°43.2	4°44.0	4°30.3	5.3 - 1.6	11.3 - 3.5	17.3 - 5.3
54	4°43.5	4°44.3	4°30.6	5.4 - 1.7	11.4 - 3.5	17.4 - 5.4
55	4°43.8	4°44.5	4°30.8	5.5 - 1.7	11.5 - 3.5	17.5 - 5.4
56	4°44.0	4°44.8	4°31.1	5.6 - 1.7	11.6 - 3.6	17.6 - 5.4
57	4°44.2	4°45.0	4°31.3	5.7 - 1.8	11.7 - 3.6	17.7 - 5.5
58	4°44.5	4°45.3	4°31.5	5.8 - 1.8	11.8 - 3.6	17.8 - 5.5
59	4°44.8	4°45.5	4°31.8	5.9 - 1.8	11.9 - 3.7	17.9 - 5.5

m 19	Sun Plan.	Aries	Moon	v and d corr		
0	4°45.0	4°45.8	4°32.0	0.0 - 0.0	6.0 - 2.0	12.0 - 3.9
1	4°45.2	4°46.0	4°32.3	0.1 - 0.0	6.1 - 2.0	12.1 - 3.9
2	4°45.5	4°46.3	4°32.5	0.2 - 0.1	6.2 - 2.0	12.2 - 4.0
3	4°45.8	4°46.5	4°32.7	0.3 - 0.1	6.3 - 2.0	12.3 - 4.0
4	4°46.0	4°46.8	4°33.0	0.4 - 0.1	6.4 - 2.1	12.4 - 4.0
5	4°46.2	4°47.0	4°33.2	0.5 - 0.2	6.5 - 2.1	12.5 - 4.1
6	4°46.5	4°47.3	4°33.4	0.6 - 0.2	6.6 - 2.1	12.6 - 4.1
7	4°46.8	4°47.5	4°33.7	0.7 - 0.2	6.7 - 2.2	12.7 - 4.1
8	4°47.0	4°47.8	4°33.9	0.8 - 0.3	6.8 - 2.2	12.8 - 4.2
9	4°47.2	4°48.0	4°34.2	0.9 - 0.3	6.9 - 2.2	12.9 - 4.2
10	4°47.5	4°48.3	4°34.4	1.0 - 0.3	7.0 - 2.3	13.0 - 4.2
11	4°47.8	4°48.5	4°34.6	1.1 - 0.4	7.1 - 2.3	13.1 - 4.3
12	4°48.0	4°48.8	4°34.9	1.2 - 0.4	7.2 - 2.3	13.2 - 4.3
13	4°48.2	4°49.0	4°35.1	1.3 - 0.4	7.3 - 2.4	13.3 - 4.3
14	4°48.5	4°49.3	4°35.4	1.4 - 0.5	7.4 - 2.4	13.4 - 4.4
15	4°48.8	4°49.5	4°35.6	1.5 - 0.5	7.5 - 2.4	13.5 - 4.4
16	4°49.0	4°49.8	4°35.8	1.6 - 0.5	7.6 - 2.5	13.6 - 4.4
17	4°49.3	4°50.0	4°36.1	1.7 - 0.6	7.7 - 2.5	13.7 - 4.5
18	4°49.5	4°50.3	4°36.3	1.8 - 0.6	7.8 - 2.5	13.8 - 4.5
19	4°49.8	4°50.5	4°36.6	1.9 - 0.6	7.9 - 2.6	13.9 - 4.5
20	4°50.0	4°50.8	4°36.8	2.0 - 0.7	8.0 - 2.6	14.0 - 4.5
21	4°50.3	4°51.0	4°37.0	2.1 - 0.7	8.1 - 2.6	14.1 - 4.6
22	4°50.5	4°51.3	4°37.3	2.2 - 0.7	8.2 - 2.7	14.2 - 4.6
23	4°50.7	4°51.5	4°37.5	2.3 - 0.7	8.3 - 2.7	14.3 - 4.6
24	4°51.0	4°51.8	4°37.7	2.4 - 0.8	8.4 - 2.7	14.4 - 4.7
25	4°51.3	4°52.0	4°38.0	2.5 - 0.8	8.5 - 2.8	14.5 - 4.7
26	4°51.5	4°52.3	4°38.2	2.6 - 0.8	8.6 - 2.8	14.6 - 4.7
27	4°51.7	4°52.5	4°38.5	2.7 - 0.9	8.7 - 2.8	14.7 - 4.8
28	4°52.0	4°52.8	4°38.7	2.8 - 0.9	8.8 - 2.9	14.8 - 4.8
29	4°52.3	4°53.0	4°38.9	2.9 - 0.9	8.9 - 2.9	14.9 - 4.8
30	4°52.5	4°53.3	4°39.2	3.0 - 1.0	9.0 - 2.9	15.0 - 4.9
31	4°52.7	4°53.6	4°39.4	3.1 - 1.0	9.1 - 3.0	15.1 - 4.9
32	4°53.0	4°53.8	4°39.7	3.2 - 1.0	9.2 - 3.0	15.2 - 4.9
33	4°53.3	4°54.1	4°39.9	3.3 - 1.1	9.3 - 3.0	15.3 - 5.0
34	4°53.5	4°54.3	4°40.1	3.4 - 1.1	9.4 - 3.1	15.4 - 5.0
35	4°53.7	4°54.6	4°40.4	3.5 - 1.1	9.5 - 3.1	15.5 - 5.0
36	4°54.0	4°54.8	4°40.6	3.6 - 1.2	9.6 - 3.1	15.6 - 5.1
37	4°54.3	4°55.1	4°40.8	3.7 - 1.2	9.7 - 3.2	15.7 - 5.1
38	4°54.5	4°55.3	4°41.1	3.8 - 1.2	9.8 - 3.2	15.8 - 5.1
39	4°54.7	4°55.6	4°41.3	3.9 - 1.3	9.9 - 3.2	15.9 - 5.2
40	4°55.0	4°55.8	4°41.6	4.0 - 1.3	10.0 - 3.3	16.0 - 5.2
41	4°55.3	4°56.1	4°41.8	4.1 - 1.3	10.1 - 3.3	16.1 - 5.2
42	4°55.5	4°56.3	4°42.0	4.2 - 1.4	10.2 - 3.3	16.2 - 5.3
43	4°55.7	4°56.6	4°42.3	4.3 - 1.4	10.3 - 3.3	16.3 - 5.3
44	4°56.0	4°56.8	4°42.5	4.4 - 1.4	10.4 - 3.4	16.4 - 5.3
45	4°56.3	4°57.1	4°42.8	4.5 - 1.5	10.5 - 3.4	16.5 - 5.4
46	4°56.5	4°57.3	4°43.0	4.6 - 1.5	10.6 - 3.4	16.6 - 5.4
47	4°56.8	4°57.6	4°43.2	4.7 - 1.5	10.7 - 3.5	16.7 - 5.4
48	4°57.0	4°57.8	4°43.5	4.8 - 1.6	10.8 - 3.5	16.8 - 5.5
49	4°57.3	4°58.1	4°43.7	4.9 - 1.6	10.9 - 3.5	16.9 - 5.5
50	4°57.5	4°58.3	4°43.9	5.0 - 1.6	11.0 - 3.6	17.0 - 5.5
51	4°57.8	4°58.6	4°44.2	5.1 - 1.7	11.1 - 3.6	17.1 - 5.6
52	4°58.0	4°58.8	4°44.4	5.2 - 1.7	11.2 - 3.6	17.2 - 5.6
53	4°58.2	4°59.1	4°44.7	5.3 - 1.7	11.3 - 3.7	17.3 - 5.6
54	4°58.5	4°59.3	4°44.9	5.4 - 1.8	11.4 - 3.7	17.4 - 5.7
55	4°58.8	4°59.6	4°45.1	5.5 - 1.8	11.5 - 3.7	17.5 - 5.7
56	4°59.0	4°59.8	4°45.4	5.6 - 1.8	11.6 - 3.8	17.6 - 5.7
57	4°59.2	5°00.1	4°45.6	5.7 - 1.9	11.7 - 3.8	17.7 - 5.8
58	4°59.5	5°00.3	4°45.9	5.8 - 1.9	11.8 - 3.8	17.8 - 5.8
59	4°59.8	5°00.6	4°46.1	5.9 - 1.9	11.9 - 3.9	17.9 - 5.8

m 20	Sun Plan.	Aries	Moon	v and d corr		
0	5°00.0	5°00.8	4°46.3	0.0 - 0.0	6.0 - 2.0	12.0 - 4.1
1	5°00.2	5°01.1	4°46.6	0.1 - 0.0	6.1 - 2.1	12.1 - 4.1
2	5°00.5	5°01.3	4°46.8	0.2 - 0.1	6.2 - 2.1	12.2 - 4.2
3	5°00.8	5°01.6	4°47.0	0.3 - 0.1	6.3 - 2.2	12.3 - 4.2
4	5°01.0	5°01.8	4°47.3	0.4 - 0.1	6.4 - 2.2	12.4 - 4.2
5	5°01.2	5°02.1	4°47.5	0.5 - 0.2	6.5 - 2.2	12.5 - 4.3
6	5°01.5	5°02.3	4°47.8	0.6 - 0.2	6.6 - 2.3	12.6 - 4.3
7	5°01.8	5°02.6	4°48.0	0.7 - 0.2	6.7 - 2.3	12.7 - 4.3
8	5°02.0	5°02.8	4°48.2	0.8 - 0.3	6.8 - 2.3	12.8 - 4.4
9	5°02.2	5°03.1	4°48.5	0.9 - 0.3	6.9 - 2.4	12.9 - 4.4
10	5°02.5	5°03.3	4°48.7	1.0 - 0.3	7.0 - 2.4	13.0 - 4.4
11	5°02.8	5°03.6	4°49.0	1.1 - 0.4	7.1 - 2.4	13.1 - 4.5
12	5°03.0	5°03.8	4°49.2	1.2 - 0.4	7.2 - 2.5	13.2 - 4.5
13	5°03.2	5°04.1	4°49.4	1.3 - 0.4	7.3 - 2.5	13.3 - 4.5
14	5°03.5	5°04.3	4°49.7	1.4 - 0.5	7.4 - 2.5	13.4 - 4.6
15	5°03.8	5°04.6	4°49.9	1.5 - 0.5	7.5 - 2.6	13.5 - 4.6
16	5°04.0	5°04.8	4°50.2	1.6 - 0.5	7.6 - 2.6	13.6 - 4.6
17	5°04.3	5°05.1	4°50.4	1.7 - 0.6	7.7 - 2.6	13.7 - 4.7
18	5°04.5	5°05.3	4°50.6	1.8 - 0.6	7.8 - 2.7	13.8 - 4.7
19	5°04.7	5°05.6	4°50.9	1.9 - 0.6	7.9 - 2.7	13.9 - 4.7
20	5°05.0	5°05.8	4°51.1	2.0 - 0.7	8.0 - 2.7	14.0 - 4.8
21	5°05.3	5°06.1	4°51.3	2.1 - 0.7	8.1 - 2.8	14.1 - 4.8
22	5°05.5	5°06.3	4°51.6	2.2 - 0.8	8.2 - 2.8	14.2 - 4.9
23	5°05.7	5°06.6	4°51.8	2.3 - 0.8	8.3 - 2.8	14.3 - 4.9
24	5°06.0	5°06.8	4°52.1	2.4 - 0.8	8.4 - 2.9	14.4 - 4.9
25	5°06.3	5°07.1	4°52.3	2.5 - 0.9	8.5 - 2.9	14.5 - 5.0
26	5°06.5	5°07.3	4°52.5	2.6 - 0.9	8.6 - 2.9	14.6 - 5.0
27	5°06.7	5°07.6	4°52.8	2.7 - 0.9	8.7 - 3.0	14.7 - 5.0
28	5°07.0	5°07.8	4°53.0	2.8 - 1.0	8.8 - 3.0	14.8 - 5.1
29	5°07.3	5°08.1	4°53.3	2.9 - 1.0	8.9 - 3.0	14.9 - 5.1
30	5°07.5	5°08.3	4°53.5	3.0 - 1.0	9.0 - 3.1	15.0 - 5.1
31	5°07.7	5°08.6	4°53.7	3.1 - 1.1	9.1 - 3.1	15.1 - 5.2
32	5°08.0	5°08.8	4°54.0	3.2 - 1.1	9.2 - 3.1	15.2 - 5.2
33	5°08.3	5°09.1	4°54.2	3.3 - 1.1	9.3 - 3.2	15.3 - 5.2
34	5°08.5	5°09.3	4°54.4	3.4 - 1.2	9.4 - 3.2	15.4 - 5.3
35	5°08.7	5°09.6	4°54.7	3.5 - 1.2	9.5 - 3.2	15.5 - 5.3
36	5°09.0	5°09.8	4°54.9	3.6 - 1.2	9.6 - 3.3	15.6 - 5.3
37	5°09.3	5°10.1	4°55.2	3.7 - 1.3	9.7 - 3.3	15.7 - 5.4
38	5°09.5	5°10.3	4°55.4	3.8 - 1.3	9.8 - 3.3	15.8 - 5.4
39	5°09.7	5°10.6	4°55.6	3.9 - 1.3	9.9 - 3.4	15.9 - 5.4
40	5°10.0	5°10.8	4°55.9	4.0 - 1.4	10.0 - 3.4	16.0 - 5.5
41	5°10.3	5°11.1	4°56.1	4.1 - 1.4	10.1 - 3.5	16.1 - 5.5
42	5°10.5	5°11.3	4°56.4	4.2 - 1.4	10.2 - 3.5	16.2 - 5.5
43	5°10.7	5°11.6	4°56.6	4.3 - 1.5	10.3 - 3.5	16.3 - 5.6
44	5°11.0	5°11.9	4°56.8	4.4 - 1.5	10.4 - 3.6	16.4 - 5.6
45	5°11.3	5°12.1	4°57.1	4.5 - 1.5	10.5 - 3.6	16.5 - 5.6
46	5°11.5	5°12.4	4°57.3	4.6 - 1.6	10.6 - 3.6	16.6 - 5.7
47	5°11.8	5°12.6	4°57.5	4.7 - 1.6	10.7 - 3.7	16.7 - 5.7
48	5°12.0	5°12.9	4°57.8	4.8 - 1.6	10.8 - 3.7	16.8 - 5.7
49	5°12.2	5°13.1	4°58.0	4.9 - 1.7	10.9 - 3.7	16.9 - 5.8
50	5°12.5	5°13.4	4°58.3	5.0 - 1.7	11.0 - 3.8	17.0 - 5.8
51	5°12.8	5°13.6	4°58.5	5.1 - 1.7	11.1 - 3.8	17.1 - 5.8
52	5°13.0	5°13.9	4°58.7	5.2 - 1.8	11.2 - 3.8	17.2 - 5.9
53	5°13.2	5°14.1	4°59.0	5.3 - 1.8	11.3 - 3.9	17.3 - 5.9
54	5°13.5	5°14.4	4°59.2	5.4 - 1.8	11.4 - 3.9	17.4 - 5.9
55	5°13.8	5°14.6	4°59.5	5.5 - 1.9	11.5 - 3.9	17.5 - 6.0
56	5°14.0	5°14.9	4°59.7	5.6 - 1.9	11.6 - 4.0	17.6 - 6.0
57	5°14.2	5°15.1	4°59.9	5.7 - 1.9	11.7 - 4.0	17.7 - 6.0
58	5°14.5	5°15.4	5°00.2	5.8 - 2.0	11.8 - 4.0	17.8 - 6.1
59	5°14.8	5°15.6	5°00.4	5.9 - 2.0	11.9 - 4.1	17.9 - 6.1

Increments and Corrections

m 21	Sun Plan.	Aries	Moon	v and d corr		
0	5°15.0	5°15.9	5°00.6	0.0 - 0.0	6.0 - 2.1	12.0 - 4.3
1	5°15.2	5°16.1	5°00.9	0.1 - 0.0	6.1 - 2.2	12.1 - 4.3
2	5°15.5	5°16.4	5°01.1	0.2 - 0.1	6.2 - 2.2	12.2 - 4.4
3	5°15.8	5°16.6	5°01.4	0.3 - 0.1	6.3 - 2.3	12.3 - 4.4
4	5°16.0	5°16.9	5°01.6	0.4 - 0.1	6.4 - 2.3	12.4 - 4.4
5	5°16.2	5°17.1	5°01.8	0.5 - 0.2	6.5 - 2.3	12.5 - 4.5
6	5°16.5	5°17.4	5°02.1	0.6 - 0.2	6.6 - 2.4	12.6 - 4.5
7	5°16.8	5°17.6	5°02.3	0.7 - 0.3	6.7 - 2.4	12.7 - 4.6
8	5°17.0	5°17.9	5°02.6	0.8 - 0.3	6.8 - 2.4	12.8 - 4.6
9	5°17.2	5°18.1	5°02.8	0.9 - 0.3	6.9 - 2.5	12.9 - 4.6
10	5°17.5	5°18.4	5°03.0	1.0 - 0.4	7.0 - 2.5	13.0 - 4.7
11	5°17.8	5°18.6	5°03.3	1.1 - 0.4	7.1 - 2.5	13.1 - 4.7
12	5°18.0	5°18.9	5°03.5	1.2 - 0.4	7.2 - 2.6	13.2 - 4.7
13	5°18.2	5°19.1	5°03.8	1.3 - 0.5	7.3 - 2.6	13.3 - 4.8
14	5°18.5	5°19.4	5°04.0	1.4 - 0.5	7.4 - 2.7	13.4 - 4.8
15	5°18.8	5°19.6	5°04.2	1.5 - 0.5	7.5 - 2.7	13.5 - 4.8
16	5°19.0	5°19.9	5°04.5	1.6 - 0.6	7.6 - 2.7	13.6 - 4.9
17	5°19.3	5°20.1	5°04.7	1.7 - 0.6	7.7 - 2.8	13.7 - 4.9
18	5°19.5	5°20.4	5°04.9	1.8 - 0.6	7.8 - 2.8	13.8 - 4.9
19	5°19.7	5°20.6	5°05.2	1.9 - 0.7	7.9 - 2.8	13.9 - 5.0
20	5°20.0	5°20.9	5°05.4	2.0 - 0.7	8.0 - 2.9	14.0 - 5.0
21	5°20.3	5°21.1	5°05.7	2.1 - 0.8	8.1 - 2.9	14.1 - 5.1
22	5°20.5	5°21.4	5°05.9	2.2 - 0.8	8.2 - 2.9	14.2 - 5.1
23	5°20.7	5°21.6	5°06.1	2.3 - 0.8	8.3 - 3.0	14.3 - 5.1
24	5°21.0	5°21.9	5°06.4	2.4 - 0.9	8.4 - 3.0	14.4 - 5.2
25	5°21.3	5°22.1	5°06.6	2.5 - 0.9	8.5 - 3.0	14.5 - 5.2
26	5°21.5	5°22.4	5°06.9	2.6 - 0.9	8.6 - 3.1	14.6 - 5.2
27	5°21.7	5°22.6	5°07.1	2.7 - 1.0	8.7 - 3.1	14.7 - 5.3
28	5°22.0	5°22.9	5°07.3	2.8 - 1.0	8.8 - 3.2	14.8 - 5.3
29	5°22.3	5°23.1	5°07.6	2.9 - 1.0	8.9 - 3.2	14.9 - 5.3
30	5°22.5	5°23.4	5°07.8	3.0 - 1.1	9.0 - 3.2	15.0 - 5.4
31	5°22.7	5°23.6	5°08.0	3.1 - 1.1	9.1 - 3.3	15.1 - 5.4
32	5°23.0	5°23.9	5°08.3	3.2 - 1.1	9.2 - 3.3	15.2 - 5.4
33	5°23.3	5°24.1	5°08.5	3.3 - 1.2	9.3 - 3.3	15.3 - 5.5
34	5°23.5	5°24.4	5°08.8	3.4 - 1.2	9.4 - 3.4	15.4 - 5.5
35	5°23.7	5°24.6	5°09.0	3.5 - 1.3	9.5 - 3.4	15.5 - 5.6
36	5°24.0	5°24.9	5°09.2	3.6 - 1.3	9.6 - 3.4	15.6 - 5.6
37	5°24.3	5°25.1	5°09.5	3.7 - 1.3	9.7 - 3.5	15.7 - 5.6
38	5°24.5	5°25.4	5°09.7	3.8 - 1.4	9.8 - 3.5	15.8 - 5.7
39	5°24.7	5°25.6	5°10.0	3.9 - 1.4	9.9 - 3.5	15.9 - 5.7
40	5°25.0	5°25.9	5°10.2	4.0 - 1.4	10.0 - 3.6	16.0 - 5.7
41	5°25.3	5°26.1	5°10.4	4.1 - 1.5	10.1 - 3.6	16.1 - 5.8
42	5°25.5	5°26.4	5°10.7	4.2 - 1.5	10.2 - 3.7	16.2 - 5.8
43	5°25.7	5°26.6	5°10.9	4.3 - 1.5	10.3 - 3.7	16.3 - 5.8
44	5°26.0	5°26.9	5°11.1	4.4 - 1.6	10.4 - 3.7	16.4 - 5.9
45	5°26.3	5°27.1	5°11.4	4.5 - 1.6	10.5 - 3.8	16.5 - 5.9
46	5°26.5	5°27.4	5°11.6	4.6 - 1.6	10.6 - 3.8	16.6 - 5.9
47	5°26.8	5°27.6	5°11.9	4.7 - 1.7	10.7 - 3.8	16.7 - 6.0
48	5°27.0	5°27.9	5°12.1	4.8 - 1.7	10.8 - 3.9	16.8 - 6.0
49	5°27.2	5°28.1	5°12.3	4.9 - 1.8	10.9 - 3.9	16.9 - 6.1
50	5°27.5	5°28.4	5°12.6	5.0 - 1.8	11.0 - 3.9	17.0 - 6.1
51	5°27.8	5°28.6	5°12.8	5.1 - 1.8	11.1 - 4.0	17.1 - 6.1
52	5°28.0	5°28.9	5°13.1	5.2 - 1.9	11.2 - 4.0	17.2 - 6.2
53	5°28.2	5°29.1	5°13.3	5.3 - 1.9	11.3 - 4.0	17.3 - 6.2
54	5°28.5	5°29.4	5°13.5	5.4 - 1.9	11.4 - 4.1	17.4 - 6.2
55	5°28.8	5°29.6	5°13.8	5.5 - 2.0	11.5 - 4.1	17.5 - 6.3
56	5°29.0	5°29.9	5°14.0	5.6 - 2.0	11.6 - 4.2	17.6 - 6.3
57	5°29.2	5°30.1	5°14.3	5.7 - 2.0	11.7 - 4.2	17.7 - 6.3
58	5°29.5	5°30.4	5°14.5	5.8 - 2.1	11.8 - 4.2	17.8 - 6.4
59	5°29.8	5°30.7	5°14.7	5.9 - 2.1	11.9 - 4.3	17.9 - 6.4

m 22	Sun Plan.	Aries	Moon	v and d corr		
0	5°30.0	5°30.9	5°15.0	0.0 - 0.0	6.0 - 2.3	12.0 - 4.5
1	5°30.2	5°31.2	5°15.2	0.1 - 0.0	6.1 - 2.3	12.1 - 4.5
2	5°30.5	5°31.4	5°15.4	0.2 - 0.1	6.2 - 2.3	12.2 - 4.6
3	5°30.8	5°31.7	5°15.7	0.3 - 0.1	6.3 - 2.4	12.3 - 4.6
4	5°31.0	5°31.9	5°15.9	0.4 - 0.2	6.4 - 2.4	12.4 - 4.7
5	5°31.2	5°32.2	5°16.2	0.5 - 0.2	6.5 - 2.4	12.5 - 4.7
6	5°31.5	5°32.4	5°16.4	0.6 - 0.2	6.6 - 2.5	12.6 - 4.7
7	5°31.8	5°32.7	5°16.6	0.7 - 0.3	6.7 - 2.5	12.7 - 4.8
8	5°32.0	5°32.9	5°16.9	0.8 - 0.3	6.8 - 2.5	12.8 - 4.8
9	5°32.2	5°33.2	5°17.1	0.9 - 0.3	6.9 - 2.6	12.9 - 4.8
10	5°32.5	5°33.4	5°17.4	1.0 - 0.4	7.0 - 2.6	13.0 - 4.9
11	5°32.8	5°33.7	5°17.6	1.1 - 0.4	7.1 - 2.7	13.1 - 4.9
12	5°33.0	5°33.9	5°17.8	1.2 - 0.5	7.2 - 2.7	13.2 - 4.9
13	5°33.2	5°34.2	5°18.1	1.3 - 0.5	7.3 - 2.7	13.3 - 5.0
14	5°33.5	5°34.4	5°18.3	1.4 - 0.5	7.4 - 2.8	13.4 - 5.0
15	5°33.8	5°34.7	5°18.5	1.5 - 0.6	7.5 - 2.8	13.5 - 5.1
16	5°34.0	5°34.9	5°18.8	1.6 - 0.6	7.6 - 2.8	13.6 - 5.1
17	5°34.3	5°35.2	5°19.0	1.7 - 0.6	7.7 - 2.9	13.7 - 5.1
18	5°34.5	5°35.4	5°19.3	1.8 - 0.7	7.8 - 2.9	13.8 - 5.2
19	5°34.8	5°35.7	5°19.5	1.9 - 0.7	7.9 - 3.0	13.9 - 5.2
20	5°35.0	5°35.9	5°19.7	2.0 - 0.8	8.0 - 3.0	14.0 - 5.3
21	5°35.3	5°36.2	5°20.0	2.1 - 0.8	8.1 - 3.0	14.1 - 5.3
22	5°35.5	5°36.4	5°20.2	2.2 - 0.8	8.2 - 3.1	14.2 - 5.3
23	5°35.7	5°36.7	5°20.5	2.3 - 0.9	8.3 - 3.1	14.3 - 5.4
24	5°36.0	5°36.9	5°20.7	2.4 - 0.9	8.4 - 3.2	14.4 - 5.4
25	5°36.3	5°37.2	5°20.9	2.5 - 0.9	8.5 - 3.2	14.5 - 5.4
26	5°36.5	5°37.4	5°21.2	2.6 - 1.0	8.6 - 3.2	14.6 - 5.5
27	5°36.7	5°37.7	5°21.4	2.7 - 1.0	8.7 - 3.3	14.7 - 5.5
28	5°37.0	5°37.9	5°21.6	2.8 - 1.1	8.8 - 3.3	14.8 - 5.6
29	5°37.3	5°38.2	5°21.9	2.9 - 1.1	8.9 - 3.3	14.9 - 5.6
30	5°37.5	5°38.4	5°22.1	3.0 - 1.1	9.0 - 3.4	15.0 - 5.6
31	5°37.7	5°38.7	5°22.4	3.1 - 1.2	9.1 - 3.4	15.1 - 5.7
32	5°38.0	5°38.9	5°22.6	3.2 - 1.2	9.2 - 3.4	15.2 - 5.7
33	5°38.3	5°39.2	5°22.8	3.3 - 1.2	9.3 - 3.5	15.3 - 5.7
34	5°38.5	5°39.4	5°23.1	3.4 - 1.3	9.4 - 3.5	15.4 - 5.8
35	5°38.7	5°39.7	5°23.3	3.5 - 1.3	9.5 - 3.6	15.5 - 5.8
36	5°39.0	5°39.9	5°23.6	3.6 - 1.4	9.6 - 3.6	15.6 - 5.8
37	5°39.3	5°40.2	5°23.8	3.7 - 1.4	9.7 - 3.6	15.7 - 5.9
38	5°39.5	5°40.4	5°24.0	3.8 - 1.4	9.8 - 3.7	15.8 - 5.9
39	5°39.7	5°40.7	5°24.3	3.9 - 1.5	9.9 - 3.7	15.9 - 6.0
40	5°40.0	5°40.9	5°24.5	4.0 - 1.5	10.0 - 3.8	16.0 - 6.0
41	5°40.3	5°41.2	5°24.7	4.1 - 1.5	10.1 - 3.8	16.1 - 6.0
42	5°40.5	5°41.4	5°25.0	4.2 - 1.6	10.2 - 3.8	16.2 - 6.1
43	5°40.7	5°41.7	5°25.2	4.3 - 1.6	10.3 - 3.9	16.3 - 6.1
44	5°41.0	5°41.9	5°25.5	4.4 - 1.7	10.4 - 3.9	16.4 - 6.1
45	5°41.3	5°42.2	5°25.7	4.5 - 1.7	10.5 - 3.9	16.5 - 6.2
46	5°41.5	5°42.4	5°25.9	4.6 - 1.7	10.6 - 4.0	16.6 - 6.2
47	5°41.8	5°42.7	5°26.2	4.7 - 1.8	10.7 - 4.0	16.7 - 6.3
48	5°42.0	5°42.9	5°26.4	4.8 - 1.8	10.8 - 4.1	16.8 - 6.3
49	5°42.3	5°43.2	5°26.7	4.9 - 1.8	10.9 - 4.1	16.9 - 6.3
50	5°42.5	5°43.4	5°26.9	5.0 - 1.9	11.0 - 4.1	17.0 - 6.4
51	5°42.8	5°43.7	5°27.1	5.1 - 1.9	11.1 - 4.2	17.1 - 6.4
52	5°43.0	5°43.9	5°27.4	5.2 - 2.0	11.2 - 4.2	17.2 - 6.4
53	5°43.2	5°44.2	5°27.6	5.3 - 2.0	11.3 - 4.2	17.3 - 6.5
54	5°43.5	5°44.4	5°27.9	5.4 - 2.0	11.4 - 4.3	17.4 - 6.5
55	5°43.8	5°44.7	5°28.1	5.5 - 2.1	11.5 - 4.3	17.5 - 6.6
56	5°44.0	5°44.9	5°28.3	5.6 - 2.1	11.6 - 4.4	17.6 - 6.6
57	5°44.2	5°45.2	5°28.6	5.7 - 2.1	11.7 - 4.4	17.7 - 6.6
58	5°44.5	5°45.4	5°28.8	5.8 - 2.2	11.8 - 4.4	17.8 - 6.7
59	5°44.8	5°45.7	5°29.0	5.9 - 2.2	11.9 - 4.5	17.9 - 6.7

m 23	Sun Plan.	Aries	Moon	v and d corr		
0	5°45.0	5°45.9	5°29.3	0.0 - 0.0	6.0 - 2.4	12.0 - 4.7
1	5°45.2	5°46.2	5°29.5	0.1 - 0.0	6.1 - 2.4	12.1 - 4.7
2	5°45.5	5°46.4	5°29.8	0.2 - 0.1	6.2 - 2.4	12.2 - 4.8
3	5°45.8	5°46.7	5°30.0	0.3 - 0.1	6.3 - 2.5	12.3 - 4.8
4	5°46.0	5°46.9	5°30.2	0.4 - 0.2	6.4 - 2.5	12.4 - 4.9
5	5°46.2	5°47.2	5°30.5	0.5 - 0.2	6.5 - 2.5	12.5 - 4.9
6	5°46.5	5°47.4	5°30.7	0.6 - 0.2	6.6 - 2.6	12.6 - 4.9
7	5°46.8	5°47.7	5°31.0	0.7 - 0.3	6.7 - 2.6	12.7 - 5.0
8	5°47.0	5°47.9	5°31.2	0.8 - 0.3	6.8 - 2.7	12.8 - 5.0
9	5°47.2	5°48.2	5°31.4	0.9 - 0.4	6.9 - 2.7	12.9 - 5.1
10	5°47.5	5°48.4	5°31.7	1.0 - 0.4	7.0 - 2.7	13.0 - 5.1
11	5°47.8	5°48.7	5°31.9	1.1 - 0.4	7.1 - 2.8	13.1 - 5.1
12	5°48.0	5°49.0	5°32.1	1.2 - 0.5	7.2 - 2.8	13.2 - 5.2
13	5°48.2	5°49.2	5°32.4	1.3 - 0.5	7.3 - 2.9	13.3 - 5.2
14	5°48.5	5°49.5	5°32.6	1.4 - 0.5	7.4 - 2.9	13.4 - 5.2
15	5°48.8	5°49.7	5°32.9	1.5 - 0.6	7.5 - 2.9	13.5 - 5.3
16	5°49.0	5°50.0	5°33.1	1.6 - 0.6	7.6 - 3.0	13.6 - 5.3
17	5°49.3	5°50.2	5°33.3	1.7 - 0.7	7.7 - 3.0	13.7 - 5.4
18	5°49.5	5°50.5	5°33.6	1.8 - 0.7	7.8 - 3.1	13.8 - 5.4
19	5°49.8	5°50.7	5°33.8	1.9 - 0.7	7.9 - 3.1	13.9 - 5.4
20	5°50.0	5°51.0	5°34.1	2.0 - 0.8	8.0 - 3.1	14.0 - 5.5
21	5°50.3	5°51.2	5°34.3	2.1 - 0.8	8.1 - 3.2	14.1 - 5.5
22	5°50.5	5°51.5	5°34.5	2.2 - 0.9	8.2 - 3.2	14.2 - 5.6
23	5°50.7	5°51.7	5°34.8	2.3 - 0.9	8.3 - 3.3	14.3 - 5.6
24	5°51.0	5°52.0	5°35.0	2.4 - 0.9	8.4 - 3.3	14.4 - 5.6
25	5°51.3	5°52.2	5°35.2	2.5 - 1.0	8.5 - 3.3	14.5 - 5.7
26	5°51.5	5°52.5	5°35.5	2.6 - 1.0	8.6 - 3.4	14.6 - 5.7
27	5°51.7	5°52.7	5°35.7	2.7 - 1.1	8.7 - 3.4	14.7 - 5.8
28	5°52.0	5°53.0	5°36.0	2.8 - 1.1	8.8 - 3.4	14.8 - 5.8
29	5°52.3	5°53.2	5°36.2	2.9 - 1.1	8.9 - 3.5	14.9 - 5.8
30	5°52.5	5°53.5	5°36.4	3.0 - 1.2	9.0 - 3.5	15.0 - 5.9
31	5°52.7	5°53.7	5°36.7	3.1 - 1.2	9.1 - 3.6	15.1 - 5.9
32	5°53.0	5°54.0	5°36.9	3.2 - 1.3	9.2 - 3.6	15.2 - 6.0
33	5°53.3	5°54.2	5°37.2	3.3 - 1.3	9.3 - 3.6	15.3 - 6.0
34	5°53.5	5°54.5	5°37.4	3.4 - 1.3	9.4 - 3.7	15.4 - 6.0
35	5°53.7	5°54.7	5°37.6	3.5 - 1.4	9.5 - 3.7	15.5 - 6.1
36	5°54.0	5°55.0	5°37.9	3.6 - 1.4	9.6 - 3.8	15.6 - 6.1
37	5°54.3	5°55.2	5°38.1	3.7 - 1.4	9.7 - 3.8	15.7 - 6.1
38	5°54.5	5°55.5	5°38.4	3.8 - 1.5	9.8 - 3.8	15.8 - 6.2
39	5°54.7	5°55.7	5°38.6	3.9 - 1.5	9.9 - 3.9	15.9 - 6.2
40	5°55.0	5°56.0	5°38.8	4.0 - 1.6	10.0 - 3.9	16.0 - 6.3
41	5°55.3	5°56.2	5°39.1	4.1 - 1.6	10.1 - 4.0	16.1 - 6.3
42	5°55.5	5°56.5	5°39.3	4.2 - 1.6	10.2 - 4.0	16.2 - 6.3
43	5°55.7	5°56.7	5°39.5	4.3 - 1.7	10.3 - 4.0	16.3 - 6.4
44	5°56.0	5°57.0	5°39.8	4.4 - 1.7	10.4 - 4.1	16.4 - 6.4
45	5°56.3	5°57.2	5°40.0	4.5 - 1.8	10.5 - 4.1	16.5 - 6.5
46	5°56.5	5°57.5	5°40.3	4.6 - 1.8	10.6 - 4.2	16.6 - 6.5
47	5°56.8	5°57.7	5°40.5	4.7 - 1.8	10.7 - 4.2	16.7 - 6.5
48	5°57.0	5°58.0	5°40.7	4.8 - 1.9	10.8 - 4.2	16.8 - 6.6
49	5°57.3	5°58.2	5°41.0	4.9 - 1.9	10.9 - 4.3	16.9 - 6.6
50	5°57.5	5°58.5	5°41.2	5.0 - 2.0	11.0 - 4.3	17.0 - 6.7
51	5°57.8	5°58.7	5°41.5	5.1 - 2.0	11.1 - 4.3	17.1 - 6.7
52	5°58.0	5°59.0	5°41.7	5.2 - 2.0	11.2 - 4.4	17.2 - 6.7
53	5°58.2	5°59.2	5°41.9	5.3 - 2.1	11.3 - 4.4	17.3 - 6.8
54	5°58.5	5°59.5	5°42.2	5.4 - 2.1	11.4 - 4.5	17.4 - 6.8
55	5°58.8	5°59.7	5°42.4	5.5 - 2.2	11.5 - 4.5	17.5 - 6.9
56	5°59.0	6°00.0	5°42.6	5.6 - 2.2	11.6 - 4.5	17.6 - 6.9
57	5°59.2	6°00.2	5°42.9	5.7 - 2.2	11.7 - 4.6	17.7 - 6.9
58	5°59.5	6°00.5	5°43.1	5.8 - 2.3	11.8 - 4.6	17.8 - 7.0
59	5°59.8	6°00.7	5°43.4	5.9 - 2.3	11.9 - 4.7	17.9 - 7.0

Increments and Corrections

m 24	Sun Plan.	Aries	Moon	v and d corr		
0	6°00.0	6°01.0	5°43.6	0.0 - 0.0	6.0 - 2.5	12.0 - 4.9
1	6°00.2	6°01.2	5°43.8	0.1 - 0.0	6.1 - 2.5	12.1 - 4.9
2	6°00.5	6°01.5	5°44.1	0.2 - 0.1	6.2 - 2.5	12.2 - 5.0
3	6°00.8	6°01.7	5°44.3	0.3 - 0.1	6.3 - 2.6	12.3 - 5.0
4	6°01.0	6°02.0	5°44.6	0.4 - 0.2	6.4 - 2.6	12.4 - 5.1
5	6°01.2	6°02.2	5°44.8	0.5 - 0.2	6.5 - 2.7	12.5 - 5.1
6	6°01.5	6°02.5	5°45.0	0.6 - 0.2	6.6 - 2.7	12.6 - 5.1
7	6°01.8	6°02.7	5°45.3	0.7 - 0.3	6.7 - 2.7	12.7 - 5.2
8	6°02.0	6°03.0	5°45.5	0.8 - 0.3	6.8 - 2.8	12.8 - 5.2
9	6°02.2	6°03.2	5°45.7	0.9 - 0.4	6.9 - 2.8	12.9 - 5.3
10	6°02.5	6°03.5	5°46.0	1.0 - 0.4	7.0 - 2.9	13.0 - 5.3
11	6°02.8	6°03.7	5°46.2	1.1 - 0.4	7.1 - 2.9	13.1 - 5.3
12	6°03.0	6°04.0	5°46.5	1.2 - 0.5	7.2 - 2.9	13.2 - 5.4
13	6°03.2	6°04.2	5°46.7	1.3 - 0.5	7.3 - 3.0	13.3 - 5.4
14	6°03.5	6°04.5	5°46.9	1.4 - 0.6	7.4 - 3.0	13.4 - 5.5
15	6°03.8	6°04.7	5°47.2	1.5 - 0.6	7.5 - 3.1	13.5 - 5.5
16	6°04.0	6°05.0	5°47.4	1.6 - 0.7	7.6 - 3.1	13.6 - 5.6
17	6°04.3	6°05.2	5°47.7	1.7 - 0.7	7.7 - 3.1	13.7 - 5.6
18	6°04.5	6°05.5	5°47.9	1.8 - 0.7	7.8 - 3.2	13.8 - 5.6
19	6°04.7	6°05.7	5°48.1	1.9 - 0.8	7.9 - 3.2	13.9 - 5.7
20	6°05.0	6°06.0	5°48.4	2.0 - 0.8	8.0 - 3.3	14.0 - 5.7
21	6°05.3	6°06.2	5°48.6	2.1 - 0.9	8.1 - 3.3	14.1 - 5.8
22	6°05.5	6°06.5	5°48.8	2.2 - 0.9	8.2 - 3.3	14.2 - 5.8
23	6°05.7	6°06.7	5°49.1	2.3 - 0.9	8.3 - 3.4	14.3 - 5.8
24	6°06.0	6°07.0	5°49.3	2.4 - 1.0	8.4 - 3.4	14.4 - 5.9
25	6°06.3	6°07.3	5°49.6	2.5 - 1.0	8.5 - 3.5	14.5 - 5.9
26	6°06.5	6°07.5	5°49.8	2.6 - 1.1	8.6 - 3.5	14.6 - 6.0
27	6°06.7	6°07.8	5°50.0	2.7 - 1.1	8.7 - 3.6	14.7 - 6.0
28	6°07.0	6°08.0	5°50.3	2.8 - 1.1	8.8 - 3.6	14.8 - 6.0
29	6°07.3	6°08.3	5°50.5	2.9 - 1.2	8.9 - 3.6	14.9 - 6.1
30	6°07.5	6°08.5	5°50.8	3.0 - 1.2	9.0 - 3.7	15.0 - 6.1
31	6°07.7	6°08.8	5°51.0	3.1 - 1.3	9.1 - 3.7	15.1 - 6.2
32	6°08.0	6°09.0	5°51.2	3.2 - 1.3	9.2 - 3.8	15.2 - 6.2
33	6°08.3	6°09.3	5°51.5	3.3 - 1.3	9.3 - 3.8	15.3 - 6.2
34	6°08.5	6°09.5	5°51.7	3.4 - 1.4	9.4 - 3.8	15.4 - 6.3
35	6°08.7	6°09.8	5°52.0	3.5 - 1.4	9.5 - 3.9	15.5 - 6.3
36	6°09.0	6°10.0	5°52.2	3.6 - 1.5	9.6 - 3.9	15.6 - 6.4
37	6°09.3	6°10.3	5°52.4	3.7 - 1.5	9.7 - 4.0	15.7 - 6.4
38	6°09.5	6°10.5	5°52.7	3.8 - 1.6	9.8 - 4.0	15.8 - 6.5
39	6°09.7	6°10.8	5°52.9	3.9 - 1.6	9.9 - 4.0	15.9 - 6.5
40	6°10.0	6°11.0	5°53.1	4.0 - 1.6	10.0 - 4.1	16.0 - 6.5
41	6°10.3	6°11.3	5°53.4	4.1 - 1.7	10.1 - 4.1	16.1 - 6.6
42	6°10.5	6°11.5	5°53.6	4.2 - 1.7	10.2 - 4.2	16.2 - 6.6
43	6°10.7	6°11.8	5°53.9	4.3 - 1.8	10.3 - 4.2	16.3 - 6.7
44	6°11.0	6°12.0	5°54.1	4.4 - 1.8	10.4 - 4.2	16.4 - 6.7
45	6°11.3	6°12.3	5°54.3	4.5 - 1.8	10.5 - 4.3	16.5 - 6.7
46	6°11.5	6°12.5	5°54.6	4.6 - 1.9	10.6 - 4.3	16.6 - 6.8
47	6°11.8	6°12.8	5°54.8	4.7 - 1.9	10.7 - 4.4	16.7 - 6.8
48	6°12.0	6°13.0	5°55.1	4.8 - 2.0	10.8 - 4.4	16.8 - 6.9
49	6°12.2	6°13.3	5°55.3	4.9 - 2.0	10.9 - 4.5	16.9 - 6.9
50	6°12.5	6°13.5	5°55.5	5.0 - 2.0	11.0 - 4.5	17.0 - 6.9
51	6°12.8	6°13.8	5°55.8	5.1 - 2.1	11.1 - 4.5	17.1 - 7.0
52	6°13.0	6°14.0	5°56.0	5.2 - 2.1	11.2 - 4.6	17.2 - 7.0
53	6°13.2	6°14.3	5°56.2	5.3 - 2.2	11.3 - 4.6	17.3 - 7.1
54	6°13.5	6°14.5	5°56.5	5.4 - 2.2	11.4 - 4.7	17.4 - 7.1
55	6°13.8	6°14.8	5°56.7	5.5 - 2.2	11.5 - 4.7	17.5 - 7.1
56	6°14.0	6°15.0	5°57.0	5.6 - 2.3	11.6 - 4.7	17.6 - 7.2
57	6°14.2	6°15.3	5°57.2	5.7 - 2.3	11.7 - 4.8	17.7 - 7.2
58	6°14.5	6°15.5	5°57.4	5.8 - 2.4	11.8 - 4.8	17.8 - 7.3
59	6°14.8	6°15.8	5°57.7	5.9 - 2.4	11.9 - 4.9	17.9 - 7.3

m 25	Sun Plan.	Aries	Moon	v and d corr		
0	6°15.0	6°16.0	5°57.9	0.0 - 0.0	6.0 - 2.5	12.0 - 5.1
1	6°15.2	6°16.3	5°58.2	0.1 - 0.0	6.1 - 2.6	12.1 - 5.1
2	6°15.5	6°16.5	5°58.4	0.2 - 0.1	6.2 - 2.6	12.2 - 5.2
3	6°15.8	6°16.8	5°58.6	0.3 - 0.1	6.3 - 2.7	12.3 - 5.2
4	6°16.0	6°17.0	5°58.9	0.4 - 0.2	6.4 - 2.7	12.4 - 5.3
5	6°16.2	6°17.3	5°59.1	0.5 - 0.2	6.5 - 2.8	12.5 - 5.3
6	6°16.5	6°17.5	5°59.3	0.6 - 0.3	6.6 - 2.8	12.6 - 5.4
7	6°16.8	6°17.8	5°59.6	0.7 - 0.3	6.7 - 2.8	12.7 - 5.4
8	6°17.0	6°18.0	5°59.8	0.8 - 0.3	6.8 - 2.9	12.8 - 5.4
9	6°17.2	6°18.3	6°00.1	0.9 - 0.4	6.9 - 2.9	12.9 - 5.5
10	6°17.5	6°18.5	6°00.3	1.0 - 0.4	7.0 - 3.0	13.0 - 5.5
11	6°17.8	6°18.8	6°00.5	1.1 - 0.5	7.1 - 3.0	13.1 - 5.6
12	6°18.0	6°19.0	6°00.8	1.2 - 0.5	7.2 - 3.1	13.2 - 5.6
13	6°18.2	6°19.3	6°01.0	1.3 - 0.6	7.3 - 3.1	13.3 - 5.7
14	6°18.5	6°19.5	6°01.3	1.4 - 0.6	7.4 - 3.1	13.4 - 5.7
15	6°18.8	6°19.8	6°01.5	1.5 - 0.6	7.5 - 3.2	13.5 - 5.7
16	6°19.0	6°20.0	6°01.7	1.6 - 0.7	7.6 - 3.2	13.6 - 5.8
17	6°19.3	6°20.3	6°02.0	1.7 - 0.7	7.7 - 3.3	13.7 - 5.8
18	6°19.5	6°20.5	6°02.2	1.8 - 0.8	7.8 - 3.3	13.8 - 5.9
19	6°19.7	6°20.8	6°02.5	1.9 - 0.8	7.9 - 3.4	13.9 - 5.9
20	6°20.0	6°21.0	6°02.7	2.0 - 0.8	8.0 - 3.4	14.0 - 6.0
21	6°20.3	6°21.3	6°02.9	2.1 - 0.9	8.1 - 3.4	14.1 - 6.0
22	6°20.5	6°21.5	6°03.2	2.2 - 0.9	8.2 - 3.5	14.2 - 6.0
23	6°20.7	6°21.8	6°03.4	2.3 - 1.0	8.3 - 3.5	14.3 - 6.1
24	6°21.0	6°22.0	6°03.6	2.4 - 1.0	8.4 - 3.6	14.4 - 6.1
25	6°21.3	6°22.3	6°03.9	2.5 - 1.1	8.5 - 3.6	14.5 - 6.2
26	6°21.5	6°22.5	6°04.1	2.6 - 1.1	8.6 - 3.7	14.6 - 6.2
27	6°21.7	6°22.8	6°04.4	2.7 - 1.1	8.7 - 3.7	14.7 - 6.2
28	6°22.0	6°23.0	6°04.6	2.8 - 1.2	8.8 - 3.7	14.8 - 6.3
29	6°22.3	6°23.3	6°04.8	2.9 - 1.2	8.9 - 3.8	14.9 - 6.3
30	6°22.5	6°23.5	6°05.1	3.0 - 1.3	9.0 - 3.8	15.0 - 6.4
31	6°22.7	6°23.8	6°05.3	3.1 - 1.3	9.1 - 3.9	15.1 - 6.4
32	6°23.0	6°24.0	6°05.6	3.2 - 1.4	9.2 - 3.9	15.2 - 6.5
33	6°23.3	6°24.3	6°05.8	3.3 - 1.4	9.3 - 4.0	15.3 - 6.5
34	6°23.5	6°24.5	6°06.0	3.4 - 1.4	9.4 - 4.0	15.4 - 6.5
35	6°23.7	6°24.8	6°06.3	3.5 - 1.5	9.5 - 4.0	15.5 - 6.6
36	6°24.0	6°25.0	6°06.5	3.6 - 1.5	9.6 - 4.1	15.6 - 6.6
37	6°24.3	6°25.3	6°06.7	3.7 - 1.6	9.7 - 4.1	15.7 - 6.7
38	6°24.5	6°25.6	6°07.0	3.8 - 1.6	9.8 - 4.2	15.8 - 6.7
39	6°24.7	6°25.8	6°07.2	3.9 - 1.7	9.9 - 4.2	15.9 - 6.8
40	6°25.0	6°26.1	6°07.5	4.0 - 1.7	10.0 - 4.3	16.0 - 6.8
41	6°25.3	6°26.3	6°07.7	4.1 - 1.7	10.1 - 4.3	16.1 - 6.8
42	6°25.5	6°26.6	6°07.9	4.2 - 1.8	10.2 - 4.3	16.2 - 6.9
43	6°25.7	6°26.8	6°08.2	4.3 - 1.8	10.3 - 4.4	16.3 - 6.9
44	6°26.0	6°27.1	6°08.4	4.4 - 1.9	10.4 - 4.4	16.4 - 7.0
45	6°26.3	6°27.3	6°08.7	4.5 - 1.9	10.5 - 4.5	16.5 - 7.0
46	6°26.5	6°27.6	6°08.9	4.6 - 2.0	10.6 - 4.5	16.6 - 7.1
47	6°26.8	6°27.8	6°09.1	4.7 - 2.0	10.7 - 4.5	16.7 - 7.1
48	6°27.0	6°28.1	6°09.4	4.8 - 2.0	10.8 - 4.6	16.8 - 7.1
49	6°27.2	6°28.3	6°09.6	4.9 - 2.1	10.9 - 4.6	16.9 - 7.2
50	6°27.5	6°28.6	6°09.8	5.0 - 2.1	11.0 - 4.7	17.0 - 7.2
51	6°27.8	6°28.8	6°10.1	5.1 - 2.2	11.1 - 4.7	17.1 - 7.3
52	6°28.0	6°29.1	6°10.3	5.2 - 2.2	11.2 - 4.8	17.2 - 7.3
53	6°28.2	6°29.3	6°10.6	5.3 - 2.3	11.3 - 4.8	17.3 - 7.4
54	6°28.5	6°29.6	6°10.8	5.4 - 2.3	11.4 - 4.8	17.4 - 7.4
55	6°28.8	6°29.8	6°11.0	5.5 - 2.3	11.5 - 4.9	17.5 - 7.4
56	6°29.0	6°30.1	6°11.3	5.6 - 2.4	11.6 - 4.9	17.6 - 7.5
57	6°29.2	6°30.3	6°11.5	5.7 - 2.4	11.7 - 5.0	17.7 - 7.5
58	6°29.5	6°30.6	6°11.8	5.8 - 2.5	11.8 - 5.0	17.8 - 7.6
59	6°29.8	6°30.8	6°12.0	5.9 - 2.5	11.9 - 5.1	17.9 - 7.6

