The Nautical Almanac 2010

TheNauticalAlmanac.com

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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. To that end 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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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° 20.4' ***v =*** 12.1' GHA increment 4° 34.4' ***v-*** correction for 12.1' + 0° 03.9' GHA= 251° 58.7' 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

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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 m-3.8		v2.8 d0.2 m-0.7		v2.0 d0.2 m-2.0		v2.4 d-0.0 m0.9	

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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 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

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 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

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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

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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

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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	▭

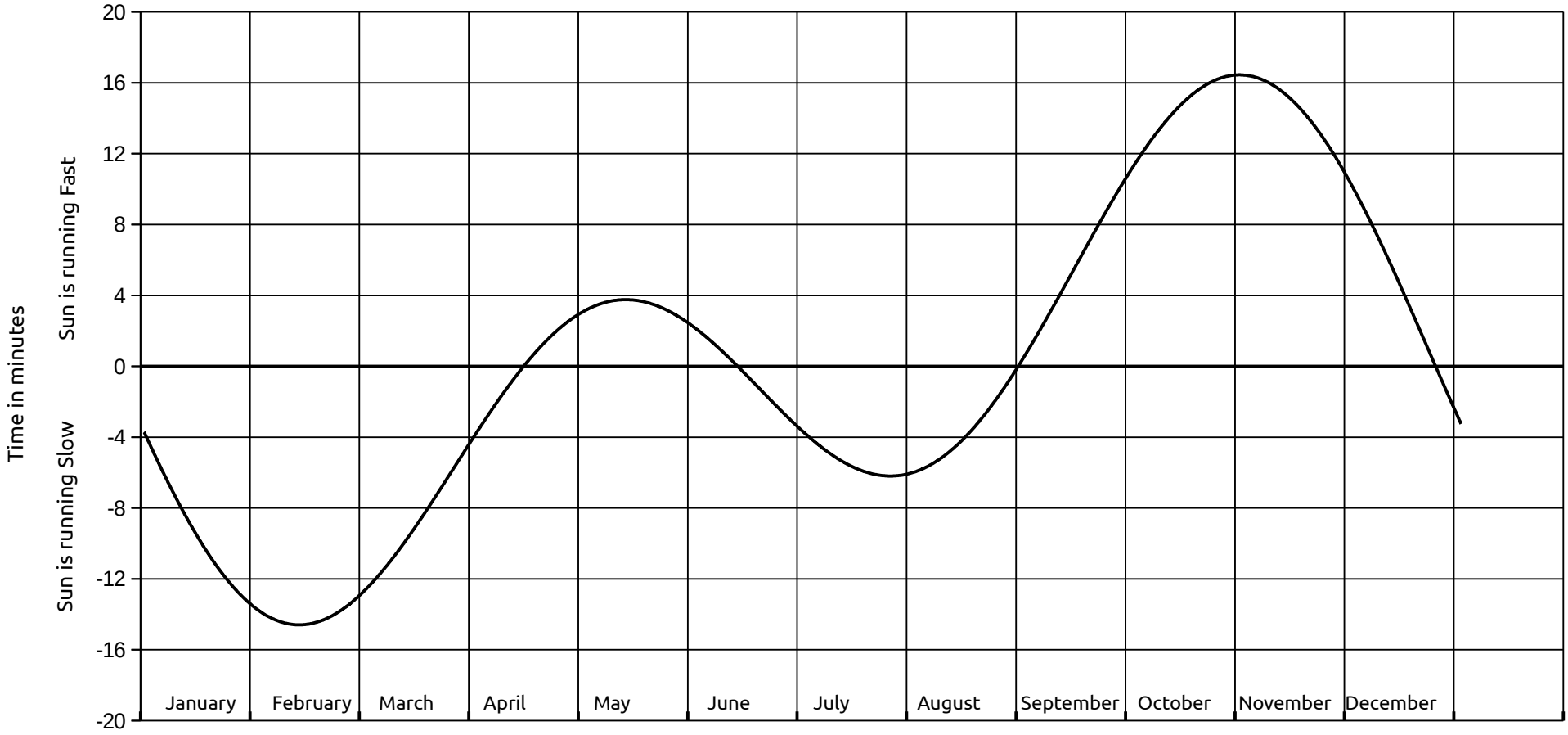
18

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 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	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	

9 10 3 11 3 12 13 14 15 16

Equation of Time
for the Sun



Equation_of_Time_Curve.odt

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

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Formula Sheet added to NA.odt