m 26	Sun Plan.	Aries	Moon	v and d corr		
0	6°30.0	6°31.1	6°12.2	0.0 - 0.0	6.0 - 2.6	12.0 - 5.3
1	6°30.2	6°31.3	6°12.5	0.1 - 0.0	6.1 - 2.7	12.1 - 5.3
2	6°30.5	6°31.6	6°12.7	0.2 - 0.1	6.2 - 2.7	12.2 - 5.4
3	6°30.8	6°31.8	6°12.9	0.3 - 0.1	6.3 - 2.8	12.3 - 5.4
4	6°31.0	6°32.1	6°13.2	0.4 - 0.2	6.4 - 2.8	12.4 - 5.5
5	6°31.2	6°32.3	6°13.4	0.5 - 0.2	6.5 - 2.9	12.5 - 5.5
6	6°31.5	6°32.6	6°13.7	0.6 - 0.3	6.6 - 2.9	12.6 - 5.6
7	6°31.8	6°32.8	6°13.9	0.7 - 0.3	6.7 - 3.0	12.7 - 5.6
8	6°32.0	6°33.1	6°14.1	0.8 - 0.4	6.8 - 3.0	12.8 - 5.7
9	6°32.2	6°33.3	6°14.4	0.9 - 0.4	6.9 - 3.0	12.9 - 5.7
10	6°32.5	6°33.6	6°14.6	1.0 - 0.4	7.0 - 3.1	13.0 - 5.7
11	6°32.8	6°33.8	6°14.9	1.1 - 0.5	7.1 - 3.1	13.1 - 5.8
12	6°33.0	6°34.1	6°15.1	1.2 - 0.5	7.2 - 3.2	13.2 - 5.8
13	6°33.2	6°34.3	6°15.3	1.3 - 0.6	7.3 - 3.2	13.3 - 5.9
14	6°33.5	6°34.6	6°15.6	1.4 - 0.6	7.4 - 3.3	13.4 - 5.9
15	6°33.8	6°34.8	6°15.8	1.5 - 0.7	7.5 - 3.3	13.5 - 6.0
16	6°34.0	6°35.1	6°16.1	1.6 - 0.7	7.6 - 3.4	13.6 - 6.0
17	6°34.3	6°35.3	6°16.3	1.7 - 0.8	7.7 - 3.4	13.7 - 6.1
18	6°34.5	6°35.6	6°16.5	1.8 - 0.8	7.8 - 3.4	13.8 - 6.1
19	6°34.8	6°35.8	6°16.8	1.9 - 0.8	7.9 - 3.5	13.9 - 6.1
20	6°35.0	6°36.1	6°17.0	2.0 - 0.9	8.0 - 3.5	14.0 - 6.2
21	6°35.3	6°36.3	6°17.2	2.1 - 0.9	8.1 - 3.6	14.1 - 6.2
22	6°35.5	6°36.6	6°17.5	2.2 - 1.0	8.2 - 3.6	14.2 - 6.3
23	6°35.7	6°36.8	6°17.7	2.3 - 1.0	8.3 - 3.7	14.3 - 6.3
24	6°36.0	6°37.1	6°18.0	2.4 - 1.1	8.4 - 3.7	14.4 - 6.4
25	6°36.3	6°37.3	6°18.2	2.5 - 1.1	8.5 - 3.8	14.5 - 6.4
26	6°36.5	6°37.6	6°18.4	2.6 - 1.1	8.6 - 3.8	14.6 - 6.4
27	6°36.7	6°37.8	6°18.7	2.7 - 1.2	8.7 - 3.8	14.7 - 6.5
28	6°37.0	6°38.1	6°18.9	2.8 - 1.2	8.8 - 3.9	14.8 - 6.5
29	6°37.3	6°38.3	6°19.2	2.9 - 1.3	8.9 - 3.9	14.9 - 6.6
30	6°37.5	6°38.6	6°19.4	3.0 - 1.3	9.0 - 4.0	15.0 - 6.6
31	6°37.7	6°38.8	6°19.6	3.1 - 1.4	9.1 - 4.0	15.1 - 6.7
32	6°38.0	6°39.1	6°19.9	3.2 - 1.4	9.2 - 4.1	15.2 - 6.7
33	6°38.3	6°39.3	6°20.1	3.3 - 1.5	9.3 - 4.1	15.3 - 6.8
34	6°38.5	6°39.6	6°20.3	3.4 - 1.5	9.4 - 4.2	15.4 - 6.8
35	6°38.7	6°39.8	6°20.6	3.5 - 1.5	9.5 - 4.2	15.5 - 6.8
36	6°39.0	6°40.1	6°20.8	3.6 - 1.6	9.6 - 4.2	15.6 - 6.9
37	6°39.3	6°40.3	6°21.1	3.7 - 1.6	9.7 - 4.3	15.7 - 6.9
38	6°39.5	6°40.6	6°21.3	3.8 - 1.7	9.8 - 4.3	15.8 - 7.0
39	6°39.7	6°40.8	6°21.5	3.9 - 1.7	9.9 - 4.4	15.9 - 7.0
40	6°40.0	6°41.1	6°21.8	4.0 - 1.8	10.0 - 4.4	16.0 - 7.1
41	6°40.3	6°41.3	6°22.0	4.1 - 1.8	10.1 - 4.5	16.1 - 7.1
42	6°40.5	6°41.6	6°22.3	4.2 - 1.9	10.2 - 4.5	16.2 - 7.2
43	6°40.7	6°41.8	6°22.5	4.3 - 1.9	10.3 - 4.5	16.3 - 7.2
44	6°41.0	6°42.1	6°22.7	4.4 - 1.9	10.4 - 4.6	16.4 - 7.2
45	6°41.3	6°42.3	6°23.0	4.5 - 2.0	10.5 - 4.6	16.5 - 7.3
46	6°41.5	6°42.6	6°23.2	4.6 - 2.0	10.6 - 4.7	16.6 - 7.3
47	6°41.8	6°42.8	6°23.4	4.7 - 2.1	10.7 - 4.7	16.7 - 7.4
48	6°42.0	6°43.1	6°23.7	4.8 - 2.1	10.8 - 4.8	16.8 - 7.4
49	6°42.3	6°43.3	6°23.9	4.9 - 2.2	10.9 - 4.8	16.9 - 7.5
50	6°42.5	6°43.6	6°24.2	5.0 - 2.2	11.0 - 4.9	17.0 - 7.5
51	6°42.8	6°43.9	6°24.4	5.1 - 2.3	11.1 - 4.9	17.1 - 7.6
52	6°43.0	6°44.1	6°24.6	5.2 - 2.3	11.2 - 4.9	17.2 - 7.6
53	6°43.2	6°44.4	6°24.9	5.3 - 2.3	11.3 - 5.0	17.3 - 7.6
54	6°43.5	6°44.6	6°25.1	5.4 - 2.4	11.4 - 5.0	17.4 - 7.7
55	6°43.8	6°44.9	6°25.4	5.5 - 2.4	11.5 - 5.1	17.5 - 7.7
56	6°44.0	6°45.1	6°25.6	5.6 - 2.5	11.6 - 5.1	17.6 - 7.8
57	6°44.2	6°45.4	6°25.8	5.7 - 2.5	11.7 - 5.2	17.7 - 7.8
58	6°44.5	6°45.6	6°26.1	5.8 - 2.6	11.8 - 5.2	17.8 - 7.9
59	6°44.8	6°45.9	6°26.3	5.9 - 2.6	11.9 - 5.3	17.9 - 7.9

Increments and Corrections

m 27	Sun Plan.	Aries	Moon	v and d corr		
0	6°45.0	6°46.1	6°26.5	0.0 - 0.0	6.0 - 2.8	12.0 - 5.5
1	6°45.2	6°46.4	6°26.8	0.1 - 0.0	6.1 - 2.8	12.1 - 5.5
2	6°45.5	6°46.6	6°27.0	0.2 - 0.1	6.2 - 2.8	12.2 - 5.6
3	6°45.8	6°46.9	6°27.3	0.3 - 0.1	6.3 - 2.9	12.3 - 5.6
4	6°46.0	6°47.1	6°27.5	0.4 - 0.2	6.4 - 2.9	12.4 - 5.7
5	6°46.2	6°47.4	6°27.7	0.5 - 0.2	6.5 - 3.0	12.5 - 5.7
6	6°46.5	6°47.6	6°28.0	0.6 - 0.3	6.6 - 3.0	12.6 - 5.8
7	6°46.8	6°47.9	6°28.2	0.7 - 0.3	6.7 - 3.1	12.7 - 5.8
8	6°47.0	6°48.1	6°28.5	0.8 - 0.4	6.8 - 3.1	12.8 - 5.9
9	6°47.2	6°48.4	6°28.7	0.9 - 0.4	6.9 - 3.2	12.9 - 5.9
10	6°47.5	6°48.6	6°28.9	1.0 - 0.5	7.0 - 3.2	13.0 - 6.0
11	6°47.8	6°48.9	6°29.2	1.1 - 0.5	7.1 - 3.3	13.1 - 6.0
12	6°48.0	6°49.1	6°29.4	1.2 - 0.6	7.2 - 3.3	13.2 - 6.0
13	6°48.2	6°49.4	6°29.7	1.3 - 0.6	7.3 - 3.3	13.3 - 6.1
14	6°48.5	6°49.6	6°29.9	1.4 - 0.6	7.4 - 3.4	13.4 - 6.1
15	6°48.8	6°49.9	6°30.1	1.5 - 0.7	7.5 - 3.4	13.5 - 6.2
16	6°49.0	6°50.1	6°30.4	1.6 - 0.7	7.6 - 3.5	13.6 - 6.2
17	6°49.3	6°50.4	6°30.6	1.7 - 0.8	7.7 - 3.5	13.7 - 6.3
18	6°49.5	6°50.6	6°30.8	1.8 - 0.8	7.8 - 3.6	13.8 - 6.3
19	6°49.8	6°50.9	6°31.1	1.9 - 0.9	7.9 - 3.6	13.9 - 6.4
20	6°50.0	6°51.1	6°31.3	2.0 - 0.9	8.0 - 3.7	14.0 - 6.4
21	6°50.3	6°51.4	6°31.6	2.1 - 1.0	8.1 - 3.7	14.1 - 6.5
22	6°50.5	6°51.6	6°31.8	2.2 - 1.0	8.2 - 3.8	14.2 - 6.5
23	6°50.7	6°51.9	6°32.0	2.3 - 1.1	8.3 - 3.8	14.3 - 6.6
24	6°51.0	6°52.1	6°32.3	2.4 - 1.1	8.4 - 3.9	14.4 - 6.6
25	6°51.3	6°52.4	6°32.5	2.5 - 1.1	8.5 - 3.9	14.5 - 6.6
26	6°51.5	6°52.6	6°32.8	2.6 - 1.2	8.6 - 3.9	14.6 - 6.7
27	6°51.7	6°52.9	6°33.0	2.7 - 1.2	8.7 - 4.0	14.7 - 6.7
28	6°52.0	6°53.1	6°33.2	2.8 - 1.3	8.8 - 4.0	14.8 - 6.8
29	6°52.3	6°53.4	6°33.5	2.9 - 1.3	8.9 - 4.1	14.9 - 6.8
30	6°52.5	6°53.6	6°33.7	3.0 - 1.4	9.0 - 4.1	15.0 - 6.9
31	6°52.7	6°53.9	6°33.9	3.1 - 1.4	9.1 - 4.2	15.1 - 6.9
32	6°53.0	6°54.1	6°34.2	3.2 - 1.5	9.2 - 4.2	15.2 - 7.0
33	6°53.3	6°54.4	6°34.4	3.3 - 1.5	9.3 - 4.3	15.3 - 7.0
34	6°53.5	6°54.6	6°34.7	3.4 - 1.6	9.4 - 4.3	15.4 - 7.1
35	6°53.7	6°54.9	6°34.9	3.5 - 1.6	9.5 - 4.4	15.5 - 7.1
36	6°54.0	6°55.1	6°35.1	3.6 - 1.6	9.6 - 4.4	15.6 - 7.1
37	6°54.3	6°55.4	6°35.4	3.7 - 1.7	9.7 - 4.4	15.7 - 7.2
38	6°54.5	6°55.6	6°35.6	3.8 - 1.7	9.8 - 4.5	15.8 - 7.2
39	6°54.7	6°55.9	6°35.9	3.9 - 1.8	9.9 - 4.5	15.9 - 7.3
40	6°55.0	6°56.1	6°36.1	4.0 - 1.8	10.0 - 4.6	16.0 - 7.3
41	6°55.3	6°56.4	6°36.3	4.1 - 1.9	10.1 - 4.6	16.1 - 7.4
42	6°55.5	6°56.6	6°36.6	4.2 - 1.9	10.2 - 4.7	16.2 - 7.4
43	6°55.7	6°56.9	6°36.8	4.3 - 2.0	10.3 - 4.7	16.3 - 7.5
44	6°56.0	6°57.1	6°37.0	4.4 - 2.0	10.4 - 4.8	16.4 - 7.5
45	6°56.3	6°57.4	6°37.3	4.5 - 2.1	10.5 - 4.8	16.5 - 7.6
46	6°56.5	6°57.6	6°37.5	4.6 - 2.1	10.6 - 4.9	16.6 - 7.6
47	6°56.8	6°57.9	6°37.8	4.7 - 2.2	10.7 - 4.9	16.7 - 7.7
48	6°57.0	6°58.1	6°38.0	4.8 - 2.2	10.8 - 5.0	16.8 - 7.7
49	6°57.3	6°58.4	6°38.2	4.9 - 2.2	10.9 - 5.0	16.9 - 7.7
50	6°57.5	6°58.6	6°38.5	5.0 - 2.3	11.0 - 5.0	17.0 - 7.8
51	6°57.8	6°58.9	6°38.7	5.1 - 2.3	11.1 - 5.1	17.1 - 7.8
52	6°58.0	6°59.1	6°39.0	5.2 - 2.4	11.2 - 5.1	17.2 - 7.9
53	6°58.2	6°59.4	6°39.2	5.3 - 2.4	11.3 - 5.2	17.3 - 7.9
54	6°58.5	6°59.6	6°39.4	5.4 - 2.5	11.4 - 5.2	17.4 - 8.0
55	6°58.8	6°59.9	6°39.7	5.5 - 2.5	11.5 - 5.3	17.5 - 8.0
56	6°59.0	7°00.1	6°39.9	5.6 - 2.6	11.6 - 5.3	17.6 - 8.1
57	6°59.2	7°00.4	6°40.2	5.7 - 2.6	11.7 - 5.4	17.7 - 8.1
58	6°59.5	7°00.6	6°40.4	5.8 - 2.7	11.8 - 5.4	17.8 - 8.2
59	6°59.8	7°00.9	6°40.6	5.9 - 2.7	11.9 - 5.5	17.9 - 8.2

m 28	Sun Plan.	Aries	Moon	v and d corr		
0	7°00.0	7°01.1	6°40.9	0.0 - 0.0	6.0 - 2.8	12.0 - 5.7
1	7°00.2	7°01.4	6°41.1	0.1 - 0.0	6.1 - 2.9	12.1 - 5.7
2	7°00.5	7°01.6	6°41.3	0.2 - 0.1	6.2 - 2.9	12.2 - 5.8
3	7°00.8	7°01.9	6°41.6	0.3 - 0.1	6.3 - 3.0	12.3 - 5.8
4	7°01.0	7°02.2	6°41.8	0.4 - 0.2	6.4 - 3.0	12.4 - 5.9
5	7°01.2	7°02.4	6°42.1	0.5 - 0.2	6.5 - 3.1	12.5 - 5.9
6	7°01.5	7°02.7	6°42.3	0.6 - 0.3	6.6 - 3.1	12.6 - 6.0
7	7°01.8	7°02.9	6°42.5	0.7 - 0.3	6.7 - 3.2	12.7 - 6.0
8	7°02.0	7°03.2	6°42.8	0.8 - 0.4	6.8 - 3.2	12.8 - 6.1
9	7°02.2	7°03.4	6°43.0	0.9 - 0.4	6.9 - 3.3	12.9 - 6.1
10	7°02.5	7°03.7	6°43.3	1.0 - 0.5	7.0 - 3.3	13.0 - 6.2
11	7°02.8	7°03.9	6°43.5	1.1 - 0.5	7.1 - 3.4	13.1 - 6.2
12	7°03.0	7°04.2	6°43.7	1.2 - 0.6	7.2 - 3.4	13.2 - 6.3
13	7°03.2	7°04.4	6°44.0	1.3 - 0.6	7.3 - 3.5	13.3 - 6.3
14	7°03.5	7°04.7	6°44.2	1.4 - 0.7	7.4 - 3.5	13.4 - 6.4
15	7°03.8	7°04.9	6°44.4	1.5 - 0.7	7.5 - 3.6	13.5 - 6.4
16	7°04.0	7°05.2	6°44.7	1.6 - 0.8	7.6 - 3.6	13.6 - 6.5
17	7°04.3	7°05.4	6°44.9	1.7 - 0.8	7.7 - 3.7	13.7 - 6.5
18	7°04.5	7°05.7	6°45.2	1.8 - 0.9	7.8 - 3.7	13.8 - 6.6
19	7°04.7	7°05.9	6°45.4	1.9 - 0.9	7.9 - 3.8	13.9 - 6.6
20	7°05.0	7°06.2	6°45.6	2.0 - 0.9	8.0 - 3.8	14.0 - 6.6
21	7°05.3	7°06.4	6°45.9	2.1 - 1.0	8.1 - 3.8	14.1 - 6.7
22	7°05.5	7°06.7	6°46.1	2.2 - 1.0	8.2 - 3.9	14.2 - 6.7
23	7°05.7	7°06.9	6°46.4	2.3 - 1.1	8.3 - 3.9	14.3 - 6.8
24	7°06.0	7°07.2	6°46.6	2.4 - 1.1	8.4 - 4.0	14.4 - 6.8
25	7°06.3	7°07.4	6°46.8	2.5 - 1.2	8.5 - 4.0	14.5 - 6.9
26	7°06.5	7°07.7	6°47.1	2.6 - 1.2	8.6 - 4.1	14.6 - 6.9
27	7°06.7	7°07.9	6°47.3	2.7 - 1.3	8.7 - 4.1	14.7 - 7.0
28	7°07.0	7°08.2	6°47.5	2.8 - 1.3	8.8 - 4.2	14.8 - 7.0
29	7°07.3	7°08.4	6°47.8	2.9 - 1.4	8.9 - 4.2	14.9 - 7.1
30	7°07.5	7°08.7	6°48.0	3.0 - 1.4	9.0 - 4.3	15.0 - 7.1
31	7°07.7	7°08.9	6°48.3	3.1 - 1.5	9.1 - 4.3	15.1 - 7.2
32	7°08.0	7°09.2	6°48.5	3.2 - 1.5	9.2 - 4.4	15.2 - 7.2
33	7°08.3	7°09.4	6°48.7	3.3 - 1.6	9.3 - 4.4	15.3 - 7.3
34	7°08.5	7°09.7	6°49.0	3.4 - 1.6	9.4 - 4.5	15.4 - 7.3
35	7°08.7	7°09.9	6°49.2	3.5 - 1.7	9.5 - 4.5	15.5 - 7.4
36	7°09.0	7°10.2	6°49.5	3.6 - 1.7	9.6 - 4.6	15.6 - 7.4
37	7°09.3	7°10.4	6°49.7	3.7 - 1.8	9.7 - 4.6	15.7 - 7.5
38	7°09.5	7°10.7	6°49.9	3.8 - 1.8	9.8 - 4.7	15.8 - 7.5
39	7°09.7	7°10.9	6°50.2	3.9 - 1.9	9.9 - 4.7	15.9 - 7.6
40	7°10.0	7°11.2	6°50.4	4.0 - 1.9	10.0 - 4.8	16.0 - 7.6
41	7°10.3	7°11.4	6°50.6	4.1 - 1.9	10.1 - 4.8	16.1 - 7.6
42	7°10.5	7°11.7	6°50.9	4.2 - 2.0	10.2 - 4.8	16.2 - 7.7
43	7°10.7	7°11.9	6°51.1	4.3 - 2.0	10.3 - 4.9	16.3 - 7.7
44	7°11.0	7°12.2	6°51.4	4.4 - 2.1	10.4 - 4.9	16.4 - 7.8
45	7°11.3	7°12.4	6°51.6	4.5 - 2.1	10.5 - 5.0	16.5 - 7.8
46	7°11.5	7°12.7	6°51.8	4.6 - 2.2	10.6 - 5.0	16.6 - 7.9
47	7°11.8	7°12.9	6°52.1	4.7 - 2.2	10.7 - 5.1	16.7 - 7.9
48	7°12.0	7°13.2	6°52.3	4.8 - 2.3	10.8 - 5.1	16.8 - 8.0
49	7°12.2	7°13.4	6°52.6	4.9 - 2.3	10.9 - 5.2	16.9 - 8.0
50	7°12.5	7°13.7	6°52.8	5.0 - 2.4	11.0 - 5.2	17.0 - 8.1
51	7°12.8	7°13.9	6°53.0	5.1 - 2.4	11.1 - 5.3	17.1 - 8.1
52	7°13.0	7°14.2	6°53.3	5.2 - 2.5	11.2 - 5.3	17.2 - 8.2
53	7°13.2	7°14.4	6°53.5	5.3 - 2.5	11.3 - 5.4	17.3 - 8.2
54	7°13.5	7°14.7	6°53.8	5.4 - 2.6	11.4 - 5.4	17.4 - 8.3
55	7°13.8	7°14.9	6°54.0	5.5 - 2.6	11.5 - 5.5	17.5 - 8.3
56	7°14.0	7°15.2	6°54.2	5.6 - 2.7	11.6 - 5.5	17.6 - 8.4
57	7°14.2	7°15.4	6°54.5	5.7 - 2.7	11.7 - 5.6	17.7 - 8.4
58	7°14.5	7°15.7	6°54.7	5.8 - 2.8	11.8 - 5.6	17.8 - 8.5
59	7°14.8	7°15.9	6°54.9	5.9 - 2.8	11.9 - 5.7	17.9 - 8.5

m 29	Sun Plan.	Aries	Moon	v and d corr		
0	7°15.0	7°16.2	6°55.2	0.0 - 0.0	6.0 - 2.9	12.0 - 5.9
1	7°15.2	7°16.4	6°55.4	0.1 - 0.0	6.1 - 3.0	12.1 - 5.9
2	7°15.5	7°16.7	6°55.7	0.2 - 0.1	6.2 - 3.0	12.2 - 6.0
3	7°15.8	7°16.9	6°55.9	0.3 - 0.1	6.3 - 3.1	12.3 - 6.0
4	7°16.0	7°17.2	6°56.1	0.4 - 0.2	6.4 - 3.1	12.4 - 6.1
5	7°16.2	7°17.4	6°56.4	0.5 - 0.2	6.5 - 3.2	12.5 - 6.1
6	7°16.5	7°17.7	6°56.6	0.6 - 0.3	6.6 - 3.2	12.6 - 6.2
7	7°16.8	7°17.9	6°56.9	0.7 - 0.3	6.7 - 3.3	12.7 - 6.2
8	7°17.0	7°18.2	6°57.1	0.8 - 0.4	6.8 - 3.3	12.8 - 6.3
9	7°17.2	7°18.4	6°57.3	0.9 - 0.4	6.9 - 3.4	12.9 - 6.3
10	7°17.5	7°18.7	6°57.6	1.0 - 0.5	7.0 - 3.4	13.0 - 6.4
11	7°17.8	7°18.9	6°57.8	1.1 - 0.5	7.1 - 3.5	13.1 - 6.4
12	7°18.0	7°19.2	6°58.0	1.2 - 0.6	7.2 - 3.5	13.2 - 6.5
13	7°18.2	7°19.4	6°58.3	1.3 - 0.6	7.3 - 3.6	13.3 - 6.5
14	7°18.5	7°19.7	6°58.5	1.4 - 0.7	7.4 - 3.6	13.4 - 6.6
15	7°18.8	7°19.9	6°58.8	1.5 - 0.7	7.5 - 3.7	13.5 - 6.6
16	7°19.0	7°20.2	6°59.0	1.6 - 0.8	7.6 - 3.7	13.6 - 6.7
17	7°19.3	7°20.5	6°59.2	1.7 - 0.8	7.7 - 3.8	13.7 - 6.7
18	7°19.5	7°20.7	6°59.5	1.8 - 0.9	7.8 - 3.8	13.8 - 6.8
19	7°19.7	7°21.0	6°59.7	1.9 - 0.9	7.9 - 3.9	13.9 - 6.8
20	7°20.0	7°21.2	7°00.0	2.0 - 1.0	8.0 - 3.9	14.0 - 6.9
21	7°20.3	7°21.5	7°00.2	2.1 - 1.0	8.1 - 4.0	14.1 - 6.9
22	7°20.5	7°21.7	7°00.4	2.2 - 1.1	8.2 - 4.0	14.2 - 7.0
23	7°20.7	7°22.0	7°00.7	2.3 - 1.1	8.3 - 4.1	14.3 - 7.0
24	7°21.0	7°22.2	7°00.9	2.4 - 1.2	8.4 - 4.1	14.4 - 7.1
25	7°21.3	7°22.5	7°01.1	2.5 - 1.2	8.5 - 4.2	14.5 - 7.1
26	7°21.5	7°22.7	7°01.4	2.6 - 1.3	8.6 - 4.2	14.6 - 7.2
27	7°21.7	7°23.0	7°01.6	2.7 - 1.3	8.7 - 4.3	14.7 - 7.2
28	7°22.0	7°23.2	7°01.9	2.8 - 1.4	8.8 - 4.3	14.8 - 7.3
29	7°22.3	7°23.5	7°02.1	2.9 - 1.4	8.9 - 4.4	14.9 - 7.3
30	7°22.5	7°23.7	7°02.3	3.0 - 1.5	9.0 - 4.4	15.0 - 7.4
31	7°22.7	7°24.0	7°02.6	3.1 - 1.5	9.1 - 4.5	15.1 - 7.4
32	7°23.0	7°24.2	7°02.8	3.2 - 1.6	9.2 - 4.5	15.2 - 7.5
33	7°23.3	7°24.5	7°03.1	3.3 - 1.6	9.3 - 4.6	15.3 - 7.5
34	7°23.5	7°24.7	7°03.3	3.4 - 1.7	9.4 - 4.6	15.4 - 7.6
35	7°23.7	7°25.0	7°03.5	3.5 - 1.7	9.5 - 4.7	15.5 - 7.6
36	7°24.0	7°25.2	7°03.8	3.6 - 1.8	9.6 - 4.7	15.6 - 7.7
37	7°24.3	7°25.5	7°04.0	3.7 - 1.8	9.7 - 4.8	15.7 - 7.7
38	7°24.5	7°25.7	7°04.3	3.8 - 1.9	9.8 - 4.8	15.8 - 7.8
39	7°24.7	7°26.0	7°04.5	3.9 - 1.9	9.9 - 4.9	15.9 - 7.8
40	7°25.0	7°26.2	7°04.7	4.0 - 2.0	10.0 - 4.9	16.0 - 7.9
41	7°25.3	7°26.5	7°05.0	4.1 - 2.0	10.1 - 5.0	16.1 - 7.9
42	7°25.5	7°26.7	7°05.2	4.2 - 2.1	10.2 - 5.0	16.2 - 8.0
43	7°25.7	7°27.0	7°05.4	4.3 - 2.1	10.3 - 5.1	16.3 - 8.0
44	7°26.0	7°27.2	7°05.7	4.4 - 2.2	10.4 - 5.1	16.4 - 8.1
45	7°26.3	7°27.5	7°05.9	4.5 - 2.2	10.5 - 5.2	16.5 - 8.1
46	7°26.5	7°27.7	7°06.2	4.6 - 2.3	10.6 - 5.2	16.6 - 8.2
47	7°26.8	7°28.0	7°06.4	4.7 - 2.3	10.7 - 5.3	16.7 - 8.2
48	7°27.0	7°28.2	7°06.6	4.8 - 2.4	10.8 - 5.3	16.8 - 8.3
49	7°27.2	7°28.5	7°06.9	4.9 - 2.4	10.9 - 5.4	16.9 - 8.3
50	7°27.5	7°28.7	7°07.1	5.0 - 2.5	11.0 - 5.4	17.0 - 8.4
51	7°27.8	7°29.0	7°07.4	5.1 - 2.5	11.1 - 5.5	17.1 - 8.4
52	7°28.0	7°29.2	7°07.6	5.2 - 2.6	11.2 - 5.5	17.2 - 8.5
53	7°28.2	7°29.5	7°07.8	5.3 - 2.6	11.3 - 5.6	17.3 - 8.5
54	7°28.5	7°29.7	7°08.1	5.4 - 2.7	11.4 - 5.6	17.4 - 8.6
55	7°28.8	7°30.0	7°08.3	5.5 - 2.7	11.5 - 5.7	17.5 - 8.6
56	7°29.0	7°30.2	7°08.5	5.6 - 2.8	11.6 - 5.7	17.6 - 8.7
57	7°29.2	7°30.5	7°08.8	5.7 - 2.8	11.7 - 5.8	17.7 - 8.7
58	7°29.5	7°30.7	7°09.0	5.8 - 2.9	11.8 - 5.8	17.8 - 8.8
59	7°29.8	7°31.0	7°09.3	5.9 - 2.9	11.9 - 5.9	17.9 - 8.8

Increments and Corrections

m 30	Sun Plan.	Aries	Moon	v and d corr		
0	7°30.0	7°31.2	7°09.5	0.0 - 0.0	6.0 - 3.0	12.0 - 6.1
1	7°30.2	7°31.5	7°09.7	0.1 - 0.1	6.1 - 3.1	12.1 - 6.2
2	7°30.5	7°31.7	7°10.0	0.2 - 0.1	6.2 - 3.2	12.2 - 6.2
3	7°30.8	7°32.0	7°10.2	0.3 - 0.2	6.3 - 3.2	12.3 - 6.3
4	7°31.0	7°32.2	7°10.5	0.4 - 0.2	6.4 - 3.3	12.4 - 6.3
5	7°31.2	7°32.5	7°10.7	0.5 - 0.3	6.5 - 3.3	12.5 - 6.4
6	7°31.5	7°32.7	7°10.9	0.6 - 0.3	6.6 - 3.4	12.6 - 6.4
7	7°31.7	7°33.0	7°11.2	0.7 - 0.4	6.7 - 3.4	12.7 - 6.5
8	7°32.0	7°33.2	7°11.4	0.8 - 0.4	6.8 - 3.5	12.8 - 6.5
9	7°32.2	7°33.5	7°11.6	0.9 - 0.5	6.9 - 3.5	12.9 - 6.6
10	7°32.5	7°33.7	7°11.9	1.0 - 0.5	7.0 - 3.6	13.0 - 6.6
11	7°32.8	7°34.0	7°12.1	1.1 - 0.6	7.1 - 3.6	13.1 - 6.7
12	7°33.0	7°34.2	7°12.4	1.2 - 0.6	7.2 - 3.7	13.2 - 6.7
13	7°33.3	7°34.5	7°12.6	1.3 - 0.7	7.3 - 3.7	13.3 - 6.8
14	7°33.5	7°34.7	7°12.8	1.4 - 0.7	7.4 - 3.8	13.4 - 6.8
15	7°33.8	7°35.0	7°13.1	1.5 - 0.8	7.5 - 3.8	13.5 - 6.9
16	7°34.0	7°35.2	7°13.3	1.6 - 0.8	7.6 - 3.9	13.6 - 6.9
17	7°34.3	7°35.5	7°13.6	1.7 - 0.9	7.7 - 3.9	13.7 - 7.0
18	7°34.5	7°35.7	7°13.8	1.8 - 0.9	7.8 - 4.0	13.8 - 7.0
19	7°34.8	7°36.0	7°14.0	1.9 - 1.0	7.9 - 4.0	13.9 - 7.1
20	7°35.0	7°36.2	7°14.3	2.0 - 1.0	8.0 - 4.1	14.0 - 7.1
21	7°35.3	7°36.5	7°14.5	2.1 - 1.1	8.1 - 4.1	14.1 - 7.2
22	7°35.5	7°36.7	7°14.7	2.2 - 1.1	8.2 - 4.2	14.2 - 7.2
23	7°35.7	7°37.0	7°15.0	2.3 - 1.2	8.3 - 4.2	14.3 - 7.3
24	7°36.0	7°37.2	7°15.2	2.4 - 1.2	8.4 - 4.3	14.4 - 7.3
25	7°36.2	7°37.5	7°15.5	2.5 - 1.3	8.5 - 4.3	14.5 - 7.4
26	7°36.5	7°37.7	7°15.7	2.6 - 1.3	8.6 - 4.4	14.6 - 7.4
27	7°36.7	7°38.0	7°15.9	2.7 - 1.4	8.7 - 4.4	14.7 - 7.5
28	7°37.0	7°38.2	7°16.2	2.8 - 1.4	8.8 - 4.5	14.8 - 7.5
29	7°37.3	7°38.5	7°16.4	2.9 - 1.5	8.9 - 4.5	14.9 - 7.6
30	7°37.5	7°38.8	7°16.7	3.0 - 1.5	9.0 - 4.6	15.0 - 7.6
31	7°37.7	7°39.0	7°16.9	3.1 - 1.6	9.1 - 4.6	15.1 - 7.7
32	7°38.0	7°39.3	7°17.1	3.2 - 1.6	9.2 - 4.7	15.2 - 7.7
33	7°38.3	7°39.5	7°17.4	3.3 - 1.7	9.3 - 4.7	15.3 - 7.8
34	7°38.5	7°39.8	7°17.6	3.4 - 1.7	9.4 - 4.8	15.4 - 7.8
35	7°38.7	7°40.0	7°17.9	3.5 - 1.8	9.5 - 4.8	15.5 - 7.9
36	7°39.0	7°40.3	7°18.1	3.6 - 1.8	9.6 - 4.9	15.6 - 7.9
37	7°39.3	7°40.5	7°18.3	3.7 - 1.9	9.7 - 4.9	15.7 - 8.0
38	7°39.5	7°40.8	7°18.6	3.8 - 1.9	9.8 - 5.0	15.8 - 8.0
39	7°39.8	7°41.0	7°18.8	3.9 - 2.0	9.9 - 5.0	15.9 - 8.1
40	7°40.0	7°41.3	7°19.0	4.0 - 2.0	10.0 - 5.1	16.0 - 8.1
41	7°40.3	7°41.5	7°19.3	4.1 - 2.1	10.1 - 5.1	16.1 - 8.2
42	7°40.5	7°41.8	7°19.5	4.2 - 2.1	10.2 - 5.2	16.2 - 8.2
43	7°40.7	7°42.0	7°19.8	4.3 - 2.2	10.3 - 5.2	16.3 - 8.3
44	7°41.0	7°42.3	7°20.0	4.4 - 2.2	10.4 - 5.3	16.4 - 8.3
45	7°41.2	7°42.5	7°20.2	4.5 - 2.3	10.5 - 5.3	16.5 - 8.4
46	7°41.5	7°42.8	7°20.5	4.6 - 2.3	10.6 - 5.4	16.6 - 8.4
47	7°41.8	7°43.0	7°20.7	4.7 - 2.4	10.7 - 5.4	16.7 - 8.5
48	7°42.0	7°43.3	7°21.0	4.8 - 2.4	10.8 - 5.5	16.8 - 8.5
49	7°42.3	7°43.5	7°21.2	4.9 - 2.5	10.9 - 5.5	16.9 - 8.6
50	7°42.5	7°43.8	7°21.4	5.0 - 2.5	11.0 - 5.6	17.0 - 8.6
51	7°42.8	7°44.0	7°21.7	5.1 - 2.6	11.1 - 5.6	17.1 - 8.7
52	7°43.0	7°44.3	7°21.9	5.2 - 2.6	11.2 - 5.7	17.2 - 8.7
53	7°43.2	7°44.5	7°22.1	5.3 - 2.7	11.3 - 5.7	17.3 - 8.8
54	7°43.5	7°44.8	7°22.4	5.4 - 2.7	11.4 - 5.8	17.4 - 8.8
55	7°43.8	7°45.0	7°22.6	5.5 - 2.8	11.5 - 5.8	17.5 - 8.9
56	7°44.0	7°45.3	7°22.9	5.6 - 2.8	11.6 - 5.9	17.6 - 8.9
57	7°44.3	7°45.5	7°23.1	5.7 - 2.9	11.7 - 5.9	17.7 - 9.0
58	7°44.5	7°45.8	7°23.3	5.8 - 2.9	11.8 - 6.0	17.8 - 9.0
59	7°44.8	7°46.0	7°23.6	5.9 - 3.0	11.9 - 6.0	17.9 - 9.1

m 31	Sun Plan.	Aries	Moon	v and d corr		
0	7°45.0	7°46.3	7°23.8	0.0 - 0.0	6.0 - 3.2	12.0 - 6.3
1	7°45.2	7°46.5	7°24.1	0.1 - 0.1	6.1 - 3.2	12.1 - 6.4
2	7°45.5	7°46.8	7°24.3	0.2 - 0.1	6.2 - 3.3	12.2 - 6.4
3	7°45.7	7°47.0	7°24.5	0.3 - 0.2	6.3 - 3.3	12.3 - 6.5
4	7°46.0	7°47.3	7°24.8	0.4 - 0.2	6.4 - 3.4	12.4 - 6.5
5	7°46.2	7°47.5	7°25.0	0.5 - 0.3	6.5 - 3.4	12.5 - 6.6
6	7°46.5	7°47.8	7°25.2	0.6 - 0.3	6.6 - 3.5	12.6 - 6.6
7	7°46.8	7°48.0	7°25.5	0.7 - 0.4	6.7 - 3.5	12.7 - 6.7
8	7°47.0	7°48.3	7°25.7	0.8 - 0.4	6.8 - 3.6	12.8 - 6.7
9	7°47.2	7°48.5	7°26.0	0.9 - 0.5	6.9 - 3.6	12.9 - 6.8
10	7°47.5	7°48.8	7°26.2	1.0 - 0.5	7.0 - 3.7	13.0 - 6.8
11	7°47.7	7°49.0	7°26.4	1.1 - 0.6	7.1 - 3.7	13.1 - 6.9
12	7°48.0	7°49.3	7°26.7	1.2 - 0.6	7.2 - 3.8	13.2 - 6.9
13	7°48.2	7°49.5	7°26.9	1.3 - 0.7	7.3 - 3.8	13.3 - 7.0
14	7°48.5	7°49.8	7°27.2	1.4 - 0.7	7.4 - 3.9	13.4 - 7.0
15	7°48.8	7°50.0	7°27.4	1.5 - 0.8	7.5 - 3.9	13.5 - 7.1
16	7°49.0	7°50.3	7°27.6	1.6 - 0.8	7.6 - 4.0	13.6 - 7.1
17	7°49.3	7°50.5	7°27.9	1.7 - 0.9	7.7 - 4.0	13.7 - 7.2
18	7°49.5	7°50.8	7°28.1	1.8 - 0.9	7.8 - 4.1	13.8 - 7.2
19	7°49.8	7°51.0	7°28.4	1.9 - 1.0	7.9 - 4.1	13.9 - 7.3
20	7°50.0	7°51.3	7°28.6	2.0 - 1.1	8.0 - 4.2	14.0 - 7.4
21	7°50.3	7°51.5	7°28.8	2.1 - 1.1	8.1 - 4.3	14.1 - 7.4
22	7°50.5	7°51.8	7°29.1	2.2 - 1.2	8.2 - 4.3	14.2 - 7.5
23	7°50.7	7°52.0	7°29.3	2.3 - 1.2	8.3 - 4.4	14.3 - 7.5
24	7°51.0	7°52.3	7°29.5	2.4 - 1.3	8.4 - 4.4	14.4 - 7.6
25	7°51.3	7°52.5	7°29.8	2.5 - 1.3	8.5 - 4.5	14.5 - 7.6
26	7°51.5	7°52.8	7°30.0	2.6 - 1.4	8.6 - 4.5	14.6 - 7.7
27	7°51.7	7°53.0	7°30.3	2.7 - 1.4	8.7 - 4.6	14.7 - 7.7
28	7°52.0	7°53.3	7°30.5	2.8 - 1.5	8.8 - 4.6	14.8 - 7.8
29	7°52.2	7°53.5	7°30.7	2.9 - 1.5	8.9 - 4.7	14.9 - 7.8
30	7°52.5	7°53.8	7°31.0	3.0 - 1.6	9.0 - 4.7	15.0 - 7.9
31	7°52.7	7°54.0	7°31.2	3.1 - 1.6	9.1 - 4.8	15.1 - 7.9
32	7°53.0	7°54.3	7°31.5	3.2 - 1.7	9.2 - 4.8	15.2 - 8.0
33	7°53.3	7°54.5	7°31.7	3.3 - 1.7	9.3 - 4.9	15.3 - 8.0
34	7°53.5	7°54.8	7°31.9	3.4 - 1.8	9.4 - 4.9	15.4 - 8.1
35	7°53.8	7°55.0	7°32.2	3.5 - 1.8	9.5 - 5.0	15.5 - 8.1
36	7°54.0	7°55.3	7°32.4	3.6 - 1.9	9.6 - 5.0	15.6 - 8.2
37	7°54.3	7°55.5	7°32.6	3.7 - 1.9	9.7 - 5.1	15.7 - 8.2
38	7°54.5	7°55.8	7°32.9	3.8 - 2.0	9.8 - 5.1	15.8 - 8.3
39	7°54.7	7°56.0	7°33.1	3.9 - 2.0	9.9 - 5.2	15.9 - 8.3
40	7°55.0	7°56.3	7°33.4	4.0 - 2.1	10.0 - 5.3	16.0 - 8.4
41	7°55.3	7°56.5	7°33.6	4.1 - 2.2	10.1 - 5.3	16.1 - 8.5
42	7°55.5	7°56.8	7°33.8	4.2 - 2.2	10.2 - 5.4	16.2 - 8.5
43	7°55.7	7°57.1	7°34.1	4.3 - 2.3	10.3 - 5.4	16.3 - 8.6
44	7°56.0	7°57.3	7°34.3	4.4 - 2.3	10.4 - 5.5	16.4 - 8.6
45	7°56.3	7°57.6	7°34.6	4.5 - 2.4	10.5 - 5.5	16.5 - 8.7
46	7°56.5	7°57.8	7°34.8	4.6 - 2.4	10.6 - 5.6	16.6 - 8.7
47	7°56.7	7°58.1	7°35.0	4.7 - 2.5	10.7 - 5.6	16.7 - 8.8
48	7°57.0	7°58.3	7°35.3	4.8 - 2.5	10.8 - 5.7	16.8 - 8.8
49	7°57.2	7°58.6	7°35.5	4.9 - 2.6	10.9 - 5.7	16.9 - 8.9
50	7°57.5	7°58.8	7°35.7	5.0 - 2.6	11.0 - 5.8	17.0 - 8.9
51	7°57.8	7°59.1	7°36.0	5.1 - 2.7	11.1 - 5.8	17.1 - 9.0
52	7°58.0	7°59.3	7°36.2	5.2 - 2.7	11.2 - 5.9	17.2 - 9.0
53	7°58.2	7°59.6	7°36.5	5.3 - 2.8	11.3 - 5.9	17.3 - 9.1
54	7°58.5	7°59.8	7°36.7	5.4 - 2.8	11.4 - 6.0	17.4 - 9.1
55	7°58.8	8°00.1	7°36.9	5.5 - 2.9	11.5 - 6.0	17.5 - 9.2
56	7°59.0	8°00.3	7°37.2	5.6 - 2.9	11.6 - 6.1	17.6 - 9.2
57	7°59.2	8°00.6	7°37.4	5.7 - 3.0	11.7 - 6.1	17.7 - 9.3
58	7°59.5	8°00.8	7°37.7	5.8 - 3.0	11.8 - 6.2	17.8 - 9.3
59	7°59.8	8°01.1	7°37.9	5.9 - 3.1	11.9 - 6.2	17.9 - 9.4

m 32	Sun Plan.	Aries	Moon	v and d corr		
0	8°00.0	8°01.3	7°38.1	0.0 - 0.0	6.0 - 3.3	12.0 - 6.5
1	8°00.2	8°01.6	7°38.4	0.1 - 0.1	6.1 - 3.3	12.1 - 6.6
2	8°00.5	8°01.8	7°38.6	0.2 - 0.1	6.2 - 3.4	12.2 - 6.6
3	8°00.7	8°02.1	7°38.8	0.3 - 0.2	6.3 - 3.4	12.3 - 6.7
4	8°01.0	8°02.3	7°39.1	0.4 - 0.2	6.4 - 3.5	12.4 - 6.7
5	8°01.3	8°02.6	7°39.3	0.5 - 0.3	6.5 - 3.5	12.5 - 6.8
6	8°01.5	8°02.8	7°39.6	0.6 - 0.3	6.6 - 3.6	12.6 - 6.8
7	8°01.8	8°03.1	7°39.8	0.7 - 0.4	6.7 - 3.6	12.7 - 6.9
8	8°02.0	8°03.3	7°40.0	0.8 - 0.4	6.8 - 3.7	12.8 - 6.9
9	8°02.2	8°03.6	7°40.3	0.9 - 0.5	6.9 - 3.7	12.9 - 7.0
10	8°02.5	8°03.8	7°40.5	1.0 - 0.5	7.0 - 3.8	13.0 - 7.0
11	8°02.7	8°04.1	7°40.8	1.1 - 0.6	7.1 - 3.8	13.1 - 7.1
12	8°03.0	8°04.3	7°41.0	1.2 - 0.7	7.2 - 3.9	13.2 - 7.1
13	8°03.3	8°04.6	7°41.2	1.3 - 0.7	7.3 - 4.0	13.3 - 7.2
14	8°03.5	8°04.8	7°41.5	1.4 - 0.8	7.4 - 4.0	13.4 - 7.3
15	8°03.8	8°05.1	7°41.7	1.5 - 0.8	7.5 - 4.1	13.5 - 7.3
16	8°04.0	8°05.3	7°42.0	1.6 - 0.9	7.6 - 4.1	13.6 - 7.4
17	8°04.2	8°05.6	7°42.2	1.7 - 0.9	7.7 - 4.2	13.7 - 7.4
18	8°04.5	8°05.8	7°42.4	1.8 - 1.0	7.8 - 4.2	13.8 - 7.5
19	8°04.8	8°06.1	7°42.7	1.9 - 1.0	7.9 - 4.3	13.9 - 7.5
20	8°05.0	8°06.3	7°42.9	2.0 - 1.1	8.0 - 4.3	14.0 - 7.6
21	8°05.3	8°06.6	7°43.1	2.1 - 1.1	8.1 - 4.4	14.1 - 7.6
22	8°05.5	8°06.8	7°43.4	2.2 - 1.2	8.2 - 4.4	14.2 - 7.7
23	8°05.7	8°07.1	7°43.6	2.3 - 1.2	8.3 - 4.5	14.3 - 7.7
24	8°06.0	8°07.3	7°43.9	2.4 - 1.3	8.4 - 4.5	14.4 - 7.8
25	8°06.2	8°07.6	7°44.1	2.5 - 1.4	8.5 - 4.6	14.5 - 7.9
26	8°06.5	8°07.8	7°44.3	2.6 - 1.4	8.6 - 4.7	14.6 - 7.9
27	8°06.8	8°08.1	7°44.6	2.7 - 1.5	8.7 - 4.7	14.7 - 8.0
28	8°07.0	8°08.3	7°44.8	2.8 - 1.5	8.8 - 4.8	14.8 - 8.0
29	8°07.3	8°08.6	7°45.1	2.9 - 1.6	8.9 - 4.8	14.9 - 8.1
30	8°07.5	8°08.8	7°45.3	3.0 - 1.6	9.0 - 4.9	15.0 - 8.1
31	8°07.7	8°09.1	7°45.5	3.1 - 1.7	9.1 - 4.9	15.1 - 8.2
32	8°08.0	8°09.3	7°45.8	3.2 - 1.7	9.2 - 5.0	15.2 - 8.2
33	8°08.2	8°09.6	7°46.0	3.3 - 1.8	9.3 - 5.0	15.3 - 8.3
34	8°08.5	8°09.8	7°46.2	3.4 - 1.8	9.4 - 5.1	15.4 - 8.3
35	8°08.8	8°10.1	7°46.5	3.5 - 1.9	9.5 - 5.1	15.5 - 8.4
36	8°09.0	8°10.3	7°46.7	3.6 - 1.9	9.6 - 5.2	15.6 - 8.4
37	8°09.3	8°10.6	7°47.0	3.7 - 2.0	9.7 - 5.3	15.7 - 8.5
38	8°09.5	8°10.8	7°47.2	3.8 - 2.1	9.8 - 5.3	15.8 - 8.6
39	8°09.7	8°11.1	7°47.4	3.9 - 2.1	9.9 - 5.4	15.9 - 8.6
40	8°10.0	8°11.3	7°47.7	4.0 - 2.2	10.0 - 5.4	16.0 - 8.7
41	8°10.2	8°11.6	7°47.9	4.1 - 2.2	10.1 - 5.5	16.1 - 8.7
42	8°10.5	8°11.8	7°48.2	4.2 - 2.3	10.2 - 5.5	16.2 - 8.8
43	8°10.8	8°12.1	7°48.4	4.3 - 2.3	10.3 - 5.6	16.3 - 8.8
44	8°11.0	8°12.3	7°48.6	4.4 - 2.4	10.4 - 5.6	16.4 - 8.9
45	8°11.3	8°12.6	7°48.9	4.5 - 2.4	10.5 - 5.7	16.5 - 8.9
46	8°11.5	8°12.8	7°49.1	4.6 - 2.5	10.6 - 5.7	16.6 - 9.0
47	8°11.7	8°13.1	7°49.3	4.7 - 2.5	10.7 - 5.8	16.7 - 9.0
48	8°12.0	8°13.3	7°49.6	4.8 - 2.6	10.8 - 5.8	16.8 - 9.1
49	8°12.3	8°13.6	7°49.8	4.9 - 2.7	10.9 - 5.9	16.9 - 9.2
50	8°12.5	8°13.8	7°50.1	5.0 - 2.7	11.0 - 6.0	17.0 - 9.2
51	8°12.8	8°14.1	7°50.3	5.1 - 2.8	11.1 - 6.0	17.1 - 9.3
52	8°13.0	8°14.3	7°50.5	5.2 - 2.8	11.2 - 6.1	17.2 - 9.3
53	8°13.2	8°14.6	7°50.8	5.3 - 2.9	11.3 - 6.1	17.3 - 9.4
54	8°13.5	8°14.8	7°51.0	5.4 - 2.9	11.4 - 6.2	17.4 - 9.4
55	8°13.7	8°15.1	7°51.3	5.5 - 3.0	11.5 - 6.2	17.5 - 9.5
56	8°14.0	8°15.4	7°51.5	5.6 - 3.0	11.6 - 6.3	17.6 - 9.5
57	8°14.3	8°15.6	7°51.7	5.7 - 3.1	11.7 - 6.3	17.7 - 9.6
58	8°14.5	8°15.9	7°52.0	5.8 - 3.1	11.8 - 6.4	17.8 - 9.6
59	8°14.8	8°16.1	7°52.2	5.9 - 3.2	11.9 - 6.4	17.9 - 9.7