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 *2017- The American Practical Navigator*

https://TheNauticalAlmanac.com/2017_Bowditch-_American_Practical_Navigator.html

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The Terrestrial Almanac Annual calendar and day planner for the entire year.

https://TheNauticalAlmanac.com/TerrestrialAlmanac.html

Pub. No. 249 Download individual Latitudes or Volumes

https://TheNauticalAlmanac.com/Pub. No. 249.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

January 01, 02, 03 UT (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	**S**23°38.5	318°03.9	**N**18°45.1	131°37.2	**S**13°36.5	275°29.9	**N**00°18.6
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°55.2	·· 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°18.0	46.2	206°47.1	35.7	350°41.9	18.5
6	190°47.3	271°52.2	**S**23°37.9	48°20.9	**N**18°46.5	221°49.1	**S**13°35.5	5°44.3	**N**00°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	**S**23°37.3	138°37.8	**N**18°47.8	312°00.9	**S**13°34.4	95°58.8	**N**00°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°06.9	·· 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	**S**23°36.7	228°54.9	**N**18°49.1	42°12.8	**S**13°33.4	186°13.2	**N**00°18.4
19	26°19.3	106°39.7	36.6	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°36.8	36.2	289°06.2	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.:17:15		v-1.0 d0.1 m-3.8		v2.8 d0.2 m-0.7		v2.0 d0.2 m-2.0		v2.4 d-0.0 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	101°31.7	181°34.8	**S**23°36.0	319°11.9	**N**18°50.5	132°24.6	**S**13°32.3	276°27.7	**N**00°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°37.4	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	**S**23°35.2	49°29.1	**N**18°51.9	222°36.4	**S**13°31.3	6°42.2	**N**00°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	**S**23°34.4	139°46.3	**N**18°53.3	312°48.3	**S**13°30.2	96°56.7	**N**00°18.2
13	297°03.7	16°22.3	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°19.4	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	**S**23°33.6	230°03.5	**N**18°54.7	43°00.1	**S**13°29.2	187°11.1	**N**00°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°09.2	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°10.0	28.3	262°23.2	18.1
Mer.pass.:17:11		v-1.0 d0.1 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	102°30.8	181°11.6	**S**23°32.7	320°20.8	**N**18°56.1	133°11.9	**S**13°28.1	277°25.6	**N**00°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°26.5	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°05.9	**S**23°31.7	50°38.1	**N**18°57.5	223°23.7	**S**13°27.0	7°40.1	**N**00°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	**S**23°30.7	140°55.5	**N**18°59.0	313°35.5	**S**13°26.0	97°54.6	**N**00°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°41.5	·· 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	**S**23°29.7	231°12.9	**N**19°00.4	43°47.4	**S**13°24.9	188°09.1	**N**00°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°14.0	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°50.5	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 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

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°58.4	-17°55.9
Achernar	335°28.3	-57°11.3
Hamal	328°03.5	23°30.8
Polaris	318°46.5	89°18.8
Acamar	315°19.9	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.1	-8°11.4
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	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°35.6	-16°43.8
Adhara	255°14.1	-28°59.2
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°18.5	-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°36.1	14°30.7
Gienah	175°54.9	-17°35.9
Acrux	173°12.3	-63°09.1
Gacrux	172°03.9	-57°10.0
Alioth	166°22.7	55°53.9
Spica	158°34.0	-11°12.9
Alkaid	153°00.9	49°15.4
Hadar	148°51.9	-60°25.1
Menkent	148°10.8	-36°25.1
Arcturus	145°58.1	19°07.6
Rigil Kent.	139°55.6	-60°52.4
Kochab	137°20.3	74°06.5
Zuben'ubi	137°08.4	-16°05.0
Alphecca	126°13.4	26°40.6
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°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.4
Al Na'ir	27°47.1	-46°54.9
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.0	28°08.5
Markab	13°41.0	15°15.7

Jan 01 Fri	**SHA**	**Mer.pass**
Venus	81°25.6	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