Increments and Corrections

m 33	Sun Plan.	Aries	Moon	v and d corr		
0	8°15.0	8°16.4	7°52.5	0.0 - 0.0	6.0 - 3.4	12.0 - 6.7
1	8°15.2	8°16.6	7°52.7	0.1 - 0.1	6.1 - 3.4	12.1 - 6.8
2	8°15.5	8°16.9	7°52.9	0.2 - 0.1	6.2 - 3.5	12.2 - 6.8
3	8°15.7	8°17.1	7°53.2	0.3 - 0.2	6.3 - 3.5	12.3 - 6.9
4	8°16.0	8°17.4	7°53.4	0.4 - 0.2	6.4 - 3.6	12.4 - 6.9
5	8°16.3	8°17.6	7°53.6	0.5 - 0.3	6.5 - 3.6	12.5 - 7.0
6	8°16.5	8°17.9	7°53.9	0.6 - 0.3	6.6 - 3.7	12.6 - 7.0
7	8°16.8	8°18.1	7°54.1	0.7 - 0.4	6.7 - 3.7	12.7 - 7.1
8	8°17.0	8°18.4	7°54.4	0.8 - 0.4	6.8 - 3.8	12.8 - 7.1
9	8°17.2	8°18.6	7°54.6	0.9 - 0.5	6.9 - 3.9	12.9 - 7.2
10	8°17.5	8°18.9	7°54.8	1.0 - 0.6	7.0 - 3.9	13.0 - 7.3
11	8°17.7	8°19.1	7°55.1	1.1 - 0.6	7.1 - 4.0	13.1 - 7.3
12	8°18.0	8°19.4	7°55.3	1.2 - 0.7	7.2 - 4.0	13.2 - 7.4
13	8°18.3	8°19.6	7°55.6	1.3 - 0.7	7.3 - 4.1	13.3 - 7.4
14	8°18.5	8°19.9	7°55.8	1.4 - 0.8	7.4 - 4.1	13.4 - 7.5
15	8°18.8	8°20.1	7°56.0	1.5 - 0.8	7.5 - 4.2	13.5 - 7.5
16	8°19.0	8°20.4	7°56.3	1.6 - 0.9	7.6 - 4.2	13.6 - 7.6
17	8°19.2	8°20.6	7°56.5	1.7 - 0.9	7.7 - 4.3	13.7 - 7.6
18	8°19.5	8°20.9	7°56.7	1.8 - 1.0	7.8 - 4.4	13.8 - 7.7
19	8°19.8	8°21.1	7°57.0	1.9 - 1.1	7.9 - 4.4	13.9 - 7.8
20	8°20.0	8°21.4	7°57.2	2.0 - 1.1	8.0 - 4.5	14.0 - 7.8
21	8°20.3	8°21.6	7°57.5	2.1 - 1.2	8.1 - 4.5	14.1 - 7.9
22	8°20.5	8°21.9	7°57.7	2.2 - 1.2	8.2 - 4.6	14.2 - 7.9
23	8°20.7	8°22.1	7°57.9	2.3 - 1.3	8.3 - 4.6	14.3 - 8.0
24	8°21.0	8°22.4	7°58.2	2.4 - 1.3	8.4 - 4.7	14.4 - 8.0
25	8°21.2	8°22.6	7°58.4	2.5 - 1.4	8.5 - 4.7	14.5 - 8.1
26	8°21.5	8°22.9	7°58.7	2.6 - 1.5	8.6 - 4.8	14.6 - 8.2
27	8°21.8	8°23.1	7°58.9	2.7 - 1.5	8.7 - 4.9	14.7 - 8.2
28	8°22.0	8°23.4	7°59.1	2.8 - 1.6	8.8 - 4.9	14.8 - 8.3
29	8°22.3	8°23.6	7°59.4	2.9 - 1.6	8.9 - 5.0	14.9 - 8.3
30	8°22.5	8°23.9	7°59.6	3.0 - 1.7	9.0 - 5.0	15.0 - 8.4
31	8°22.7	8°24.1	7°59.8	3.1 - 1.7	9.1 - 5.1	15.1 - 8.4
32	8°23.0	8°24.4	8°00.1	3.2 - 1.8	9.2 - 5.1	15.2 - 8.5
33	8°23.2	8°24.6	8°00.3	3.3 - 1.8	9.3 - 5.2	15.3 - 8.5
34	8°23.5	8°24.9	8°00.6	3.4 - 1.9	9.4 - 5.2	15.4 - 8.6
35	8°23.8	8°25.1	8°00.8	3.5 - 2.0	9.5 - 5.3	15.5 - 8.7
36	8°24.0	8°25.4	8°01.0	3.6 - 2.0	9.6 - 5.4	15.6 - 8.7
37	8°24.3	8°25.6	8°01.3	3.7 - 2.1	9.7 - 5.4	15.7 - 8.8
38	8°24.5	8°25.9	8°01.5	3.8 - 2.1	9.8 - 5.5	15.8 - 8.8
39	8°24.7	8°26.1	8°01.8	3.9 - 2.2	9.9 - 5.5	15.9 - 8.9
40	8°25.0	8°26.4	8°02.0	4.0 - 2.2	10.0 - 5.6	16.0 - 8.9
41	8°25.2	8°26.6	8°02.2	4.1 - 2.3	10.1 - 5.6	16.1 - 9.0
42	8°25.5	8°26.9	8°02.5	4.2 - 2.3	10.2 - 5.7	16.2 - 9.0
43	8°25.8	8°27.1	8°02.7	4.3 - 2.4	10.3 - 5.8	16.3 - 9.1
44	8°26.0	8°27.4	8°02.9	4.4 - 2.5	10.4 - 5.8	16.4 - 9.2
45	8°26.3	8°27.6	8°03.2	4.5 - 2.5	10.5 - 5.9	16.5 - 9.2
46	8°26.5	8°27.9	8°03.4	4.6 - 2.6	10.6 - 5.9	16.6 - 9.3
47	8°26.7	8°28.1	8°03.7	4.7 - 2.6	10.7 - 6.0	16.7 - 9.3
48	8°27.0	8°28.4	8°03.9	4.8 - 2.7	10.8 - 6.0	16.8 - 9.4
49	8°27.3	8°28.6	8°04.1	4.9 - 2.7	10.9 - 6.1	16.9 - 9.4
50	8°27.5	8°28.9	8°04.4	5.0 - 2.8	11.0 - 6.1	17.0 - 9.5
51	8°27.8	8°29.1	8°04.6	5.1 - 2.8	11.1 - 6.2	17.1 - 9.5
52	8°28.0	8°29.4	8°04.9	5.2 - 2.9	11.2 - 6.3	17.2 - 9.6
53	8°28.2	8°29.6	8°05.1	5.3 - 3.0	11.3 - 6.3	17.3 - 9.7
54	8°28.5	8°29.9	8°05.3	5.4 - 3.0	11.4 - 6.4	17.4 - 9.7
55	8°28.7	8°30.1	8°05.6	5.5 - 3.1	11.5 - 6.4	17.5 - 9.8
56	8°29.0	8°30.4	8°05.8	5.6 - 3.1	11.6 - 6.5	17.6 - 9.8
57	8°29.3	8°30.6	8°06.1	5.7 - 3.2	11.7 - 6.5	17.7 - 9.9
58	8°29.5	8°30.9	8°06.3	5.8 - 3.2	11.8 - 6.6	17.8 - 9.9
59	8°29.8	8°31.1	8°06.5	5.9 - 3.3	11.9 - 6.6	17.9 - 10.0

m 34	Sun Plan.	Aries	Moon	v and d corr		
0	8°30.0	8°31.4	8°06.8	0.0 - 0.0	6.0 - 3.4	12.0 - 6.9
1	8°30.2	8°31.6	8°07.0	0.1 - 0.1	6.1 - 3.5	12.1 - 7.0
2	8°30.5	8°31.9	8°07.2	0.2 - 0.1	6.2 - 3.6	12.2 - 7.0
3	8°30.7	8°32.1	8°07.5	0.3 - 0.2	6.3 - 3.6	12.3 - 7.1
4	8°31.0	8°32.4	8°07.7	0.4 - 0.2	6.4 - 3.7	12.4 - 7.1
5	8°31.3	8°32.6	8°08.0	0.5 - 0.3	6.5 - 3.7	12.5 - 7.2
6	8°31.5	8°32.9	8°08.2	0.6 - 0.3	6.6 - 3.8	12.6 - 7.2
7	8°31.8	8°33.1	8°08.4	0.7 - 0.4	6.7 - 3.9	12.7 - 7.3
8	8°32.0	8°33.4	8°08.7	0.8 - 0.5	6.8 - 3.9	12.8 - 7.4
9	8°32.2	8°33.7	8°08.9	0.9 - 0.5	6.9 - 4.0	12.9 - 7.4
10	8°32.5	8°33.9	8°09.2	1.0 - 0.6	7.0 - 4.0	13.0 - 7.5
11	8°32.7	8°34.2	8°09.4	1.1 - 0.6	7.1 - 4.1	13.1 - 7.5
12	8°33.0	8°34.4	8°09.6	1.2 - 0.7	7.2 - 4.1	13.2 - 7.6
13	8°33.3	8°34.7	8°09.9	1.3 - 0.7	7.3 - 4.2	13.3 - 7.6
14	8°33.5	8°34.9	8°10.1	1.4 - 0.8	7.4 - 4.3	13.4 - 7.7
15	8°33.8	8°35.2	8°10.3	1.5 - 0.9	7.5 - 4.3	13.5 - 7.8
16	8°34.0	8°35.4	8°10.6	1.6 - 0.9	7.6 - 4.4	13.6 - 7.8
17	8°34.2	8°35.7	8°10.8	1.7 - 1.0	7.7 - 4.4	13.7 - 7.9
18	8°34.5	8°35.9	8°11.1	1.8 - 1.0	7.8 - 4.5	13.8 - 7.9
19	8°34.8	8°36.2	8°11.3	1.9 - 1.1	7.9 - 4.5	13.9 - 8.0
20	8°35.0	8°36.4	8°11.5	2.0 - 1.1	8.0 - 4.6	14.0 - 8.0
21	8°35.3	8°36.7	8°11.8	2.1 - 1.2	8.1 - 4.7	14.1 - 8.1
22	8°35.5	8°36.9	8°12.0	2.2 - 1.3	8.2 - 4.7	14.2 - 8.2
23	8°35.7	8°37.2	8°12.3	2.3 - 1.3	8.3 - 4.8	14.3 - 8.2
24	8°36.0	8°37.4	8°12.5	2.4 - 1.4	8.4 - 4.8	14.4 - 8.3
25	8°36.2	8°37.7	8°12.7	2.5 - 1.4	8.5 - 4.9	14.5 - 8.3
26	8°36.5	8°37.9	8°13.0	2.6 - 1.5	8.6 - 4.9	14.6 - 8.4
27	8°36.8	8°38.2	8°13.2	2.7 - 1.6	8.7 - 5.0	14.7 - 8.5
28	8°37.0	8°38.4	8°13.4	2.8 - 1.6	8.8 - 5.1	14.8 - 8.5
29	8°37.3	8°38.7	8°13.7	2.9 - 1.7	8.9 - 5.1	14.9 - 8.6
30	8°37.5	8°38.9	8°13.9	3.0 - 1.7	9.0 - 5.2	15.0 - 8.6
31	8°37.7	8°39.2	8°14.2	3.1 - 1.8	9.1 - 5.2	15.1 - 8.7
32	8°38.0	8°39.4	8°14.4	3.2 - 1.8	9.2 - 5.3	15.2 - 8.7
33	8°38.2	8°39.7	8°14.6	3.3 - 1.9	9.3 - 5.3	15.3 - 8.8
34	8°38.5	8°39.9	8°14.9	3.4 - 2.0	9.4 - 5.4	15.4 - 8.9
35	8°38.8	8°40.2	8°15.1	3.5 - 2.0	9.5 - 5.5	15.5 - 8.9
36	8°39.0	8°40.4	8°15.4	3.6 - 2.1	9.6 - 5.5	15.6 - 9.0
37	8°39.3	8°40.7	8°15.6	3.7 - 2.1	9.7 - 5.6	15.7 - 9.0
38	8°39.5	8°40.9	8°15.8	3.8 - 2.2	9.8 - 5.6	15.8 - 9.1
39	8°39.7	8°41.2	8°16.1	3.9 - 2.2	9.9 - 5.7	15.9 - 9.1
40	8°40.0	8°41.4	8°16.3	4.0 - 2.3	10.0 - 5.8	16.0 - 9.2
41	8°40.2	8°41.7	8°16.5	4.1 - 2.4	10.1 - 5.8	16.1 - 9.3
42	8°40.5	8°41.9	8°16.8	4.2 - 2.4	10.2 - 5.9	16.2 - 9.3
43	8°40.8	8°42.2	8°17.0	4.3 - 2.5	10.3 - 5.9	16.3 - 9.4
44	8°41.0	8°42.4	8°17.3	4.4 - 2.5	10.4 - 6.0	16.4 - 9.4
45	8°41.3	8°42.7	8°17.5	4.5 - 2.6	10.5 - 6.0	16.5 - 9.5
46	8°41.5	8°42.9	8°17.7	4.6 - 2.6	10.6 - 6.1	16.6 - 9.5
47	8°41.7	8°43.2	8°18.0	4.7 - 2.7	10.7 - 6.2	16.7 - 9.6
48	8°42.0	8°43.4	8°18.2	4.8 - 2.8	10.8 - 6.2	16.8 - 9.7
49	8°42.3	8°43.7	8°18.5	4.9 - 2.8	10.9 - 6.3	16.9 - 9.7
50	8°42.5	8°43.9	8°18.7	5.0 - 2.9	11.0 - 6.3	17.0 - 9.8
51	8°42.8	8°44.2	8°18.9	5.1 - 2.9	11.1 - 6.4	17.1 - 9.8
52	8°43.0	8°44.4	8°19.2	5.2 - 3.0	11.2 - 6.4	17.2 - 9.9
53	8°43.2	8°44.7	8°19.4	5.3 - 3.0	11.3 - 6.5	17.3 - 9.9
54	8°43.5	8°44.9	8°19.7	5.4 - 3.1	11.4 - 6.6	17.4 - 10.0
55	8°43.7	8°45.2	8°19.9	5.5 - 3.2	11.5 - 6.6	17.5 - 10.1
56	8°44.0	8°45.4	8°20.1	5.6 - 3.2	11.6 - 6.7	17.6 - 10.1
57	8°44.3	8°45.7	8°20.4	5.7 - 3.3	11.7 - 6.7	17.7 - 10.2
58	8°44.5	8°45.9	8°20.6	5.8 - 3.3	11.8 - 6.8	17.8 - 10.2
59	8°44.8	8°46.2	8°20.8	5.9 - 3.4	11.9 - 6.8	17.9 - 10.3

m 35	Sun Plan.	Aries	Moon	v and d corr		
0	8°45.0	8°46.4	8°21.1	0.0 - 0.0	6.0 - 3.5	12.0 - 7.1
1	8°45.2	8°46.7	8°21.3	0.1 - 0.1	6.1 - 3.6	12.1 - 7.2
2	8°45.5	8°46.9	8°21.6	0.2 - 0.1	6.2 - 3.7	12.2 - 7.2
3	8°45.7	8°47.2	8°21.8	0.3 - 0.2	6.3 - 3.7	12.3 - 7.3
4	8°46.0	8°47.4	8°22.0	0.4 - 0.2	6.4 - 3.8	12.4 - 7.3
5	8°46.3	8°47.7	8°22.3	0.5 - 0.3	6.5 - 3.8	12.5 - 7.4
6	8°46.5	8°47.9	8°22.5	0.6 - 0.4	6.6 - 3.9	12.6 - 7.5
7	8°46.8	8°48.2	8°22.8	0.7 - 0.4	6.7 - 4.0	12.7 - 7.5
8	8°47.0	8°48.4	8°23.0	0.8 - 0.5	6.8 - 4.0	12.8 - 7.6
9	8°47.2	8°48.7	8°23.2	0.9 - 0.5	6.9 - 4.1	12.9 - 7.6
10	8°47.5	8°48.9	8°23.5	1.0 - 0.6	7.0 - 4.1	13.0 - 7.7
11	8°47.7	8°49.2	8°23.7	1.1 - 0.7	7.1 - 4.2	13.1 - 7.8
12	8°48.0	8°49.4	8°23.9	1.2 - 0.7	7.2 - 4.3	13.2 - 7.8
13	8°48.3	8°49.7	8°24.2	1.3 - 0.8	7.3 - 4.3	13.3 - 7.9
14	8°48.5	8°49.9	8°24.4	1.4 - 0.8	7.4 - 4.4	13.4 - 7.9
15	8°48.8	8°50.2	8°24.7	1.5 - 0.9	7.5 - 4.4	13.5 - 8.0
16	8°49.0	8°50.4	8°24.9	1.6 - 0.9	7.6 - 4.5	13.6 - 8.0
17	8°49.2	8°50.7	8°25.1	1.7 - 1.0	7.7 - 4.6	13.7 - 8.1
18	8°49.5	8°50.9	8°25.4	1.8 - 1.1	7.8 - 4.6	13.8 - 8.2
19	8°49.8	8°51.2	8°25.6	1.9 - 1.1	7.9 - 4.7	13.9 - 8.2
20	8°50.0	8°51.4	8°25.9	2.0 - 1.2	8.0 - 4.7	14.0 - 8.3
21	8°50.3	8°51.7	8°26.1	2.1 - 1.2	8.1 - 4.8	14.1 - 8.3
22	8°50.5	8°52.0	8°26.3	2.2 - 1.3	8.2 - 4.9	14.2 - 8.4
23	8°50.7	8°52.2	8°26.6	2.3 - 1.4	8.3 - 4.9	14.3 - 8.5
24	8°51.0	8°52.5	8°26.8	2.4 - 1.4	8.4 - 5.0	14.4 - 8.5
25	8°51.2	8°52.7	8°27.0	2.5 - 1.5	8.5 - 5.0	14.5 - 8.6
26	8°51.5	8°53.0	8°27.3	2.6 - 1.5	8.6 - 5.1	14.6 - 8.6
27	8°51.8	8°53.2	8°27.5	2.7 - 1.6	8.7 - 5.1	14.7 - 8.7
28	8°52.0	8°53.5	8°27.8	2.8 - 1.7	8.8 - 5.2	14.8 - 8.8
29	8°52.3	8°53.7	8°28.0	2.9 - 1.7	8.9 - 5.3	14.9 - 8.8
30	8°52.5	8°54.0	8°28.2	3.0 - 1.8	9.0 - 5.3	15.0 - 8.9
31	8°52.7	8°54.2	8°28.5	3.1 - 1.8	9.1 - 5.4	15.1 - 8.9
32	8°53.0	8°54.5	8°28.7	3.2 - 1.9	9.2 - 5.4	15.2 - 9.0
33	8°53.2	8°54.7	8°29.0	3.3 - 2.0	9.3 - 5.5	15.3 - 9.1
34	8°53.5	8°55.0	8°29.2	3.4 - 2.0	9.4 - 5.6	15.4 - 9.1
35	8°53.8	8°55.2	8°29.4	3.5 - 2.1	9.5 - 5.6	15.5 - 9.2
36	8°54.0	8°55.5	8°29.7	3.6 - 2.1	9.6 - 5.7	15.6 - 9.2
37	8°54.3	8°55.7	8°29.9	3.7 - 2.2	9.7 - 5.7	15.7 - 9.3
38	8°54.5	8°56.0	8°30.2	3.8 - 2.2	9.8 - 5.8	15.8 - 9.3
39	8°54.7	8°56.2	8°30.4	3.9 - 2.3	9.9 - 5.9	15.9 - 9.4
40	8°55.0	8°56.5	8°30.6	4.0 - 2.4	10.0 - 5.9	16.0 - 9.5
41	8°55.2	8°56.7	8°30.9	4.1 - 2.4	10.1 - 6.0	16.1 - 9.5
42	8°55.5	8°57.0	8°31.1	4.2 - 2.5	10.2 - 6.0	16.2 - 9.6
43	8°55.8	8°57.2	8°31.3	4.3 - 2.5	10.3 - 6.1	16.3 - 9.6
44	8°56.0	8°57.5	8°31.6	4.4 - 2.6	10.4 - 6.2	16.4 - 9.7
45	8°56.3	8°57.7	8°31.8	4.5 - 2.7	10.5 - 6.2	16.5 - 9.8
46	8°56.5	8°58.0	8°32.1	4.6 - 2.7	10.6 - 6.3	16.6 - 9.8
47	8°56.7	8°58.2	8°32.3	4.7 - 2.8	10.7 - 6.3	16.7 - 9.9
48	8°57.0	8°58.5	8°32.5	4.8 - 2.8	10.8 - 6.4	16.8 - 9.9
49	8°57.3	8°58.7	8°32.8	4.9 - 2.9	10.9 - 6.4	16.9 - 10.0
50	8°57.5	8°59.0	8°33.0	5.0 - 3.0	11.0 - 6.5	17.0 - 10.1
51	8°57.8	8°59.2	8°33.3	5.1 - 3.0	11.1 - 6.6	17.1 - 10.1
52	8°58.0	8°59.5	8°33.5	5.2 - 3.1	11.2 - 6.6	17.2 - 10.2
53	8°58.2	8°59.7	8°33.7	5.3 - 3.1	11.3 - 6.7	17.3 - 10.2
54	8°58.5	9°00.0	8°34.0	5.4 - 3.2	11.4 - 6.7	17.4 - 10.3
55	8°58.7	9°00.2	8°34.2	5.5 - 3.3	11.5 - 6.8	17.5 - 10.4
56	8°59.0	9°00.5	8°34.4	5.6 - 3.3	11.6 - 6.9	17.6 - 10.4
57	8°59.3	9°00.7	8°34.7	5.7 - 3.4	11.7 - 6.9	17.7 - 10.5
58	8°59.5	9°01.0	8°34.9	5.8 - 3.4	11.8 - 7.0	17.8 - 10.5
59	8°59.8	9°01.2	8°35.2	5.9 - 3.5	11.9 - 7.0	17.9 - 10.6

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
36	Plan.					
0	9°00.0	9°01.5	8°35.4	0.0 - 0.0	6.0 - 3.6	12.0 - 7.3
1	9°00.2	9°01.7	8°35.6	0.1 - 0.1	6.1 - 3.7	12.1 - 7.4
2	9°00.5	9°02.0	8°35.9	0.2 - 0.1	6.2 - 3.8	12.2 - 7.4
3	9°00.7	9°02.2	8°36.1	0.3 - 0.2	6.3 - 3.8	12.3 - 7.5
4	9°01.0	9°02.5	8°36.4	0.4 - 0.2	6.4 - 3.9	12.4 - 7.5
5	9°01.3	9°02.7	8°36.6	0.5 - 0.3	6.5 - 4.0	12.5 - 7.6
6	9°01.5	9°03.0	8°36.8	0.6 - 0.4	6.6 - 4.0	12.6 - 7.7
7	9°01.8	9°03.2	8°37.1	0.7 - 0.4	6.7 - 4.1	12.7 - 7.7
8	9°02.0	9°03.5	8°37.3	0.8 - 0.5	6.8 - 4.1	12.8 - 7.8
9	9°02.2	9°03.7	8°37.5	0.9 - 0.5	6.9 - 4.2	12.9 - 7.8
10	9°02.5	9°04.0	8°37.8	1.0 - 0.6	7.0 - 4.3	13.0 - 7.9
11	9°02.7	9°04.2	8°38.0	1.1 - 0.7	7.1 - 4.3	13.1 - 8.0
12	9°03.0	9°04.5	8°38.3	1.2 - 0.7	7.2 - 4.4	13.2 - 8.0
13	9°03.3	9°04.7	8°38.5	1.3 - 0.8	7.3 - 4.4	13.3 - 8.1
14	9°03.5	9°05.0	8°38.7	1.4 - 0.9	7.4 - 4.5	13.4 - 8.2
15	9°03.8	9°05.2	8°39.0	1.5 - 0.9	7.5 - 4.6	13.5 - 8.2
16	9°04.0	9°05.5	8°39.2	1.6 - 1.0	7.6 - 4.6	13.6 - 8.3
17	9°04.2	9°05.7	8°39.5	1.7 - 1.0	7.7 - 4.7	13.7 - 8.3
18	9°04.5	9°06.0	8°39.7	1.8 - 1.1	7.8 - 4.7	13.8 - 8.4
19	9°04.8	9°06.2	8°39.9	1.9 - 1.2	7.9 - 4.8	13.9 - 8.5
20	9°05.0	9°06.5	8°40.2	2.0 - 1.2	8.0 - 4.9	14.0 - 8.5
21	9°05.3	9°06.7	8°40.4	2.1 - 1.3	8.1 - 4.9	14.1 - 8.6
22	9°05.5	9°07.0	8°40.6	2.2 - 1.3	8.2 - 5.0	14.2 - 8.6
23	9°05.7	9°07.2	8°40.9	2.3 - 1.4	8.3 - 5.0	14.3 - 8.7
24	9°06.0	9°07.5	8°41.1	2.4 - 1.5	8.4 - 5.1	14.4 - 8.8
25	9°06.2	9°07.7	8°41.4	2.5 - 1.5	8.5 - 5.2	14.5 - 8.8
26	9°06.5	9°08.0	8°41.6	2.6 - 1.6	8.6 - 5.2	14.6 - 8.9
27	9°06.8	9°08.2	8°41.8	2.7 - 1.6	8.7 - 5.3	14.7 - 8.9
28	9°07.0	9°08.5	8°42.1	2.8 - 1.7	8.8 - 5.4	14.8 - 9.0
29	9°07.3	9°08.7	8°42.3	2.9 - 1.8	8.9 - 5.4	14.9 - 9.1
30	9°07.5	9°09.0	8°42.6	3.0 - 1.8	9.0 - 5.5	15.0 - 9.1
31	9°07.7	9°09.2	8°42.8	3.1 - 1.9	9.1 - 5.5	15.1 - 9.2
32	9°08.0	9°09.5	8°43.0	3.2 - 1.9	9.2 - 5.6	15.2 - 9.2
33	9°08.2	9°09.7	8°43.3	3.3 - 2.0	9.3 - 5.7	15.3 - 9.3
34	9°08.5	9°10.0	8°43.5	3.4 - 2.1	9.4 - 5.7	15.4 - 9.4
35	9°08.8	9°10.2	8°43.8	3.5 - 2.1	9.5 - 5.8	15.5 - 9.4
36	9°09.0	9°10.5	8°44.0	3.6 - 2.2	9.6 - 5.8	15.6 - 9.5
37	9°09.3	9°10.8	8°44.2	3.7 - 2.3	9.7 - 5.9	15.7 - 9.6
38	9°09.5	9°11.0	8°44.5	3.8 - 2.3	9.8 - 6.0	15.8 - 9.6
39	9°09.7	9°11.3	8°44.7	3.9 - 2.4	9.9 - 6.0	15.9 - 9.7
40	9°10.0	9°11.5	8°44.9	4.0 - 2.4	10.0 - 6.1	16.0 - 9.7
41	9°10.2	9°11.8	8°45.2	4.1 - 2.5	10.1 - 6.1	16.1 - 9.8
42	9°10.5	9°12.0	8°45.4	4.2 - 2.6	10.2 - 6.2	16.2 - 9.9
43	9°10.8	9°12.3	8°45.7	4.3 - 2.6	10.3 - 6.3	16.3 - 9.9
44	9°11.0	9°12.5	8°45.9	4.4 - 2.7	10.4 - 6.3	16.4 - 10.0
45	9°11.3	9°12.8	8°46.1	4.5 - 2.7	10.5 - 6.4	16.5 - 10.0
46	9°11.5	9°13.0	8°46.4	4.6 - 2.8	10.6 - 6.4	16.6 - 10.1
47	9°11.7	9°13.3	8°46.6	4.7 - 2.9	10.7 - 6.5	16.7 - 10.2
48	9°12.0	9°13.5	8°46.9	4.8 - 2.9	10.8 - 6.6	16.8 - 10.2
49	9°12.3	9°13.8	8°47.1	4.9 - 3.0	10.9 - 6.6	16.9 - 10.3
50	9°12.5	9°14.0	8°47.3	5.0 - 3.0	11.0 - 6.7	17.0 - 10.3
51	9°12.8	9°14.3	8°47.6	5.1 - 3.1	11.1 - 6.8	17.1 - 10.4
52	9°13.0	9°14.5	8°47.8	5.2 - 3.2	11.2 - 6.8	17.2 - 10.5
53	9°13.2	9°14.8	8°48.0	5.3 - 3.2	11.3 - 6.9	17.3 - 10.5
54	9°13.5	9°15.0	8°48.3	5.4 - 3.3	11.4 - 6.9	17.4 - 10.6
55	9°13.7	9°15.3	8°48.5	5.5 - 3.3	11.5 - 7.0	17.5 - 10.6
56	9°14.0	9°15.5	8°48.8	5.6 - 3.4	11.6 - 7.1	17.6 - 10.7
57	9°14.3	9°15.8	8°49.0	5.7 - 3.5	11.7 - 7.1	17.7 - 10.8
58	9°14.5	9°16.0	8°49.2	5.8 - 3.5	11.8 - 7.2	17.8 - 10.8
59	9°14.8	9°16.3	8°49.5	5.9 - 3.6	11.9 - 7.2	17.9 - 10.9

m	Sun	Aries	Moon	v and d corr		
37	Plan.					
0	9°15.0	9°16.5	8°49.7	0.0 - 0.0	6.0 - 3.8	12.0 - 7.5
1	9°15.2	9°16.8	8°50.0	0.1 - 0.1	6.1 - 3.8	12.1 - 7.6
2	9°15.5	9°17.0	8°50.2	0.2 - 0.1	6.2 - 3.9	12.2 - 7.6
3	9°15.7	9°17.3	8°50.4	0.3 - 0.2	6.3 - 3.9	12.3 - 7.7
4	9°16.0	9°17.5	8°50.7	0.4 - 0.3	6.4 - 4.0	12.4 - 7.8
5	9°16.3	9°17.8	8°50.9	0.5 - 0.3	6.5 - 4.1	12.5 - 7.8
6	9°16.5	9°18.0	8°51.1	0.6 - 0.4	6.6 - 4.1	12.6 - 7.9
7	9°16.8	9°18.3	8°51.4	0.7 - 0.4	6.7 - 4.2	12.7 - 7.9
8	9°17.0	9°18.5	8°51.6	0.8 - 0.5	6.8 - 4.3	12.8 - 8.0
9	9°17.2	9°18.8	8°51.9	0.9 - 0.6	6.9 - 4.3	12.9 - 8.1
10	9°17.5	9°19.0	8°52.1	1.0 - 0.6	7.0 - 4.4	13.0 - 8.1
11	9°17.7	9°19.3	8°52.3	1.1 - 0.7	7.1 - 4.4	13.1 - 8.2
12	9°18.0	9°19.5	8°52.6	1.2 - 0.8	7.2 - 4.5	13.2 - 8.3
13	9°18.3	9°19.8	8°52.8	1.3 - 0.8	7.3 - 4.6	13.3 - 8.3
14	9°18.5	9°20.0	8°53.1	1.4 - 0.9	7.4 - 4.6	13.4 - 8.4
15	9°18.8	9°20.3	8°53.3	1.5 - 0.9	7.5 - 4.7	13.5 - 8.4
16	9°19.0	9°20.5	8°53.5	1.6 - 1.0	7.6 - 4.8	13.6 - 8.5
17	9°19.2	9°20.8	8°53.8	1.7 - 1.1	7.7 - 4.8	13.7 - 8.6
18	9°19.5	9°21.0	8°54.0	1.8 - 1.1	7.8 - 4.9	13.8 - 8.6
19	9°19.8	9°21.3	8°54.3	1.9 - 1.2	7.9 - 4.9	13.9 - 8.7
20	9°20.0	9°21.5	8°54.5	2.0 - 1.3	8.0 - 5.0	14.0 - 8.8
21	9°20.3	9°21.8	8°54.7	2.1 - 1.3	8.1 - 5.1	14.1 - 8.8
22	9°20.5	9°22.0	8°55.0	2.2 - 1.4	8.2 - 5.1	14.2 - 8.9
23	9°20.7	9°22.3	8°55.2	2.3 - 1.4	8.3 - 5.2	14.3 - 8.9
24	9°21.0	9°22.5	8°55.4	2.4 - 1.5	8.4 - 5.3	14.4 - 9.0
25	9°21.2	9°22.8	8°55.7	2.5 - 1.6	8.5 - 5.3	14.5 - 9.1
26	9°21.5	9°23.0	8°55.9	2.6 - 1.6	8.6 - 5.4	14.6 - 9.1
27	9°21.8	9°23.3	8°56.2	2.7 - 1.7	8.7 - 5.4	14.7 - 9.2
28	9°22.0	9°23.5	8°56.4	2.8 - 1.8	8.8 - 5.5	14.8 - 9.3
29	9°22.3	9°23.8	8°56.6	2.9 - 1.8	8.9 - 5.6	14.9 - 9.3
30	9°22.5	9°24.0	8°56.9	3.0 - 1.9	9.0 - 5.6	15.0 - 9.4
31	9°22.7	9°24.3	8°57.1	3.1 - 1.9	9.1 - 5.7	15.1 - 9.4
32	9°23.0	9°24.5	8°57.4	3.2 - 2.0	9.2 - 5.8	15.2 - 9.5
33	9°23.2	9°24.8	8°57.6	3.3 - 2.1	9.3 - 5.8	15.3 - 9.6
34	9°23.5	9°25.0	8°57.8	3.4 - 2.1	9.4 - 5.9	15.4 - 9.6
35	9°23.8	9°25.3	8°58.1	3.5 - 2.2	9.5 - 5.9	15.5 - 9.7
36	9°24.0	9°25.5	8°58.3	3.6 - 2.3	9.6 - 6.0	15.6 - 9.8
37	9°24.3	9°25.8	8°58.5	3.7 - 2.3	9.7 - 6.1	15.7 - 9.8
38	9°24.5	9°26.0	8°58.8	3.8 - 2.4	9.8 - 6.1	15.8 - 9.9
39	9°24.7	9°26.3	8°59.0	3.9 - 2.4	9.9 - 6.2	15.9 - 9.9
40	9°25.0	9°26.5	8°59.3	4.0 - 2.5	10.0 - 6.3	16.0 - 10.0
41	9°25.2	9°26.8	8°59.5	4.1 - 2.6	10.1 - 6.3	16.1 - 10.1
42	9°25.5	9°27.0	8°59.7	4.2 - 2.6	10.2 - 6.4	16.2 - 10.1
43	9°25.8	9°27.3	9°00.0	4.3 - 2.7	10.3 - 6.4	16.3 - 10.2
44	9°26.0	9°27.5	9°00.2	4.4 - 2.8	10.4 - 6.5	16.4 - 10.3
45	9°26.3	9°27.8	9°00.5	4.5 - 2.8	10.5 - 6.6	16.5 - 10.3
46	9°26.5	9°28.0	9°00.7	4.6 - 2.9	10.6 - 6.6	16.6 - 10.4
47	9°26.7	9°28.3	9°00.9	4.7 - 2.9	10.7 - 6.7	16.7 - 10.4
48	9°27.0	9°28.5	9°01.2	4.8 - 3.0	10.8 - 6.8	16.8 - 10.5
49	9°27.3	9°28.8	9°01.4	4.9 - 3.1	10.9 - 6.8	16.9 - 10.6
50	9°27.5	9°29.1	9°01.6	5.0 - 3.1	11.0 - 6.9	17.0 - 10.6
51	9°27.8	9°29.3	9°01.9	5.1 - 3.2	11.1 - 6.9	17.1 - 10.7
52	9°28.0	9°29.6	9°02.1	5.2 - 3.3	11.2 - 7.0	17.2 - 10.8
53	9°28.2	9°29.8	9°02.4	5.3 - 3.3	11.3 - 7.1	17.3 - 10.8
54	9°28.5	9°30.1	9°02.6	5.4 - 3.4	11.4 - 7.1	17.4 - 10.9
55	9°28.7	9°30.3	9°02.8	5.5 - 3.4	11.5 - 7.2	17.5 - 10.9
56	9°29.0	9°30.6	9°03.1	5.6 - 3.5	11.6 - 7.3	17.6 - 11.0
57	9°29.3	9°30.8	9°03.3	5.7 - 3.6	11.7 - 7.3	17.7 - 11.1
58	9°29.5	9°31.1	9°03.6	5.8 - 3.6	11.8 - 7.4	17.8 - 11.1
59	9°29.8	9°31.3	9°03.8	5.9 - 3.7	11.9 - 7.4	17.9 - 11.2

m	Sun	Aries	Moon	v and d corr		
38	Plan.					
0	9°30.0	9°31.6	9°04.0	0.0 - 0.0	6.0 - 3.9	12.0 - 7.7
1	9°30.2	9°31.8	9°04.3	0.1 - 0.1	6.1 - 3.9	12.1 - 7.8
2	9°30.5	9°32.1	9°04.5	0.2 - 0.1	6.2 - 4.0	12.2 - 7.8
3	9°30.7	9°32.3	9°04.7	0.3 - 0.2	6.3 - 4.0	12.3 - 7.9
4	9°31.0	9°32.6	9°05.0	0.4 - 0.3	6.4 - 4.1	12.4 - 8.0
5	9°31.3	9°32.8	9°05.2	0.5 - 0.3	6.5 - 4.2	12.5 - 8.0
6	9°31.5	9°33.1	9°05.5	0.6 - 0.4	6.6 - 4.2	12.6 - 8.1
7	9°31.8	9°33.3	9°05.7	0.7 - 0.4	6.7 - 4.3	12.7 - 8.1
8	9°32.0	9°33.6	9°05.9	0.8 - 0.5	6.8 - 4.4	12.8 - 8.2
9	9°32.2	9°33.8	9°06.2	0.9 - 0.6	6.9 - 4.4	12.9 - 8.3
10	9°32.5	9°34.1	9°06.4	1.0 - 0.6	7.0 - 4.5	13.0 - 8.3
11	9°32.7	9°34.3	9°06.7	1.1 - 0.7	7.1 - 4.6	13.1 - 8.4
12	9°33.0	9°34.6	9°06.9	1.2 - 0.8	7.2 - 4.6	13.2 - 8.5
13	9°33.3	9°34.8	9°07.1	1.3 - 0.8	7.3 - 4.7	13.3 - 8.5
14	9°33.5	9°35.1	9°07.4	1.4 - 0.9	7.4 - 4.7	13.4 - 8.6
15	9°33.8	9°35.3	9°07.6	1.5 - 1.0	7.5 - 4.8	13.5 - 8.7
16	9°34.0	9°35.6	9°07.9	1.6 - 1.0	7.6 - 4.9	13.6 - 8.7
17	9°34.2	9°35.8	9°08.1	1.7 - 1.1	7.7 - 4.9	13.7 - 8.8
18	9°34.5	9°36.1	9°08.3	1.8 - 1.2	7.8 - 5.0	13.8 - 8.9
19	9°34.8	9°36.3	9°08.6	1.9 - 1.2	7.9 - 5.1	13.9 - 8.9
20	9°35.0	9°36.6	9°08.8	2.0 - 1.3	8.0 - 5.1	14.0 - 9.0
21	9°35.3	9°36.8	9°09.0	2.1 - 1.3	8.1 - 5.2	14.1 - 9.0
22	9°35.5	9°37.1	9°09.3	2.2 - 1.4	8.2 - 5.3	14.2 - 9.1
23	9°35.7	9°37.3	9°09.5	2.3 - 1.5	8.3 - 5.3	14.3 - 9.2
24	9°36.0	9°37.6	9°09.8	2.4 - 1.5	8.4 - 5.4	14.4 - 9.2
25	9°36.2	9°37.8	9°10.0	2.5 - 1.6	8.5 - 5.5	14.5 - 9.3
26	9°36.5	9°38.1	9°10.2	2.6 - 1.7	8.6 - 5.5	14.6 - 9.4
27	9°36.8	9°38.3	9°10.5	2.7 - 1.7	8.7 - 5.6	14.7 - 9.4
28	9°37.0	9°38.6	9°10.7	2.8 - 1.8	8.8 - 5.6	14.8 - 9.5
29	9°37.3	9°38.8	9°11.0	2.9 - 1.9	8.9 - 5.7	14.9 - 9.6
30	9°37.5	9°39.1	9°11.2	3.0 - 1.9	9.0 - 5.8	15.0 - 9.6
31	9°37.7	9°39.3	9°11.4	3.1 - 2.0	9.1 - 5.8	15.1 - 9.7
32	9°38.0	9°39.6	9°11.7	3.2 - 2.1	9.2 - 5.9	15.2 - 9.8
33	9°38.2	9°39.8	9°11.9	3.3 - 2.1	9.3 - 6.0	15.3 - 9.8
34	9°38.5	9°40.1	9°12.1	3.4 - 2.2	9.4 - 6.0	15.4 - 9.9
35	9°38.8	9°40.3	9°12.4	3.5 - 2.2	9.5 - 6.1	15.5 - 9.9
36	9°39.0	9°40.6	9°12.6	3.6 - 2.3	9.6 - 6.2	15.6 - 10.0
37	9°39.3	9°40.8	9°12.9	3.7 - 2.4	9.7 - 6.2	15.7 - 10.1
38	9°39.5	9°41.1	9°13.1	3.8 - 2.4	9.8 - 6.3	15.8 - 10.1
39	9°39.7	9°41.3	9°13.3	3.9 - 2.5	9.9 - 6.4	15.9 - 10.2
40	9°40.0	9°41.6	9°13.6	4.0 - 2.6	10.0 - 6.4	16.0 - 10.3
41	9°40.2	9°41.8	9°13.8	4.1 - 2.6	10.1 - 6.5	16.1 - 10.3
42	9°40.5	9°42.1	9°14.1	4.2 - 2.7	10.2 - 6.5	16.2 - 10.4
43	9°40.8	9°42.3	9°14.3	4.3 - 2.8	10.3 - 6.6	16.3 - 10.5
44	9°41.0	9°42.6	9°14.5	4.4 - 2.8	10.4 - 6.7	16.4 - 10.5
45	9°41.3	9°42.8	9°14.8	4.5 - 2.9	10.5 - 6.7	16.5 - 10.6
46	9°41.5	9°43.1	9°15.0	4.6 - 3.0	10.6 - 6.8	16.6 - 10.7
47	9°41.7	9°43.3	9°15.2	4.7 - 3.0	10.7 - 6.9	16.7 - 10.7
48	9°42.0	9°43.6	9°15.5	4.8 - 3.1	10.8 - 6.9	16.8 - 10.8
49	9°42.3	9°43.8	9°15.7	4.9 - 3.1	10.9 - 7.0	16.9 - 10.8
50	9°42.5	9°44.1	9°16.0	5.0 - 3.2	11.0 - 7.1	17.0 - 10.9
51	9°42.8	9°44.3	9°16.2	5.1 - 3.3	11.1 - 7.1	17.1 - 11.0
52	9°43.0	9°44.6	9°16.4	5.2 - 3.3	11.2 - 7.2	17.2 - 11.0
53	9°43.2	9°44.8	9°16.7	5.3 - 3.4	11.3 - 7.3	17.3 - 11.1
54	9°43.5	9°45.1	9°16.9	5.4 - 3.5	11.4 - 7.3	17.4 - 11.2
55	9°43.7	9°45.3	9°17.2	5.5 - 3.5	11.5 - 7.4	17.5 - 11.2
56	9°44.0	9°45.6	9°17.4	5.6 - 3.6	11.6 - 7.4	17.6 - 11.3
57	9°44.3	9°45.8	9°17.6	5.7 - 3.7	11.7 - 7.5	17.7 - 11.4
58	9°44.5	9°46.1	9°17.9	5.8 - 3.7	11.8 - 7.6	17.8 - 11.4
59	9°44.8	9°46.3	9°18.1	5.9 - 3.8	11.9 - 7.6	17.9 - 11.5