DUT1 = UT1-UTC = +0.1141 sec ΔT = TT-UT1 = +66.0699 sec

2010 January 01 to Jan. 03 UT

h Sun Moon

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°10.5	S23°01.6	356°04.6	3.1'	N23°30.0	-7.2'	61.0'
1	194°10.2	01.4	10°26.6	3.1'	23°22.7	-7.3'	61.0'
2	209°09.9	01.2	24°48.8	3.2'	23°15.3	-7.5'	61.0'
3	224°09.6	·· 01.0	39°11.0	3.2'	23°07.7	-7.7'	61.0'
4	239°09.3	00.8	53°33.3	3.3'	22°59.9	-7.9'	61.0'
5	254°09.0	00.6	67°55.6	3.4'	22°52.0	-8.0'	61.1'
6	269°08.7	S23°00.4	82°18.0	3.4'	N22°43.8	-8.2'	61.1'
7	284°08.4	00.2	96°40.5	3.5'	22°35.6	-8.4'	61.1'
8	299°08.1	23°00.0	111°03.1	3.6'	22°27.1	-8.5'	61.1'
9	314°07.8	22°59.8	125°25.7	3.7'	22°18.5	-8.7'	61.1'
10	329°07.5	59.6	139°48.4	3.7'	22°09.7	-8.9'	61.1'
11	344°07.2	59.4	154°11.2	3.8'	22°00.8	-9.0'	61.1'
12	359°06.9	S22°59.2	168°34.0	3.9'	N21°51.7	-9.2'	61.1'
13	14°06.6	59.0	182°57.0	4.0'	21°42.4	-9.3'	61.1'
14	29°06.3	58.8	197°20.0	4.1'	21°33.0	-9.5'	61.1'
15	44°06.0	·· 58.6	211°43.1	4.1'	21°23.4	-9.6'	61.1'
16	59°05.8	58.3	226°06.3	4.2'	21°13.7	-9.8'	61.1'
17	74°05.5	58.1	240°29.5	4.3'	21°03.8	-10.0'	61.1'
18	89°05.2	S22°57.9	254°52.9	4.4'	N20°53.8	-10.1'	61.1'
19	104°04.9	57.7	269°16.3	4.5'	20°43.6	-10.2'	61.1'
20	119°04.6	57.5	283°39.8	4.6'	20°33.3	-10.4'	61.1'
21	134°04.3	·· 57.3	298°03.5	4.7'	20°22.8	-10.5'	61.1'
22	149°04.0	57.1	312°27.2	4.8'	20°12.2	-10.7'	61.1'
23	164°03.7	56.8	326°51.0	4.8'	20°01.5	-10.8'	61.1'
	SD.=16.3	d=0.2			S.D.=16.7		