Increments and Corrections

m 39	Sun Plan.	Aries	Moon	v and d corr		
0	9°45.0	9°46.6	9°18.4	0.0 - 0.0	6.0 - 4.0	12.0 - 7.9
1	9°45.2	9°46.8	9°18.6	0.1 - 0.1	6.1 - 4.0	12.1 - 8.0
2	9°45.5	9°47.1	9°18.8	0.2 - 0.1	6.2 - 4.1	12.2 - 8.0
3	9°45.7	9°47.4	9°19.1	0.3 - 0.2	6.3 - 4.1	12.3 - 8.1
4	9°46.0	9°47.6	9°19.3	0.4 - 0.3	6.4 - 4.2	12.4 - 8.2
5	9°46.3	9°47.9	9°19.5	0.5 - 0.3	6.5 - 4.3	12.5 - 8.2
6	9°46.5	9°48.1	9°19.8	0.6 - 0.4	6.6 - 4.3	12.6 - 8.3
7	9°46.8	9°48.4	9°20.0	0.7 - 0.5	6.7 - 4.4	12.7 - 8.4
8	9°47.0	9°48.6	9°20.3	0.8 - 0.5	6.8 - 4.5	12.8 - 8.4
9	9°47.2	9°48.9	9°20.5	0.9 - 0.6	6.9 - 4.5	12.9 - 8.5
10	9°47.5	9°49.1	9°20.7	1.0 - 0.7	7.0 - 4.6	13.0 - 8.6
11	9°47.7	9°49.4	9°21.0	1.1 - 0.7	7.1 - 4.7	13.1 - 8.6
12	9°48.0	9°49.6	9°21.2	1.2 - 0.8	7.2 - 4.7	13.2 - 8.7
13	9°48.3	9°49.9	9°21.5	1.3 - 0.9	7.3 - 4.8	13.3 - 8.8
14	9°48.5	9°50.1	9°21.7	1.4 - 0.9	7.4 - 4.9	13.4 - 8.8
15	9°48.8	9°50.4	9°21.9	1.5 - 1.0	7.5 - 4.9	13.5 - 8.9
16	9°49.0	9°50.6	9°22.2	1.6 - 1.1	7.6 - 5.0	13.6 - 9.0
17	9°49.2	9°50.9	9°22.4	1.7 - 1.1	7.7 - 5.1	13.7 - 9.0
18	9°49.5	9°51.1	9°22.6	1.8 - 1.2	7.8 - 5.1	13.8 - 9.1
19	9°49.8	9°51.4	9°22.9	1.9 - 1.3	7.9 - 5.2	13.9 - 9.2
20	9°50.0	9°51.6	9°23.1	2.0 - 1.3	8.0 - 5.3	14.0 - 9.2
21	9°50.3	9°51.9	9°23.4	2.1 - 1.4	8.1 - 5.3	14.1 - 9.3
22	9°50.5	9°52.1	9°23.6	2.2 - 1.4	8.2 - 5.4	14.2 - 9.3
23	9°50.7	9°52.4	9°23.8	2.3 - 1.5	8.3 - 5.5	14.3 - 9.4
24	9°51.0	9°52.6	9°24.1	2.4 - 1.6	8.4 - 5.5	14.4 - 9.5
25	9°51.2	9°52.9	9°24.3	2.5 - 1.6	8.5 - 5.6	14.5 - 9.5
26	9°51.5	9°53.1	9°24.6	2.6 - 1.7	8.6 - 5.7	14.6 - 9.6
27	9°51.8	9°53.4	9°24.8	2.7 - 1.8	8.7 - 5.7	14.7 - 9.7
28	9°52.0	9°53.6	9°25.0	2.8 - 1.8	8.8 - 5.8	14.8 - 9.7
29	9°52.3	9°53.9	9°25.3	2.9 - 1.9	8.9 - 5.9	14.9 - 9.8
30	9°52.5	9°54.1	9°25.5	3.0 - 2.0	9.0 - 5.9	15.0 - 9.9
31	9°52.7	9°54.4	9°25.7	3.1 - 2.0	9.1 - 6.0	15.1 - 9.9
32	9°53.0	9°54.6	9°26.0	3.2 - 2.1	9.2 - 6.1	15.2 - 10.0
33	9°53.2	9°54.9	9°26.2	3.3 - 2.2	9.3 - 6.1	15.3 - 10.1
34	9°53.5	9°55.1	9°26.5	3.4 - 2.2	9.4 - 6.2	15.4 - 10.1
35	9°53.8	9°55.4	9°26.7	3.5 - 2.3	9.5 - 6.3	15.5 - 10.2
36	9°54.0	9°55.6	9°26.9	3.6 - 2.4	9.6 - 6.3	15.6 - 10.3
37	9°54.3	9°55.9	9°27.2	3.7 - 2.4	9.7 - 6.4	15.7 - 10.3
38	9°54.5	9°56.1	9°27.4	3.8 - 2.5	9.8 - 6.5	15.8 - 10.4
39	9°54.7	9°56.4	9°27.7	3.9 - 2.6	9.9 - 6.5	15.9 - 10.5
40	9°55.0	9°56.6	9°27.9	4.0 - 2.6	10.0 - 6.6	16.0 - 10.5
41	9°55.2	9°56.9	9°28.1	4.1 - 2.7	10.1 - 6.6	16.1 - 10.6
42	9°55.5	9°57.1	9°28.4	4.2 - 2.8	10.2 - 6.7	16.2 - 10.7
43	9°55.8	9°57.4	9°28.6	4.3 - 2.8	10.3 - 6.8	16.3 - 10.7
44	9°56.0	9°57.6	9°28.8	4.4 - 2.9	10.4 - 6.8	16.4 - 10.8
45	9°56.3	9°57.9	9°29.1	4.5 - 3.0	10.5 - 6.9	16.5 - 10.9
46	9°56.5	9°58.1	9°29.3	4.6 - 3.0	10.6 - 7.0	16.6 - 10.9
47	9°56.7	9°58.4	9°29.6	4.7 - 3.1	10.7 - 7.0	16.7 - 11.0
48	9°57.0	9°58.6	9°29.8	4.8 - 3.2	10.8 - 7.1	16.8 - 11.1
49	9°57.3	9°58.9	9°30.0	4.9 - 3.2	10.9 - 7.2	16.9 - 11.1
50	9°57.5	9°59.1	9°30.3	5.0 - 3.3	11.0 - 7.2	17.0 - 11.2
51	9°57.8	9°59.4	9°30.5	5.1 - 3.4	11.1 - 7.3	17.1 - 11.3
52	9°58.0	9°59.6	9°30.8	5.2 - 3.4	11.2 - 7.4	17.2 - 11.3
53	9°58.2	9°59.9	9°31.0	5.3 - 3.5	11.3 - 7.4	17.3 - 11.4
54	9°58.5	10°00.1	9°31.2	5.4 - 3.6	11.4 - 7.5	17.4 - 11.5
55	9°58.7	10°00.4	9°31.5	5.5 - 3.6	11.5 - 7.6	17.5 - 11.5
56	9°59.0	10°00.6	9°31.7	5.6 - 3.7	11.6 - 7.6	17.6 - 11.6
57	9°59.3	10°00.9	9°32.0	5.7 - 3.8	11.7 - 7.7	17.7 - 11.7
58	9°59.5	10°01.1	9°32.2	5.8 - 3.8	11.8 - 7.8	17.8 - 11.7
59	9°59.8	10°01.4	9°32.4	5.9 - 3.9	11.9 - 7.8	17.9 - 11.8

m 40	Sun Plan.	Aries	Moon	v and d corr		
0	10°00.0	10°01.6	9°32.7	0.0 - 0.0	6.0 - 4.1	12.0 - 8.1
1	10°00.2	10°01.9	9°32.9	0.1 - 0.1	6.1 - 4.1	12.1 - 8.2
2	10°00.5	10°02.1	9°33.1	0.2 - 0.1	6.2 - 4.2	12.2 - 8.2
3	10°00.7	10°02.4	9°33.4	0.3 - 0.2	6.3 - 4.3	12.3 - 8.3
4	10°01.0	10°02.6	9°33.6	0.4 - 0.3	6.4 - 4.3	12.4 - 8.4
5	10°01.3	10°02.9	9°33.9	0.5 - 0.3	6.5 - 4.4	12.5 - 8.4
6	10°01.5	10°03.1	9°34.1	0.6 - 0.4	6.6 - 4.5	12.6 - 8.5
7	10°01.8	10°03.4	9°34.3	0.7 - 0.5	6.7 - 4.5	12.7 - 8.6
8	10°02.0	10°03.6	9°34.6	0.8 - 0.5	6.8 - 4.6	12.8 - 8.6
9	10°02.2	10°03.9	9°34.8	0.9 - 0.6	6.9 - 4.7	12.9 - 8.7
10	10°02.5	10°04.1	9°35.1	1.0 - 0.7	7.0 - 4.7	13.0 - 8.8
11	10°02.7	10°04.4	9°35.3	1.1 - 0.7	7.1 - 4.8	13.1 - 8.8
12	10°03.0	10°04.6	9°35.5	1.2 - 0.8	7.2 - 4.9	13.2 - 8.9
13	10°03.3	10°04.9	9°35.8	1.3 - 0.9	7.3 - 4.9	13.3 - 9.0
14	10°03.5	10°05.1	9°36.0	1.4 - 0.9	7.4 - 5.0	13.4 - 9.0
15	10°03.8	10°05.4	9°36.2	1.5 - 1.0	7.5 - 5.1	13.5 - 9.1
16	10°04.0	10°05.7	9°36.5	1.6 - 1.1	7.6 - 5.1	13.6 - 9.2
17	10°04.2	10°05.9	9°36.7	1.7 - 1.1	7.7 - 5.2	13.7 - 9.2
18	10°04.5	10°06.2	9°37.0	1.8 - 1.2	7.8 - 5.3	13.8 - 9.3
19	10°04.8	10°06.4	9°37.2	1.9 - 1.3	7.9 - 5.3	13.9 - 9.4
20	10°05.0	10°06.7	9°37.4	2.0 - 1.4	8.0 - 5.4	14.0 - 9.5
21	10°05.3	10°06.9	9°37.7	2.1 - 1.4	8.1 - 5.5	14.1 - 9.5
22	10°05.5	10°07.2	9°37.9	2.2 - 1.5	8.2 - 5.5	14.2 - 9.6
23	10°05.7	10°07.4	9°38.2	2.3 - 1.6	8.3 - 5.6	14.3 - 9.7
24	10°06.0	10°07.7	9°38.4	2.4 - 1.6	8.4 - 5.7	14.4 - 9.7
25	10°06.2	10°07.9	9°38.6	2.5 - 1.7	8.5 - 5.7	14.5 - 9.8
26	10°06.5	10°08.2	9°38.9	2.6 - 1.8	8.6 - 5.8	14.6 - 9.9
27	10°06.8	10°08.4	9°39.1	2.7 - 1.8	8.7 - 5.9	14.7 - 9.9
28	10°07.0	10°08.7	9°39.3	2.8 - 1.9	8.8 - 5.9	14.8 - 10.0
29	10°07.3	10°08.9	9°39.6	2.9 - 2.0	8.9 - 6.0	14.9 - 10.1
30	10°07.5	10°09.2	9°39.8	3.0 - 2.0	9.0 - 6.1	15.0 - 10.1
31	10°07.7	10°09.4	9°40.1	3.1 - 2.1	9.1 - 6.1	15.1 - 10.2
32	10°08.0	10°09.7	9°40.3	3.2 - 2.2	9.2 - 6.2	15.2 - 10.3
33	10°08.2	10°09.9	9°40.5	3.3 - 2.2	9.3 - 6.3	15.3 - 10.3
34	10°08.5	10°10.2	9°40.8	3.4 - 2.3	9.4 - 6.3	15.4 - 10.4
35	10°08.8	10°10.4	9°41.0	3.5 - 2.4	9.5 - 6.4	15.5 - 10.5
36	10°09.0	10°10.7	9°41.3	3.6 - 2.4	9.6 - 6.5	15.6 - 10.5
37	10°09.3	10°10.9	9°41.5	3.7 - 2.5	9.7 - 6.5	15.7 - 10.6
38	10°09.5	10°11.2	9°41.7	3.8 - 2.6	9.8 - 6.6	15.8 - 10.7
39	10°09.7	10°11.4	9°42.0	3.9 - 2.6	9.9 - 6.7	15.9 - 10.7
40	10°10.0	10°11.7	9°42.2	4.0 - 2.7	10.0 - 6.8	16.0 - 10.8
41	10°10.2	10°11.9	9°42.4	4.1 - 2.8	10.1 - 6.8	16.1 - 10.9
42	10°10.5	10°12.2	9°42.7	4.2 - 2.8	10.2 - 6.9	16.2 - 10.9
43	10°10.8	10°12.4	9°42.9	4.3 - 2.9	10.3 - 7.0	16.3 - 11.0
44	10°11.0	10°12.7	9°43.2	4.4 - 3.0	10.4 - 7.0	16.4 - 11.1
45	10°11.3	10°12.9	9°43.4	4.5 - 3.0	10.5 - 7.1	16.5 - 11.1
46	10°11.5	10°13.2	9°43.6	4.6 - 3.1	10.6 - 7.2	16.6 - 11.2
47	10°11.7	10°13.4	9°43.9	4.7 - 3.2	10.7 - 7.2	16.7 - 11.3
48	10°12.0	10°13.7	9°44.1	4.8 - 3.2	10.8 - 7.3	16.8 - 11.3
49	10°12.3	10°13.9	9°44.4	4.9 - 3.3	10.9 - 7.4	16.9 - 11.4
50	10°12.5	10°14.2	9°44.6	5.0 - 3.4	11.0 - 7.4	17.0 - 11.5
51	10°12.8	10°14.4	9°44.8	5.1 - 3.4	11.1 - 7.5	17.1 - 11.5
52	10°13.0	10°14.7	9°45.1	5.2 - 3.5	11.2 - 7.6	17.2 - 11.6
53	10°13.2	10°14.9	9°45.3	5.3 - 3.6	11.3 - 7.6	17.3 - 11.7
54	10°13.5	10°15.2	9°45.6	5.4 - 3.6	11.4 - 7.7	17.4 - 11.7
55	10°13.7	10°15.4	9°45.8	5.5 - 3.7	11.5 - 7.8	17.5 - 11.8
56	10°14.0	10°15.7	9°46.0	5.6 - 3.8	11.6 - 7.8	17.6 - 11.9
57	10°14.3	10°15.9	9°46.3	5.7 - 3.8	11.7 - 7.9	17.7 - 11.9
58	10°14.5	10°16.2	9°46.5	5.8 - 3.9	11.8 - 8.0	17.8 - 12.0
59	10°14.8	10°16.4	9°46.7	5.9 - 4.0	11.9 - 8.0	17.9 - 12.1

m 41	Sun Plan.	Aries	Moon	v and d corr		
0	10°15.0	10°16.7	9°47.0	0.0 - 0.0	6.0 - 4.2	12.0 - 8.3
1	10°15.2	10°16.9	9°47.2	0.1 - 0.1	6.1 - 4.2	12.1 - 8.4
2	10°15.5	10°17.2	9°47.5	0.2 - 0.1	6.2 - 4.3	12.2 - 8.4
3	10°15.7	10°17.4	9°47.7	0.3 - 0.2	6.3 - 4.4	12.3 - 8.5
4	10°16.0	10°17.7	9°47.9	0.4 - 0.3	6.4 - 4.4	12.4 - 8.6
5	10°16.3	10°17.9	9°48.2	0.5 - 0.3	6.5 - 4.5	12.5 - 8.6
6	10°16.5	10°18.2	9°48.4	0.6 - 0.4	6.6 - 4.6	12.6 - 8.7
7	10°16.8	10°18.4	9°48.7	0.7 - 0.5	6.7 - 4.6	12.7 - 8.8
8	10°17.0	10°18.7	9°48.9	0.8 - 0.6	6.8 - 4.7	12.8 - 8.9
9	10°17.2	10°18.9	9°49.1	0.9 - 0.6	6.9 - 4.8	12.9 - 8.9
10	10°17.5	10°19.2	9°49.4	1.0 - 0.7	7.0 - 4.8	13.0 - 9.0
11	10°17.7	10°19.4	9°49.6	1.1 - 0.8	7.1 - 4.9	13.1 - 9.1
12	10°18.0	10°19.7	9°49.8	1.2 - 0.8	7.2 - 5.0	13.2 - 9.1
13	10°18.3	10°19.9	9°50.1	1.3 - 0.9	7.3 - 5.0	13.3 - 9.2
14	10°18.5	10°20.2	9°50.3	1.4 - 1.0	7.4 - 5.1	13.4 - 9.3
15	10°18.8	10°20.4	9°50.6	1.5 - 1.0	7.5 - 5.2	13.5 - 9.3
16	10°19.0	10°20.7	9°50.8	1.6 - 1.1	7.6 - 5.3	13.6 - 9.4
17	10°19.2	10°20.9	9°51.0	1.7 - 1.2	7.7 - 5.3	13.7 - 9.5
18	10°19.5	10°21.2	9°51.3	1.8 - 1.2	7.8 - 5.4	13.8 - 9.5
19	10°19.8	10°21.4	9°51.5	1.9 - 1.3	7.9 - 5.5	13.9 - 9.6
20	10°20.0	10°21.7	9°51.8	2.0 - 1.4	8.0 - 5.5	14.0 - 9.7
21	10°20.3	10°21.9	9°52.0	2.1 - 1.5	8.1 - 5.6	14.1 - 9.8
22	10°20.5	10°22.2	9°52.2	2.2 - 1.5	8.2 - 5.7	14.2 - 9.8
23	10°20.7	10°22.4	9°52.5	2.3 - 1.6	8.3 - 5.7	14.3 - 9.9
24	10°21.0	10°22.7	9°52.7	2.4 - 1.7	8.4 - 5.8	14.4 - 10.0
25	10°21.2	10°22.9	9°52.9	2.5 - 1.7	8.5 - 5.9	14.5 - 10.0
26	10°21.5	10°23.2	9°53.2	2.6 - 1.8	8.6 - 5.9	14.6 - 10.1
27	10°21.8	10°23.4	9°53.4	2.7 - 1.9	8.7 - 6.0	14.7 - 10.2
28	10°22.0	10°23.7	9°53.7	2.8 - 1.9	8.8 - 6.1	14.8 - 10.2
29	10°22.3	10°24.0	9°53.9	2.9 - 2.0	8.9 - 6.2	14.9 - 10.3
30	10°22.5	10°24.2	9°54.1	3.0 - 2.1	9.0 - 6.2	15.0 - 10.4
31	10°22.7	10°24.5	9°54.4	3.1 - 2.1	9.1 - 6.3	15.1 - 10.4
32	10°23.0	10°24.7	9°54.6	3.2 - 2.2	9.2 - 6.4	15.2 - 10.5
33	10°23.2	10°25.0	9°54.9	3.3 - 2.3	9.3 - 6.4	15.3 - 10.6
34	10°23.5	10°25.2	9°55.1	3.4 - 2.4	9.4 - 6.5	15.4 - 10.7
35	10°23.8	10°25.5	9°55.3	3.5 - 2.4	9.5 - 6.6	15.5 - 10.7
36	10°24.0	10°25.7	9°55.6	3.6 - 2.5	9.6 - 6.6	15.6 - 10.8
37	10°24.3	10°26.0	9°55.8	3.7 - 2.6	9.7 - 6.7	15.7 - 10.9
38	10°24.5	10°26.2	9°56.1	3.8 - 2.6	9.8 - 6.8	15.8 - 10.9
39	10°24.7	10°26.5	9°56.3	3.9 - 2.7	9.9 - 6.8	15.9 - 11.0
40	10°25.0	10°26.7	9°56.5	4.0 - 2.8	10.0 - 6.9	16.0 - 11.1
41	10°25.2	10°27.0	9°56.8	4.1 - 2.8	10.1 - 7.0	16.1 - 11.1
42	10°25.5	10°27.2	9°57.0	4.2 - 2.9	10.2 - 7.1	16.2 - 11.2
43	10°25.8	10°27.5	9°57.2	4.3 - 3.0	10.3 - 7.1	16.3 - 11.3
44	10°26.0	10°27.7	9°57.5	4.4 - 3.0	10.4 - 7.2	16.4 - 11.3
45	10°26.3	10°28.0	9°57.7	4.5 - 3.1	10.5 - 7.3	16.5 - 11.4
46	10°26.5	10°28.2	9°58.0	4.6 - 3.2	10.6 - 7.3	16.6 - 11.5
47	10°26.7	10°28.5	9°58.2	4.7 - 3.3	10.7 - 7.4	16.7 - 11.6
48	10°27.0	10°28.7	9°58.4	4.8 - 3.3	10.8 - 7.5	16.8 - 11.6
49	10°27.3	10°29.0	9°58.7	4.9 - 3.4	10.9 - 7.5	16.9 - 11.7
50	10°27.5	10°29.2	9°58.9	5.0 - 3.5	11.0 - 7.6	17.0 - 11.8
51	10°27.8	10°29.5	9°59.2	5.1 - 3.5	11.1 - 7.7	17.1 - 11.8
52	10°28.0	10°29.7	9°59.4	5.2 - 3.6	11.2 - 7.7	17.2 - 11.9
53	10°28.2	10°30.0	9°59.6	5.3 - 3.7	11.3 - 7.8	17.3 - 12.0
54	10°28.5	10°30.2	9°59.9	5.4 - 3.7	11.4 - 7.9	17.4 - 12.0
55	10°28.7	10°30.5	10°00.1	5.5 - 3.8	11.5 - 8.0	17.5 - 12.1
56	10°29.0	10°30.7	10°00.3	5.6 - 3.9	11.6 - 8.0	17.6 - 12.2
57	10°29.3	10°31.0	10°00.6	5.7 - 3.9	11.7 - 8.1	17.7 - 12.2
58	10°29.5	10°31.2	10°00.8	5.8 - 4.0	11.8 - 8.2	17.8 - 12.3
59	10°29.8	10°31.5	10°01.1	5.9 - 4.1	11.9 - 8.2	17.9 - 12.4

Increments and Corrections

m 42	Sun Plan.	Aries	Moon	v and d corr		
0	10°30.0	10°31.7	10°01.3	0.0 - 0.0	6.0 - 4.3	12.0 - 8.5
1	10°30.2	10°32.0	10°01.5	0.1 - 0.1	6.1 - 4.3	12.1 - 8.6
2	10°30.5	10°32.2	10°01.8	0.2 - 0.1	6.2 - 4.4	12.2 - 8.6
3	10°30.7	10°32.5	10°02.0	0.3 - 0.2	6.3 - 4.5	12.3 - 8.7
4	10°31.0	10°32.7	10°02.3	0.4 - 0.3	6.4 - 4.5	12.4 - 8.8
5	10°31.3	10°33.0	10°02.5	0.5 - 0.4	6.5 - 4.6	12.5 - 8.9
6	10°31.5	10°33.2	10°02.7	0.6 - 0.4	6.6 - 4.7	12.6 - 8.9
7	10°31.8	10°33.5	10°03.0	0.7 - 0.5	6.7 - 4.7	12.7 - 9.0
8	10°32.0	10°33.7	10°03.2	0.8 - 0.6	6.8 - 4.8	12.8 - 9.1
9	10°32.2	10°34.0	10°03.4	0.9 - 0.6	6.9 - 4.9	12.9 - 9.1
10	10°32.5	10°34.2	10°03.7	1.0 - 0.7	7.0 - 5.0	13.0 - 9.2
11	10°32.7	10°34.5	10°03.9	1.1 - 0.8	7.1 - 5.0	13.1 - 9.3
12	10°33.0	10°34.7	10°04.2	1.2 - 0.9	7.2 - 5.1	13.2 - 9.3
13	10°33.3	10°35.0	10°04.4	1.3 - 0.9	7.3 - 5.2	13.3 - 9.4
14	10°33.5	10°35.2	10°04.6	1.4 - 1.0	7.4 - 5.2	13.4 - 9.5
15	10°33.8	10°35.5	10°04.9	1.5 - 1.1	7.5 - 5.3	13.5 - 9.6
16	10°34.0	10°35.7	10°05.1	1.6 - 1.1	7.6 - 5.4	13.6 - 9.6
17	10°34.2	10°36.0	10°05.4	1.7 - 1.2	7.7 - 5.5	13.7 - 9.7
18	10°34.5	10°36.2	10°05.6	1.8 - 1.3	7.8 - 5.5	13.8 - 9.8
19	10°34.8	10°36.5	10°05.8	1.9 - 1.3	7.9 - 5.6	13.9 - 9.8
20	10°35.0	10°36.7	10°06.1	2.0 - 1.4	8.0 - 5.7	14.0 - 9.9
21	10°35.3	10°37.0	10°06.3	2.1 - 1.5	8.1 - 5.7	14.1 - 10.0
22	10°35.5	10°37.2	10°06.5	2.2 - 1.6	8.2 - 5.8	14.2 - 10.1
23	10°35.7	10°37.5	10°06.8	2.3 - 1.6	8.3 - 5.9	14.3 - 10.1
24	10°36.0	10°37.7	10°07.0	2.4 - 1.7	8.4 - 6.0	14.4 - 10.2
25	10°36.2	10°38.0	10°07.3	2.5 - 1.8	8.5 - 6.0	14.5 - 10.3
26	10°36.5	10°38.2	10°07.5	2.6 - 1.8	8.6 - 6.1	14.6 - 10.3
27	10°36.8	10°38.5	10°07.7	2.7 - 1.9	8.7 - 6.2	14.7 - 10.4
28	10°37.0	10°38.7	10°08.0	2.8 - 2.0	8.8 - 6.2	14.8 - 10.5
29	10°37.3	10°39.0	10°08.2	2.9 - 2.1	8.9 - 6.3	14.9 - 10.6
30	10°37.5	10°39.2	10°08.5	3.0 - 2.1	9.0 - 6.4	15.0 - 10.6
31	10°37.7	10°39.5	10°08.7	3.1 - 2.2	9.1 - 6.4	15.1 - 10.7
32	10°38.0	10°39.7	10°08.9	3.2 - 2.3	9.2 - 6.5	15.2 - 10.8
33	10°38.2	10°40.0	10°09.2	3.3 - 2.3	9.3 - 6.6	15.3 - 10.8
34	10°38.5	10°40.2	10°09.4	3.4 - 2.4	9.4 - 6.7	15.4 - 10.9
35	10°38.8	10°40.5	10°09.7	3.5 - 2.5	9.5 - 6.7	15.5 - 11.0
36	10°39.0	10°40.7	10°09.9	3.6 - 2.6	9.6 - 6.8	15.6 - 11.1
37	10°39.3	10°41.0	10°10.1	3.7 - 2.6	9.7 - 6.9	15.7 - 11.1
38	10°39.5	10°41.2	10°10.4	3.8 - 2.7	9.8 - 6.9	15.8 - 11.2
39	10°39.7	10°41.5	10°10.6	3.9 - 2.8	9.9 - 7.0	15.9 - 11.3
40	10°40.0	10°41.7	10°10.8	4.0 - 2.8	10.0 - 7.1	16.0 - 11.3
41	10°40.2	10°42.0	10°11.1	4.1 - 2.9	10.1 - 7.2	16.1 - 11.4
42	10°40.5	10°42.3	10°11.3	4.2 - 3.0	10.2 - 7.2	16.2 - 11.5
43	10°40.8	10°42.5	10°11.6	4.3 - 3.0	10.3 - 7.3	16.3 - 11.5
44	10°41.0	10°42.8	10°11.8	4.4 - 3.1	10.4 - 7.4	16.4 - 11.6
45	10°41.3	10°43.0	10°12.0	4.5 - 3.2	10.5 - 7.4	16.5 - 11.7
46	10°41.5	10°43.3	10°12.3	4.6 - 3.3	10.6 - 7.5	16.6 - 11.8
47	10°41.7	10°43.5	10°12.5	4.7 - 3.3	10.7 - 7.6	16.7 - 11.8
48	10°42.0	10°43.8	10°12.8	4.8 - 3.4	10.8 - 7.7	16.8 - 11.9
49	10°42.3	10°44.0	10°13.0	4.9 - 3.5	10.9 - 7.7	16.9 - 12.0
50	10°42.5	10°44.3	10°13.2	5.0 - 3.5	11.0 - 7.8	17.0 - 12.0
51	10°42.8	10°44.5	10°13.5	5.1 - 3.6	11.1 - 7.9	17.1 - 12.1
52	10°43.0	10°44.8	10°13.7	5.2 - 3.7	11.2 - 7.9	17.2 - 12.2
53	10°43.2	10°45.0	10°13.9	5.3 - 3.8	11.3 - 8.0	17.3 - 12.3
54	10°43.5	10°45.3	10°14.2	5.4 - 3.8	11.4 - 8.1	17.4 - 12.3
55	10°43.7	10°45.5	10°14.4	5.5 - 3.9	11.5 - 8.1	17.5 - 12.4
56	10°44.0	10°45.8	10°14.7	5.6 - 4.0	11.6 - 8.2	17.6 - 12.5
57	10°44.3	10°46.0	10°14.9	5.7 - 4.0	11.7 - 8.3	17.7 - 12.5
58	10°44.5	10°46.3	10°15.1	5.8 - 4.1	11.8 - 8.4	17.8 - 12.6
59	10°44.8	10°46.5	10°15.4	5.9 - 4.2	11.9 - 8.4	17.9 - 12.7

m 43	Sun Plan.	Aries	Moon	v and d corr		
0	10°45.0	10°46.8	10°15.6	0.0 - 0.0	6.0 - 4.3	12.0 - 8.7
1	10°45.2	10°47.0	10°15.9	0.1 - 0.1	6.1 - 4.4	12.1 - 8.8
2	10°45.5	10°47.3	10°16.1	0.2 - 0.1	6.2 - 4.5	12.2 - 8.8
3	10°45.7	10°47.5	10°16.3	0.3 - 0.2	6.3 - 4.6	12.3 - 8.9
4	10°46.0	10°47.8	10°16.6	0.4 - 0.3	6.4 - 4.6	12.4 - 9.0
5	10°46.3	10°48.0	10°16.8	0.5 - 0.4	6.5 - 4.7	12.5 - 9.1
6	10°46.5	10°48.3	10°17.0	0.6 - 0.4	6.6 - 4.8	12.6 - 9.1
7	10°46.8	10°48.5	10°17.3	0.7 - 0.5	6.7 - 4.9	12.7 - 9.2
8	10°47.0	10°48.8	10°17.5	0.8 - 0.6	6.8 - 4.9	12.8 - 9.3
9	10°47.2	10°49.0	10°17.8	0.9 - 0.7	6.9 - 5.0	12.9 - 9.4
10	10°47.5	10°49.3	10°18.0	1.0 - 0.7	7.0 - 5.1	13.0 - 9.4
11	10°47.7	10°49.5	10°18.2	1.1 - 0.8	7.1 - 5.1	13.1 - 9.5
12	10°48.0	10°49.8	10°18.5	1.2 - 0.9	7.2 - 5.2	13.2 - 9.6
13	10°48.3	10°50.0	10°18.7	1.3 - 0.9	7.3 - 5.3	13.3 - 9.6
14	10°48.5	10°50.3	10°19.0	1.4 - 1.0	7.4 - 5.4	13.4 - 9.7
15	10°48.8	10°50.5	10°19.2	1.5 - 1.1	7.5 - 5.4	13.5 - 9.8
16	10°49.0	10°50.8	10°19.4	1.6 - 1.2	7.6 - 5.5	13.6 - 9.9
17	10°49.2	10°51.0	10°19.7	1.7 - 1.2	7.7 - 5.6	13.7 - 9.9
18	10°49.5	10°51.3	10°19.9	1.8 - 1.3	7.8 - 5.7	13.8 - 10.0
19	10°49.8	10°51.5	10°20.2	1.9 - 1.4	7.9 - 5.7	13.9 - 10.1
20	10°50.0	10°51.8	10°20.4	2.0 - 1.4	8.0 - 5.8	14.0 - 10.2
21	10°50.3	10°52.0	10°20.6	2.1 - 1.5	8.1 - 5.9	14.1 - 10.2
22	10°50.5	10°52.3	10°20.9	2.2 - 1.6	8.2 - 5.9	14.2 - 10.3
23	10°50.7	10°52.5	10°21.1	2.3 - 1.7	8.3 - 6.0	14.3 - 10.4
24	10°51.0	10°52.8	10°21.3	2.4 - 1.7	8.4 - 6.1	14.4 - 10.4
25	10°51.2	10°53.0	10°21.6	2.5 - 1.8	8.5 - 6.2	14.5 - 10.5
26	10°51.5	10°53.3	10°21.8	2.6 - 1.9	8.6 - 6.2	14.6 - 10.6
27	10°51.8	10°53.5	10°22.1	2.7 - 2.0	8.7 - 6.3	14.7 - 10.7
28	10°52.0	10°53.8	10°22.3	2.8 - 2.0	8.8 - 6.4	14.8 - 10.7
29	10°52.3	10°54.0	10°22.5	2.9 - 2.1	8.9 - 6.5	14.9 - 10.8
30	10°52.5	10°54.3	10°22.8	3.0 - 2.2	9.0 - 6.5	15.0 - 10.9
31	10°52.7	10°54.5	10°23.0	3.1 - 2.2	9.1 - 6.6	15.1 - 10.9
32	10°53.0	10°54.8	10°23.3	3.2 - 2.3	9.2 - 6.7	15.2 - 11.0
33	10°53.2	10°55.0	10°23.5	3.3 - 2.4	9.3 - 6.7	15.3 - 11.1
34	10°53.5	10°55.3	10°23.7	3.4 - 2.5	9.4 - 6.8	15.4 - 11.2
35	10°53.8	10°55.5	10°24.0	3.5 - 2.5	9.5 - 6.9	15.5 - 11.2
36	10°54.0	10°55.8	10°24.2	3.6 - 2.6	9.6 - 7.0	15.6 - 11.3
37	10°54.3	10°56.0	10°24.4	3.7 - 2.7	9.7 - 7.0	15.7 - 11.4
38	10°54.5	10°56.3	10°24.7	3.8 - 2.8	9.8 - 7.1	15.8 - 11.5
39	10°54.7	10°56.5	10°24.9	3.9 - 2.8	9.9 - 7.2	15.9 - 11.5
40	10°55.0	10°56.8	10°25.2	4.0 - 2.9	10.0 - 7.3	16.0 - 11.6
41	10°55.2	10°57.0	10°25.4	4.1 - 3.0	10.1 - 7.3	16.1 - 11.7
42	10°55.5	10°57.3	10°25.6	4.2 - 3.0	10.2 - 7.4	16.2 - 11.7
43	10°55.8	10°57.5	10°25.9	4.3 - 3.1	10.3 - 7.5	16.3 - 11.8
44	10°56.0	10°57.8	10°26.1	4.4 - 3.2	10.4 - 7.5	16.4 - 11.9
45	10°56.3	10°58.0	10°26.4	4.5 - 3.3	10.5 - 7.6	16.5 - 12.0
46	10°56.5	10°58.3	10°26.6	4.6 - 3.3	10.6 - 7.7	16.6 - 12.0
47	10°56.7	10°58.5	10°26.8	4.7 - 3.4	10.7 - 7.8	16.7 - 12.1
48	10°57.0	10°58.8	10°27.1	4.8 - 3.5	10.8 - 7.8	16.8 - 12.2
49	10°57.3	10°59.0	10°27.3	4.9 - 3.6	10.9 - 7.9	16.9 - 12.3
50	10°57.5	10°59.3	10°27.5	5.0 - 3.6	11.0 - 8.0	17.0 - 12.3
51	10°57.8	10°59.5	10°27.8	5.1 - 3.7	11.1 - 8.0	17.1 - 12.4
52	10°58.0	10°59.8	10°28.0	5.2 - 3.8	11.2 - 8.1	17.2 - 12.5
53	10°58.2	11°00.0	10°28.3	5.3 - 3.8	11.3 - 8.2	17.3 - 12.5
54	10°58.5	11°00.3	10°28.5	5.4 - 3.9	11.4 - 8.3	17.4 - 12.6
55	10°58.7	11°00.6	10°28.7	5.5 - 4.0	11.5 - 8.3	17.5 - 12.7
56	10°59.0	11°00.8	10°29.0	5.6 - 4.1	11.6 - 8.4	17.6 - 12.8
57	10°59.3	11°01.1	10°29.2	5.7 - 4.1	11.7 - 8.5	17.7 - 12.8
58	10°59.5	11°01.3	10°29.5	5.8 - 4.2	11.8 - 8.6	17.8 - 12.9
59	10°59.8	11°01.6	10°29.7	5.9 - 4.3	11.9 - 8.6	17.9 - 13.0

m 44	Sun Plan.	Aries	Moon	v and d corr		
0	11°00.0	11°01.8	10°29.9	0.0 - 0.0	6.0 - 4.5	12.0 - 8.9
1	11°00.2	11°02.1	10°30.2	0.1 - 0.1	6.1 - 4.5	12.1 - 9.0
2	11°00.5	11°02.3	10°30.4	0.2 - 0.1	6.2 - 4.6	12.2 - 9.0
3	11°00.7	11°02.6	10°30.6	0.3 - 0.2	6.3 - 4.7	12.3 - 9.1
4	11°01.0	11°02.8	10°30.9	0.4 - 0.3	6.4 - 4.7	12.4 - 9.2
5	11°01.3	11°03.1	10°31.1	0.5 - 0.4	6.5 - 4.8	12.5 - 9.3
6	11°01.5	11°03.3	10°31.4	0.6 - 0.4	6.6 - 4.9	12.6 - 9.3
7	11°01.8	11°03.6	10°31.6	0.7 - 0.5	6.7 - 5.0	12.7 - 9.4
8	11°02.0	11°03.8	10°31.8	0.8 - 0.6	6.8 - 5.0	12.8 - 9.5
9	11°02.2	11°04.1	10°32.1	0.9 - 0.7	6.9 - 5.1	12.9 - 9.6
10	11°02.5	11°04.3	10°32.3	1.0 - 0.7	7.0 - 5.2	13.0 - 9.6
11	11°02.7	11°04.6	10°32.6	1.1 - 0.8	7.1 - 5.3	13.1 - 9.7
12	11°03.0	11°04.8	10°32.8	1.2 - 0.9	7.2 - 5.3	13.2 - 9.8
13	11°03.3	11°05.1	10°33.0	1.3 - 1.0	7.3 - 5.4	13.3 - 9.9
14	11°03.5	11°05.3	10°33.3	1.4 - 1.0	7.4 - 5.5	13.4 - 9.9
15	11°03.8	11°05.6	10°33.5	1.5 - 1.1	7.5 - 5.6	13.5 - 10.0
16	11°04.0	11°05.8	10°33.8	1.6 - 1.2	7.6 - 5.6	13.6 - 10.1
17	11°04.2	11°06.1	10°34.0	1.7 - 1.3	7.7 - 5.7	13.7 - 10.2
18	11°04.5	11°06.3	10°34.2	1.8 - 1.3	7.8 - 5.8	13.8 - 10.2
19	11°04.8	11°06.6	10°34.5	1.9 - 1.4	7.9 - 5.9	13.9 - 10.3
20	11°05.0	11°06.8	10°34.7	2.0 - 1.5	8.0 - 5.9	14.0 - 10.4
21	11°05.3	11°07.1	10°34.9	2.1 - 1.6	8.1 - 6.0	14.1 - 10.5
22	11°05.5	11°07.3	10°35.2	2.2 - 1.6	8.2 - 6.1	14.2 - 10.5
23	11°05.7	11°07.6	10°35.4	2.3 - 1.7	8.3 - 6.2	14.3 - 10.6
24	11°06.0	11°07.8	10°35.7	2.4 - 1.8	8.4 - 6.2	14.4 - 10.7
25	11°06.2	11°08.1	10°35.9	2.5 - 1.9	8.5 - 6.3	14.5 - 10.8
26	11°06.5	11°08.3	10°36.1	2.6 - 1.9	8.6 - 6.4	14.6 - 10.8
27	11°06.8	11°08.6	10°36.4	2.7 - 2.0	8.7 - 6.5	14.7 - 10.9
28	11°07.0	11°08.8	10°36.6	2.8 - 2.1	8.8 - 6.5	14.8 - 11.0
29	11°07.3	11°09.1	10°36.9	2.9 - 2.2	8.9 - 6.6	14.9 - 11.1
30	11°07.5	11°09.3	10°37.1	3.0 - 2.2	9.0 - 6.7	15.0 - 11.1
31	11°07.7	11°09.6	10°37.3	3.1 - 2.3	9.1 - 6.7	15.1 - 11.2
32	11°08.0	11°09.8	10°37.6	3.2 - 2.4	9.2 - 6.8	15.2 - 11.3
33	11°08.2	11°10.1	10°37.8	3.3 - 2.4	9.3 - 6.9	15.3 - 11.3
34	11°08.5	11°10.3	10°38.0	3.4 - 2.5	9.4 - 7.0	15.4 - 11.4
35	11°08.8	11°10.6	10°38.3	3.5 - 2.6	9.5 - 7.0	15.5 - 11.5
36	11°09.0	11°10.8	10°38.5	3.6 - 2.7	9.6 - 7.1	15.6 - 11.6
37	11°09.3	11°11.1	10°38.8	3.7 - 2.7	9.7 - 7.2	15.7 - 11.6
38	11°09.5	11°11.3	10°39.0	3.8 - 2.8	9.8 - 7.3	15.8 - 11.7
39	11°09.7	11°11.6	10°39.2	3.9 - 2.9	9.9 - 7.3	15.9 - 11.8
40	11°10.0	11°11.8	10°39.5	4.0 - 3.0	10.0 - 7.4	16.0 - 11.9
41	11°10.2	11°12.1	10°39.7	4.1 - 3.0	10.1 - 7.5	16.1 - 11.9
42	11°10.5	11°12.3	10°40.0	4.2 - 3.1	10.2 - 7.6	16.2 - 12.0
43	11°10.8	11°12.6	10°40.2	4.3 - 3.2	10.3 - 7.6	16.3 - 12.1
44	11°11.0	11°12.8	10°40.4	4.4 - 3.3	10.4 - 7.7	16.4 - 12.2
45	11°11.3	11°13.1	10°40.7	4.5 - 3.3	10.5 - 7.8	16.5 - 12.2
46	11°11.5	11°13.3	10°40.9	4.6 - 3.4	10.6 - 7.9	16.6 - 12.3
47	11°11.7	11°13.6	10°41.1	4.7 - 3.5	10.7 - 7.9	16.7 - 12.4
48	11°12.0	11°13.8	10°41.4	4.8 - 3.6	10.8 - 8.0	16.8 - 12.5
49	11°12.3	11°14.1	10°41.6	4.9 - 3.6	10.9 - 8.1	16.9 - 12.5
50	11°12.5	11°14.3	10°41.9	5.0 - 3.7	11.0 - 8.2	17.0 - 12.6
51	11°12.8	11°14.6	10°42.1	5.1 - 3.8	11.1 - 8.2	17.1 - 12.7
52	11°13.0	11°14.8	10°42.3	5.2 - 3.9	11.2 - 8.3	17.2 - 12.8
53	11°13.2	11°15.1	10°42.6	5.3 - 3.9	11.3 - 8.4	17.3 - 12.8
54	11°13.5	11°15.3	10°42.8	5.4 - 4.0	11.4 - 8.5	17.4 - 12.9
55	11°13.7	11°15.6	10°43.1	5.5 - 4.1	11.5 - 8.5	17.5 - 13.0
56	11°14.0	11°15.8	10°43.3	5.6 - 4.2	11.6 - 8.6	17.6 - 13.1
57	11°14.3	11°16.1	10°43.5	5.7 - 4.2	11.7 - 8.7	17.7 - 13.1
58	11°14.5	11°16.3	10°43.8	5.8 - 4.3	11.8 - 8.8	17.8 - 13.2
59	11°14.8	11°16.6	10°44.0	5.9 - 4.4	11.9 - 8.8	17.9 - 13.3