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°03.4	S22°56.6	341°14.9	4.9'	N19°50.6	-11.0'	61.1'
1	194°03.1	56.4	355°38.8	5.0'	19°39.6	-11.1'	61.1'
2	209°02.8	56.2	10°02.9	5.1'	19°28.4	-11.2'	61.1'
3	224°02.5	·· 56.0	24°27.1	5.2'	19°17.1	-11.4'	61.1'
4	239°02.3	55.7	38°51.4	5.3'	19°05.7	-11.5'	61.1'
5	254°02.0	55.5	53°15.7	5.4'	18°54.2	-11.6'	61.1'
6	269°01.7	S22°55.3	67°40.2	5.5'	N18°42.5	-11.7'	61.1'
7	284°01.4	55.1	82°04.7	5.6'	18°30.7	-11.9'	61.1'
8	299°01.1	54.8	96°29.4	5.7'	18°18.7	-12.0'	61.1'
9	314°00.8	·· 54.6	110°54.1	5.8'	18°06.7	-12.1'	61.1'
10	329°00.5	54.4	125°19.0	5.9'	17°54.5	-12.2'	61.1'
11	344°00.2	54.2	139°43.9	6.0'	17°42.3	-12.3'	61.1'
12	358°59.9	S22°53.9	154°08.9	6.1'	N17°29.9	-12.5'	61.1'
13	13°59.6	53.7	168°34.1	6.2'	17°17.3	-12.6'	61.1'
14	28°59.3	53.5	182°59.3	6.3'	17°04.7	-12.7'	61.0'
15	43°59.1	·· 53.3	197°24.6	6.4'	16°52.0	-12.8'	61.0'
16	58°58.8	53.0	211°50.1	6.5'	16°39.2	-12.9'	61.0'
17	73°58.5	52.8	226°15.6	6.6'	16°26.2	-13.0'	61.0'
18	88°58.2	S22°52.6	240°41.2	6.7'	N16°13.2	-13.1'	61.0'
19	103°57.9	52.3	255°06.9	6.8'	16°00.0	-13.2'	61.0'
20	118°57.6	52.1	269°32.7	6.9'	15°46.8	-13.3'	61.0'
21	133°57.3	·· 51.9	283°58.7	7.0'	15°33.5	-13.4'	61.0'
22	148°57.0	51.6	298°24.7	7.1'	15°20.0	-13.5'	61.0'
23	163°56.7	51.4	312°50.8	7.2'	15°06.5	-13.6'	60.9'
	SD.=16.3	d=0.2			S.D.=16.6		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.5	S22°51.1	327°17.0	7.3'	N14°52.9	-13.7'	60.9'
1	193°56.2	50.9	341°43.3	7.3'	14°39.2	-13.7'	60.9'
2	208°55.9	50.7	356°09.7	7.4'	14°25.4	-13.8'	60.9'
3	223°55.6	·· 50.4	10°36.2	7.5'	14°11.6	-13.9'	60.9'
4	238°55.3	50.2	25°02.8	7.6'	13°57.6	-14.0'	60.9'
5	253°55.0	49.9	39°29.4	7.7'	13°43.6	-14.1'	60.8'
6	268°54.7	S22°49.7	53°56.2	7.8'	N13°29.5	-14.1'	60.8'
7	283°54.4	49.5	68°23.1	7.9'	13°15.3	-14.2'	60.8'
8	298°54.2	49.2	82°50.0	8.0'	13°01.0	-14.3'	60.8'
9	313°53.9	·· 49.0	97°17.1	8.1'	12°46.7	-14.4'	60.8'
10	328°53.6	48.7	111°44.2	8.2'	12°32.3	-14.4'	60.8'
11	343°53.3	48.5	126°11.4	8.3'	12°17.9	-14.5'	60.7'
12	358°53.0	S22°48.2	140°38.8	8.4'	N12°03.4	-14.6'	60.7'
13	13°52.7	48.0	155°06.2	8.5'	11°48.8	-14.6'	60.7'
14	28°52.4	47.7	169°33.7	8.5'	11°34.1	-14.7'	60.7'
15	43°52.2	·· 47.5	184°01.2	8.6'	11°19.4	-14.7'	60.7'
16	58°51.9	47.2	198°28.9	8.7'	11°04.7	-14.8'	60.6'
17	73°51.6	47.0	212°56.7	8.8'	10°49.8	-14.8'	60.6'
18	88°51.3	S22°46.7	227°24.5	8.9'	N10°35.0	-14.9'	60.6'
19	103°51.0	46.5	241°52.4	9.0'	10°20.0	-14.9'	60.6'
20	118°50.7	46.2	256°20.4	9.0'	10°05.1	-15.0'	60.6'
21	133°50.4	·· 46.0	270°48.5	9.1'	09°50.1	-15.0'	60.5'
22	148°50.2	45.7	285°16.7	9.2'	09°35.0	-15.1'	60.5'
23	163°49.9	45.5	299°44.9	9.3'	09°19.9	-15.1'	60.5'
	SD.=16.3	d=0.2			S.D.=16.5		