Increments and Corrections

m 45	Sun Plan.	Aries	Moon	v and d corr		
0	11°15.0	11°16.8	10°44.3	0.0 - 0.0	6.0 - 4.5	12.0 - 9.1
1	11°15.2	11°17.1	10°44.5	0.1 - 0.1	6.1 - 4.6	12.1 - 9.2
2	11°15.5	11°17.3	10°44.7	0.2 - 0.2	6.2 - 4.7	12.2 - 9.3
3	11°15.7	11°17.6	10°45.0	0.3 - 0.2	6.3 - 4.8	12.3 - 9.3
4	11°16.0	11°17.8	10°45.2	0.4 - 0.3	6.4 - 4.9	12.4 - 9.4
5	11°16.3	11°18.1	10°45.4	0.5 - 0.4	6.5 - 4.9	12.5 - 9.5
6	11°16.5	11°18.3	10°45.7	0.6 - 0.5	6.6 - 5.0	12.6 - 9.6
7	11°16.8	11°18.6	10°45.9	0.7 - 0.5	6.7 - 5.1	12.7 - 9.6
8	11°17.0	11°18.9	10°46.2	0.8 - 0.6	6.8 - 5.2	12.8 - 9.7
9	11°17.2	11°19.1	10°46.4	0.9 - 0.7	6.9 - 5.2	12.9 - 9.8
10	11°17.5	11°19.4	10°46.6	1.0 - 0.8	7.0 - 5.3	13.0 - 9.9
11	11°17.7	11°19.6	10°46.9	1.1 - 0.8	7.1 - 5.4	13.1 - 9.9
12	11°18.0	11°19.9	10°47.1	1.2 - 0.9	7.2 - 5.5	13.2 - 10.0
13	11°18.3	11°20.1	10°47.4	1.3 - 1.0	7.3 - 5.5	13.3 - 10.1
14	11°18.5	11°20.4	10°47.6	1.4 - 1.1	7.4 - 5.6	13.4 - 10.2
15	11°18.8	11°20.6	10°47.8	1.5 - 1.1	7.5 - 5.7	13.5 - 10.2
16	11°19.0	11°20.9	10°48.1	1.6 - 1.2	7.6 - 5.8	13.6 - 10.3
17	11°19.2	11°21.1	10°48.3	1.7 - 1.3	7.7 - 5.8	13.7 - 10.4
18	11°19.5	11°21.4	10°48.5	1.8 - 1.4	7.8 - 5.9	13.8 - 10.5
19	11°19.8	11°21.6	10°48.8	1.9 - 1.4	7.9 - 6.0	13.9 - 10.5
20	11°20.0	11°21.9	10°49.0	2.0 - 1.5	8.0 - 6.1	14.0 - 10.6
21	11°20.3	11°22.1	10°49.3	2.1 - 1.6	8.1 - 6.1	14.1 - 10.7
22	11°20.5	11°22.4	10°49.5	2.2 - 1.7	8.2 - 6.2	14.2 - 10.8
23	11°20.7	11°22.6	10°49.7	2.3 - 1.7	8.3 - 6.3	14.3 - 10.8
24	11°21.0	11°22.9	10°50.0	2.4 - 1.8	8.4 - 6.4	14.4 - 10.9
25	11°21.2	11°23.1	10°50.2	2.5 - 1.9	8.5 - 6.4	14.5 - 11.0
26	11°21.5	11°23.4	10°50.5	2.6 - 2.0	8.6 - 6.5	14.6 - 11.1
27	11°21.8	11°23.6	10°50.7	2.7 - 2.0	8.7 - 6.6	14.7 - 11.1
28	11°22.0	11°23.9	10°50.9	2.8 - 2.1	8.8 - 6.7	14.8 - 11.2
29	11°22.3	11°24.1	10°51.2	2.9 - 2.2	8.9 - 6.7	14.9 - 11.3
30	11°22.5	11°24.4	10°51.4	3.0 - 2.3	9.0 - 6.8	15.0 - 11.4
31	11°22.7	11°24.6	10°51.6	3.1 - 2.4	9.1 - 6.9	15.1 - 11.5
32	11°23.0	11°24.9	10°51.9	3.2 - 2.4	9.2 - 7.0	15.2 - 11.5
33	11°23.2	11°25.1	10°52.1	3.3 - 2.5	9.3 - 7.1	15.3 - 11.6
34	11°23.5	11°25.4	10°52.4	3.4 - 2.6	9.4 - 7.1	15.4 - 11.7
35	11°23.8	11°25.6	10°52.6	3.5 - 2.7	9.5 - 7.2	15.5 - 11.8
36	11°24.0	11°25.9	10°52.8	3.6 - 2.7	9.6 - 7.3	15.6 - 11.8
37	11°24.3	11°26.1	10°53.1	3.7 - 2.8	9.7 - 7.4	15.7 - 11.9
38	11°24.5	11°26.4	10°53.3	3.8 - 2.9	9.8 - 7.4	15.8 - 12.0
39	11°24.7	11°26.6	10°53.6	3.9 - 3.0	9.9 - 7.5	15.9 - 12.1
40	11°25.0	11°26.9	10°53.8	4.0 - 3.0	10.0 - 7.6	16.0 - 12.1
41	11°25.2	11°27.1	10°54.0	4.1 - 3.1	10.1 - 7.7	16.1 - 12.2
42	11°25.5	11°27.4	10°54.3	4.2 - 3.2	10.2 - 7.7	16.2 - 12.3
43	11°25.8	11°27.6	10°54.5	4.3 - 3.3	10.3 - 7.8	16.3 - 12.4
44	11°26.0	11°27.9	10°54.7	4.4 - 3.3	10.4 - 7.9	16.4 - 12.4
45	11°26.3	11°28.1	10°55.0	4.5 - 3.4	10.5 - 8.0	16.5 - 12.5
46	11°26.5	11°28.4	10°55.2	4.6 - 3.5	10.6 - 8.0	16.6 - 12.6
47	11°26.7	11°28.6	10°55.5	4.7 - 3.6	10.7 - 8.1	16.7 - 12.7
48	11°27.0	11°28.9	10°55.7	4.8 - 3.6	10.8 - 8.2	16.8 - 12.7
49	11°27.3	11°29.1	10°55.9	4.9 - 3.7	10.9 - 8.3	16.9 - 12.8
50	11°27.5	11°29.4	10°56.2	5.0 - 3.8	11.0 - 8.3	17.0 - 12.9
51	11°27.8	11°29.6	10°56.4	5.1 - 3.9	11.1 - 8.4	17.1 - 13.0
52	11°28.0	11°29.9	10°56.7	5.2 - 3.9	11.2 - 8.5	17.2 - 13.0
53	11°28.2	11°30.1	10°56.9	5.3 - 4.0	11.3 - 8.6	17.3 - 13.1
54	11°28.5	11°30.4	10°57.1	5.4 - 4.1	11.4 - 8.6	17.4 - 13.2
55	11°28.7	11°30.6	10°57.4	5.5 - 4.2	11.5 - 8.7	17.5 - 13.3
56	11°29.0	11°30.9	10°57.6	5.6 - 4.2	11.6 - 8.8	17.6 - 13.3
57	11°29.3	11°31.1	10°57.9	5.7 - 4.3	11.7 - 8.9	17.7 - 13.4
58	11°29.5	11°31.4	10°58.1	5.8 - 4.4	11.8 - 8.9	17.8 - 13.5
59	11°29.8	11°31.6	10°58.3	5.9 - 4.5	11.9 - 9.0	17.9 - 13.6

m 46	Sun Plan.	Aries	Moon	v and d corr		
0	11°30.0	11°31.9	10°58.6	0.0 - 0.0	6.0 - 4.7	12.0 - 9.3
1	11°30.2	11°32.1	10°58.8	0.1 - 0.1	6.1 - 4.7	12.1 - 9.4
2	11°30.5	11°32.4	10°59.0	0.2 - 0.2	6.2 - 4.8	12.2 - 9.5
3	11°30.7	11°32.6	10°59.3	0.3 - 0.2	6.3 - 4.9	12.3 - 9.5
4	11°31.0	11°32.9	10°59.5	0.4 - 0.3	6.4 - 5.0	12.4 - 9.6
5	11°31.3	11°33.1	10°59.8	0.5 - 0.4	6.5 - 5.0	12.5 - 9.7
6	11°31.5	11°33.4	11°00.0	0.6 - 0.5	6.6 - 5.1	12.6 - 9.8
7	11°31.8	11°33.6	11°00.2	0.7 - 0.5	6.7 - 5.2	12.7 - 9.8
8	11°32.0	11°33.9	11°00.5	0.8 - 0.6	6.8 - 5.3	12.8 - 9.9
9	11°32.2	11°34.1	11°00.7	0.9 - 0.7	6.9 - 5.3	12.9 - 10.0
10	11°32.5	11°34.4	11°01.0	1.0 - 0.8	7.0 - 5.4	13.0 - 10.1
11	11°32.7	11°34.6	11°01.2	1.1 - 0.9	7.1 - 5.5	13.1 - 10.2
12	11°33.0	11°34.9	11°01.4	1.2 - 0.9	7.2 - 5.6	13.2 - 10.2
13	11°33.3	11°35.1	11°01.7	1.3 - 1.0	7.3 - 5.7	13.3 - 10.3
14	11°33.5	11°35.4	11°01.9	1.4 - 1.1	7.4 - 5.7	13.4 - 10.4
15	11°33.8	11°35.6	11°02.1	1.5 - 1.2	7.5 - 5.8	13.5 - 10.5
16	11°34.0	11°35.9	11°02.4	1.6 - 1.2	7.6 - 5.9	13.6 - 10.5
17	11°34.2	11°36.1	11°02.6	1.7 - 1.3	7.7 - 6.0	13.7 - 10.6
18	11°34.5	11°36.4	11°02.9	1.8 - 1.4	7.8 - 6.0	13.8 - 10.7
19	11°34.8	11°36.6	11°03.1	1.9 - 1.5	7.9 - 6.1	13.9 - 10.8
20	11°35.0	11°36.9	11°03.3	2.0 - 1.6	8.0 - 6.2	14.0 - 10.8
21	11°35.3	11°37.2	11°03.6	2.1 - 1.6	8.1 - 6.3	14.1 - 10.9
22	11°35.5	11°37.4	11°03.8	2.2 - 1.7	8.2 - 6.4	14.2 - 11.0
23	11°35.7	11°37.7	11°04.1	2.3 - 1.8	8.3 - 6.4	14.3 - 11.1
24	11°36.0	11°37.9	11°04.3	2.4 - 1.9	8.4 - 6.5	14.4 - 11.2
25	11°36.2	11°38.2	11°04.5	2.5 - 1.9	8.5 - 6.6	14.5 - 11.2
26	11°36.5	11°38.4	11°04.8	2.6 - 2.0	8.6 - 6.7	14.6 - 11.3
27	11°36.8	11°38.7	11°05.0	2.7 - 2.1	8.7 - 6.7	14.7 - 11.4
28	11°37.0	11°38.9	11°05.2	2.8 - 2.2	8.8 - 6.8	14.8 - 11.5
29	11°37.3	11°39.2	11°05.5	2.9 - 2.2	8.9 - 6.9	14.9 - 11.5
30	11°37.5	11°39.4	11°05.7	3.0 - 2.3	9.0 - 7.0	15.0 - 11.6
31	11°37.7	11°39.7	11°06.0	3.1 - 2.4	9.1 - 7.1	15.1 - 11.7
32	11°38.0	11°39.9	11°06.2	3.2 - 2.5	9.2 - 7.1	15.2 - 11.8
33	11°38.2	11°40.2	11°06.4	3.3 - 2.6	9.3 - 7.2	15.3 - 11.9
34	11°38.5	11°40.4	11°06.7	3.4 - 2.6	9.4 - 7.3	15.4 - 11.9
35	11°38.8	11°40.7	11°06.9	3.5 - 2.7	9.5 - 7.4	15.5 - 12.0
36	11°39.0	11°40.9	11°07.2	3.6 - 2.8	9.6 - 7.4	15.6 - 12.1
37	11°39.3	11°41.2	11°07.4	3.7 - 2.9	9.7 - 7.5	15.7 - 12.2
38	11°39.5	11°41.4	11°07.6	3.8 - 2.9	9.8 - 7.6	15.8 - 12.2
39	11°39.7	11°41.7	11°07.9	3.9 - 3.0	9.9 - 7.7	15.9 - 12.3
40	11°40.0	11°41.9	11°08.1	4.0 - 3.1	10.0 - 7.8	16.0 - 12.4
41	11°40.2	11°42.2	11°08.3	4.1 - 3.2	10.1 - 7.8	16.1 - 12.5
42	11°40.5	11°42.4	11°08.6	4.2 - 3.3	10.2 - 7.9	16.2 - 12.6
43	11°40.8	11°42.7	11°08.8	4.3 - 3.3	10.3 - 8.0	16.3 - 12.6
44	11°41.0	11°42.9	11°09.1	4.4 - 3.4	10.4 - 8.1	16.4 - 12.7
45	11°41.3	11°43.2	11°09.3	4.5 - 3.5	10.5 - 8.1	16.5 - 12.8
46	11°41.5	11°43.4	11°09.5	4.6 - 3.6	10.6 - 8.2	16.6 - 12.9
47	11°41.7	11°43.7	11°09.8	4.7 - 3.6	10.7 - 8.3	16.7 - 12.9
48	11°42.0	11°43.9	11°10.0	4.8 - 3.7	10.8 - 8.4	16.8 - 13.0
49	11°42.3	11°44.2	11°10.3	4.9 - 3.8	10.9 - 8.4	16.9 - 13.1
50	11°42.5	11°44.4	11°10.5	5.0 - 3.9	11.0 - 8.5	17.0 - 13.2
51	11°42.8	11°44.7	11°10.7	5.1 - 4.0	11.1 - 8.6	17.1 - 13.3
52	11°43.0	11°44.9	11°11.0	5.2 - 4.0	11.2 - 8.7	17.2 - 13.3
53	11°43.2	11°45.2	11°11.2	5.3 - 4.1	11.3 - 8.8	17.3 - 13.4
54	11°43.5	11°45.4	11°11.5	5.4 - 4.2	11.4 - 8.8	17.4 - 13.5
55	11°43.7	11°45.7	11°11.7	5.5 - 4.3	11.5 - 8.9	17.5 - 13.6
56	11°44.0	11°45.9	11°11.9	5.6 - 4.3	11.6 - 9.0	17.6 - 13.6
57	11°44.3	11°46.2	11°12.2	5.7 - 4.4	11.7 - 9.1	17.7 - 13.7
58	11°44.5	11°46.4	11°12.4	5.8 - 4.5	11.8 - 9.1	17.8 - 13.8
59	11°44.8	11°46.7	11°12.6	5.9 - 4.6	11.9 - 9.2	17.9 - 13.9

m 47	Sun Plan.	Aries	Moon	v and d corr		
0	11°45.0	11°46.9	11°12.9	0.0 - 0.0	6.0 - 4.8	12.0 - 9.5
1	11°45.2	11°47.2	11°13.1	0.1 - 0.1	6.1 - 4.8	12.1 - 9.6
2	11°45.5	11°47.4	11°13.4	0.2 - 0.2	6.2 - 4.9	12.2 - 9.7
3	11°45.7	11°47.7	11°13.6	0.3 - 0.2	6.3 - 5.0	12.3 - 9.7
4	11°46.0	11°47.9	11°13.8	0.4 - 0.3	6.4 - 5.1	12.4 - 9.8
5	11°46.3	11°48.2	11°14.1	0.5 - 0.4	6.5 - 5.1	12.5 - 9.9
6	11°46.5	11°48.4	11°14.3	0.6 - 0.5	6.6 - 5.2	12.6 - 10.0
7	11°46.8	11°48.7	11°14.6	0.7 - 0.6	6.7 - 5.3	12.7 - 10.1
8	11°47.0	11°48.9	11°14.8	0.8 - 0.6	6.8 - 5.4	12.8 - 10.1
9	11°47.2	11°49.2	11°15.0	0.9 - 0.7	6.9 - 5.5	12.9 - 10.2
10	11°47.5	11°49.4	11°15.3	1.0 - 0.8	7.0 - 5.5	13.0 - 10.3
11	11°47.7	11°49.7	11°15.5	1.1 - 0.9	7.1 - 5.6	13.1 - 10.4
12	11°48.0	11°49.9	11°15.7	1.2 - 1.0	7.2 - 5.7	13.2 - 10.4
13	11°48.3	11°50.2	11°16.0	1.3 - 1.0	7.3 - 5.8	13.3 - 10.5
14	11°48.5	11°50.4	11°16.2	1.4 - 1.1	7.4 - 5.9	13.4 - 10.6
15	11°48.8	11°50.7	11°16.5	1.5 - 1.2	7.5 - 5.9	13.5 - 10.7
16	11°49.0	11°50.9	11°16.7	1.6 - 1.3	7.6 - 6.0	13.6 - 10.8
17	11°49.2	11°51.2	11°16.9	1.7 - 1.3	7.7 - 6.1	13.7 - 10.8
18	11°49.5	11°51.4	11°17.2	1.8 - 1.4	7.8 - 6.2	13.8 - 10.9
19	11°49.8	11°51.7	11°17.4	1.9 - 1.5	7.9 - 6.3	13.9 - 11.0
20	11°50.0	11°51.9	11°17.7	2.0 - 1.6	8.0 - 6.3	14.0 - 11.1
21	11°50.3	11°52.2	11°17.9	2.1 - 1.7	8.1 - 6.4	14.1 - 11.2
22	11°50.5	11°52.4	11°18.1	2.2 - 1.7	8.2 - 6.5	14.2 - 11.2
23	11°50.7	11°52.7	11°18.4	2.3 - 1.8	8.3 - 6.6	14.3 - 11.3
24	11°51.0	11°52.9	11°18.6	2.4 - 1.9	8.4 - 6.7	14.4 - 11.4
25	11°51.2	11°53.2	11°18.8	2.5 - 2.0	8.5 - 6.7	14.5 - 11.5
26	11°51.5	11°53.4	11°19.1	2.6 - 2.1	8.6 - 6.8	14.6 - 11.6
27	11°51.8	11°53.7	11°19.3	2.7 - 2.1	8.7 - 6.9	14.7 - 11.6
28	11°52.0	11°53.9	11°19.6	2.8 - 2.2	8.8 - 7.0	14.8 - 11.7
29	11°52.3	11°54.2	11°19.8	2.9 - 2.3	8.9 - 7.0	14.9 - 11.8
30	11°52.5	11°54.4	11°20.0	3.0 - 2.4	9.0 - 7.1	15.0 - 11.9
31	11°52.7	11°54.7	11°20.3	3.1 - 2.5	9.1 - 7.2	15.1 - 12.0
32	11°53.0	11°54.9	11°20.5	3.2 - 2.5	9.2 - 7.3	15.2 - 12.0
33	11°53.2	11°55.2	11°20.8	3.3 - 2.6	9.3 - 7.4	15.3 - 12.1
34	11°53.5	11°55.5	11°21.0	3.4 - 2.7	9.4 - 7.4	15.4 - 12.2
35	11°53.8	11°55.7	11°21.2	3.5 - 2.8	9.5 - 7.5	15.5 - 12.3
36	11°54.0	11°56.0	11°21.5	3.6 - 2.9	9.6 - 7.6	15.6 - 12.3
37	11°54.3	11°56.2	11°21.7	3.7 - 2.9	9.7 - 7.7	15.7 - 12.4
38	11°54.5	11°56.5	11°22.0	3.8 - 3.0	9.8 - 7.8	15.8 - 12.5
39	11°54.7	11°56.7	11°22.2	3.9 - 3.1	9.9 - 7.8	15.9 - 12.6
40	11°55.0	11°57.0	11°22.4	4.0 - 3.2	10.0 - 7.9	16.0 - 12.7
41	11°55.2	11°57.2	11°22.7	4.1 - 3.2	10.1 - 8.0	16.1 - 12.7
42	11°55.5	11°57.5	11°22.9	4.2 - 3.3	10.2 - 8.1	16.2 - 12.8
43	11°55.8	11°57.7	11°23.1	4.3 - 3.4	10.3 - 8.2	16.3 - 12.9
44	11°56.0	11°58.0	11°23.4	4.4 - 3.5	10.4 - 8.2	16.4 - 13.0
45	11°56.3	11°58.2	11°23.6	4.5 - 3.6	10.5 - 8.3	16.5 - 13.1
46	11°56.5	11°58.5	11°23.9	4.6 - 3.6	10.6 - 8.4	16.6 - 13.1
47	11°56.7	11°58.7	11°24.1	4.7 - 3.7	10.7 - 8.5	16.7 - 13.2
48	11°57.0	11°59.0	11°24.3	4.8 - 3.8	10.8 - 8.6	16.8 - 13.3
49	11°57.3	11°59.2	11°24.6	4.9 - 3.9	10.9 - 8.6	16.9 - 13.4
50	11°57.5	11°59.5	11°24.8	5.0 - 4.0	11.0 - 8.7	17.0 - 13.5
51	11°57.8	11°59.7	11°25.1	5.1 - 4.0	11.1 - 8.8	17.1 - 13.5
52	11°58.0	12°00.0	11°25.3	5.2 - 4.1	11.2 - 8.9	17.2 - 13.6
53	11°58.2	12°00.2	11°25.5	5.3 - 4.2	11.3 - 8.9	17.3 - 13.7
54	11°58.5	12°00.5	11°25.8	5.4 - 4.3	11.4 - 9.0	17.4 - 13.8
55	11°58.7	12°00.7	11°26.0	5.5 - 4.4	11.5 - 9.1	17.5 - 13.9
56	11°59.0	12°01.0	11°26.2	5.6 - 4.4	11.6 - 9.2	17.6 - 13.9
57	11°59.3	12°01.2	11°26.5	5.7 - 4.5	11.7 - 9.3	17.7 - 14.0
58	11°59.5	12°01.5	11°26.7	5.8 - 4.6	11.8 - 9.3	17.8 - 14.1
59	11°59.8	12°01.7	11°27.0	5.9 - 4.7	11.9 - 9.4	17.9 - 14.2

Increments and Corrections

m 48	Sun Plan.	Aries	Moon	v and d corr		
0	12°00.0	12°02.0	11°27.2	0.0 - 0.0	6.0 - 4.8	12.0 - 9.7
1	12°00.2	12°02.2	11°27.4	0.1 - 0.1	6.1 - 4.9	12.1 - 9.8
2	12°00.5	12°02.5	11°27.7	0.2 - 0.2	6.2 - 5.0	12.2 - 9.9
3	12°00.7	12°02.7	11°27.9	0.3 - 0.2	6.3 - 5.1	12.3 - 9.9
4	12°01.0	12°03.0	11°28.2	0.4 - 0.3	6.4 - 5.2	12.4 - 10.0
5	12°01.3	12°03.2	11°28.4	0.5 - 0.4	6.5 - 5.3	12.5 - 10.1
6	12°01.5	12°03.5	11°28.6	0.6 - 0.5	6.6 - 5.3	12.6 - 10.2
7	12°01.8	12°03.7	11°28.9	0.7 - 0.6	6.7 - 5.4	12.7 - 10.3
8	12°02.0	12°04.0	11°29.1	0.8 - 0.6	6.8 - 5.5	12.8 - 10.3
9	12°02.2	12°04.2	11°29.3	0.9 - 0.7	6.9 - 5.6	12.9 - 10.4
10	12°02.5	12°04.5	11°29.6	1.0 - 0.8	7.0 - 5.7	13.0 - 10.5
11	12°02.7	12°04.7	11°29.8	1.1 - 0.9	7.1 - 5.7	13.1 - 10.6
12	12°03.0	12°05.0	11°30.1	1.2 - 1.0	7.2 - 5.8	13.2 - 10.7
13	12°03.3	12°05.2	11°30.3	1.3 - 1.1	7.3 - 5.9	13.3 - 10.8
14	12°03.5	12°05.5	11°30.5	1.4 - 1.1	7.4 - 6.0	13.4 - 10.8
15	12°03.8	12°05.7	11°30.8	1.5 - 1.2	7.5 - 6.1	13.5 - 10.9
16	12°04.0	12°06.0	11°31.0	1.6 - 1.3	7.6 - 6.1	13.6 - 11.0
17	12°04.2	12°06.2	11°31.3	1.7 - 1.4	7.7 - 6.2	13.7 - 11.1
18	12°04.5	12°06.5	11°31.5	1.8 - 1.5	7.8 - 6.3	13.8 - 11.2
19	12°04.8	12°06.7	11°31.7	1.9 - 1.5	7.9 - 6.4	13.9 - 11.2
20	12°05.0	12°07.0	11°32.0	2.0 - 1.6	8.0 - 6.5	14.0 - 11.3
21	12°05.3	12°07.2	11°32.2	2.1 - 1.7	8.1 - 6.5	14.1 - 11.4
22	12°05.5	12°07.5	11°32.4	2.2 - 1.8	8.2 - 6.6	14.2 - 11.5
23	12°05.7	12°07.7	11°32.7	2.3 - 1.9	8.3 - 6.7	14.3 - 11.6
24	12°06.0	12°08.0	11°32.9	2.4 - 1.9	8.4 - 6.8	14.4 - 11.6
25	12°06.2	12°08.2	11°33.2	2.5 - 2.0	8.5 - 6.9	14.5 - 11.7
26	12°06.5	12°08.5	11°33.4	2.6 - 2.1	8.6 - 7.0	14.6 - 11.8
27	12°06.8	12°08.7	11°33.6	2.7 - 2.2	8.7 - 7.0	14.7 - 11.9
28	12°07.0	12°09.0	11°33.9	2.8 - 2.3	8.8 - 7.1	14.8 - 12.0
29	12°07.3	12°09.2	11°34.1	2.9 - 2.3	8.9 - 7.2	14.9 - 12.0
30	12°07.5	12°09.5	11°34.4	3.0 - 2.4	9.0 - 7.3	15.0 - 12.1
31	12°07.7	12°09.7	11°34.6	3.1 - 2.5	9.1 - 7.4	15.1 - 12.2
32	12°08.0	12°10.0	11°34.8	3.2 - 2.6	9.2 - 7.4	15.2 - 12.3
33	12°08.2	12°10.2	11°35.1	3.3 - 2.7	9.3 - 7.5	15.3 - 12.4
34	12°08.5	12°10.5	11°35.3	3.4 - 2.7	9.4 - 7.6	15.4 - 12.4
35	12°08.8	12°10.7	11°35.6	3.5 - 2.8	9.5 - 7.7	15.5 - 12.5
36	12°09.0	12°11.0	11°35.8	3.6 - 2.9	9.6 - 7.8	15.6 - 12.6
37	12°09.3	12°11.2	11°36.0	3.7 - 3.0	9.7 - 7.8	15.7 - 12.7
38	12°09.5	12°11.5	11°36.3	3.8 - 3.1	9.8 - 7.9	15.8 - 12.8
39	12°09.7	12°11.7	11°36.5	3.9 - 3.2	9.9 - 8.0	15.9 - 12.9
40	12°10.0	12°12.0	11°36.7	4.0 - 3.2	10.0 - 8.1	16.0 - 12.9
41	12°10.2	12°12.2	11°37.0	4.1 - 3.3	10.1 - 8.2	16.1 - 13.0
42	12°10.5	12°12.5	11°37.2	4.2 - 3.4	10.2 - 8.2	16.2 - 13.1
43	12°10.8	12°12.7	11°37.5	4.3 - 3.5	10.3 - 8.3	16.3 - 13.2
44	12°11.0	12°13.0	11°37.7	4.4 - 3.6	10.4 - 8.4	16.4 - 13.3
45	12°11.3	12°13.2	11°37.9	4.5 - 3.6	10.5 - 8.5	16.5 - 13.3
46	12°11.5	12°13.5	11°38.2	4.6 - 3.7	10.6 - 8.6	16.6 - 13.4
47	12°11.7	12°13.8	11°38.4	4.7 - 3.8	10.7 - 8.6	16.7 - 13.5
48	12°12.0	12°14.0	11°38.7	4.8 - 3.9	10.8 - 8.7	16.8 - 13.6
49	12°12.3	12°14.3	11°38.9	4.9 - 4.0	10.9 - 8.8	16.9 - 13.7
50	12°12.5	12°14.5	11°39.1	5.0 - 4.0	11.0 - 8.9	17.0 - 13.7
51	12°12.8	12°14.8	11°39.4	5.1 - 4.1	11.1 - 9.0	17.1 - 13.8
52	12°13.0	12°15.0	11°39.6	5.2 - 4.2	11.2 - 9.1	17.2 - 13.9
53	12°13.2	12°15.3	11°39.8	5.3 - 4.3	11.3 - 9.1	17.3 - 14.0
54	12°13.5	12°15.5	11°40.1	5.4 - 4.4	11.4 - 9.2	17.4 - 14.1
55	12°13.7	12°15.8	11°40.3	5.5 - 4.4	11.5 - 9.3	17.5 - 14.1
56	12°14.0	12°16.0	11°40.6	5.6 - 4.5	11.6 - 9.4	17.6 - 14.2
57	12°14.3	12°16.3	11°40.8	5.7 - 4.6	11.7 - 9.5	17.7 - 14.3
58	12°14.5	12°16.5	11°41.0	5.8 - 4.7	11.8 - 9.5	17.8 - 14.4
59	12°14.8	12°16.8	11°41.3	5.9 - 4.8	11.9 - 9.6	17.9 - 14.5

m 49	Sun Plan.	Aries	Moon	v and d corr		
0	12°15.0	12°17.0	11°41.5	0.0 - 0.0	6.0 - 4.9	12.0 - 9.9
1	12°15.2	12°17.3	11°41.8	0.1 - 0.1	6.1 - 5.0	12.1 - 10.0
2	12°15.5	12°17.5	11°42.0	0.2 - 0.2	6.2 - 5.1	12.2 - 10.1
3	12°15.7	12°17.8	11°42.2	0.3 - 0.2	6.3 - 5.2	12.3 - 10.1
4	12°16.0	12°18.0	11°42.5	0.4 - 0.3	6.4 - 5.3	12.4 - 10.2
5	12°16.3	12°18.3	11°42.7	0.5 - 0.4	6.5 - 5.4	12.5 - 10.3
6	12°16.5	12°18.5	11°42.9	0.6 - 0.5	6.6 - 5.4	12.6 - 10.4
7	12°16.8	12°18.8	11°43.2	0.7 - 0.6	6.7 - 5.5	12.7 - 10.5
8	12°17.0	12°19.0	11°43.4	0.8 - 0.7	6.8 - 5.6	12.8 - 10.6
9	12°17.2	12°19.3	11°43.7	0.9 - 0.7	6.9 - 5.7	12.9 - 10.6
10	12°17.5	12°19.5	11°43.9	1.0 - 0.8	7.0 - 5.8	13.0 - 10.7
11	12°17.7	12°19.8	11°44.1	1.1 - 0.9	7.1 - 5.9	13.1 - 10.8
12	12°18.0	12°20.0	11°44.4	1.2 - 1.0	7.2 - 5.9	13.2 - 10.9
13	12°18.3	12°20.3	11°44.6	1.3 - 1.1	7.3 - 6.0	13.3 - 11.0
14	12°18.5	12°20.5	11°44.9	1.4 - 1.2	7.4 - 6.1	13.4 - 11.1
15	12°18.8	12°20.8	11°45.1	1.5 - 1.2	7.5 - 6.2	13.5 - 11.1
16	12°19.0	12°21.0	11°45.3	1.6 - 1.3	7.6 - 6.3	13.6 - 11.2
17	12°19.2	12°21.3	11°45.6	1.7 - 1.4	7.7 - 6.4	13.7 - 11.3
18	12°19.5	12°21.5	11°45.8	1.8 - 1.5	7.8 - 6.4	13.8 - 11.4
19	12°19.8	12°21.8	11°46.1	1.9 - 1.6	7.9 - 6.5	13.9 - 11.5
20	12°20.0	12°22.0	11°46.3	2.0 - 1.6	8.0 - 6.6	14.0 - 11.5
21	12°20.3	12°22.3	11°46.5	2.1 - 1.7	8.1 - 6.7	14.1 - 11.6
22	12°20.5	12°22.5	11°46.8	2.2 - 1.8	8.2 - 6.8	14.2 - 11.7
23	12°20.7	12°22.8	11°47.0	2.3 - 1.9	8.3 - 6.8	14.3 - 11.8
24	12°21.0	12°23.0	11°47.2	2.4 - 2.0	8.4 - 6.9	14.4 - 11.9
25	12°21.2	12°23.3	11°47.5	2.5 - 2.1	8.5 - 7.0	14.5 - 12.0
26	12°21.5	12°23.5	11°47.7	2.6 - 2.1	8.6 - 7.1	14.6 - 12.0
27	12°21.8	12°23.8	11°48.0	2.7 - 2.2	8.7 - 7.2	14.7 - 12.1
28	12°22.0	12°24.0	11°48.2	2.8 - 2.3	8.8 - 7.3	14.8 - 12.2
29	12°22.3	12°24.3	11°48.4	2.9 - 2.4	8.9 - 7.3	14.9 - 12.3
30	12°22.5	12°24.5	11°48.7	3.0 - 2.5	9.0 - 7.4	15.0 - 12.4
31	12°22.7	12°24.8	11°48.9	3.1 - 2.6	9.1 - 7.5	15.1 - 12.5
32	12°23.0	12°25.0	11°49.2	3.2 - 2.6	9.2 - 7.6	15.2 - 12.5
33	12°23.2	12°25.3	11°49.4	3.3 - 2.7	9.3 - 7.7	15.3 - 12.6
34	12°23.5	12°25.5	11°49.6	3.4 - 2.8	9.4 - 7.8	15.4 - 12.7
35	12°23.8	12°25.8	11°49.9	3.5 - 2.9	9.5 - 7.8	15.5 - 12.8
36	12°24.0	12°26.0	11°50.1	3.6 - 3.0	9.6 - 7.9	15.6 - 12.9
37	12°24.3	12°26.3	11°50.3	3.7 - 3.1	9.7 - 8.0	15.7 - 13.0
38	12°24.5	12°26.5	11°50.6	3.8 - 3.1	9.8 - 8.1	15.8 - 13.0
39	12°24.7	12°26.8	11°50.8	3.9 - 3.2	9.9 - 8.2	15.9 - 13.1
40	12°25.0	12°27.0	11°51.1	4.0 - 3.3	10.0 - 8.3	16.0 - 13.2
41	12°25.2	12°27.3	11°51.3	4.1 - 3.4	10.1 - 8.3	16.1 - 13.3
42	12°25.5	12°27.5	11°51.5	4.2 - 3.5	10.2 - 8.4	16.2 - 13.4
43	12°25.8	12°27.8	11°51.8	4.3 - 3.5	10.3 - 8.5	16.3 - 13.4
44	12°26.0	12°28.0	11°52.0	4.4 - 3.6	10.4 - 8.6	16.4 - 13.5
45	12°26.3	12°28.3	11°52.3	4.5 - 3.7	10.5 - 8.7	16.5 - 13.6
46	12°26.5	12°28.5	11°52.5	4.6 - 3.8	10.6 - 8.7	16.6 - 13.7
47	12°26.7	12°28.8	11°52.7	4.7 - 3.9	10.7 - 8.8	16.7 - 13.8
48	12°27.0	12°29.0	11°53.0	4.8 - 4.0	10.8 - 8.9	16.8 - 13.9
49	12°27.3	12°29.3	11°53.2	4.9 - 4.0	10.9 - 9.0	16.9 - 13.9
50	12°27.5	12°29.5	11°53.4	5.0 - 4.1	11.0 - 9.1	17.0 - 14.0
51	12°27.8	12°29.8	11°53.7	5.1 - 4.2	11.1 - 9.2	17.1 - 14.1
52	12°28.0	12°30.0	11°53.9	5.2 - 4.3	11.2 - 9.2	17.2 - 14.2
53	12°28.2	12°30.3	11°54.2	5.3 - 4.4	11.3 - 9.3	17.3 - 14.3
54	12°28.5	12°30.5	11°54.4	5.4 - 4.5	11.4 - 9.4	17.4 - 14.4
55	12°28.7	12°30.8	11°54.6	5.5 - 4.5	11.5 - 9.5	17.5 - 14.4
56	12°29.0	12°31.0	11°54.9	5.6 - 4.6	11.6 - 9.6	17.6 - 14.5
57	12°29.3	12°31.3	11°55.1	5.7 - 4.7	11.7 - 9.7	17.7 - 14.6
58	12°29.5	12°31.5	11°55.4	5.8 - 4.8	11.8 - 9.7	17.8 - 14.7
59	12°29.8	12°31.8	11°55.6	5.9 - 4.9	11.9 - 9.8	17.9 - 14.8

m 50	Sun Plan.	Aries	Moon	v and d corr		
0	12°30.0	12°32.1	11°55.8	0.0 - 0.0	6.0 - 5.0	12.0 - 10.1
1	12°30.2	12°32.3	11°56.1	0.1 - 0.1	6.1 - 5.1	12.1 - 10.2
2	12°30.5	12°32.6	11°56.3	0.2 - 0.2	6.2 - 5.2	12.2 - 10.3
3	12°30.7	12°32.8	11°56.5	0.3 - 0.3	6.3 - 5.3	12.3 - 10.4
4	12°31.0	12°33.1	11°56.8	0.4 - 0.3	6.4 - 5.4	12.4 - 10.4
5	12°31.3	12°33.3	11°57.0	0.5 - 0.4	6.5 - 5.5	12.5 - 10.5
6	12°31.5	12°33.6	11°57.3	0.6 - 0.5	6.6 - 5.6	12.6 - 10.6
7	12°31.8	12°33.8	11°57.5	0.7 - 0.6	6.7 - 5.6	12.7 - 10.7
8	12°32.0	12°34.1	11°57.7	0.8 - 0.7	6.8 - 5.7	12.8 - 10.8
9	12°32.2	12°34.3	11°58.0	0.9 - 0.8	6.9 - 5.8	12.9 - 10.9
10	12°32.5	12°34.6	11°58.2	1.0 - 0.8	7.0 - 5.9	13.0 - 10.9
11	12°32.7	12°34.8	11°58.5	1.1 - 0.9	7.1 - 6.0	13.1 - 11.0
12	12°33.0	12°35.1	11°58.7	1.2 - 1.0	7.2 - 6.1	13.2 - 11.1
13	12°33.3	12°35.3	11°58.9	1.3 - 1.1	7.3 - 6.1	13.3 - 11.2
14	12°33.5	12°35.6	11°59.2	1.4 - 1.2	7.4 - 6.2	13.4 - 11.3
15	12°33.8	12°35.8	11°59.4	1.5 - 1.3	7.5 - 6.3	13.5 - 11.4
16	12°34.0	12°36.1	11°59.7	1.6 - 1.3	7.6 - 6.4	13.6 - 11.4
17	12°34.2	12°36.3	11°59.9	1.7 - 1.4	7.7 - 6.5	13.7 - 11.5
18	12°34.5	12°36.6	12°00.1	1.8 - 1.5	7.8 - 6.6	13.8 - 11.6
19	12°34.8	12°36.8	12°00.4	1.9 - 1.6	7.9 - 6.6	13.9 - 11.7
20	12°35.0	12°37.1	12°00.6	2.0 - 1.7	8.0 - 6.7	14.0 - 11.8
21	12°35.3	12°37.3	12°00.8	2.1 - 1.8	8.1 - 6.8	14.1 - 11.9
22	12°35.5	12°37.6	12°01.1	2.2 - 1.9	8.2 - 6.9	14.2 - 12.0
23	12°35.7	12°37.8	12°01.3	2.3 - 1.9	8.3 - 7.0	14.3 - 12.0
24	12°36.0	12°38.1	12°01.6	2.4 - 2.0	8.4 - 7.1	14.4 - 12.1
25	12°36.2	12°38.3	12°01.8	2.5 - 2.1	8.5 - 7.2	14.5 - 12.2
26	12°36.5	12°38.6	12°02.0	2.6 - 2.2	8.6 - 7.2	14.6 - 12.3
27	12°36.8	12°38.8	12°02.3	2.7 - 2.3	8.7 - 7.3	14.7 - 12.4
28	12°37.0	12°39.1	12°02.5	2.8 - 2.4	8.8 - 7.4	14.8 - 12.5
29	12°37.3	12°39.3	12°02.8	2.9 - 2.4	8.9 - 7.5	14.9 - 12.5
30	12°37.5	12°39.6	12°03.0	3.0 - 2.5	9.0 - 7.6	15.0 - 12.6
31	12°37.7	12°39.8	12°03.2	3.1 - 2.6	9.1 - 7.7	15.1 - 12.7
32	12°38.0	12°40.1	12°03.5	3.2 - 2.7	9.2 - 7.7	15.2 - 12.8
33	12°38.2	12°40.3	12°03.7	3.3 - 2.8	9.3 - 7.8	15.3 - 12.9
34	12°38.5	12°40.6	12°03.9	3.4 - 2.9	9.4 - 7.9	15.4 - 13.0
35	12°38.8	12°40.8	12°04.2	3.5 - 2.9	9.5 - 8.0	15.5 - 13.0
36	12°39.0	12°41.1	12°04.4	3.6 - 3.0	9.6 - 8.1	15.6 - 13.1
37	12°39.3	12°41.3	12°04.7	3.7 - 3.1	9.7 - 8.2	15.7 - 13.2
38	12°39.5	12°41.6	12°04.9	3.8 - 3.2	9.8 - 8.2	15.8 - 13.3
39	12°39.7	12°41.8	12°05.1	3.9 - 3.3	9.9 - 8.3	15.9 - 13.4
40	12°40.0	12°42.1	12°05.4	4.0 - 3.4	10.0 - 8.4	16.0 - 13.5
41	12°40.2	12°42.3	12°05.6	4.1 - 3.5	10.1 - 8.5	16.1 - 13.6
42	12°40.5	12°42.6	12°05.9	4.2 - 3.5	10.2 - 8.6	16.2 - 13.6
43	12°40.8	12°42.8	12°06.1	4.3 - 3.6	10.3 - 8.7	16.3 - 13.7
44	12°41.0	12°43.1	12°06.3	4.4 - 3.7	10.4 - 8.8	16.4 - 13.8
45	12°41.3	12°43.3	12°06.6	4.5 - 3.8	10.5 - 8.8	16.5 - 13.9
46	12°41.5	12°43.6	12°06.8	4.6 - 3.9	10.6 - 8.9	16.6 - 14.0
47	12°41.7	12°43.8	12°07.0	4.7 - 4.0	10.7 - 9.0	16.7 - 14.1
48	12°42.0	12°44.1	12°07.3	4.8 - 4.0	10.8 - 9.1	16.8 - 14.1
49	12°42.3	12°44.3	12°07.5	4.9 - 4.1	10.9 - 9.2	16.9 - 14.2
50	12°42.5	12°44.6	12°07.8	5.0 - 4.2	11.0 - 9.3	17.0 - 14.3
51	12°42.8	12°44.8	12°08.0	5.1 - 4.3	11.1 - 9.3	17.1 - 14.4
52	12°43.0	12°45.1	12°08.2	5.2 - 4.4	11.2 - 9.4	17.2 - 14.5
53	12°43.2	12°45.3	12°08.5	5.3 - 4.5	11.3 - 9.5	17.3 - 14.6
54	12°43.5	12°45.6	12°08.7	5.4 - 4.5	11.4 - 9.6	17.4 - 14.6
55	12°43.7	12°45.8	12°09.0	5.5 - 4.6	11.5 - 9.7	17.5 - 14.7
56	12°44.0	12°46.1	12°09.2	5.6 - 4.7	11.6 - 9.8	17.6 - 14.8
57	12°44.3	12°46.3	12°09.4	5.7 - 4.8	11.7 - 9.8	17.7 - 14.9
58	12°44.5	12°46.6	12°09.7	5.8 - 4.9	11.8 - 9.9	17.8 - 15.0
59	12°44.8	12°46.8	12°09.9	5.9 - 5.0	11.9 - 10.0	17.9 - 15.1

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
51	Plan.					
0	12°45.0	12°47.1	12°10.1	0.0 - 0.0	6.0 - 5.1	12.0 - 10.3
1	12°45.2	12°47.3	12°10.4	0.1 - 0.1	6.1 - 5.2	12.1 - 10.4
2	12°45.5	12°47.6	12°10.6	0.2 - 0.2	6.2 - 5.3	12.2 - 10.5
3	12°45.7	12°47.8	12°10.9	0.3 - 0.3	6.3 - 5.4	12.3 - 10.6
4	12°46.0	12°48.1	12°11.1	0.4 - 0.3	6.4 - 5.5	12.4 - 10.6
5	12°46.3	12°48.3	12°11.3	0.5 - 0.4	6.5 - 5.6	12.5 - 10.7
6	12°46.5	12°48.6	12°11.6	0.6 - 0.5	6.6 - 5.7	12.6 - 10.8
7	12°46.8	12°48.8	12°11.8	0.7 - 0.6	6.7 - 5.8	12.7 - 10.9
8	12°47.0	12°49.1	12°12.1	0.8 - 0.7	6.8 - 5.8	12.8 - 11.0
9	12°47.2	12°49.3	12°12.3	0.9 - 0.8	6.9 - 5.9	12.9 - 11.1
10	12°47.5	12°49.6	12°12.5	1.0 - 0.9	7.0 - 6.0	13.0 - 11.2
11	12°47.7	12°49.8	12°12.8	1.1 - 0.9	7.1 - 6.1	13.1 - 11.2
12	12°48.0	12°50.1	12°13.0	1.2 - 1.0	7.2 - 6.2	13.2 - 11.3
13	12°48.3	12°50.3	12°13.3	1.3 - 1.1	7.3 - 6.3	13.3 - 11.4
14	12°48.5	12°50.6	12°13.5	1.4 - 1.2	7.4 - 6.4	13.4 - 11.5
15	12°48.8	12°50.9	12°13.7	1.5 - 1.3	7.5 - 6.4	13.5 - 11.6
16	12°49.0	12°51.1	12°14.0	1.6 - 1.4	7.6 - 6.5	13.6 - 11.7
17	12°49.2	12°51.4	12°14.2	1.7 - 1.5	7.7 - 6.6	13.7 - 11.8
18	12°49.5	12°51.6	12°14.4	1.8 - 1.5	7.8 - 6.7	13.8 - 11.8
19	12°49.8	12°51.9	12°14.7	1.9 - 1.6	7.9 - 6.8	13.9 - 11.9
20	12°50.0	12°52.1	12°14.9	2.0 - 1.7	8.0 - 6.9	14.0 - 12.0
21	12°50.3	12°52.4	12°15.2	2.1 - 1.8	8.1 - 7.0	14.1 - 12.1
22	12°50.5	12°52.6	12°15.4	2.2 - 1.9	8.2 - 7.0	14.2 - 12.2
23	12°50.7	12°52.9	12°15.6	2.3 - 2.0	8.3 - 7.1	14.3 - 12.3
24	12°51.0	12°53.1	12°15.9	2.4 - 2.1	8.4 - 7.2	14.4 - 12.4
25	12°51.2	12°53.4	12°16.1	2.5 - 2.1	8.5 - 7.3	14.5 - 12.4
26	12°51.5	12°53.6	12°16.4	2.6 - 2.2	8.6 - 7.4	14.6 - 12.5
27	12°51.8	12°53.9	12°16.6	2.7 - 2.3	8.7 - 7.5	14.7 - 12.6
28	12°52.0	12°54.1	12°16.8	2.8 - 2.4	8.8 - 7.6	14.8 - 12.7
29	12°52.3	12°54.4	12°17.1	2.9 - 2.5	8.9 - 7.6	14.9 - 12.8
30	12°52.5	12°54.6	12°17.3	3.0 - 2.6	9.0 - 7.7	15.0 - 12.9
31	12°52.7	12°54.9	12°17.5	3.1 - 2.7	9.1 - 7.8	15.1 - 13.0
32	12°53.0	12°55.1	12°17.8	3.2 - 2.7	9.2 - 7.9	15.2 - 13.0
33	12°53.2	12°55.4	12°18.0	3.3 - 2.8	9.3 - 8.0	15.3 - 13.1
34	12°53.5	12°55.6	12°18.3	3.4 - 2.9	9.4 - 8.1	15.4 - 13.2
35	12°53.8	12°55.9	12°18.5	3.5 - 3.0	9.5 - 8.2	15.5 - 13.3
36	12°54.0	12°56.1	12°18.7	3.6 - 3.1	9.6 - 8.2	15.6 - 13.4
37	12°54.3	12°56.4	12°19.0	3.7 - 3.2	9.7 - 8.3	15.7 - 13.5
38	12°54.5	12°56.6	12°19.2	3.8 - 3.3	9.8 - 8.4	15.8 - 13.6
39	12°54.7	12°56.9	12°19.5	3.9 - 3.3	9.9 - 8.5	15.9 - 13.6
40	12°55.0	12°57.1	12°19.7	4.0 - 3.4	10.0 - 8.6	16.0 - 13.7
41	12°55.2	12°57.4	12°19.9	4.1 - 3.5	10.1 - 8.7	16.1 - 13.8
42	12°55.5	12°57.6	12°20.2	4.2 - 3.6	10.2 - 8.8	16.2 - 13.9
43	12°55.8	12°57.9	12°20.4	4.3 - 3.7	10.3 - 8.8	16.3 - 14.0
44	12°56.0	12°58.1	12°20.6	4.4 - 3.8	10.4 - 8.9	16.4 - 14.1
45	12°56.3	12°58.4	12°20.9	4.5 - 3.9	10.5 - 9.0	16.5 - 14.2
46	12°56.5	12°58.6	12°21.1	4.6 - 3.9	10.6 - 9.1	16.6 - 14.2
47	12°56.7	12°58.9	12°21.4	4.7 - 4.0	10.7 - 9.2	16.7 - 14.3
48	12°57.0	12°59.1	12°21.6	4.8 - 4.1	10.8 - 9.3	16.8 - 14.4
49	12°57.3	12°59.4	12°21.8	4.9 - 4.2	10.9 - 9.4	16.9 - 14.5
50	12°57.5	12°59.6	12°22.1	5.0 - 4.3	11.0 - 9.4	17.0 - 14.6
51	12°57.8	12°59.9	12°22.3	5.1 - 4.4	11.1 - 9.5	17.1 - 14.7
52	12°58.0	13°00.1	12°22.6	5.2 - 4.5	11.2 - 9.6	17.2 - 14.8
53	12°58.2	13°00.4	12°22.8	5.3 - 4.5	11.3 - 9.7	17.3 - 14.8
54	12°58.5	13°00.6	12°23.0	5.4 - 4.6	11.4 - 9.8	17.4 - 14.9
55	12°58.7	13°00.9	12°23.3	5.5 - 4.7	11.5 - 9.9	17.5 - 15.0
56	12°59.0	13°01.1	12°23.5	5.6 - 4.8	11.6 - 10.0	17.6 - 15.1
57	12°59.3	13°01.4	12°23.8	5.7 - 4.9	11.7 - 10.0	17.7 - 15.2
58	12°59.5	13°01.6	12°24.0	5.8 - 5.0	11.8 - 10.1	17.8 - 15.3
59	12°59.8	13°01.9	12°24.2	5.9 - 5.1	11.9 - 10.2	17.9 - 15.4

m	Sun	Aries	Moon	v and d corr		
52	Plan.					
0	13°00.0	13°02.1	12°24.5	0.0 - 0.0	6.0 - 5.3	12.0 - 10.5
1	13°00.2	13°02.4	12°24.7	0.1 - 0.1	6.1 - 5.3	12.1 - 10.6
2	13°00.5	13°02.6	12°24.9	0.2 - 0.2	6.2 - 5.4	12.2 - 10.7
3	13°00.7	13°02.9	12°25.2	0.3 - 0.3	6.3 - 5.5	12.3 - 10.8
4	13°01.0	13°03.1	12°25.4	0.4 - 0.4	6.4 - 5.6	12.4 - 10.8
5	13°01.3	13°03.4	12°25.7	0.5 - 0.4	6.5 - 5.7	12.5 - 10.9
6	13°01.5	13°03.6	12°25.9	0.6 - 0.5	6.6 - 5.8	12.6 - 11.0
7	13°01.8	13°03.9	12°26.1	0.7 - 0.6	6.7 - 5.9	12.7 - 11.1
8	13°02.0	13°04.1	12°26.4	0.8 - 0.7	6.8 - 6.0	12.8 - 11.2
9	13°02.2	13°04.4	12°26.6	0.9 - 0.8	6.9 - 6.0	12.9 - 11.3
10	13°02.5	13°04.6	12°26.9	1.0 - 0.9	7.0 - 6.1	13.0 - 11.4
11	13°02.7	13°04.9	12°27.1	1.1 - 1.0	7.1 - 6.2	13.1 - 11.5
12	13°03.0	13°05.1	12°27.3	1.2 - 1.1	7.2 - 6.3	13.2 - 11.5
13	13°03.3	13°05.4	12°27.6	1.3 - 1.1	7.3 - 6.4	13.3 - 11.6
14	13°03.5	13°05.6	12°27.8	1.4 - 1.2	7.4 - 6.5	13.4 - 11.7
15	13°03.8	13°05.9	12°28.0	1.5 - 1.3	7.5 - 6.6	13.5 - 11.8
16	13°04.0	13°06.1	12°28.3	1.6 - 1.4	7.6 - 6.6	13.6 - 11.9
17	13°04.2	13°06.4	12°28.5	1.7 - 1.5	7.7 - 6.7	13.7 - 12.0
18	13°04.5	13°06.6	12°28.8	1.8 - 1.6	7.8 - 6.8	13.8 - 12.1
19	13°04.8	13°06.9	12°29.0	1.9 - 1.7	7.9 - 6.9	13.9 - 12.2
20	13°05.0	13°07.1	12°29.2	2.0 - 1.8	8.0 - 7.0	14.0 - 12.3
21	13°05.3	13°07.4	12°29.5	2.1 - 1.8	8.1 - 7.1	14.1 - 12.3
22	13°05.5	13°07.6	12°29.7	2.2 - 1.9	8.2 - 7.2	14.2 - 12.4
23	13°05.7	13°07.9	12°30.0	2.3 - 2.0	8.3 - 7.3	14.3 - 12.5
24	13°06.0	13°08.1	12°30.2	2.4 - 2.1	8.4 - 7.4	14.4 - 12.6
25	13°06.2	13°08.4	12°30.4	2.5 - 2.2	8.5 - 7.4	14.5 - 12.7
26	13°06.5	13°08.6	12°30.7	2.6 - 2.3	8.6 - 7.5	14.6 - 12.8
27	13°06.8	13°08.9	12°30.9	2.7 - 2.4	8.7 - 7.6	14.7 - 12.9
28	13°07.0	13°09.2	12°31.1	2.8 - 2.5	8.8 - 7.7	14.8 - 13.0
29	13°07.3	13°09.4	12°31.4	2.9 - 2.5	8.9 - 7.8	14.9 - 13.0
30	13°07.5	13°09.7	12°31.6	3.0 - 2.6	9.0 - 7.9	15.0 - 13.1
31	13°07.7	13°09.9	12°31.9	3.1 - 2.7	9.1 - 8.0	15.1 - 13.2
32	13°08.0	13°10.2	12°32.1	3.2 - 2.8	9.2 - 8.0	15.2 - 13.3
33	13°08.2	13°10.4	12°32.3	3.3 - 2.9	9.3 - 8.1	15.3 - 13.4
34	13°08.5	13°10.7	12°32.6	3.4 - 3.0	9.4 - 8.2	15.4 - 13.5
35	13°08.8	13°10.9	12°32.8	3.5 - 3.1	9.5 - 8.3	15.5 - 13.6
36	13°09.0	13°11.2	12°33.1	3.6 - 3.1	9.6 - 8.4	15.6 - 13.7
37	13°09.3	13°11.4	12°33.3	3.7 - 3.2	9.7 - 8.5	15.7 - 13.7
38	13°09.5	13°11.7	12°33.5	3.8 - 3.3	9.8 - 8.6	15.8 - 13.8
39	13°09.7	13°11.9	12°33.8	3.9 - 3.4	9.9 - 8.7	15.9 - 13.9
40	13°10.0	13°12.2	12°34.0	4.0 - 3.5	10.0 - 8.8	16.0 - 14.0
41	13°10.2	13°12.4	12°34.2	4.1 - 3.6	10.1 - 8.8	16.1 - 14.1
42	13°10.5	13°12.7	12°34.5	4.2 - 3.7	10.2 - 8.9	16.2 - 14.2
43	13°10.8	13°12.9	12°34.7	4.3 - 3.8	10.3 - 9.0	16.3 - 14.3
44	13°11.0	13°13.2	12°35.0	4.4 - 3.9	10.4 - 9.1	16.4 - 14.3
45	13°11.3	13°13.4	12°35.2	4.5 - 3.9	10.5 - 9.2	16.5 - 14.4
46	13°11.5	13°13.7	12°35.4	4.6 - 4.0	10.6 - 9.3	16.6 - 14.5
47	13°11.7	13°13.9	12°35.7	4.7 - 4.1	10.7 - 9.4	16.7 - 14.6
48	13°12.0	13°14.2	12°35.9	4.8 - 4.2	10.8 - 9.5	16.8 - 14.7
49	13°12.3	13°14.4	12°36.2	4.9 - 4.3	10.9 - 9.5	16.9 - 14.8
50	13°12.5	13°14.7	12°36.4	5.0 - 4.4	11.0 - 9.6	17.0 - 14.9
51	13°12.8	13°14.9	12°36.6	5.1 - 4.5	11.1 - 9.7	17.1 - 15.0
52	13°13.0	13°15.2	12°36.9	5.2 - 4.5	11.2 - 9.8	17.2 - 15.0
53	13°13.2	13°15.4	12°37.1	5.3 - 4.6	11.3 - 9.9	17.3 - 15.1
54	13°13.5	13°15.7	12°37.4	5.4 - 4.7	11.4 - 10.0	17.4 - 15.2
55	13°13.7	13°15.9	12°37.6	5.5 - 4.8	11.5 - 10.1	17.5 - 15.3
56	13°14.0	13°16.2	12°37.8	5.6 - 4.9	11.6 - 10.2	17.6 - 15.4
57	13°14.3	13°16.4	12°38.1	5.7 - 5.0	11.7 - 10.2	17.7 - 15.5
58	13°14.5	13°16.7	12°38.3	5.8 - 5.1	11.8 - 10.3	17.8 - 15.6
59	13°14.8	13°16.9	12°38.5	5.9 - 5.2	11.9 - 10.4	17.9 - 15.7

m	Sun	Aries	Moon	v and d corr		
53	Plan.					
0	13°15.0	13°17.2	12°38.8	0.0 - 0.0	6.0 - 5.4	12.0 - 10.7
1	13°15.2	13°17.4	12°39.0	0.1 - 0.1	6.1 - 5.4	12.1 - 10.8
2	13°15.5	13°17.7	12°39.3	0.2 - 0.2	6.2 - 5.5	12.2 - 10.9
3	13°15.7	13°17.9	12°39.5	0.3 - 0.3	6.3 - 5.6	12.3 - 11.0
4	13°16.0	13°18.2	12°39.7	0.4 - 0.4	6.4 - 5.7	12.4 - 11.1
5	13°16.3	13°18.4	12°40.0	0.5 - 0.4	6.5 - 5.8	12.5 - 11.1
6	13°16.5	13°18.7	12°40.2	0.6 - 0.5	6.6 - 5.9	12.6 - 11.2
7	13°16.8	13°18.9	12°40.5	0.7 - 0.6	6.7 - 6.0	12.7 - 11.3
8	13°17.0	13°19.2	12°40.7	0.8 - 0.7	6.8 - 6.1	12.8 - 11.4
9	13°17.2	13°19.4	12°40.9	0.9 - 0.8	6.9 - 6.2	12.9 - 11.5
10	13°17.5	13°19.7	12°41.2	1.0 - 0.9	7.0 - 6.2	13.0 - 11.6
11	13°17.7	13°19.9	12°41.4	1.1 - 1.0	7.1 - 6.3	13.1 - 11.7
12	13°18.0	13°20.2	12°41.6	1.2 - 1.1	7.2 - 6.4	13.2 - 11.8
13	13°18.3	13°20.4	12°41.9	1.3 - 1.2	7.3 - 6.5	13.3 - 11.9
14	13°18.5	13°20.7	12°42.1	1.4 - 1.2	7.4 - 6.6	13.4 - 11.9
15	13°18.8	13°20.9	12°42.4	1.5 - 1.3	7.5 - 6.7	13.5 - 12.0
16	13°19.0	13°21.2	12°42.6	1.6 - 1.4	7.6 - 6.8	13.6 - 12.1
17	13°19.2	13°21.4	12°42.8	1.7 - 1.5	7.7 - 6.9	13.7 - 12.2
18	13°19.5	13°21.7	12°43.1	1.8 - 1.6	7.8 - 7.0	13.8 - 12.3
19	13°19.8	13°21.9	12°43.3	1.9 - 1.7	7.9 - 7.0	13.9 - 12.4
20	13°20.0	13°22.2	12°43.6	2.0 - 1.8	8.0 - 7.1	14.0 - 12.5
21	13°20.3	13°22.4	12°43.8	2.1 - 1.9	8.1 - 7.2	14.1 - 12.6
22	13°20.5	13°22.7	12°44.0	2.2 - 2.0	8.2 - 7.3	14.2 - 12.7
23	13°20.7	13°22.9	12°44.3	2.3 - 2.1	8.3 - 7.4	14.3 - 12.8
24	13°21.0	13°23.2	12°44.5	2.4 - 2.1	8.4 - 7.5	14.4 - 12.8
25	13°21.2	13°23.4	12°44.7	2.5 - 2.2	8.5 - 7.6	14.5 - 12.9
26	13°21.5	13°23.7	12°45.0	2.6 - 2.3	8.6 - 7.7	14.6 - 13.0
27	13°21.8	13°23.9	12°45.2	2.7 - 2.4	8.7 - 7.8	14.7 - 13.1
28	13°22.0	13°24.2	12°45.5	2.8 - 2.5	8.8 - 7.8	14.8 - 13.2
29	13°22.3	13°24.4	12°45.7	2.9 - 2.6	8.9 - 7.9	14.9 - 13.3
30	13°22.5	13°24.7	12°45.9	3.0 - 2.7	9.0 - 8.0	15.0 - 13.4
31	13°22.7	13°24.9	12°46.2	3.1 - 2.8	9.1 - 8.1	15.1 - 13.5
32	13°23.0	13°25.2	12°46.4	3.2 - 2.9	9.2 - 8.2	15.2 - 13.6
33	13°23.2	13°25.4	12°46.7	3.3 - 2.9	9.3 - 8.3	15.3 - 13.6
34	13°23.5	13°25.7	12°46.9	3.4 - 3.0	9.4 - 8.4	15.4 - 13.7
35	13°23.8	13°25.9	12°47.1	3.5 - 3.1	9.5 - 8.5	15.5 - 13.8
36	13°24.0	13°26.2	12°47.4	3.6 - 3.2	9.6 - 8.6	15.6 - 13.9
37	13°24.3	13°26.4	12°47.6	3.7 - 3.3	9.7 - 8.6	15.7 - 14.0
38	13°24.5	13°26.7	12°47.9	3.8 - 3.4	9.8 - 8.7	15.8 - 14.1
39	13°24.7	13°26.9	12°48.1	3.9 - 3.5	9.9 - 8.8	15.9 - 14.2
40	13°25.0	13°27.2	12°48.3	4.0 - 3.6	10.0 - 8.9	16.0 - 14.3
41	13°25.2	13°27.5	12°48.6	4.1 - 3.7	10.1 - 9.0	16.1 - 14.4
42	13°25.5	13°27.7	12°48.8	4.2 - 3.7	10.2 - 9.1	16.2 - 14.4
43	13°25.8	13°28.0	12°49.0	4.3 - 3.8	10.3 - 9.2	16.3 - 14.5
44	13°26.0	13°28.2	12°49.3	4.4 - 3.9	10.4 - 9.3	16.4 - 14.6
45	13°26.3	13°28.5	12°49.5	4.5 - 4.0	10.5 - 9.4	16.5 - 14.7
46	13°26.5	13°28.7	12°49.8	4.6 - 4.1	10.6 - 9.5	16.6 - 14.8
47	13°26.7	13°29.0	12°50.0	4.7 - 4.2	10.7 - 9.5	16.7 - 14.9
48	13°27.0	13°29.2	12°50.2	4.8 - 4.3	10.8 - 9.6	16.8 - 15.0
49	13°27.3	13°29.5	12°50.5	4.9 - 4.4	10.9 - 9.7	16.9 - 15.1
50	13°27.5	13°29.7	12°50.7	5.0 - 4.5	11.0 - 9.8	17.0 - 15.2
51	13°27.8	13°30.0	12°51.0	5.1 - 4.5	11.1 - 9.9	17.1 - 15.2
52	13°28.0	13°30.2	12°51.2	5.2 - 4.6	11.2 - 10.0	17.2 - 15.3
53	13°28.2	13°30.5	12°51.4	5.3 - 4.7	11.3 - 10.1	17.3 - 15.4
54	13°28.5	13°30.7	12°51.7	5.4 - 4.8	11.4 - 10.2	17.4 - 15.5
55	13°28.7	13°31.0	12°51.9	5.5 - 4.9	11.5 - 10.3	17.5 - 15.6
56	13°29.0	13°31.2	12°52.1	5.6 - 5.0	11.6 - 10.3	17.6 - 15.7
57	13°29.3	13°31.5	12°52.4	5.7 - 5.1	11.7 - 10.4	17.7 - 15.8
58	13°29.5	13°31.7	12°52.6	5.8 - 5.2	11.8 - 10.5	17.8 - 15.9
59	13°29.8	13°32.0	12°52.9	5.9 - 5.3	11.9 - 10.6	17.9 - 16.0

Increments and Corrections

m 54	Sun Plan.	Aries	Moon	v and d corr		
0	13°30.0	13°32.2	12°53.1	0.0 - 0.0	6.0 - 5.5	12.0 - 10.9
1	13°30.2	13°32.5	12°53.3	0.1 - 0.1	6.1 - 5.5	12.1 - 11.0
2	13°30.5	13°32.7	12°53.6	0.2 - 0.2	6.2 - 5.6	12.2 - 11.1
3	13°30.7	13°33.0	12°53.8	0.3 - 0.3	6.3 - 5.7	12.3 - 11.2
4	13°31.0	13°33.2	12°54.1	0.4 - 0.4	6.4 - 5.8	12.4 - 11.3
5	13°31.3	13°33.5	12°54.3	0.5 - 0.5	6.5 - 5.9	12.5 - 11.4
6	13°31.5	13°33.7	12°54.5	0.6 - 0.5	6.6 - 6.0	12.6 - 11.4
7	13°31.8	13°34.0	12°54.8	0.7 - 0.6	6.7 - 6.1	12.7 - 11.5
8	13°32.0	13°34.2	12°55.0	0.8 - 0.7	6.8 - 6.2	12.8 - 11.6
9	13°32.2	13°34.5	12°55.2	0.9 - 0.8	6.9 - 6.3	12.9 - 11.7
10	13°32.5	13°34.7	12°55.5	1.0 - 0.9	7.0 - 6.4	13.0 - 11.8
11	13°32.7	13°35.0	12°55.7	1.1 - 1.0	7.1 - 6.4	13.1 - 11.9
12	13°33.0	13°35.2	12°56.0	1.2 - 1.1	7.2 - 6.5	13.2 - 12.0
13	13°33.3	13°35.5	12°56.2	1.3 - 1.2	7.3 - 6.6	13.3 - 12.1
14	13°33.5	13°35.7	12°56.4	1.4 - 1.3	7.4 - 6.7	13.4 - 12.2
15	13°33.8	13°36.0	12°56.7	1.5 - 1.4	7.5 - 6.8	13.5 - 12.3
16	13°34.0	13°36.2	12°56.9	1.6 - 1.5	7.6 - 6.9	13.6 - 12.4
17	13°34.2	13°36.5	12°57.2	1.7 - 1.5	7.7 - 7.0	13.7 - 12.4
18	13°34.5	13°36.7	12°57.4	1.8 - 1.6	7.8 - 7.1	13.8 - 12.5
19	13°34.8	13°37.0	12°57.6	1.9 - 1.7	7.9 - 7.2	13.9 - 12.6
20	13°35.0	13°37.2	12°57.9	2.0 - 1.8	8.0 - 7.3	14.0 - 12.7
21	13°35.3	13°37.5	12°58.1	2.1 - 1.9	8.1 - 7.4	14.1 - 12.8
22	13°35.5	13°37.7	12°58.3	2.2 - 2.0	8.2 - 7.4	14.2 - 12.9
23	13°35.7	13°38.0	12°58.6	2.3 - 2.1	8.3 - 7.5	14.3 - 13.0
24	13°36.0	13°38.2	12°58.8	2.4 - 2.2	8.4 - 7.6	14.4 - 13.1
25	13°36.2	13°38.5	12°59.1	2.5 - 2.3	8.5 - 7.7	14.5 - 13.2
26	13°36.5	13°38.7	12°59.3	2.6 - 2.4	8.6 - 7.8	14.6 - 13.3
27	13°36.8	13°39.0	12°59.5	2.7 - 2.5	8.7 - 7.9	14.7 - 13.4
28	13°37.0	13°39.2	12°59.8	2.8 - 2.5	8.8 - 8.0	14.8 - 13.4
29	13°37.3	13°39.5	13°00.0	2.9 - 2.6	8.9 - 8.1	14.9 - 13.5
30	13°37.5	13°39.7	13°00.3	3.0 - 2.7	9.0 - 8.2	15.0 - 13.6
31	13°37.7	13°40.0	13°00.5	3.1 - 2.8	9.1 - 8.3	15.1 - 13.7
32	13°38.0	13°40.2	13°00.7	3.2 - 2.9	9.2 - 8.4	15.2 - 13.8
33	13°38.2	13°40.5	13°01.0	3.3 - 3.0	9.3 - 8.4	15.3 - 13.9
34	13°38.5	13°40.7	13°01.2	3.4 - 3.1	9.4 - 8.5	15.4 - 14.0
35	13°38.8	13°41.0	13°01.5	3.5 - 3.2	9.5 - 8.6	15.5 - 14.1
36	13°39.0	13°41.2	13°01.7	3.6 - 3.3	9.6 - 8.7	15.6 - 14.2
37	13°39.3	13°41.5	13°01.9	3.7 - 3.4	9.7 - 8.8	15.7 - 14.3
38	13°39.5	13°41.7	13°02.2	3.8 - 3.5	9.8 - 8.9	15.8 - 14.4
39	13°39.7	13°42.0	13°02.4	3.9 - 3.5	9.9 - 9.0	15.9 - 14.4
40	13°40.0	13°42.2	13°02.6	4.0 - 3.6	10.0 - 9.1	16.0 - 14.5
41	13°40.2	13°42.5	13°02.9	4.1 - 3.7	10.1 - 9.2	16.1 - 14.6
42	13°40.5	13°42.7	13°03.1	4.2 - 3.8	10.2 - 9.3	16.2 - 14.7
43	13°40.8	13°43.0	13°03.4	4.3 - 3.9	10.3 - 9.4	16.3 - 14.8
44	13°41.0	13°43.2	13°03.6	4.4 - 4.0	10.4 - 9.4	16.4 - 14.9
45	13°41.3	13°43.5	13°03.8	4.5 - 4.1	10.5 - 9.5	16.5 - 15.0
46	13°41.5	13°43.7	13°04.1	4.6 - 4.2	10.6 - 9.6	16.6 - 15.1
47	13°41.7	13°44.0	13°04.3	4.7 - 4.3	10.7 - 9.7	16.7 - 15.2
48	13°42.0	13°44.2	13°04.6	4.8 - 4.4	10.8 - 9.8	16.8 - 15.3
49	13°42.3	13°44.5	13°04.8	4.9 - 4.5	10.9 - 9.9	16.9 - 15.4
50	13°42.5	13°44.7	13°05.0	5.0 - 4.5	11.0 - 10.0	17.0 - 15.4
51	13°42.8	13°45.0	13°05.3	5.1 - 4.6	11.1 - 10.1	17.1 - 15.5
52	13°43.0	13°45.2	13°05.5	5.2 - 4.7	11.2 - 10.2	17.2 - 15.6
53	13°43.2	13°45.5	13°05.7	5.3 - 4.8	11.3 - 10.3	17.3 - 15.7
54	13°43.5	13°45.8	13°06.0	5.4 - 4.9	11.4 - 10.4	17.4 - 15.8
55	13°43.7	13°46.0	13°06.2	5.5 - 5.0	11.5 - 10.4	17.5 - 15.9
56	13°44.0	13°46.3	13°06.5	5.6 - 5.1	11.6 - 10.5	17.6 - 16.0
57	13°44.3	13°46.5	13°06.7	5.7 - 5.2	11.7 - 10.6	17.7 - 16.1
58	13°44.5	13°46.8	13°06.9	5.8 - 5.3	11.8 - 10.7	17.8 - 16.2
59	13°44.8	13°47.0	13°07.2	5.9 - 5.4	11.9 - 10.8	17.9 - 16.3

m 55	Sun Plan.	Aries	Moon	v and d corr		
0	13°45.0	13°47.3	13°07.4	0.0 - 0.0	6.0 - 5.6	12.0 - 11.1
1	13°45.2	13°47.5	13°07.7	0.1 - 0.1	6.1 - 5.6	12.1 - 11.2
2	13°45.5	13°47.8	13°07.9	0.2 - 0.2	6.2 - 5.7	12.2 - 11.3
3	13°45.7	13°48.0	13°08.1	0.3 - 0.3	6.3 - 5.8	12.3 - 11.4
4	13°46.0	13°48.3	13°08.4	0.4 - 0.4	6.4 - 5.9	12.4 - 11.5
5	13°46.3	13°48.5	13°08.6	0.5 - 0.5	6.5 - 6.0	12.5 - 11.6
6	13°46.5	13°48.8	13°08.8	0.6 - 0.6	6.6 - 6.1	12.6 - 11.7
7	13°46.8	13°49.0	13°09.1	0.7 - 0.6	6.7 - 6.2	12.7 - 11.7
8	13°47.0	13°49.3	13°09.3	0.8 - 0.7	6.8 - 6.3	12.8 - 11.8
9	13°47.2	13°49.5	13°09.6	0.9 - 0.8	6.9 - 6.4	12.9 - 11.9
10	13°47.5	13°49.8	13°09.8	1.0 - 0.9	7.0 - 6.5	13.0 - 12.0
11	13°47.7	13°50.0	13°10.0	1.1 - 1.0	7.1 - 6.6	13.1 - 12.1
12	13°48.0	13°50.3	13°10.3	1.2 - 1.1	7.2 - 6.7	13.2 - 12.2
13	13°48.3	13°50.5	13°10.5	1.3 - 1.2	7.3 - 6.8	13.3 - 12.3
14	13°48.5	13°50.8	13°10.8	1.4 - 1.3	7.4 - 6.8	13.4 - 12.4
15	13°48.8	13°51.0	13°11.0	1.5 - 1.4	7.5 - 6.9	13.5 - 12.5
16	13°49.0	13°51.3	13°11.2	1.6 - 1.5	7.6 - 7.0	13.6 - 12.6
17	13°49.2	13°51.5	13°11.5	1.7 - 1.6	7.7 - 7.1	13.7 - 12.7
18	13°49.5	13°51.8	13°11.7	1.8 - 1.7	7.8 - 7.2	13.8 - 12.8
19	13°49.8	13°52.0	13°12.0	1.9 - 1.8	7.9 - 7.3	13.9 - 12.9
20	13°50.0	13°52.3	13°12.2	2.0 - 1.9	8.0 - 7.4	14.0 - 13.0
21	13°50.3	13°52.5	13°12.4	2.1 - 1.9	8.1 - 7.5	14.1 - 13.0
22	13°50.5	13°52.8	13°12.7	2.2 - 2.0	8.2 - 7.6	14.2 - 13.1
23	13°50.7	13°53.0	13°12.9	2.3 - 2.1	8.3 - 7.7	14.3 - 13.2
24	13°51.0	13°53.3	13°13.1	2.4 - 2.2	8.4 - 7.8	14.4 - 13.3
25	13°51.2	13°53.5	13°13.4	2.5 - 2.3	8.5 - 7.9	14.5 - 13.4
26	13°51.5	13°53.8	13°13.6	2.6 - 2.4	8.6 - 8.0	14.6 - 13.5
27	13°51.8	13°54.0	13°13.9	2.7 - 2.5	8.7 - 8.0	14.7 - 13.6
28	13°52.0	13°54.3	13°14.1	2.8 - 2.6	8.8 - 8.1	14.8 - 13.7
29	13°52.3	13°54.5	13°14.3	2.9 - 2.7	8.9 - 8.2	14.9 - 13.8
30	13°52.5	13°54.8	13°14.6	3.0 - 2.8	9.0 - 8.3	15.0 - 13.9
31	13°52.7	13°55.0	13°14.8	3.1 - 2.9	9.1 - 8.4	15.1 - 14.0
32	13°53.0	13°55.3	13°15.1	3.2 - 3.0	9.2 - 8.5	15.2 - 14.1
33	13°53.2	13°55.5	13°15.3	3.3 - 3.1	9.3 - 8.6	15.3 - 14.2
34	13°53.5	13°55.8	13°15.5	3.4 - 3.1	9.4 - 8.7	15.4 - 14.2
35	13°53.8	13°56.0	13°15.8	3.5 - 3.2	9.5 - 8.8	15.5 - 14.3
36	13°54.0	13°56.3	13°16.0	3.6 - 3.3	9.6 - 8.9	15.6 - 14.4
37	13°54.3	13°56.5	13°16.2	3.7 - 3.4	9.7 - 9.0	15.7 - 14.5
38	13°54.5	13°56.8	13°16.5	3.8 - 3.5	9.8 - 9.1	15.8 - 14.6
39	13°54.7	13°57.0	13°16.7	3.9 - 3.6	9.9 - 9.2	15.9 - 14.7
40	13°55.0	13°57.3	13°17.0	4.0 - 3.7	10.0 - 9.3	16.0 - 14.8
41	13°55.2	13°57.5	13°17.2	4.1 - 3.8	10.1 - 9.3	16.1 - 14.9
42	13°55.5	13°57.8	13°17.4	4.2 - 3.9	10.2 - 9.4	16.2 - 15.0
43	13°55.8	13°58.0	13°17.7	4.3 - 4.0	10.3 - 9.5	16.3 - 15.1
44	13°56.0	13°58.3	13°17.9	4.4 - 4.1	10.4 - 9.6	16.4 - 15.2
45	13°56.3	13°58.5	13°18.2	4.5 - 4.2	10.5 - 9.7	16.5 - 15.3
46	13°56.5	13°58.8	13°18.4	4.6 - 4.3	10.6 - 9.8	16.6 - 15.4
47	13°56.7	13°59.0	13°18.6	4.7 - 4.3	10.7 - 9.9	16.7 - 15.4
48	13°57.0	13°59.3	13°18.9	4.8 - 4.4	10.8 - 10.0	16.8 - 15.5
49	13°57.3	13°59.5	13°19.1	4.9 - 4.5	10.9 - 10.1	16.9 - 15.6
50	13°57.5	13°59.8	13°19.3	5.0 - 4.6	11.0 - 10.2	17.0 - 15.7
51	13°57.8	14°00.0	13°19.6	5.1 - 4.7	11.1 - 10.3	17.1 - 15.8
52	13°58.0	14°00.3	13°19.8	5.2 - 4.8	11.2 - 10.4	17.2 - 15.9
53	13°58.2	14°00.5	13°20.1	5.3 - 4.9	11.3 - 10.5	17.3 - 16.0
54	13°58.5	14°00.8	13°20.3	5.4 - 5.0	11.4 - 10.5	17.4 - 16.1
55	13°58.7	14°01.0	13°20.5	5.5 - 5.1	11.5 - 10.6	17.5 - 16.2
56	13°59.0	14°01.3	13°20.8	5.6 - 5.2	11.6 - 10.7	17.6 - 16.3
57	13°59.3	14°01.5	13°21.0	5.7 - 5.3	11.7 - 10.8	17.7 - 16.4
58	13°59.5	14°01.8	13°21.3	5.8 - 5.4	11.8 - 10.9	17.8 - 16.5
59	13°59.8	14°02.0	13°21.5	5.9 - 5.5	11.9 - 11.0	17.9 - 16.6

m 56	Sun Plan.	Aries	Moon	v and d corr		
0	14°00.0	14°02.3	13°21.7	0.0 - 0.0	6.0 - 5.7	12.0 - 11.3
1	14°00.2	14°02.5	13°22.0	0.1 - 0.1	6.1 - 5.7	12.1 - 11.4
2	14°00.5	14°02.8	13°22.2	0.2 - 0.2	6.2 - 5.8	12.2 - 11.5
3	14°00.7	14°03.0	13°22.4	0.3 - 0.3	6.3 - 5.9	12.3 - 11.6
4	14°01.0	14°03.3	13°22.7	0.4 - 0.4	6.4 - 6.0	12.4 - 11.7
5	14°01.3	14°03.5	13°22.9	0.5 - 0.5	6.5 - 6.1	12.5 - 11.8
6	14°01.5	14°03.8	13°23.2	0.6 - 0.6	6.6 - 6.2	12.6 - 11.9
7	14°01.8	14°04.1	13°23.4	0.7 - 0.7	6.7 - 6.3	12.7 - 12.0
8	14°02.0	14°04.3	13°23.6	0.8 - 0.8	6.8 - 6.4	12.8 - 12.1
9	14°02.2	14°04.6	13°23.9	0.9 - 0.8	6.9 - 6.5	12.9 - 12.1
10	14°02.5	14°04.8	13°24.1	1.0 - 0.9	7.0 - 6.6	13.0 - 12.2
11	14°02.7	14°05.1	13°24.4	1.1 - 1.0	7.1 - 6.7	13.1 - 12.3
12	14°03.0	14°05.3	13°24.6	1.2 - 1.1	7.2 - 6.8	13.2 - 12.4
13	14°03.3	14°05.6	13°24.8	1.3 - 1.2	7.3 - 6.9	13.3 - 12.5
14	14°03.5	14°05.8	13°25.1	1.4 - 1.3	7.4 - 7.0	13.4 - 12.6
15	14°03.8	14°06.1	13°25.3	1.5 - 1.4	7.5 - 7.1	13.5 - 12.7
16	14°04.0	14°06.3	13°25.6	1.6 - 1.5	7.6 - 7.2	13.6 - 12.8
17	14°04.2	14°06.6	13°25.8	1.7 - 1.6	7.7 - 7.3	13.7 - 12.9
18	14°04.5	14°06.8	13°26.0	1.8 - 1.7	7.8 - 7.3	13.8 - 13.0
19	14°04.8	14°07.1	13°26.3	1.9 - 1.8	7.9 - 7.4	13.9 - 13.1
20	14°05.0	14°07.3	13°26.5	2.0 - 1.9	8.0 - 7.5	14.0 - 13.2
21	14°05.3	14°07.6	13°26.7	2.1 - 2.0	8.1 - 7.6	14.1 - 13.3
22	14°05.5	14°07.8	13°27.0	2.2 - 2.1	8.2 - 7.7	14.2 - 13.4
23	14°05.7	14°08.1	13°27.2	2.3 - 2.2	8.3 - 7.8	14.3 - 13.5
24	14°06.0	14°08.3	13°27.5	2.4 - 2.3	8.4 - 7.9	14.4 - 13.6
25	14°06.2	14°08.6	13°27.7	2.5 - 2.4	8.5 - 8.0	14.5 - 13.7
26	14°06.5	14°08.8	13°27.9	2.6 - 2.4	8.6 - 8.1	14.6 - 13.7
27	14°06.8	14°09.1	13°28.2	2.7 - 2.5	8.7 - 8.2	14.7 - 13.8
28	14°07.0	14°09.3	13°28.4	2.8 - 2.6	8.8 - 8.3	14.8 - 13.9
29	14°07.3	14°09.6	13°28.7	2.9 - 2.7	8.9 - 8.4	14.9 - 14.0
30	14°07.5	14°09.8	13°28.9	3.0 - 2.8	9.0 - 8.5	15.0 - 14.1
31	14°07.7	14°10.1	13°29.1	3.1 - 2.9	9.1 - 8.6	15.1 - 14.2
32	14°08.0	14°10.3	13°29.4	3.2 - 3.0	9.2 - 8.7	15.2 - 14.3
33	14°08.2	14°10.6	13°29.6	3.3 - 3.1	9.3 - 8.8	15.3 - 14.4
34	14°08.5	14°10.8	13°29.8	3.4 - 3.2	9.4 - 8.9	15.4 - 14.5
35	14°08.8	14°11.1	13°30.1	3.5 - 3.3	9.5 - 8.9	15.5 - 14.6
36	14°09.0	14°11.3	13°30.3	3.6 - 3.4	9.6 - 9.0	15.6 - 14.7
37	14°09.3	14°11.6	13°30.6	3.7 - 3.5	9.7 - 9.1	15.7 - 14.8
38	14°09.5	14°11.8	13°30.8	3.8 - 3.6	9.8 - 9.2	15.8 - 14.9
39	14°09.7	14°12.1	13°31.0	3.9 - 3.7	9.9 - 9.3	15.9 - 15.0
40	14°10.0	14°12.3	13°31.3	4.0 - 3.8	10.0 - 9.4	16.0 - 15.1
41	14°10.2	14°12.6	13°31.5	4.1 - 3.9	10.1 - 9.5	16.1 - 15.2
42	14°10.5	14°12.8	13°31.8	4.2 - 4.0	10.2 - 9.6	16.2 - 15.3
43	14°10.8	14°13.1	13°32.0	4.3 - 4.0	10.3 - 9.7	16.3 - 15.3
44	14°11.0	14°13.3	13°32.2	4.4 - 4.1	10.4 - 9.8	16.4 - 15.4
45	14°11.3	14°13.6	13°32.5	4.5 - 4.2	10.5 - 9.9	16.5 - 15.5
46	14°11.5	14°13.8	13°32.7	4.6 - 4.3	10.6 - 10.0	16.6 - 15.6
47	14°11.7	14°14.1	13°32.9	4.7 - 4.4	10.7 - 10.1	16.7 - 15.7
48	14°12.0	14°14.3	13°33.2	4.8 - 4.5	10.8 - 10.2	16.8 - 15.8
49	14°12.3	14°14.6	13°33.4	4.9 - 4.6	10.9 - 10.3	16.9 - 15.9
50	14°12.5	14°14.8	13°33.7	5.0 - 4.7	11.0 - 10.4	17.0 - 16.0
51	14°12.8	14°15.1	13°33.9	5.1 - 4.8	11.1 - 10.5	17.1 - 16.1
52	14°13.0	14°15.3	13°34.1	5.2 - 4.9	11.2 - 10.5	17.2 - 16.2
53	14°13.2	14°15.6	13°34.4	5.3 - 5.0	11.3 - 10.6	17.3 - 16.3
54	14°13.5	14°15.8	13°34.6	5.4 - 5.1	11.4 - 10.7	17.4 - 16.4
55	14°13.7	14°16.1	13°34.9	5.5 - 5.2	11.5 - 10.8	17.5 - 16.5
56	14°14.0	14°16.3	13°35.1	5.6 - 5.3	11.6 - 10.9	17.6 - 16.6
57	14°14.3	14°16.6	13°35.3	5.7 - 5.4	11.7 - 11.0	17.7 - 16.7
58	14°14.5	14°16.8	13°35.6	5.8 - 5.5	11.8 - 11.1	17.8 - 16.8
59	14°14.8	14°17.1	13°35.8	5.9 - 5.6	11.9 - 11.2	17.9 - 16.9

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
57	Plan.					
0	14°15.0	14°17.3	13°36.0	0.0 - 0.0	6.0 - 5.8	12.0 - 11.5
1	14°15.2	14°17.6	13°36.3	0.1 - 0.1	6.1 - 5.8	12.1 - 11.6
2	14°15.5	14°17.8	13°36.5	0.2 - 0.2	6.2 - 5.9	12.2 - 11.7
3	14°15.7	14°18.1	13°36.8	0.3 - 0.3	6.3 - 6.0	12.3 - 11.8
4	14°16.0	14°18.3	13°37.0	0.4 - 0.4	6.4 - 6.1	12.4 - 11.9
5	14°16.3	14°18.6	13°37.2	0.5 - 0.5	6.5 - 6.2	12.5 - 12.0
6	14°16.5	14°18.8	13°37.5	0.6 - 0.6	6.6 - 6.3	12.6 - 12.1
7	14°16.8	14°19.1	13°37.7	0.7 - 0.7	6.7 - 6.4	12.7 - 12.2
8	14°17.0	14°19.3	13°38.0	0.8 - 0.8	6.8 - 6.5	12.8 - 12.3
9	14°17.2	14°19.6	13°38.2	0.9 - 0.9	6.9 - 6.6	12.9 - 12.4
10	14°17.5	14°19.8	13°38.4	1.0 - 1.0	7.0 - 6.7	13.0 - 12.5
11	14°17.7	14°20.1	13°38.7	1.1 - 1.1	7.1 - 6.8	13.1 - 12.6
12	14°18.0	14°20.3	13°38.9	1.2 - 1.2	7.2 - 6.9	13.2 - 12.7
13	14°18.3	14°20.6	13°39.2	1.3 - 1.2	7.3 - 7.0	13.3 - 12.7
14	14°18.5	14°20.8	13°39.4	1.4 - 1.3	7.4 - 7.1	13.4 - 12.8
15	14°18.8	14°21.1	13°39.6	1.5 - 1.4	7.5 - 7.2	13.5 - 12.9
16	14°19.0	14°21.3	13°39.9	1.6 - 1.5	7.6 - 7.3	13.6 - 13.0
17	14°19.2	14°21.6	13°40.1	1.7 - 1.6	7.7 - 7.4	13.7 - 13.1
18	14°19.5	14°21.8	13°40.3	1.8 - 1.7	7.8 - 7.5	13.8 - 13.2
19	14°19.8	14°22.1	13°40.6	1.9 - 1.8	7.9 - 7.6	13.9 - 13.3
20	14°20.0	14°22.4	13°40.8	2.0 - 1.9	8.0 - 7.7	14.0 - 13.4
21	14°20.3	14°22.6	13°41.1	2.1 - 2.0	8.1 - 7.8	14.1 - 13.5
22	14°20.5	14°22.9	13°41.3	2.2 - 2.1	8.2 - 7.9	14.2 - 13.6
23	14°20.7	14°23.1	13°41.5	2.3 - 2.2	8.3 - 8.0	14.3 - 13.7
24	14°21.0	14°23.4	13°41.8	2.4 - 2.3	8.4 - 8.1	14.4 - 13.8
25	14°21.2	14°23.6	13°42.0	2.5 - 2.4	8.5 - 8.1	14.5 - 13.9
26	14°21.5	14°23.9	13°42.3	2.6 - 2.5	8.6 - 8.2	14.6 - 14.0
27	14°21.8	14°24.1	13°42.5	2.7 - 2.6	8.7 - 8.3	14.7 - 14.1
28	14°22.0	14°24.4	13°42.7	2.8 - 2.7	8.8 - 8.4	14.8 - 14.2
29	14°22.3	14°24.6	13°43.0	2.9 - 2.8	8.9 - 8.5	14.9 - 14.3
30	14°22.5	14°24.9	13°43.2	3.0 - 2.9	9.0 - 8.6	15.0 - 14.4
31	14°22.7	14°25.1	13°43.4	3.1 - 3.0	9.1 - 8.7	15.1 - 14.5
32	14°23.0	14°25.4	13°43.7	3.2 - 3.1	9.2 - 8.8	15.2 - 14.6
33	14°23.2	14°25.6	13°43.9	3.3 - 3.2	9.3 - 8.9	15.3 - 14.7
34	14°23.5	14°25.9	13°44.2	3.4 - 3.3	9.4 - 9.0	15.4 - 14.8
35	14°23.8	14°26.1	13°44.4	3.5 - 3.4	9.5 - 9.1	15.5 - 14.9
36	14°24.0	14°26.4	13°44.6	3.6 - 3.5	9.6 - 9.2	15.6 - 15.0
37	14°24.3	14°26.6	13°44.9	3.7 - 3.5	9.7 - 9.3	15.7 - 15.0
38	14°24.5	14°26.9	13°45.1	3.8 - 3.6	9.8 - 9.4	15.8 - 15.1
39	14°24.7	14°27.1	13°45.4	3.9 - 3.7	9.9 - 9.5	15.9 - 15.2
40	14°25.0	14°27.4	13°45.6	4.0 - 3.8	10.0 - 9.6	16.0 - 15.3
41	14°25.2	14°27.6	13°45.8	4.1 - 3.9	10.1 - 9.7	16.1 - 15.4
42	14°25.5	14°27.9	13°46.1	4.2 - 4.0	10.2 - 9.8	16.2 - 15.5
43	14°25.8	14°28.1	13°46.3	4.3 - 4.1	10.3 - 9.9	16.3 - 15.6
44	14°26.0	14°28.4	13°46.5	4.4 - 4.2	10.4 - 10.0	16.4 - 15.7
45	14°26.3	14°28.6	13°46.8	4.5 - 4.3	10.5 - 10.1	16.5 - 15.8
46	14°26.5	14°28.9	13°47.0	4.6 - 4.4	10.6 - 10.2	16.6 - 15.9
47	14°26.7	14°29.1	13°47.3	4.7 - 4.5	10.7 - 10.3	16.7 - 16.0
48	14°27.0	14°29.4	13°47.5	4.8 - 4.6	10.8 - 10.4	16.8 - 16.1
49	14°27.3	14°29.6	13°47.7	4.9 - 4.7	10.9 - 10.4	16.9 - 16.2
50	14°27.5	14°29.9	13°48.0	5.0 - 4.8	11.0 - 10.5	17.0 - 16.3
51	14°27.8	14°30.1	13°48.2	5.1 - 4.9	11.1 - 10.6	17.1 - 16.4
52	14°28.0	14°30.4	13°48.5	5.2 - 5.0	11.2 - 10.7	17.2 - 16.5
53	14°28.2	14°30.6	13°48.7	5.3 - 5.1	11.3 - 10.8	17.3 - 16.6
54	14°28.5	14°30.9	13°48.9	5.4 - 5.2	11.4 - 10.9	17.4 - 16.7
55	14°28.7	14°31.1	13°49.2	5.5 - 5.3	11.5 - 11.0	17.5 - 16.8
56	14°29.0	14°31.4	13°49.4	5.6 - 5.4	11.6 - 11.1	17.6 - 16.9
57	14°29.3	14°31.6	13°49.7	5.7 - 5.5	11.7 - 11.2	17.7 - 17.0
58	14°29.5	14°31.9	13°49.9	5.8 - 5.6	11.8 - 11.3	17.8 - 17.1
59	14°29.8	14°32.1	13°50.1	5.9 - 5.7	11.9 - 11.4	17.9 - 17.2

m	Sun	Aries	Moon	v and d corr		
58	Plan.					
0	14°30.0	14°32.4	13°50.4	0.0 - 0.0	6.0 - 5.8	12.0 - 11.7
1	14°30.2	14°32.6	13°50.6	0.1 - 0.1	6.1 - 5.9	12.1 - 11.8
2	14°30.5	14°32.9	13°50.8	0.2 - 0.2	6.2 - 6.0	12.2 - 11.9
3	14°30.7	14°33.1	13°51.1	0.3 - 0.3	6.3 - 6.1	12.3 - 12.0
4	14°31.0	14°33.4	13°51.3	0.4 - 0.4	6.4 - 6.2	12.4 - 12.1
5	14°31.3	14°33.6	13°51.6	0.5 - 0.5	6.5 - 6.3	12.5 - 12.2
6	14°31.5	14°33.9	13°51.8	0.6 - 0.6	6.6 - 6.4	12.6 - 12.3
7	14°31.8	14°34.1	13°52.0	0.7 - 0.7	6.7 - 6.5	12.7 - 12.4
8	14°32.0	14°34.4	13°52.3	0.8 - 0.8	6.8 - 6.6	12.8 - 12.5
9	14°32.2	14°34.6	13°52.5	0.9 - 0.9	6.9 - 6.7	12.9 - 12.6
10	14°32.5	14°34.9	13°52.8	1.0 - 1.0	7.0 - 6.8	13.0 - 12.7
11	14°32.7	14°35.1	13°53.0	1.1 - 1.1	7.1 - 6.9	13.1 - 12.8
12	14°33.0	14°35.4	13°53.2	1.2 - 1.2	7.2 - 7.0	13.2 - 12.9
13	14°33.3	14°35.6	13°53.5	1.3 - 1.3	7.3 - 7.1	13.3 - 13.0
14	14°33.5	14°35.9	13°53.7	1.4 - 1.4	7.4 - 7.2	13.4 - 13.1
15	14°33.8	14°36.1	13°53.9	1.5 - 1.5	7.5 - 7.3	13.5 - 13.2
16	14°34.0	14°36.4	13°54.2	1.6 - 1.6	7.6 - 7.4	13.6 - 13.3
17	14°34.2	14°36.6	13°54.4	1.7 - 1.7	7.7 - 7.5	13.7 - 13.4
18	14°34.5	14°36.9	13°54.7	1.8 - 1.8	7.8 - 7.6	13.8 - 13.5
19	14°34.8	14°37.1	13°54.9	1.9 - 1.9	7.9 - 7.7	13.9 - 13.6
20	14°35.0	14°37.4	13°55.1	2.0 - 1.9	8.0 - 7.8	14.0 - 13.7
21	14°35.3	14°37.6	13°55.4	2.1 - 2.0	8.1 - 7.9	14.1 - 13.7
22	14°35.5	14°37.9	13°55.6	2.2 - 2.1	8.2 - 8.0	14.2 - 13.8
23	14°35.7	14°38.1	13°55.9	2.3 - 2.2	8.3 - 8.1	14.3 - 13.9
24	14°36.0	14°38.4	13°56.1	2.4 - 2.3	8.4 - 8.2	14.4 - 14.0
25	14°36.2	14°38.6	13°56.3	2.5 - 2.4	8.5 - 8.3	14.5 - 14.1
26	14°36.5	14°38.9	13°56.6	2.6 - 2.5	8.6 - 8.4	14.6 - 14.2
27	14°36.8	14°39.1	13°56.8	2.7 - 2.6	8.7 - 8.5	14.7 - 14.3
28	14°37.0	14°39.4	13°57.0	2.8 - 2.7	8.8 - 8.6	14.8 - 14.4
29	14°37.3	14°39.6	13°57.3	2.9 - 2.8	8.9 - 8.7	14.9 - 14.5
30	14°37.5	14°39.9	13°57.5	3.0 - 2.9	9.0 - 8.8	15.0 - 14.6
31	14°37.7	14°40.1	13°57.8	3.1 - 3.0	9.1 - 8.9	15.1 - 14.7
32	14°38.0	14°40.4	13°58.0	3.2 - 3.1	9.2 - 9.0	15.2 - 14.8
33	14°38.2	14°40.7	13°58.2	3.3 - 3.2	9.3 - 9.1	15.3 - 14.9
34	14°38.5	14°40.9	13°58.5	3.4 - 3.3	9.4 - 9.2	15.4 - 15.0
35	14°38.8	14°41.2	13°58.7	3.5 - 3.4	9.5 - 9.3	15.5 - 15.1
36	14°39.0	14°41.4	13°59.0	3.6 - 3.5	9.6 - 9.4	15.6 - 15.2
37	14°39.3	14°41.7	13°59.2	3.7 - 3.6	9.7 - 9.5	15.7 - 15.3
38	14°39.5	14°41.9	13°59.4	3.8 - 3.7	9.8 - 9.6	15.8 - 15.4
39	14°39.7	14°42.2	13°59.7	3.9 - 3.8	9.9 - 9.7	15.9 - 15.5
40	14°40.0	14°42.4	13°59.9	4.0 - 3.9	10.0 - 9.8	16.0 - 15.6
41	14°40.2	14°42.7	14°00.1	4.1 - 4.0	10.1 - 9.8	16.1 - 15.7
42	14°40.5	14°42.9	14°00.4	4.2 - 4.1	10.2 - 9.9	16.2 - 15.8
43	14°40.8	14°43.2	14°00.6	4.3 - 4.2	10.3 - 10.0	16.3 - 15.9
44	14°41.0	14°43.4	14°00.9	4.4 - 4.3	10.4 - 10.1	16.4 - 16.0
45	14°41.3	14°43.7	14°01.1	4.5 - 4.4	10.5 - 10.2	16.5 - 16.1
46	14°41.5	14°43.9	14°01.3	4.6 - 4.5	10.6 - 10.3	16.6 - 16.2
47	14°41.7	14°44.2	14°01.6	4.7 - 4.6	10.7 - 10.4	16.7 - 16.3
48	14°42.0	14°44.4	14°01.8	4.8 - 4.7	10.8 - 10.5	16.8 - 16.4
49	14°42.3	14°44.7	14°02.1	4.9 - 4.8	10.9 - 10.6	16.9 - 16.5
50	14°42.5	14°44.9	14°02.3	5.0 - 4.9	11.0 - 10.7	17.0 - 16.6
51	14°42.8	14°45.2	14°02.5	5.1 - 5.0	11.1 - 10.8	17.1 - 16.7
52	14°43.0	14°45.4	14°02.8	5.2 - 5.1	11.2 - 10.9	17.2 - 16.8
53	14°43.2	14°45.7	14°03.0	5.3 - 5.2	11.3 - 11.0	17.3 - 16.9
54	14°43.5	14°45.9	14°03.3	5.4 - 5.3	11.4 - 11.1	17.4 - 17.0
55	14°43.7	14°46.2	14°03.5	5.5 - 5.4	11.5 - 11.2	17.5 - 17.1
56	14°44.0	14°46.4	14°03.7	5.6 - 5.5	11.6 - 11.3	17.6 - 17.2
57	14°44.3	14°46.7	14°04.0	5.7 - 5.6	11.7 - 11.4	17.7 - 17.3
58	14°44.5	14°46.9	14°04.2	5.8 - 5.7	11.8 - 11.5	17.8 - 17.4
59	14°44.8	14°47.2	14°04.4	5.9 - 5.8	11.9 - 11.6	17.9 - 17.5

m	Sun	Aries	Moon	v and d corr		
59	Plan.					
0	14°45.0	14°47.4	14°04.7	0.0 - 0.0	6.0 - 6.0	12.0 - 11.9
1	14°45.2	14°47.7	14°04.9	0.1 - 0.1	6.1 - 6.0	12.1 - 12.0
2	14°45.5	14°47.9	14°05.2	0.2 - 0.2	6.2 - 6.1	12.2 - 12.1
3	14°45.7	14°48.2	14°05.4	0.3 - 0.3	6.3 - 6.2	12.3 - 12.2
4	14°46.0	14°48.4	14°05.6	0.4 - 0.4	6.4 - 6.3	12.4 - 12.3
5	14°46.3	14°48.7	14°05.9	0.5 - 0.5	6.5 - 6.4	12.5 - 12.4
6	14°46.5	14°48.9	14°06.1	0.6 - 0.6	6.6 - 6.5	12.6 - 12.5
7	14°46.8	14°49.2	14°06.4	0.7 - 0.7	6.7 - 6.6	12.7 - 12.6
8	14°47.0	14°49.4	14°06.6	0.8 - 0.8	6.8 - 6.7	12.8 - 12.7
9	14°47.2	14°49.7	14°06.8	0.9 - 0.9	6.9 - 6.8	12.9 - 12.8
10	14°47.5	14°49.9	14°07.1	1.0 - 1.0	7.0 - 6.9	13.0 - 12.9
11	14°47.7	14°50.2	14°07.3	1.1 - 1.1	7.1 - 7.0	13.1 - 13.0
12	14°48.0	14°50.4	14°07.5	1.2 - 1.2	7.2 - 7.1	13.2 - 13.1
13	14°48.3	14°50.7	14°07.8	1.3 - 1.3	7.3 - 7.2	13.3 - 13.2
14	14°48.5	14°50.9	14°08.0	1.4 - 1.4	7.4 - 7.3	13.4 - 13.3
15	14°48.8	14°51.2	14°08.3	1.5 - 1.5	7.5 - 7.4	13.5 - 13.4
16	14°49.0	14°51.4	14°08.5	1.6 - 1.6	7.6 - 7.5	13.6 - 13.5
17	14°49.2	14°51.7	14°08.7	1.7 - 1.7	7.7 - 7.6	13.7 - 13.6
18	14°49.5	14°51.9	14°09.0	1.8 - 1.8	7.8 - 7.7	13.8 - 13.7
19	14°49.8	14°52.2	14°09.2	1.9 - 1.9	7.9 - 7.8	13.9 - 13.8
20	14°50.0	14°52.4	14°09.5	2.0 - 2.0	8.0 - 7.9	14.0 - 13.9
21	14°50.3	14°52.7	14°09.7	2.1 - 2.1	8.1 - 8.0	14.1 - 14.0
22	14°50.5	14°52.9	14°09.9	2.2 - 2.2	8.2 - 8.1	14.2 - 14.1
23	14°50.7	14°53.2	14°10.2	2.3 - 2.3	8.3 - 8.2	14.3 - 14.2
24	14°51.0	14°53.4	14°10.4	2.4 - 2.4	8.4 - 8.3	14.4 - 14.3
25	14°51.2	14°53.7	14°10.6	2.5 - 2.5	8.5 - 8.4	14.5 - 14.4
26	14°51.5	14°53.9	14°10.9	2.6 - 2.6	8.6 - 8.5	14.6 - 14.5
27	14°51.8	14°54.2	14°11.1	2.7 - 2.7	8.7 - 8.6	14.7 - 14.6
28	14°52.0	14°54.4	14°11.4	2.8 - 2.8	8.8 - 8.7	14.8 - 14.7
29	14°52.3	14°54.7	14°11.6	2.9 - 2.9	8.9 - 8.8	14.9 - 14.8
30	14°52.5	14°54.9	14°11.8	3.0 - 3.0	9.0 - 8.9	15.0 - 14.9
31	14°52.7	14°55.2	14°12.1	3.1 - 3.1	9.1 - 9.0	15.1 - 15.0
32	14°53.0	14°55.4	14°12.3	3.2 - 3.2	9.2 - 9.1	15.2 - 15.1
33	14°53.2	14°55.7	14°12.6	3.3 - 3.3	9.3 - 9.2	15.3 - 15.2
34	14°53.5	14°55.9	14°12.8	3.4 - 3.4	9.4 - 9.3	15.4 - 15.3
35	14°53.8	14°56.2	14°13.0	3.5 - 3.5	9.5 - 9.4	15.5 - 15.4
36	14°54.0	14°56.4	14°13.3	3.6 - 3.6	9.6 - 9.5	15.6 - 15.5
37	14°54.3	14°56.7	14°13.5	3.7 - 3.7	9.7 - 9.6	15.7 - 15.6
38	14°54.5	14°56.9	14°13.8	3.8 - 3.8	9.8 - 9.7	15.8 - 15.7
39	14°54.7	14°57.2	14°14.0	3.9 - 3.9	9.9 - 9.8	15.9 - 15.8
40	14°55.0	14°57.4	14°14.2	4.0 - 4.0	10.0 - 9.9	16.0 - 15.9
41	14°55.2	14°57.7	14°14.5	4.1 - 4.1	10.1 - 10.0	16.1 - 16.0
42	14°55.5	14°57.9	14°14.7	4.2 - 4.2	10.2 - 10.1	16.2 - 16.1
43	14°55.8	14°58.2	14°14.9	4.3 - 4.3	10.3 - 10.2	16.3 - 16.2
44	14°56.0	14°58.4	14°15.2	4.4 - 4.4	10.4 - 10.3	16.4 - 16.3
45	14°56.3	14°58.7	14°15.4	4.5 - 4.5	10.5 - 10.4	16.5 - 16.4
46	14°56.5	14°59.0	14°15.7	4.6 - 4.6	10.6 - 10.5	16.6 - 16.5
47	14°56.7	14°59.2	14°15.9	4.7 - 4.7	10.7 - 10.6	16.7 - 16.6
48	14°57.0	14°59.5	14°16.1	4.8 - 4.8	10.8 - 10.7	16.8 - 16.7
49	14°57.3	14°59.7	14°16.4	4.9 - 4.9	10.9 - 10.8	16.9 - 16.8
50	14°57.5	15°00.0	14°16.6	5.0 - 5.0	11.0 - 10.9	17.0 - 16.9
51	14°57.8	15°00.2	14°16.9	5.1 - 5.1	11.1 - 11.0	17.1 - 17.0
52	14°58.0	15°00.5	14°17.1	5.2 - 5.2	11.2 - 11.1	17.2 - 17.1
53	14°58.2	15°00.7	14°17.3	5.3 - 5.3	11.3 - 11.2	17.3 - 17.2
54	14°58.5	15°01.0	14°17.6	5.4 - 5.4	11.4 - 11.3	17.4 - 17.3
55	14°58.7	15°01.2	14°17.8	5.5 - 5.5	11.5 - 11.4	17.5 - 17.4
56	14°59.0	15°01.5	14°18.0	5.6 - 5.6	11.6 - 11.5	17.6 - 17.5
57	14°59.3	15°01.7	14°18.3	5.7 - 5.7	11.7 - 11.6	17.7 - 17.6
58	14°59.5	15°02.0	14°18.5	5.8 - 5.8	11.8 - 11.7	17.8 - 17.7
59	14°59.8	15°02.2	14°18.8	5.9 - 5.9	11.9 - 11.8	17.9 - 17.8

Altitude Correction Tables for 10° to 90° — Sun, Stars, Planets

SUN — October – March

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 33	+10.8	− 21.5
9 45	+10.9	− 21.4
9 56	+11.0	− 21.3
10 08	+11.1	− 21.2
10 20	+11.2	− 21.1
10 33	+11.3	− 21.0
10 46	+11.4	− 20.9
11 00	+11.5	− 20.8
11 15	+11.6	− 20.7
11 30	+11.7	− 20.6
11 45	+11.8	− 20.5
12 01	+11.9	− 20.4
12 18	+12.0	− 20.3
12 36	+12.1	− 20.2
12 54	+12.2	− 20.1
13 14	+12.3	− 20.0
13 34	+12.4	− 19.9
13 55	+12.5	− 19.8
14 17	+12.6	− 19.7
14 41	+12.7	− 19.6
15 05	+12.8	− 19.5
15 31	+12.9	− 19.4
15 59	+13.0	− 19.3
16 27	+13.1	− 19.2
16 58	+13.2	− 19.1
17 30	+13.3	− 19.0
18 05	+13.4	− 18.9
18 41	+13.5	− 18.8
19 20	+13.6	− 18.7
20 02	+13.7	− 18.6
20 46	+13.8	− 18.5
21 34	+13.9	− 18.4
22 25	+14.0	− 18.3
23 20	+14.1	− 18.2
24 20	+14.2	− 18.1
25 24	+14.3	− 18.0
26 34	+14.4	− 17.9
27 50	+14.5	− 17.8
29 13	+14.6	− 17.7
30 44	+14.7	− 17.6
32 24	+14.8	− 17.5
34 15	+14.9	− 17.4
36 17	+15.0	− 17.3
38 34	+15.1	− 17.2
41 06	+15.2	− 17.1
43 56	+15.3	− 17.0
47 07	+15.4	− 16.9
50 43	+15.5	− 16.8
54 46	+15.6	− 16.7
59 21	+15.7	− 16.6
64 28	+15.8	− 16.5
70 10	+15.9	− 16.4
76 24	+16.0	− 16.3
83 05	+16.1	− 16.2
90 00		

SUN — April – September

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 39	+10.6	− 21.2
9 50	+10.7	− 21.1
10 02	+10.8	− 21.0
10 14	+10.9	− 20.9
10 27	+11.0	− 20.8
10 40	+11.1	− 20.7
10 53	+11.2	− 20.6
11 07	+11.3	− 20.5
11 22	+11.4	− 20.4
11 37	+11.5	− 20.3
11 53	+11.6	− 20.2
12 10	+11.7	− 20.1
12 27	+11.8	− 20.0
14 45	+11.9	− 19.9
13 04	+12.0	− 19.8
13 24	+12.1	− 19.7
13 44	+12.2	− 19.6
14 06	+12.3	− 19.5
14 29	+12.4	− 19.4
14 53	+12.5	− 19.3
15 18	+12.6	− 19.2
15 45	+12.7	− 19.1
16 13	+12.8	− 19.0
16 43	+12.9	− 18.9
17 14	+13.0	− 18.8
17 47	+13.1	− 18.7
18 23	+13.2	− 18.6
19 00	+13.3	− 18.5
19 41	+13.4	− 18.4
20 24	+13.5	− 18.3
21 10	+13.6	− 18.2
21 59	+13.7	− 18.1
22 52	+13.8	− 18.0
23 49	+13.9	− 17.9
24 51	+14.0	− 17.8
25 58	+14.1	− 17.7
27 11	+14.2	− 17.6
28 31	+14.3	− 17.5
29 58	+14.4	− 17.4
31 33	+14.5	− 17.3
33 18	+14.6	− 17.2
35 15	+14.7	− 17.1
37 24	+14.8	− 17.0
39 48	+14.9	− 16.9
42 28	+15.0	− 16.8
45 29	+15.1	− 16.7
48 52	+15.2	− 16.6
51 41	+15.3	− 16.5
56 59	+15.4	− 16.4
61 50	+15.5	− 16.3
67 15	+15.6	− 16.2
73 14	+15.7	− 16.1
79 42	+15.8	− 16.0
86 21	+15.9	− 15.9
90 00		

Stars & Planets

App. Alt.	Corr
° ′	′
9 55	− 5.3
10 07	− 5.2
10 20	− 5.1
10 32	− 5.0
10 46	− 4.9
10 59	− 4.8
11 14	− 4.7
11 29	− 4.6
11 44	− 4.5
12 00	− 4.4
12 17	− 4.3
12 35	− 4.2
12 53	− 4.1
13 12	− 4.0
13 32	− 3.9
13 53	− 3.8
14 16	− 3.7
14 39	− 3.6
15 03	− 3.5
15 29	− 3.4
15 56	− 3.3
16 25	− 3.2
16 55	− 3.1
17 27	− 3.0
18 01	− 2.9
18 37	− 2.8
19 16	− 2.7
19 56	− 2.6
20 40	− 2.5
21 27	− 2.4
22 17	− 2.3
23 11	− 2.2
24 09	− 2.1
25 12	− 2.0
26 20	− 1.9
27 34	− 1.8
28 54	− 1.7
30 22	− 1.6
31 58	− 1.5
33 43	− 1.4
35 38	− 1.3
37 45	− 1.2
40 06	− 1.1
42 42	− 1.0
45 34	− 0.9
48 45	− 0.8
52 16	− 0.7
56 09	− 0.6
60 26	− 0.5
65 06	− 0.4
70 09	− 0.3
75 32	− 0.2
81 12	− 0.1
87 03	0.0
90 00	

Additional Altitude Correction for Mars & Venus

A small additional altitude correction for Mars & Venus can be obtained in the Daily Pages of The Nautical Almanac for the day of the observation.

Find the correction in the block labeled **Horizontal parallax**.

The figure will cover the range of 3 days found on that Daily Page.

The correction is to be added to Apparent Altitude.

Refraction

App. Alt.	Corr
°	′
5.5	− 9.1
6.0	− 8.5
6.5	− 7.9
7.0	− 7.5
7.5	− 7.0
8.0	− 6.6
8.5	− 6.3
9.0	− 5.9
9.5	− 5.7
10.0	− 5.4
10.5	− 5.1
11.0	− 4.9
11.5	− 4.7
12.0	− 4.5
12.5	− 4.4
13.0	− 4.2
13.5	− 4.0
14.0	− 3.9
14.5	− 3.8
15.0	− 3.6
15.5	− 3.5
16.0	− 3.4
16.5	− 3.3
17.0	− 3.2
17.5	− 3.1
18.0	− 3.0
18.5	− 2.9
19.0	− 2.9
19.5	− 2.8
20.0	− 2.7
21.0	− 2.6
22.0	− 2.4
23.0	− 2.3
24.0	− 2.2
25.0	− 2.1
26.0	− 2.0
27.0	− 1.9
28.0	− 1.9
29.0	− 1.8
30.0	− 1.7
31.0	− 1.7
32.0	− 1.6
33.0	− 1.5
34.0	− 1.5
35.0	− 1.4
36.0	− 1.4
37.0	− 1.3
38.0	− 1.3
39.0	− 1.2
40.0	− 1.2
45.0	− 1.0
50.0	− 0.8
55.0	− 0.7
60.0	− 0.6
65.0	− 0.5
70.0	− 0.4
75.0	− 0.3
80.0	− 0.2
85.0	− 0.1

DIP

always subtracted from Hs

Ht. of Eye	Corr	Ht. of Eye	Ht. of Eye	Corr
meters	**′**	**feet**	**meters**	**′**
2.4	**−2.8**	8.0	1.0	**−1.8**
2.6	**−2.9**	8.6	1.5	**−2.2**
2.8	**−3.0**	9.2	2.0	**−2.5**
3.0	**−3.1**	9.8	2.5	**−2.8**
3.2	**−3.2**	10.5	3.0	**−3.0**
3.4	**−3.3**	11.2		
3.6	**−3.4**	11.9	See table ←	
3.8	**−3.5**	12.6		
4.0	**−3.6**	13.3	**meters**	**′**
4.3	**−3.7**	14.1	20	**−7.9**
4.5	**−3.8**	14.9	22	**−8.3**
4.7	**−3.9**	15.7	24	**−8.6**
5.0	**−4.0**	16.5	26	**−9.0**
5.2	**−4.1**	17.4	28	**−9.3**
5.5	**−4.2**	18.3	30	**−9.6**
5.8	**−4.3**	19.1	32	**−10.0**
6.1	**−4.4**	20.1	34	**−10.3**
6.3	**−4.5**	21.0	36	**−10.6**
6.6	**−4.6**	22.0	38	**−10.8**
6.9	**−4.7**	22.9	40	**−11.1**
7.2	**−4.8**	23.9	42	**−11.4**
7.5	**−4.9**	24.9	44	**−11.7**
7.9	**−5.0**	26.0	46	**−11.9**
8.2	**−5.1**	27.1	48	**−12.2**
8.5	**−5.2**	28.1	**feet**	**′**
8.8	**−5.3**	29.2	2	**−1.4**
9.2	**−5.4**	30.4	4	**−1.9**
9.5	**−5.5**	31.5	6	**−2.4**
9.9	**−5.6**	32.7	8	**−2.7**
10.3	**−5.7**	33.9	10	**−3.1**
10.6	**−5.8**	35.1	See table ←	
11.0	**−5.9**	36.3		
11.4	**−6.0**	37.6	**feet**	**′**
11.8	**−6.1**	38.9	70	**−8.1**
12.2	**−6.2**	40.1	75	**−8.4**
12.6	**−6.3**	41.5	80	**−8.7**
13.0	**−6.4**	42.8	85	**−8.9**
13.4	**−6.5**	44.2	90	**−9.2**
13.8	**−6.6**	45.5	95	**9.5**
14.2	**−6.7**	46.9	100	**−9.7**
14.7	**−6.8**	48.4	105	**−9.9**
15.1	**−6.9**	49.8	110	**−10.2**
15.5	**−7.0**	51.3	115	**−10.4**
16.0	**−7.1**	52.8	120	**−10.6**
16.5	**−7.2**	54.3	125	**−10.8**
16.9	**−7.3**	55.8	130	**−11.1**
17.4	**−7.4**	57.4	135	**−11.3**
17.9	**−7.5**	58.9	140	**−11.5**
18.4	**−7.6**	60.5	145	**−11.7**
18.8	**−7.7**	62.1	150	**−11.9**
19.3	**−7.8**	63.8	155	**−12.1**
19.8	**−7.9**	65.4		
20.4	**−8.0**	67.1		
20.9	**−8.1**	68.8		
21.4		70.5		

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

Altitude Correction Tables for 0° to 10° — Sun, Stars, Planets

App. Alt.	Sun October – March Lower Limb	Sun October – March Upper Limb	Sun April – September Lower Limb	Sun April – September Upper Limb	Stars & Planets
° ′	′	′	′	′	′
0 00	– 17.5	– 49.8	– 17.8	– 49.6	– 33.8
0 03	16.9	49.2	17.2	49.0	33.2
0 06	16.3	48.6	16.6	48.4	32.6
0 09	15.7	48.0	16.0	47.8	32.0
0 12	15.2	47.5	15.4	47.2	31.5
0 15	14.6	46.9	14.8	46.6	30.9
0 18	– 14.1	– 46.4	– 14.3	– 46.1	– 30.4
0 21	13.5	45.8	13.8	33.8	29.8
0 24	13.0	45.3	13.3	45.1	29.3
0 27	12.5	44.8	12.8	44.6	28.8
0 30	12.0	44.3	12.3	44.1	28.3
0 33	11.6	43.9	11.8	43.6	27.9
0 36	– 11.1	– 10.0	– 11.3	– 43.1	– 27.4
0 39	10.6	42.9	10.9	42.7	26.9
0 42	10.2	42.5	10.5	42.3	26.5
0 45	9.8	42.1	10.0	41.8	26.1
0 48	9.4	41.7	9.6	41.4	25.7
0 51	9.0	41.3	9.2	41.0	25.3
0 54	– 8.6	– 40.9	– 8.8	– 40.6	– 24.9
0 57	8.2	40.5	8.4	40.2	24.5
1 00	7.8	40.1	8.0	39.8	24.1
1 03	7.4	39.7	7.7	39.5	23.7
1 06	7.1	39.4	7.3	39.1	23.4
1 09	6.7	39.0	7.0	38.8	23.0
1 12	– 6.4	– 38.7	– 6.6	– 38.4	– 22.7
1 15	6.0	38.3	6.3	38.1	22.3
1 18	5.7	38.0	6.0	37.8	22.0
1 21	5.4	37.7	5.7	37.5	21.7
1 24	5.1	37.4	5.3	37.1	21.4
1 27	4.8	37.1	5.0	33.8	21.1
1 30	– 4.5	– 36.8	– 4.7	– 36.5	– 20.8
1 35	4.0	36.3	4.3	36.1	20.3
1 40	3.6	35.9	3.8	35.6	19.9
1 45	3.1	35.4	3.4	35.2	19.4
1 50	2.7	35.0	2.9	34.7	19.0
1 55	2.3	34.6	2.5	34.3	18.6
2 00	– 1.9	– 34.2	– 2.1	– 33.9	– 18.2
2 05	1.5	33.8	1.7	33.5	17.8
2 10	1.1	33.4	1.4	33.2	17.4
2 15	0.8	33.1	1.0	32.8	17.1
2 20	0.4	32.7	0.7	32.5	16.7
2 25	– 0.1	32.4	– 0.3	32.1	16.4
2 30	+ 0.2	– 32.1	0.0	– 31.8	– 16.1
2 35	0.5	31.8	+ 0.3	31.5	15.8
2 40	0.8	31.5	0.6	31.2	15.4
2 45	1.1	31.2	0.9	30.9	15.2
2 50	1.4	30.9	1.2	30.6	14.9
2 55	1.7	30.6	1.4	30.4	14.9
3 00	+ 2.0	– 30.3	+ 1.7	– 30.1	– 14.3
3 05	2.2	30.1	2.0	29.8	14.1
3 10	2.5	29.8	2.2	29.6	13.8
3 15	2.7	29.6	2.5	29.3	13.6
3 20	2.9	29.4	2.7	29.1	13.4
3 25	3.2	29.1	2.9	28.9	13.4
3 30	3.4	– 28.9	+ 3.1	– 28.7	– 12.9

App. Alt.	Sun October – March Lower Limb	Sun October – March Upper Limb	Sun April – September Lower Limb	Sun April – September Upper Limb	Stars & Planets
° ′	′	′	′	′	′
3 30	+ 3.4	– 28.9	+ 3.1	– 28.7	– 12.9
3 35	3.6	28.7	3.3	28.5	12.7
3 40	3.8	28.5	3.6	28.2	12.5
3 45	4.0	28.3	3.8	28.0	12.3
3 50	4.2	28.1	4.0	27.8	12.1
3 55	4.4	27.9	4.1	27.7	11.9
4 00	+ 4.6	– 27.7	+ 4.3	– 27.5	– 11.7
4 05	4.8	27.5	4.5	27.3	11.5
4 10	4.9	27.4	4.7	27.1	11.4
4 15	5.1	27.2	4.9	26.9	11.2
4 20	5.3	27.0	5.0	26.8	11.0
4 25	5.4	26.9	5.2	26.6	10.9
4 30	+ 5.6	– 26.7	+ 5.3	– 26.5	– 10.7
4 35	5.7	26.6	5.5	26.3	10.6
4 40	5.9	26.4	5.6	26.2	10.4
4 45	6.0	26.3	5.8	26.0	10.3
4 50	6.2	26.1	5.9	25.9	10.1
4 55	6.3	26.0	6.1	25.7	10.0
5 00	+ 6.4	– 25.9	+ 6.2	– 25.6	– 9.9
5 05	6.6	25.7	6.3	25.5	9.7
5 10	6.7	25.6	6.5	25.3	9.6
5 15	6.8	25.5	6.6	25.2	9.5
5 20	7.0	25.3	6.7	25.1	9.3
5 25	7.1	25.2	6.8	25.0	9.2
5 30	+ 7.2	– 25.1	+ 6.9	– 24.9	– 9.1
5 35	7.3	25.0	7.1	24.7	9.0
5 40	7.4	24.9	7.2	24.6	8.9
5 45	7.5	24.8	7.3	24.5	8.8
5 50	7.6	24.7	7.4	24.4	8.7
5 55	7.7	24.6	7.5	24.3	8.6
6 00	+ 7.8	– 24.5	+ 7.6	– 24.2	– 8.5
6 10	8.0	24.3	7.8	24.0	8.3
6 20	8.2	24.1	8.0	23.8	8.1
6 30	8.4	23.9	8.2	23.6	7.9
6 40	8.6	23.7	8.3	23.5	7.7
6 50	8.7	23.6	8.5	23.3	7.6
7 00	+ 8.9	– 23.4	+ 8.7	– 23.1	– 7.4
7 10	9.1	23.2	8.8	23.0	7.2
7 20	9.2	23.1	9.0	22.8	7.1
7 30	9.3	23.0	9.1	22.7	6.9
7 40	9.5	22.8	9.2	22.6	6.8
7 50	9.6	22.7	9.4	22.4	6.7
8 00	+ 9.7	– 22.6	+ 9.5	– 22.3	– 6.6
8 10	9.9	22.4	9.6	22.2	6.4
8 20	10.0	22.3	9.7	22.1	6.3
8 30	10.1	22.2	9.9	21.9	6.2
8 40	10.2	22.1	10.0	21.8	6.1
8 50	10.3	22.0	10.1	21.7	6.0
9 00	+ 10.4	– 21.9	+ 10.2	– 21.6	– 5.9
9 10	10.5	21.8	10.3	21.5	5.8
9 20	10.6	21.7	10.4	21.4	5.7
9 30	10.7	21.6	10.5	21.3	5.6
9 40	10.8	21.5	10.6	21.2	5.5
9 50	10.9	21.4	10.6	21.2	5.4
10 00	+ 11.0	– 21.3	+ 10.7	– 21.1	– 5.3

For bubble sextant observations- ignore dip and use star corrections for the Sun, planets and stars.

ALTITUDE CORRECTION TABLES 0° – 35° — MOON

App. Alt.	0° – 4°		5° – 9°		10° – 14°		15° – 19°		20° – 24°		25° – 29°		30° – 34°		App. Alt.
	Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		
'	'		'		'		'		'		'		'		'
	0°		5°		10°		15°		20°		25°		30°		
00	34.5		58.2		62.1		62.8		62.2		60.8		58.9		00
10	36.5		58.5		62.2		62.8		62.2		60.8		58.8		10
20	38.3		58.7		62.2		62.8		62.1		60.7		58.8		20
30	40.0		58.9		62.3		62.8		62.1		60.7		58.7		30
40	41.5		59.1		62.3		62.8		62.0		60.6		58.6		40
50	42.9		59.3		62.4		62.7		62.0		60.6		58.5		50
	1°		6°		11°		16°		21°		26°		31°		
00	44.2		59.5		62.4		62.7		62.0		60.5		58.5		00
10	45.4		59.7		62.4		62.7		61.9		60.4		58.4		10
20	46.5		59.9		62.5		62.7		61.9		60.4		58.3		20
30	47.5		60.0		62.5		62.7		61.9		60.3		58.2		30
40	48.4		60.2		62.5		62.7		61.8		60.3		58.2		40
50	49.3		60.3		62.6		62.7		61.8		60.2		58.1		50
	2°		7°		12°		17°		22°		27°		32°		
00	50.1		60.5		62.6		62.7		61.7		60.1		58.0		00
10	50.8		60.6		62.6		62.6		61.7		60.1		57.9		10
20	51.5		60.7		62.6		62.6		61.6		60.0		57.8		20
30	52.2		60.9		62.7		62.6		61.6		59.9		57.8		30
40	52.8		61.0		62.7		62.6		61.6		59.9		57.7		40
50	53.4		61.1		62.7		62.6		61.5		59.8		57.6		50
	3°		8°		13°		18°		23°		28°		33°		
00	53.9		61.2		62.7		62.5		61.5		59.7		57.5		00
10	54.4		61.3		62.7		62.5		61.4		59.7		57.4		10
20	54.9		61.4		62.7		62.5		61.4		59.6		57.4		20
30	55.3		61.5		62.8		62.5		61.3		59.5		57.3		30
40	55.7		61.6		62.8		62.4		61.3		59.5		57.2		40
50	56.1		61.6		62.8		62.4		61.2		59.4		57.1		50
	4°		9°		14°		19°		24°		29°		34°		
00	56.4		61.7		62.8		62.4		61.2		59.3		57.0		00
10	56.8		61.8		62.8		62.4		61.1		59.3		56.9		10
20	57.1		61.9		62.8		62.3		61.1		59.2		56.9		20
30	57.4		61.9		62.8		62.3		61.0		59.1		56.8		30
40	57.7		62.0		62.8		62.3		61.0		59.1		56.7		40
50	58.0		62.1		62.8		62.2		60.9		59.0		56.6		50
HP	L	U	L	U	L	U	L	U	L	U	L	U	L	U	HP
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
54.0	0.3	0.9	0.3	0.9	0.4	1.0	0.5	1.1	0.6	1.2	0.7	1.3	0.9	1.5	54.0
54.3	0.7	1.1	0.7	1.2	0.8	1.2	0.8	1.3	0.9	1.4	1.1	1.5	1.2	1.7	54.3
54.6	1.1	1.4	1.1	1.4	1.1	1.4	1.2	1.5	1.3	1.6	1.4	1.7	1.5	1.8	54.6
54.9	1.4	1.6	1.4	1.6	1.5	1.6	1.6	1.7	1.6	1.8	1.8	1.9	1.9	2.0	54.9
55.2	1.8	1.8	1.8	1.8	1.9	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	55.2
55.5	2.2	2.0	2.2	2.0	2.3	2.1	2.3	2.1	2.4	2.2	2.4	2.3	2.5	2.4	55.5
55.8	2.6	2.2	2.6	2.2	2.6	2.3	2.7	2.3	2.7	2.4	2.8	2.4	2.9	2.5	55.8
56.1	3.0	2.4	3.0	2.5	3.0	2.5	3.0	2.5	3.1	2.6	3.1	2.6	3.2	2.7	56.1
56.4	3.3	2.7	3.3	2.7	3.4	2.7	3.4	2.7	3.4	2.8	3.5	2.8	3.5	2.9	56.4
56.7	3.7	2.9	3.7	2.9	3.8	2.9	3.8	2.9	3.8	3.0	3.8	3.0	3.9	3.0	56.7
57.0	4.1	3.1	4.1	3.1	4.1	3.1	4.1	3.1	4.2	3.2	4.2	3.2	4.2	3.2	57.0
57.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.4	4.6	3.4	57.3
57.6	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.6	57.6
57.9	5.3	3.8	5.3	3.8	5.2	3.8	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	57.9
58.2	5.6	4.0	5.6	4.0	5.6	4.0	5.6	4.0	5.6	3.9	5.6	3.9	5.6	3.9	58.2
58.5	6.0	4.2	6.0	4.2	6.0	4.2	6.0	4.2	6.0	4.1	5.9	4.1	5.9	4.1	58.5
58.8	6.4	4.4	6.4	4.4	6.4	4.4	6.3	4.4	6.3	4.3	6.3	4.3	6.2	4.2	58.8
59.1	6.8	4.6	6.8	4.6	6.7	4.6	6.7	4.6	6.7	4.5	6.6	4.5	6.6	4.4	59.1
59.4	7.2	4.8	7.1	4.8	7.1	4.8	7.1	4.8	7.0	4.7	7.0	4.7	6.9	4.6	59.4
59.7	7.5	5.1	7.5	5.0	7.5	5.0	7.5	5.0	7.4	4.9	7.3	4.8	7.2	4.8	59.7
60.0	7.9	5.3	7.9	5.3	7.9	5.2	7.8	5.2	7.8	5.1	7.7	5.0	7.6	4.9	60.0
60.3	8.3	5.5	8.3	5.5	8.2	5.4	8.2	5.4	8.1	5.3	8.0	5.2	7.9	5.1	60.3
60.6	8.7	5.7	8.7	5.7	8.6	5.7	8.6	5.6	8.5	5.5	8.4	5.4	8.2	5.3	60.6
60.9	9.1	5.9	9.0	5.9	9.0	5.9	8.9	5.8	8.8	5.7	8.7	5.6	8.6	5.4	60.9
61.2	9.5	6.2	9.4	6.1	9.4	6.1	9.3	6.0	9.2	5.9	9.1	5.8	8.9	5.6	61.2
61.5	9.8	6.4	9.8	6.3	9.7	6.3	9.7	6.2	9.5	6.1	9.4	5.9	9.2	5.8	61.5

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ	Ht. of Eye
m	'	ft	m	'	ft
2.4	-2.8	7.9	9.5	-5.5	31.2
2.6	-2.9	8.5	9.9	-5.6	32.5
2.8	-3.0	9.2	10.3	-5.7	33.8
3.0	-3.1	9.8	10.6	-5.8	34.8
3.2	-3.2	10.5	11.0	-5.9	36.1
3.4	-3.3	11.2	11.4	-6.0	37.4
3.6	-3.4	11.8	11.8	-6.1	38.7
3.8	-3.5	12.5	12.2	-6.2	40.0
4.0	-3.6	13.1	12.6	-6.3	41.3
4.3	-3.7	14.1	13.0	-6.4	42.7
4.5	-3.8	14.8	13.4	-6.5	44.0
4.7	-3.9	15.4	13.8	-6.6	45.3
5.0	-4.0	16.4	14.2	-6.7	46.6
5.2	-4.1	17.1	14.7	-6.8	48.2
5.5	-4.2	18.0	15.1	-6.9	49.5
5.8	-4.3	19.0	15.5	-7.0	50.9
6.1	-4.4	20.0	16.0	-7.1	52.5
6.3	-4.5	20.7	16.5	-7.2	54.1
6.6	-4.6	21.7	16.9	-7.3	55.4
6.9	-4.7	22.6	17.4	-7.4	57.1
7.2	-4.8	23.6	17.9	-7.5	58.7
7.5	-4.9	24.6	18.4	-7.6	60.4
7.9	-5.0	25.9	18.8	-7.7	61.7
8.2	-5.1	26.9	19.3	-7.8	63.3
8.5	-5.2	27.9	19.8	-7.9	65.0
8.8	-5.3	28.9	20.4	-8.0	66.9
9.2	-5.4	30.2	20.9	-8.1	68.6
9.5		31.2	21.4		70.2

MOON CORRECTION TABLE

The correction is in two parts; the first correction is taken from the upper part of the table with argument apparent altitude, and the second from the lower part, with argument HP, in the same column as that from which the first correction was taken. Separate corrections are given in the lower part for lower (L) and upper (U) limbs. All corrections are to be **added** to apparent altitude, *but* 30' *is to be subtracted from the altitude of the upper limb.*

For corrections for pressure and temperature see page A4.

For bubble sextant observations ignore dip, take the mean of upper and lower limb corrections and subtract 15' from the altitude.

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

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ALTITUDE CORRECTION TABLES 35° – 90° — MOON

App. Alt.	35° – 39°		40° – 44°		45° – 49°		50° – 54°		55° – 59°		60° – 64°		65° – 69°		70° – 74°		75° – 79°		80° – 84°		85° – 89°		App. Alt.
	Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		
'	35°	'	40°	'	45°	'	50°	'	55°	'	60°	'	65°	'	70°	'	75°	'	80°	'	85°	'	'
00		56.5		53.7		50.5		46.9		43.1		38.9		34.6		30.0		25.3		20.5		15.6	00
10		56.4		53.6		50.4		46.8		42.9		38.8		34.4		29.9		25.2		20.4		15.5	10
20		56.3		53.5		50.2		46.7		42.8		38.7		34.3		29.7		25.0		20.2		15.3	20
30		56.2		53.4		50.1		46.5		42.7		38.5		34.1		29.6		24.9		20.0		15.1	30
40		56.2		53.3		50.0		46.4		42.5		38.4		34.0		29.4		24.7		19.9		15.0	40
50		56.1		53.2		49.9		46.3		42.4		38.2		33.8		29.3		24.5		19.7		14.8	50
	36°		41°		46°		51°		56°		61°		66°		71°		76°		81°		86°		
00		56.0		53.1		49.8		46.2		42.3		38.1		33.7		29.1		24.4		19.6		14.6	00
10		55.9		53.0		49.7		46.0		42.1		37.9		33.5		29.0		24.2		19.4		14.5	10
20		55.8		52.9		49.5		45.9		42.0		37.8		33.4		28.8		24.1		19.2		14.3	20
30		55.7		52.8		49.4		45.8		41.9		37.7		33.2		28.7		23.9		19.1		14.2	30
40		55.6		52.6		49.3		45.7		41.7		37.5		33.1		28.5		23.8		18.9		14.0	40
50		55.5		52.5		49.2		45.5		41.6		37.4		32.9		28.3		23.6		18.7		13.8	50
	37°		42°		47°		52°		57°		62°		67°		72°		77°		82°		87°		
00		55.4		52.4		49.1		45.4		41.4		37.2		32.8		28.2		23.4		18.6		13.7	00
10		55.3		52.3		49.0		45.3		41.3		37.1		32.6		28.0		23.3		18.4		13.5	10
20		55.2		52.2		48.8		45.2		41.2		36.9		32.5		27.9		23.1		18.2		13.3	20
30		55.1		52.1		48.7		45.0		41.0		36.8		32.3		27.7		22.9		18.1		13.2	30
40		55.0		52.0		48.6		44.9		40.9		36.6		32.2		27.6		22.8		17.9		13.0	40
50		55.0		51.9		48.5		44.8		40.8		36.5		32.0		27.4		22.6		17.8		12.8	50
	38°		43°		48°		53°		58°		63°		68°		73°		78°		83°		88°		
00		54.9		51.8		48.4		44.6		40.6		36.4		31.9		27.2		22.5		17.6		12.7	00
10		54.8		51.7		48.3		44.5		40.5		36.2		31.7		27.1		22.3		17.4		12.5	10
20		54.7		51.6		48.1		44.4		40.3		36.1		31.6		26.9		22.1		17.3		12.3	20
30		54.6		51.5		48.0		44.2		40.2		35.9		31.4		26.8		22.0		17.1		12.2	30
40		54.5		51.4		47.9		44.1		40.1		35.8		31.3		26.6		21.8		16.9		12.0	40
50		54.4		51.2		47.8		44.0		39.9		35.6		31.1		26.5		21.7		16.8		11.8	50
	39°		44°		49°		54°		59°		64°		69°		74°		79°		84°		89°		
00		54.3		51.1		47.7		43.9		39.8		35.5		31.0		26.3		21.5		16.6		11.7	00
10		54.2		51.0		47.5		43.7		39.6		35.3		30.8		26.1		21.3		16.4		11.5	10
20		54.1		50.9		47.4		43.6		39.5		35.2		30.7		26.0		21.2		16.3		11.4	20
30		54.0		50.8		47.3		43.5		39.4		35.0		30.5		25.8		21.0		16.1		11.2	30
40		53.9		50.7		47.2		43.3		39.2		34.9		30.4		25.7		20.9		16.0		11.0	40
50		53.8		50.6		47.0		43.2		39.1		34.7		30.2		25.5		20.7		15.8		10.9	50
HP	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	HP
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
54.0	1.1	1.7	1.3	1.9	1.5	2.1	1.7	2.4	2.0	2.6	2.3	2.9	2.6	3.2	2.9	3.5	3.2	3.8	3.5	4.1	3.8	4.5	54.0
54.3	1.4	1.8	1.6	2.0	1.8	2.2	2.0	2.5	2.2	2.7	2.5	3.0	2.8	3.2	3.1	3.5	3.3	3.8	3.6	4.1	3.9	4.4	54.3
54.6	1.7	2.0	1.9	2.2	2.1	2.4	2.3	2.6	2.5	2.8	2.7	3.0	3.0	3.3	3.2	3.5	3.5	3.8	3.8	4.0	4.0	4.3	54.6
54.9	2.0	2.2	2.2	2.3	2.4	2.5	2.5	2.7	2.7	2.9	2.9	3.1	3.2	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.3	54.9
55.2	2.3	2.3	2.5	2.4	2.6	2.6	2.8	2.8	3.0	2.9	3.2	3.1	3.4	3.3	3.6	3.5	3.8	3.7	4.0	4.0	4.2	4.2	55.2
55.5	2.7	2.5	2.8	2.6	2.9	2.7	3.1	2.9	3.2	3.0	3.4	3.2	3.6	3.4	3.7	3.5	3.9	3.7	4.1	3.9	4.3	4.1	55.5
55.8	3.0	2.6	3.1	2.7	3.2	2.8	3.3	3.0	3.5	3.1	3.6	3.3	3.8	3.4	3.9	3.6	4.1	3.7	4.2	3.9	4.4	4.0	55.8
56.1	3.3	2.8	3.4	2.9	3.5	3.0	3.6	3.1	3.7	3.2	3.8	3.3	4.0	3.4	4.1	3.6	4.2	3.7	4.4	3.8	4.5	4.0	56.1
56.4	3.6	2.9	3.7	3.0	3.8	3.1	3.9	3.2	3.9	3.3	4.0	3.4	4.1	3.5	4.3	3.6	4.4	3.7	4.5	3.8	4.6	3.9	56.4
56.7	3.9	3.1	4.0	3.1	4.1	3.2	4.1	3.3	4.2	3.3	4.3	3.4	4.3	3.5	4.4	3.6	4.5	3.7	4.6	3.8	4.7	3.8	56.7
57.0	4.3	3.2	4.3	3.3	4.3	3.3	4.4	3.4	4.4	3.4	4.5	3.5	4.5	3.5	4.6	3.6	4.7	3.6	4.7	3.7	4.8	3.8	57.0
57.3	4.6	3.4	4.6	3.4	4.6	3.4	4.6	3.5	4.7	3.5	4.7	3.5	4.7	3.6	4.8	3.6	4.8	3.6	4.8	3.7	4.9	3.7	57.3
57.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	5.0	3.6	5.0	3.6	5.0	3.6	57.6
57.9	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	57.9
58.2	5.5	3.9	5.5	3.8	5.5	3.8	5.4	3.8	5.4	3.7	5.4	3.7	5.3	3.7	5.3	3.6	5.2	3.6	5.2	3.5	5.2	3.5	58.2
58.5	5.9	4.0	5.8	4.0	5.8	3.9	5.7	3.9	5.6	3.8	5.6	3.8	5.5	3.7	5.5	3.6	5.4	3.6	5.3	3.5	5.3	3.4	58.5
58.8	6.2	4.2	6.1	4.1	6.0	4.1	6.0	4.0	5.9	3.9	5.8	3.8	5.7	3.7	5.6	3.6	5.5	3.5	5.4	3.5	5.3	3.4	58.8
59.1	6.5	4.3	6.4	4.3	6.3	4.2	6.2	4.1	6.1	4.0	6.0	3.9	5.9	3.8	5.8	3.6	5.7	3.5	5.6	3.4	5.4	3.3	59.1
59.4	6.8	4.5	6.7	4.4	6.6	4.3	6.5	4.2	6.4	4.1	6.2	3.9	6.1	3.8	6.0	3.7	5.8	3.5	5.7	3.4	5.5	3.2	59.4
59.7	7.1	4.7	7.0	4.5	6.9	4.4	6.8	4.3	6.6	4.1	6.5	4.0	6.3	3.8	6.1	3.7	6.0	3.5	5.8	3.3	5.6	3.2	59.7
60.0	7.5	4.8	7.3	4.7	7.2	4.5	7.0	4.4	6.9	4.2	6.7	4.0	6.5	3.9	6.3	3.7	6.1	3.5	5.9	3.3	5.7	3.1	60.0
60.3	7.8	5.0	7.6	4.8	7.5	4.7	7.3	4.5	7.1	4.3	6.9	4.1	6.7	3.9	6.5	3.7	6.3	3.5	6.0	3.2	5.8	3.0	60.3
60.6	8.1	5.1	7.9	5.0	7.7	4.8	7.6	4.6	7.3	4.4	7.1	4.2	6.9	3.9	6.7	3.7	6.4	3.4	6.2	3.2	5.9	2.9	60.6
60.9	8.4	5.3	8.2	5.1	8.0	4.9	7.8	4.7	7.6	4.5	7.3	4.2	7.1	4.0	6.8	3.7	6.6	3.4	6.3	3.2	6.0	2.9	60.9
61.2	8.7	5.4	8.5	5.2	8.3	5.0	8.1	4.8	7.8	4.5	7.6	4.3	7.3	4.0	7.0	3.7	6.7	3.4	6.4	3.1	6.1	2.8	61.2
61.5	9.1	5.6	8.8	5.4	8.6	5.1	8.3	4.9	8.1	4.6	7.8	4.3	7.5	4.0	7.2	3.7	6.9	3.4	6.5	3.1	6.2	2.7	61.5

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POLARIS (POLE STAR) TABLE, 2026

For Determining The Latitude From a Sextant Altitude

LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q
359°	-26'	**30°**	-36'	**60°**	-37'	**90°**	-27'	**120°**	-11'	**150°**	+9'
1°	-27'	31°	-36'	61°	-36'	91°	-27'	121°	-10'	151°	+10'
2°	-27'	32°	-37'	62°	-36'	92°	-26'	122°	-9'	152°	+10'
3°	-27'	33°	-37'	63°	-36'	93°	-26'	123°	-9'	153°	+11'
4°	-28'	34°	-37'	64°	-36'	94°	-25'	124°	-8'	154°	+11'
5°	-28'	35°	-37'	65°	-36'	95°	-25'	125°	-7'	155°	+12'
6°	-29'	36°	-37'	66°	-35'	96°	-24'	126°	-7'	156°	+13'
7°	-29'	37°	-37'	67°	-35'	97°	-24'	127°	-6'	157°	+13'
8°	-30'	38°	-37'	68°	-35'	98°	-23'	128°	-5'	158°	+14'
9°	-30'	39°	-37'	69°	-35'	99°	-23'	129°	-5'	159°	+15'
10°	-30'	**40°**	-37'	**70°**	-35'	**100°**	-22'	**130°**	-4'	**160°**	+15'
11°	-31'	41°	-38'	71°	-34'	101°	-22'	131°	-3'	161°	+16'
12°	-31'	42°	-38'	72°	-34'	102°	-21'	132°	-3'	162°	+16'
13°	-32'	43°	-38'	73°	-34'	103°	-21'	133°	-2'	163°	+17'
14°	-32'	44°	-38'	74°	-33'	104°	-20'	134°	-2'	164°	+18'
15°	-32'	45°	-38'	75°	-33'	105°	-20'	135°	-1'	165°	+18'
16°	-33'	46°	-38'	76°	-33'	106°	-19'	136°	-0'	166°	+19'
17°	-33'	47°	-38'	77°	-32'	107°	-18'	137°	+0'	167°	+19'
18°	-33'	48°	-38'	78°	-32'	108°	-18'	138°	+1'	168°	+20'
19°	-34'	49°	-38'	79°	-32'	109°	-17'	139°	+2'	169°	+20'
20°	-34'	**50°**	-38'	**80°**	-31'	**110°**	-17'	**140°**	+2'	**170°**	+21'
21°	-34'	51°	-38'	81°	-31'	111°	-16'	141°	+3'	171°	+21'
22°	-34'	52°	-38'	82°	-31'	112°	-16'	142°	+4'	172°	+22'
23°	-35'	53°	-37'	83°	-30'	113°	-15'	143°	+4'	173°	+23'
24°	-35'	54°	-37'	84°	-30'	114°	-14'	144°	+5'	174°	+23'
25°	-35'	55°	-37'	85°	-29'	115°	-14'	145°	+6'	175°	+24'
26°	-35'	56°	-37'	86°	-29'	116°	-13'	146°	+6'	176°	+24'
27°	-36'	57°	-37'	87°	-29'	117°	-12'	147°	+7'	177°	+25'
28°	-36'	58°	-37'	88°	-28'	118°	-12'	148°	+8'	178°	+25'
29°	-36'	59°	-37'	89°	-28'	119°	-11'	149°	+8'	179°	+26'

LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q	LHA Aries	Q
180°	+26'	**210°**	+36'	**240°**	+37'	**270°**	+27'	**300°**	+11'	**330°**	-9'
181°	+27'	211°	+36'	241°	+36'	271°	+27'	301°	+10'	331°	-10'
182°	+27'	212°	+37'	242°	+36'	272°	+26'	302°	+9'	332°	-10'
183°	+27'	213°	+37'	243°	+36'	273°	+26'	303°	+9'	333°	-11'
184°	+28'	214°	+37'	244°	+36'	274°	+25'	304°	+8'	334°	-11'
185°	+28'	215°	+37'	245°	+36'	275°	+25'	305°	+7'	335°	-12'
186°	+29'	216°	+37'	246°	+35'	276°	+24'	306°	+7'	336°	-13'
187°	+29'	217°	+37'	247°	+35'	277°	+24'	307°	+6'	337°	-13'
188°	+30'	218°	+37'	248°	+35'	278°	+23'	308°	+5'	338°	-14'
189°	+30'	219°	+37'	249°	+35'	279°	+23'	309°	+5'	339°	-15'
190°	+30'	**220°**	+37'	**250°**	+35'	**280°**	+22'	**310°**	+4'	**340°**	-15'
191°	+31'	221°	+38'	251°	+34'	281°	+22'	311°	+3'	341°	-16'
192°	+31'	222°	+38'	252°	+34'	282°	+21'	312°	+3'	342°	-16'
193°	+32'	223°	+38'	253°	+34'	283°	+21'	313°	+2'	343°	-17'
194°	+32'	224°	+38'	254°	+33'	284°	+20'	314°	+2'	344°	-18'
195°	+32'	225°	+38'	255°	+33'	285°	+20'	315°	+1'	345°	-18'
196°	+33'	226°	+38'	256°	+33'	286°	+19'	316°	+0'	346°	-19'
197°	+33'	227°	+38'	257°	+32'	287°	+18'	317°	-0'	347°	-19'
198°	+33'	228°	+38'	258°	+32'	288°	+18'	318°	-1'	348°	-20'
199°	+34'	229°	+38'	259°	+32'	289°	+17'	319°	-2'	349°	-20'
200°	+34'	**230°**	+38'	**260°**	+31'	**290°**	+17'	**320°**	-2'	**350°**	-21'
201°	+34'	231°	+38'	261°	+31'	291°	+16'	321°	-3'	351°	-21'
202°	+34'	232°	+38'	262°	+31'	292°	+16'	322°	-4'	352°	-22'
203°	+35'	233°	+37'	263°	+30'	293°	+15'	323°	-4'	353°	-23'
204°	+35'	234°	+37'	264°	+30'	294°	+14'	324°	-5'	354°	-23'
205°	+35'	235°	+37'	265°	+29'	295°	+14'	325°	-6'	355°	-24'
206°	+35'	236°	+37'	266°	+29'	296°	+13'	326°	-6'	356°	-24'
207°	+36'	237°	+37'	267°	+29'	297°	+12'	327°	-7'	357°	-25'
208°	+36'	238°	+37'	268°	+28'	298°	+12'	328°	-8'	358°	-25'
209°	+36'	239°	+37'	269°	+28'	299°	+11'	329°	-8'	359°	-26'
										360°	-26'

In critical cases, ascend

Q, which does not include refraction, is to be applied to the corrected sextant altitude of *Polaris*

Polaris, Mag. 2.0 SHA 313° 42.2', Dec N 89° 22.3'

Azimuth of Polaris- 2026

LHA Aries	Latitude 0	30°	50°	55°	60°	65°	70°	LHA Aries	Latitude 0	30°	50°	55°	60°	65°	70°
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	0.5	0.5	0.7	0.8	0.9	1.1	1.3	**180**	359.5	359.5	359.3	359.2	359.1	358.9	358.7
10	0.4	0.4	0.6	0.6	0.7	0.9	1.1	**190**	359.6	359.6	359.4	359.4	359.3	359.1	358.9
20	0.3	0.3	0.4	0.5	0.6	0.7	0.8	**200**	359.7	359.7	359.6	359.5	359.4	359.3	359.2
30	0.2	0.2	0.3	0.3	0.4	0.4	0.5	**210**	359.8	359.8	359.7	359.7	359.6	359.6	359.5
40	0.1	0.1	0.1	0.1	0.1	0.2	0.2	**220**	359.9	359.9	359.9	359.9	359.9	359.8	359.8
50	360.0	360.0	359.9	359.9	359.9	359.9	359.9	**230**	0.0	0.0	0.1	0.1	0.1	0.1	0.1
60	359.9	359.8	359.8	359.7	359.7	359.6	359.6	**240**	0.1	0.2	0.2	0.3	0.3	0.4	0.4
70	359.7	359.7	359.6	359.6	359.5	359.4	359.3	**250**	0.3	0.3	0.4	0.4	0.5	0.6	0.7
80	359.7	359.6	359.5	359.4	359.3	359.2	359.0	**260**	0.3	0.4	0.5	0.6	0.7	0.8	1.0
90	359.6	359.5	359.3	359.2	359.1	359.0	358.7	**270**	0.4	0.5	0.7	0.8	0.9	1.0	1.3
100	359.5	359.4	359.2	359.1	359.0	358.8	358.5	**280**	0.5	0.6	0.8	0.9	1.0	1.2	1.5
110	359.4	359.3	359.1	359.0	358.9	358.7	358.4	**290**	0.6	0.7	0.9	1.0	1.1	1.3	1.6
120	359.4	359.3	359.1	358.9	358.8	358.6	358.2	**300**	0.6	0.7	0.9	1.1	1.2	1.4	1.8
130	359.4	359.3	359.0	358.9	358.8	358.5	358.2	**310**	0.6	0.7	1.0	1.1	1.2	1.5	1.8
140	359.4	359.3	359.0	358.9	358.7	358.5	358.2	**320**	0.6	0.7	1.0	1.1	1.3	1.5	1.8
150	359.4	359.3	359.1	358.9	358.8	358.6	358.2	**330**	0.6	0.7	0.9	1.1	1.2	1.4	1.8
160	359.4	359.3	359.1	359.0	358.8	358.6	358.3	**340**	0.6	0.7	0.9	1.0	1.2	1.4	1.7
170	359.5	359.4	359.2	359.1	359.0	358.8	358.5	**350**	0.5	0.6	0.8	0.9	1.0	1.2	1.5
180	359.5	359.5	359.3	359.2	359.1	358.9	358.7	**360**	0.5	0.5	0.7	0.8	0.9	1.1	1.3

When Cassiopeia is left (right), Polaris is west (east)

www.TheNauticalAlmanac.com

Annular Solar Eclipse of 2026 Feb 17

Geocentric Conjunction = 11:18:37.8 UT J.D. = 2461088.971271
Greatest Eclipse = 12:11:44.6 UT J.D. = 2461089.008155

Eclipse Magnitude = 0.9630 Gamma = -0.9742

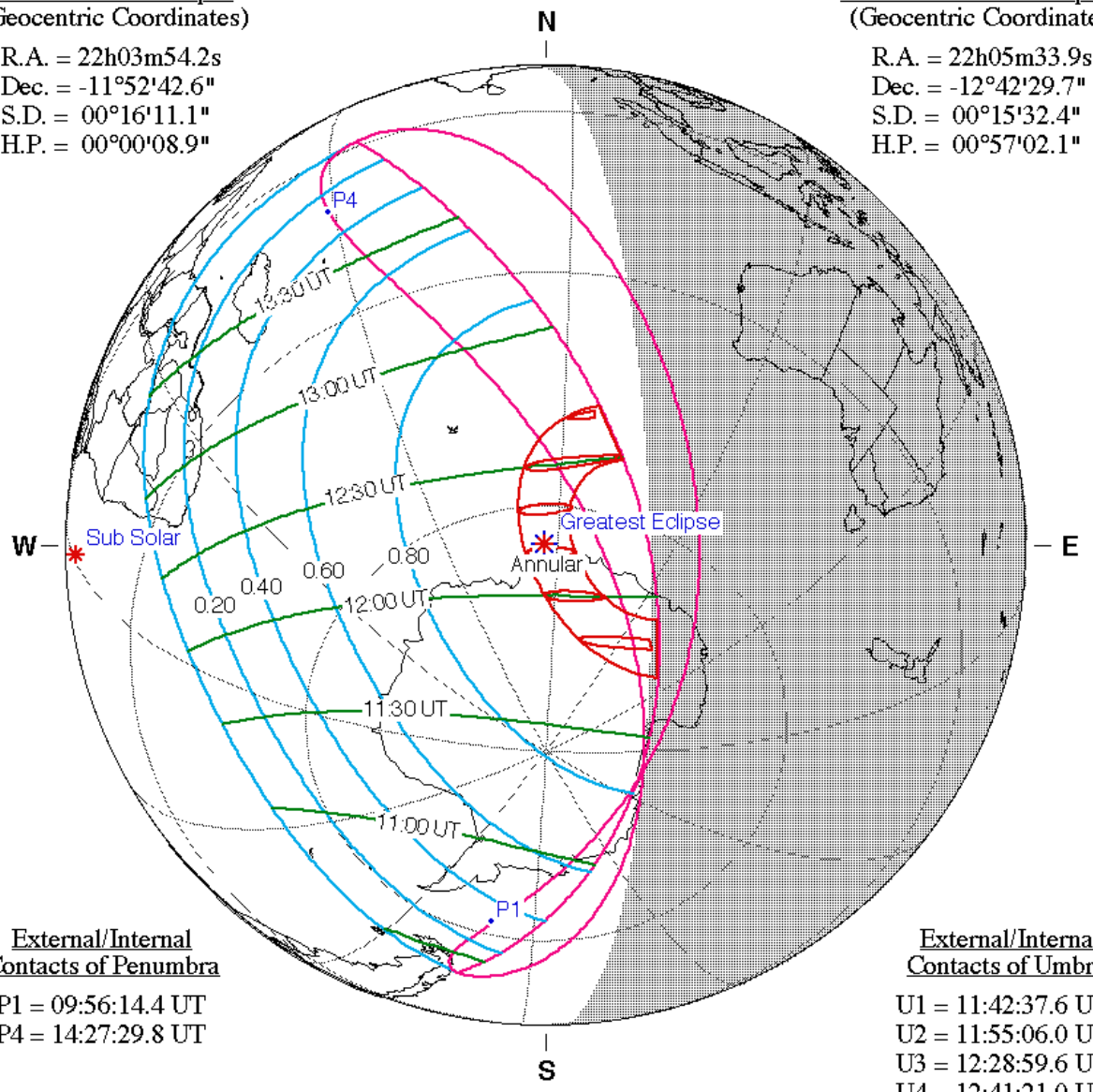
Saros Series = 121 Member = 61 of 71

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 22h03m54.2s
Dec. = -11°52'42.6"
S.D. = 00°16'11.1"
H.P. = 00°00'08.9"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 22h05m33.9s
Dec. = -12°42'29.7"
S.D. = 00°15'32.4"
H.P. = 00°57'02.1"



External/Internal Contacts of Penumbra

P1 = 09:56:14.4 UT
P4 = 14:27:29.8 UT

External/Internal Contacts of Umbra

U1 = 11:42:37.6 UT
U2 = 11:55:06.0 UT
U3 = 12:28:59.6 UT
U4 = 12:41:21.0 UT

Local Circumstances at Greatest Eclipse

Lat. = 64°43.1'S Sun Alt. = 12.3°
Long. = 086°45.3'E Sun Azm. = 268.3°
Path Width = 615.6 km Duration = 02m19.6s

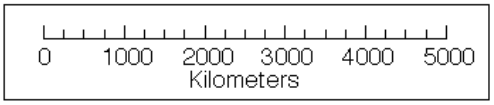
Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 83.2 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

Geocentric Libration
(Optical + Physical)

l = -5.01°
b = 1.24°
c = -18.93°

Brown Lun. No. = 1276



F. Espenak, NASA's GSFC - Fri, Jul 2,

sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Total Solar Eclipse of 2026 Aug 12

Geocentric Conjunction = 17:03:39.9 UT J.D. = 2461265.210878
Greatest Eclipse = 17:45:43.7 UT J.D. = 2461265.240089

Eclipse Magnitude = 1.0386 Gamma = 0.8976

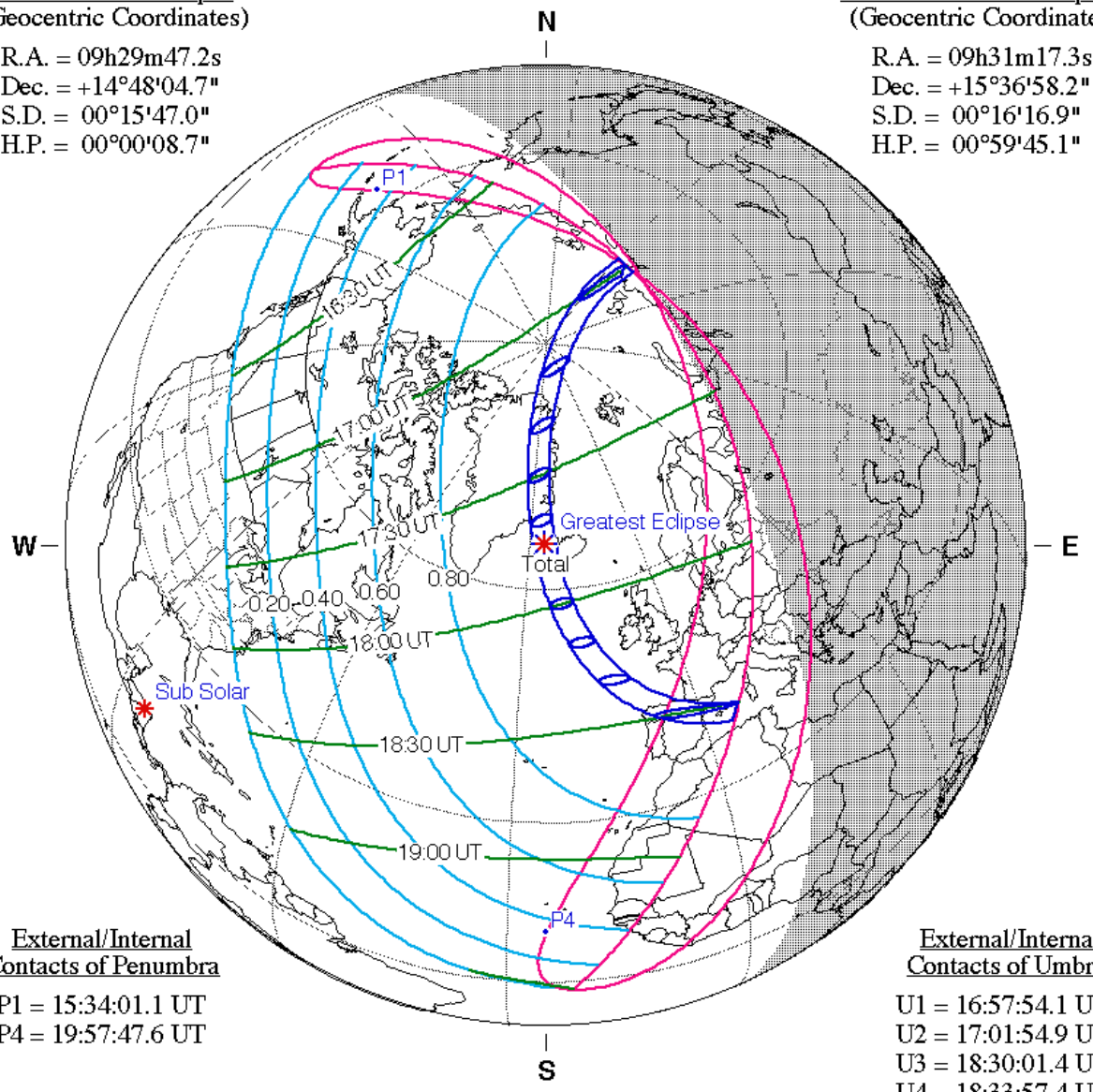
Saros Series = 126 Member = 48 of 72

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 09h29m47.2s
Dec. = +14°48'04.7"
S.D. = 00°15'47.0"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 09h31m17.3s
Dec. = +15°36'58.2"
S.D. = 00°16'16.9"
H.P. = 00°59'45.1"



External/Internal Contacts of Penumbra

P1 = 15:34:01.1 UT
P4 = 19:57:47.6 UT

External/Internal Contacts of Umbra

U1 = 16:57:54.1 UT
U2 = 17:01:54.9 UT
U3 = 18:30:01.4 UT
U4 = 18:33:57.4 UT

Local Circumstances at Greatest Eclipse

Lat. = 65°13.0'N Sun Alt. = 25.8°
Long. = 025°13.6'W Sun Azm. = 248.3°
Path Width = 293.8 km Duration = 02m18.3s

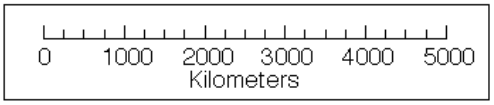
Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 83.8 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

Geocentric Libration
(Optical + Physical)

l = 4.08°
b = -1.12°
c = 16.98°

Brown Lun. No. = 1282



F. Espenak, NASA's GSFC - Fri, Jul 2,
sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Total Lunar Eclipse of 2026 Mar 03

Ecliptic Conjunction = 11:39:03.2 TD (= 11:37:48.1 UT)
Greatest Eclipse = 11:34:52.1 TD (= 11:33:37.0 UT)

Penumbral Magnitude = 2.1838 P. Radius = 1.2361° Gamma = -0.3765
Umbral Magnitude = 1.1507 U. Radius = 0.6983° Axis = 0.3596°

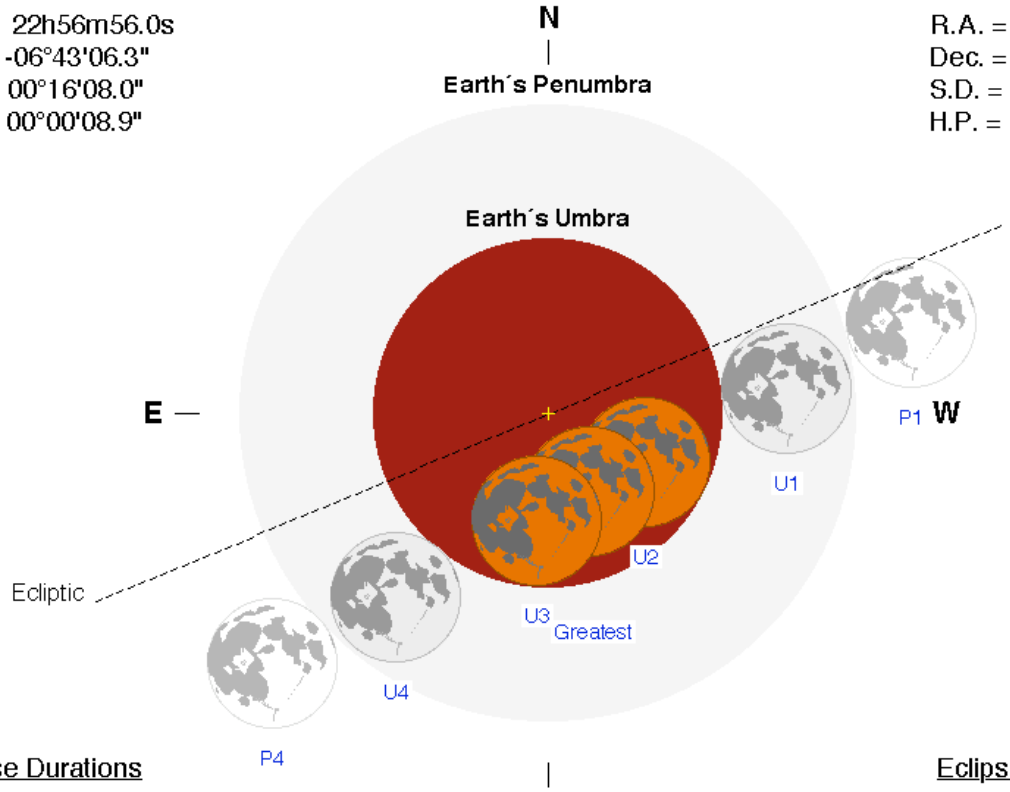
Saros Series = 133 Member = 27 of 71

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 22h56m56.0s
Dec. = -06°43'06.3"
S.D. = 00°16'08.0"
H.P. = 00°00'08.9"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 10h56m15.0s
Dec. = +06°24'05.2"
S.D. = 00°15'37.0"
H.P. = 00°57'18.7"



Eclipse Durations

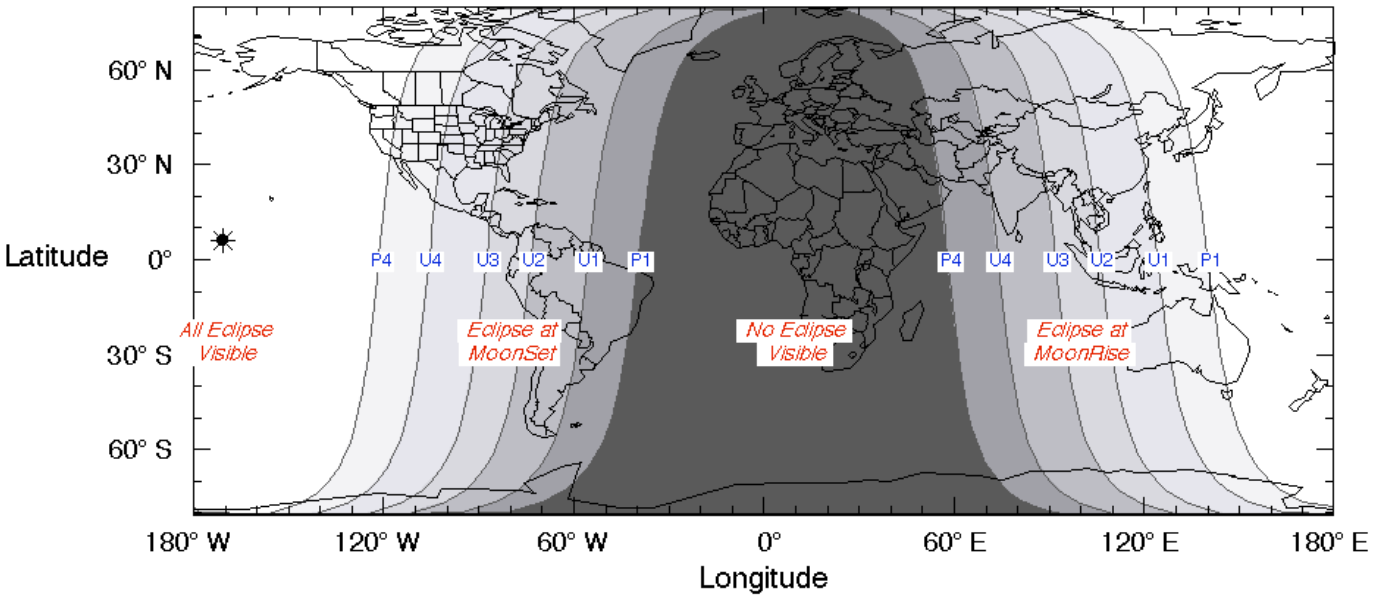
Penumbral = 05h38m37s
Umbral = 03h27m10s
Total = 00h58m19s

ΔT = 75 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html

Eclipse Contacts

P1 = 08:44:22 UT
U1 = 09:50:00 UT
U2 = 11:04:26 UT
U3 = 12:02:45 UT
U4 = 13:17:10 UT
P4 = 14:22:59 UT



2009 Apr 29

Partial Lunar Eclipse of 2026 Aug 28

Ecliptic Conjunction = 04:19:41.5 TD (= 04:18:26.0 UT)
Greatest Eclipse = 04:14:04.4 TD (= 04:12:49.0 UT)

Penumbral Magnitude = 1.9645 P. Radius = 1.2117° Gamma = 0.4964
Umbral Magnitude = 0.9299 U. Radius = 0.6840° Axis = 0.4647°

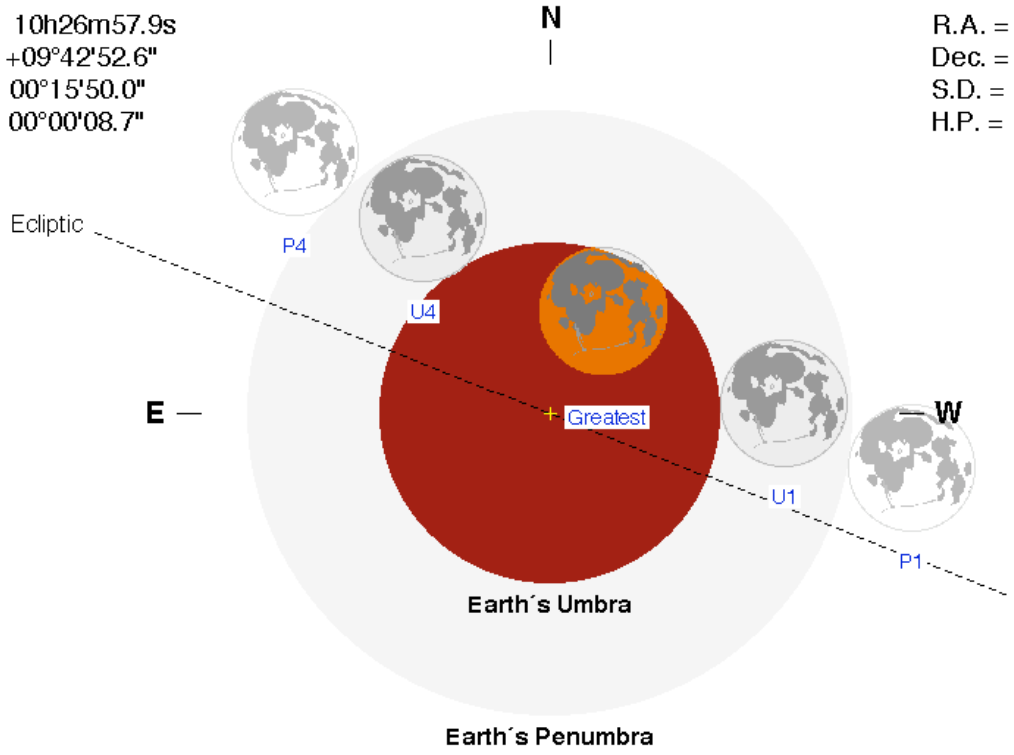
Saros Series = 138 Member = 30 of 83

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 10h26m57.9s
Dec. = +09°42'52.6"
S.D. = 00°15'50.0"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 22h26m06.3s
Dec. = -09°18'03.5"
S.D. = 00°15'18.2"
H.P. = 00°56'09.9"



Eclipse Durations

Penumbral = 05h37m46s
Umbral = 03h18m07s

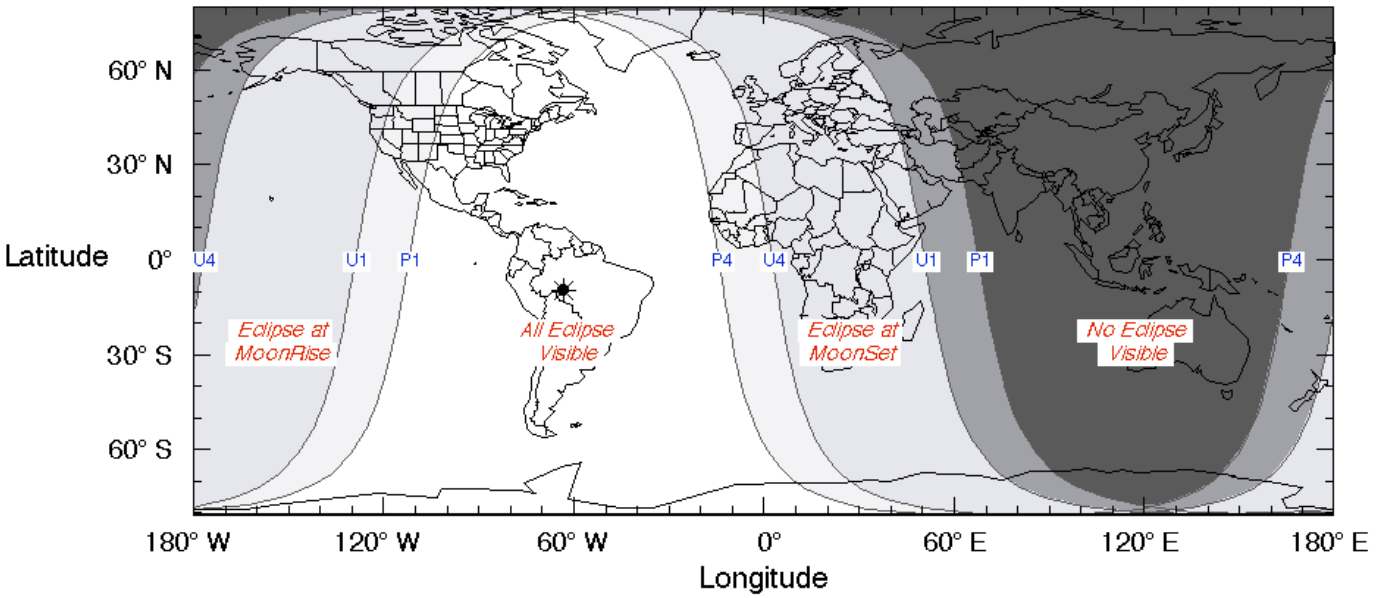
Eclipse Contacts

P1 = 01:23:55 UT
U1 = 02:33:48 UT
U4 = 05:51:55 UT
P4 = 07:01:41 UT

ΔT = 75 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

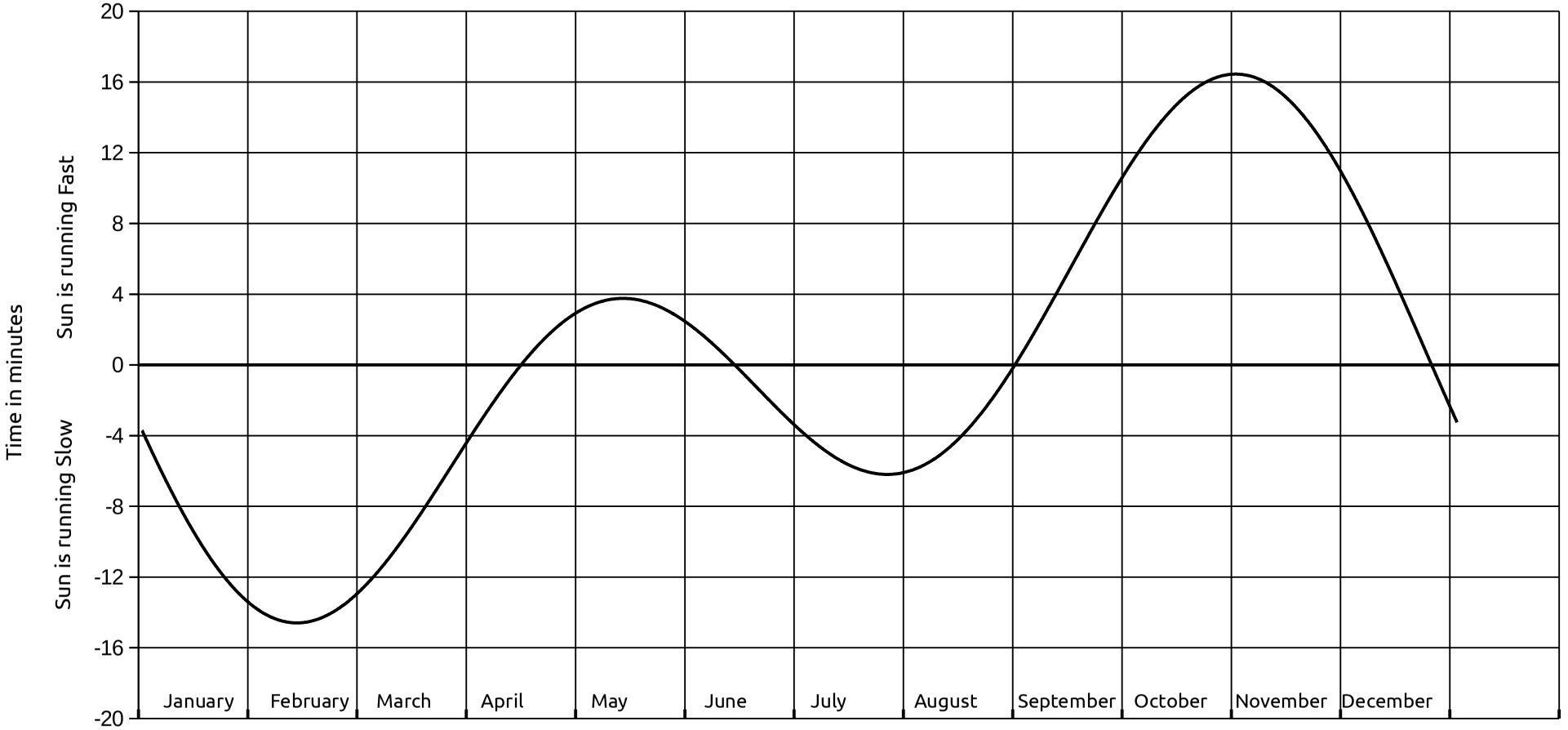
0 15 30 45 60
Arc-Minutes

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



2009 Apr 29

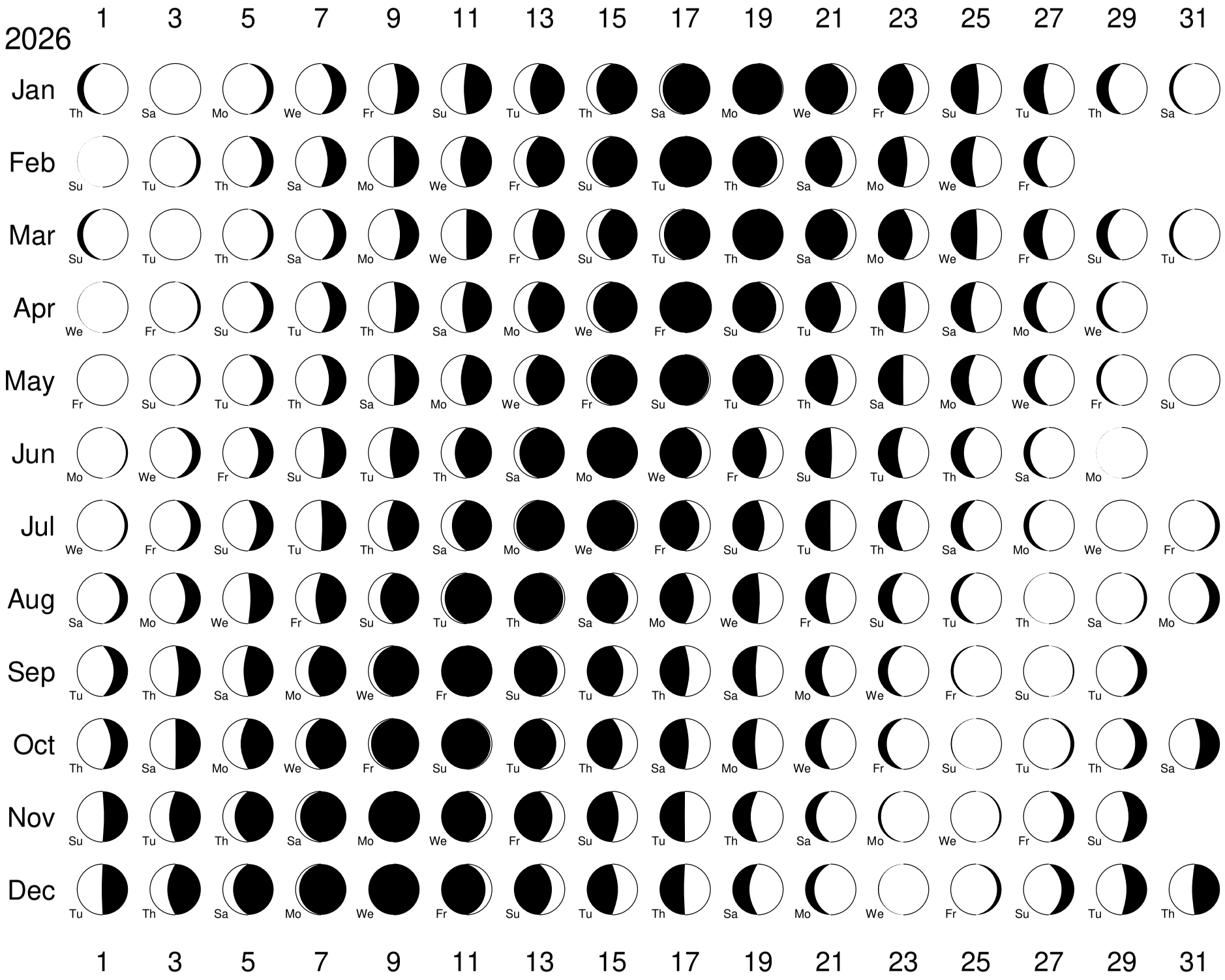
Equation of Time
for the Sun



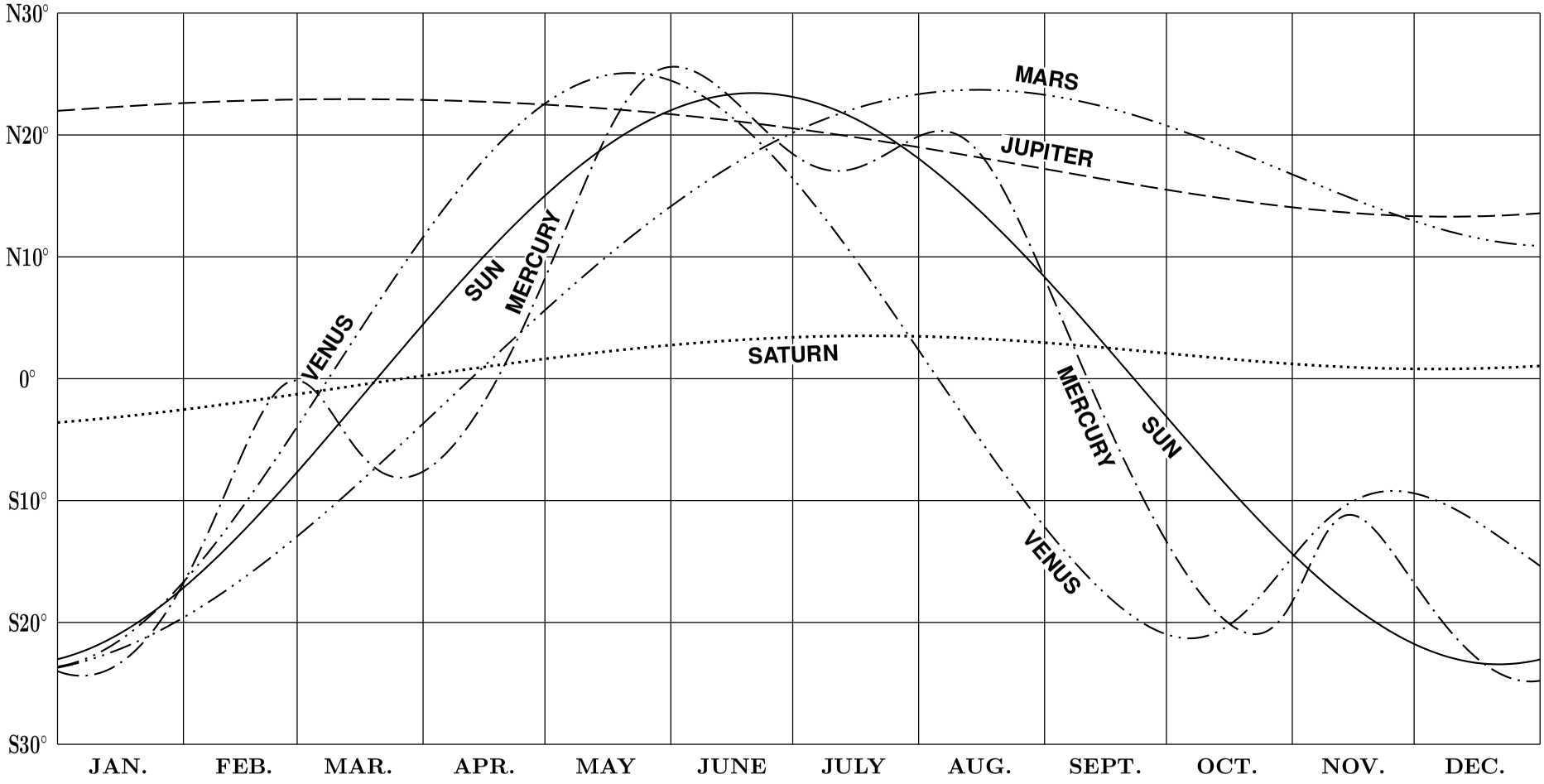
Equation_of_Time_Curve.odt

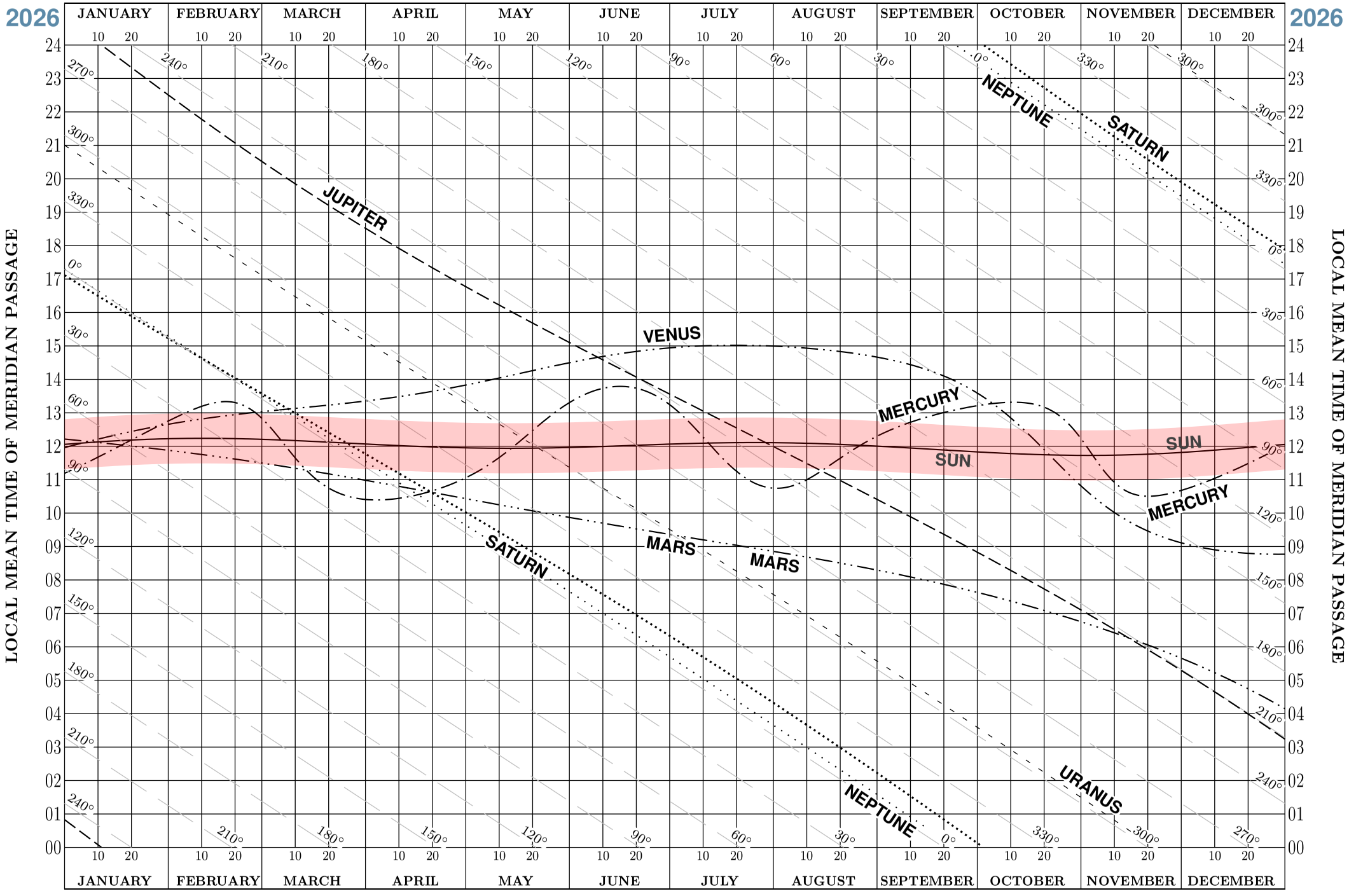
2026

Date and Time (Universal Time)			
New Moon	**First Quarter**	**Full Moon**	**Last Quarter**
--	--	Jan 3 10:03	Jan 10 15:48
Jan 18 19:52	Jan 26 04:47	Feb 1 22:09	Feb 9 12:43
Feb 17 12:01	Feb 24 12:27	Mar 3 11:38	Mar 11 09:38
Mar 19 01:23	Mar 25 19:18	Apr 2 02:12	Apr 10 04:51
Apr 17 11:52	Apr 24 02:32	May 1 17:23	May 9 21:10
May 16 20:01	May 23 11:11	May 31 08:45	Jun 8 10:00
Jun 15 02:54	Jun 21 21:55	Jun 29 23:56	Jul 7 19:29
Jul 14 09:43	Jul 21 11:05	Jul 29 14:36	Aug 6 02:21
Aug 12 17:37	Aug 20 02:46	Aug 28 04:18	Sep 4 07:51
Sep 11 03:27	Sep 18 20:44	Sep 26 16:49	Oct 3 13:25
Oct 10 15:50	Oct 18 16:12	Oct 26 04:12	Nov 1 20:28
Nov 9 07:02	Nov 17 11:48	Nov 24 14:53	Dec 1 06:08
Dec 9 00:52	Dec 17 05:42	Dec 24 01:28	Dec 30 18:59


2026
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
Jan Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Feb Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr
Mar Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
Apr We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We
May Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Jun Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Jul We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr
Aug Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Sep Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
Oct Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Nov Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Dec Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31

DECLINATION OF SUN AND PLANETS, 2026




2026
2026
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
LOCAL MEAN TIME OF MERIDIAN PASSAGE
LOCAL MEAN TIME OF MERIDIAN PASSAGE
JUPITER
VENUS
MERCURY
SUN
SUN
MERCURY
SATURN
MARS
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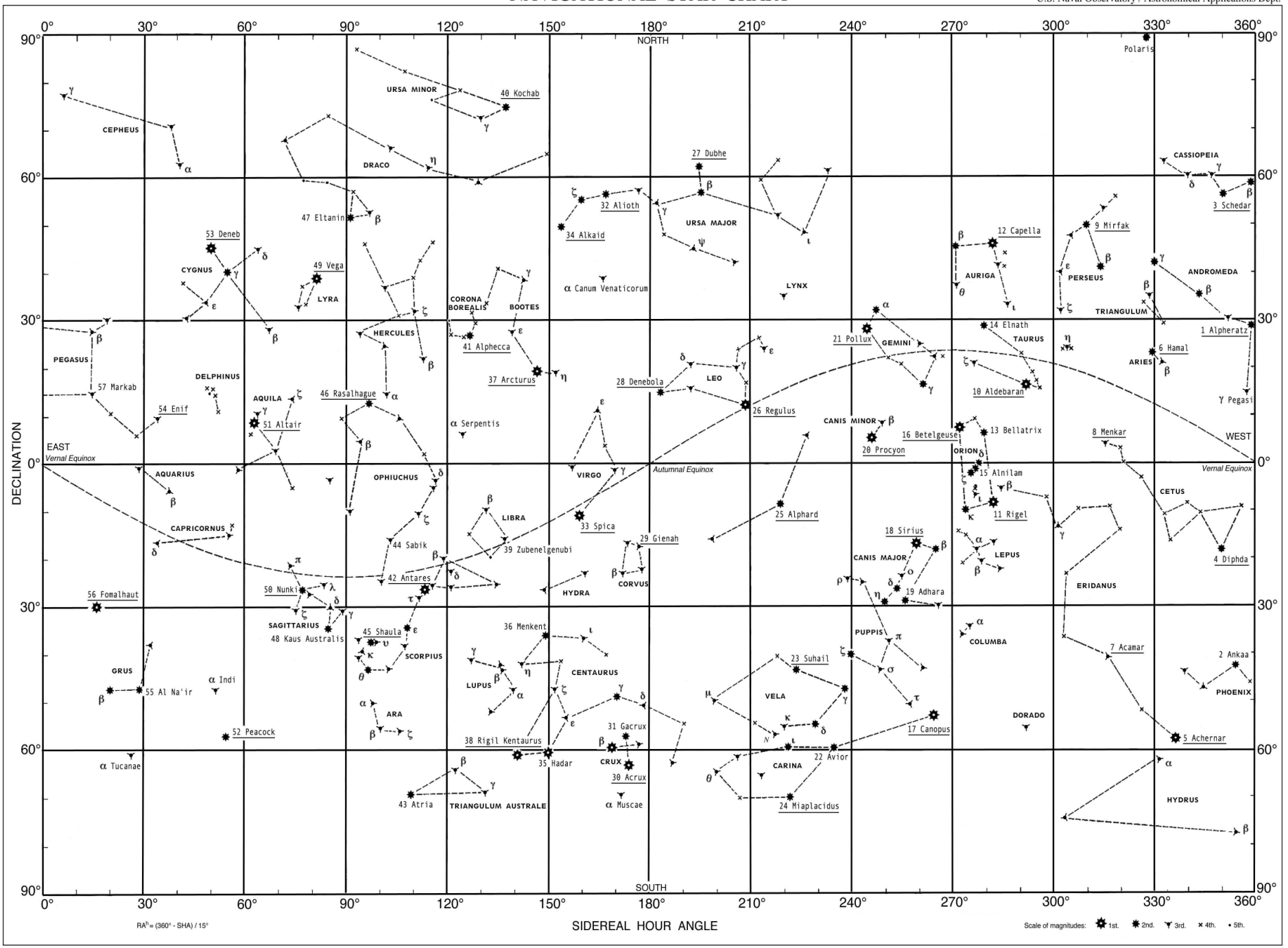
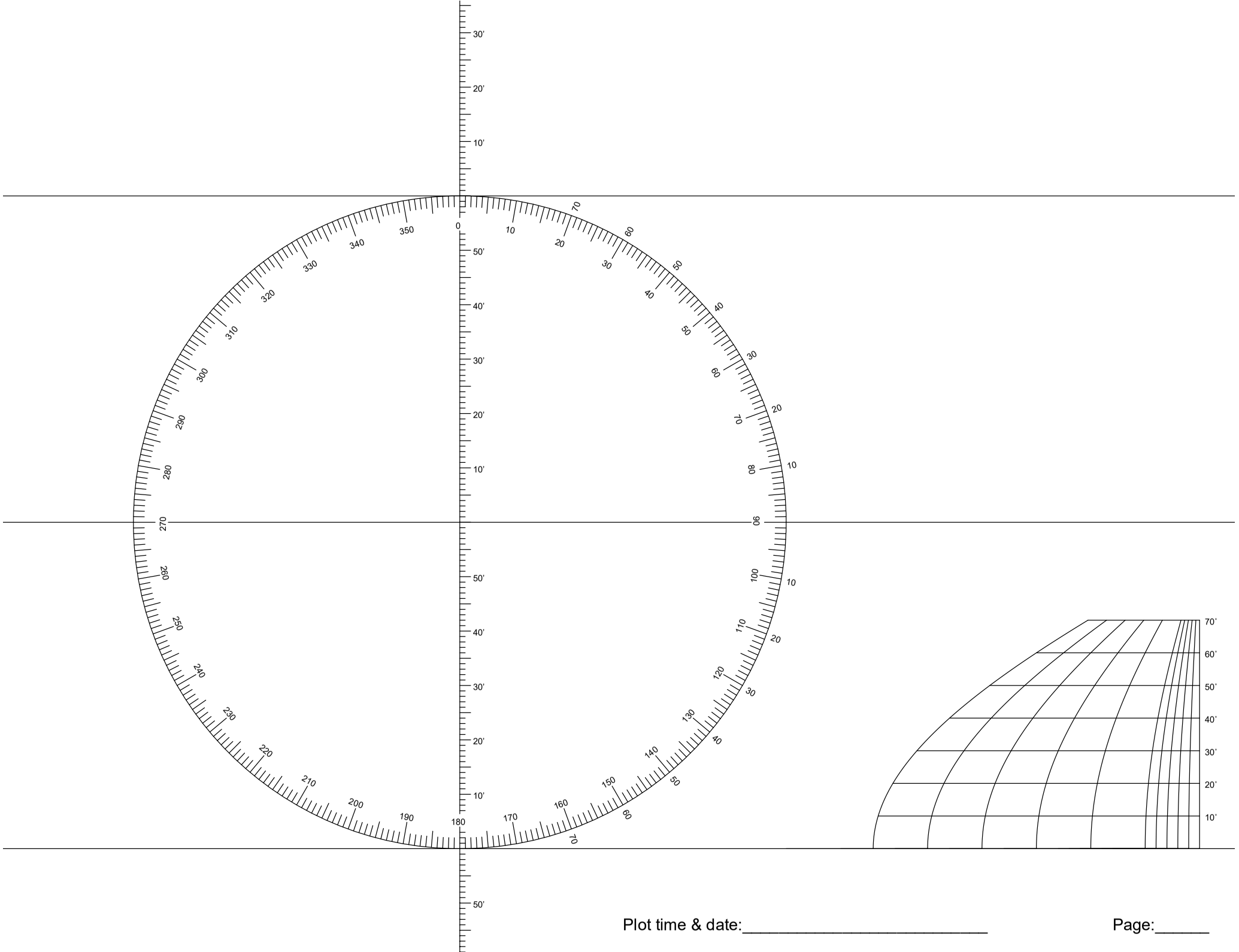
URANUS

NAVIGATIONAL STAR CHART

U.S. Naval Observatory / Astronomical Applications Dept.





Plot time & date:_____ Page:_____