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

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

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 99-90%
01	03:18	03:32	12:04	00:16	12:48	◯
02	03:46	04:00	12:04	01:18	13:48	
03	04:14	04:28	12:04	02:16	14:43	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	103°29.9	180°48.5	**S**23°28.6	321°30.4	**N**19°01.9	133°59.2	**S**13°23.8	278°23.6	**N**00°17.9
1	118°32.4	195°47.6	28.4	336°33.4	02.1	149°01.1	23.7	293°26.0	17.9
2	133°34.9	210°46.6	28.3	351°36.3	02.4	164°03.1	23.5	308°28.5	17.9
3	148°37.3	225°45.7	·· 28.1	6°39.2	·· 02.6	179°05.1	·· 23.3	323°30.9	·· 17.9
4	163°39.8	240°44.7	27.9	21°42.1	02.9	194°07.0	23.1	338°33.3	17.9
5	178°42.3	255°43.7	27.7	36°45.1	03.1	209°09.0	22.9	353°35.7	17.9
6	193°44.7	270°42.8	**S**23°27.5	51°48.0	**N**19°03.4	224°11.0	**S**13°22.8	8°38.1	**N**00°17.9
7	208°47.2	285°41.8	27.3	66°50.9	03.6	239°12.9	22.6	23°40.6	17.8
8	223°49.6	300°40.9	27.1	81°53.8	03.9	254°14.9	22.4	38°43.0	17.8
9	238°52.1	315°39.9	·· 26.9	96°56.8	·· 04.1	269°16.9	·· 22.2	53°45.4	·· 17.8
10	253°54.6	330°38.9	26.7	111°59.7	04.4	284°18.8	22.1	68°47.8	17.8
11	268°57.0	345°38.0	26.5	127°02.6	04.6	299°20.8	21.9	83°50.2	17.8
12	283°59.5	0°37.0	**S**23°26.3	142°05.6	**N**19°04.9	314°22.7	**S**13°21.7	98°52.7	**N**00°17.8
13	299°02.0	15°36.1	26.1	157°08.5	05.1	329°24.7	21.5	113°55.1	17.8
14	314°04.4	30°35.1	25.9	172°11.5	05.4	344°26.7	21.3	128°57.5	17.8
15	329°06.9	45°34.1	·· 25.7	187°14.4	·· 05.6	359°28.6	·· 21.2	143°59.9	·· 17.8
16	344°09.4	60°33.2	25.5	202°17.3	05.9	14°30.6	21.0	159°02.4	17.8
17	359°11.8	75°32.2	25.3	217°20.3	06.1	29°32.6	20.8	174°04.8	17.8
18	14°14.3	90°31.3	**S**23°25.1	232°23.2	**N**19°06.4	44°34.5	**S**13°20.6	189°07.2	**N**00°17.8
19	29°16.7	105°30.3	24.9	247°26.2	06.6	59°36.5	20.4	204°09.6	17.8
20	44°19.2	120°29.4	24.7	262°29.1	06.9	74°38.5	20.3	219°12.0	17.8
21	59°21.7	135°28.4	·· 24.5	277°32.1	·· 07.2	89°40.4	·· 20.1	234°14.5	·· 17.8
22	74°24.1	150°27.4	24.3	292°35.0	07.4	104°42.4	19.9	249°16.9	17.8
23	89°26.6	165°26.5	24.1	307°38.0	07.7	119°44.4	19.7	264°19.3	17.8
Mer.pass.:17:03		v-1.0 d0.2 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	104°29.1	180°25.5	**S**23°23.9	322°40.9	**N**19°07.9	134°46.3	**S**13°19.5	279°21.7	**N**00°17.8
1	119°31.5	195°24.6	23.7	337°43.9	08.2	149°48.3	19.4	294°24.2	17.8
2	134°34.0	210°23.6	23.4	352°46.8	08.4	164°50.3	19.2	309°26.6	17.7
3	149°36.5	225°22.7	·· 23.2	7°49.8	·· 08.7	179°52.2	·· 19.0	324°29.0	·· 17.7
4	164°38.9	240°21.7	23.0	22°52.8	08.9	194°54.2	18.8	339°31.4	17.7
5	179°41.4	255°20.7	22.8	37°55.7	09.2	209°56.1	18.6	354°33.9	17.7
6	194°43.9	270°19.8	**S**23°22.6	52°58.7	**N**19°09.5	224°58.1	**S**13°18.5	9°36.3	**N**00°17.7
7	209°46.3	285°18.8	22.4	68°01.6	09.7	240°00.1	18.3	24°38.7	17.7
8	224°48.8	300°17.9	22.1	83°04.6	10.0	255°02.0	18.1	39°41.1	17.7
9	239°51.2	315°16.9	·· 21.9	98°07.6	·· 10.2	270°04.0	·· 17.9	54°43.6	·· 17.7
10	254°53.7	330°16.0	21.7	113°10.5	10.5	285°06.0	17.7	69°46.0	17.7
11	269°56.2	345°15.0	21.5	128°13.5	10.7	300°07.9	17.6	84°48.4	17.7
12	284°58.6	0°14.1	**S**23°21.2	143°16.5	**N**19°11.0	315°09.9	**S**13°17.4	99°50.8	**N**00°17.7
13	300°01.1	15°13.1	21.0	158°19.4	11.3	330°11.8	17.2	114°53.3	17.7
14	315°03.6	30°12.2	20.8	173°22.4	11.5	345°13.8	17.0	129°55.7	17.7
15	330°06.0	45°11.2	·· 20.5	188°25.4	·· 11.8	0°15.8	·· 16.8	144°58.1	·· 17.7
16	345°08.5	60°10.2	20.3	203°28.4	12.0	15°17.7	16.7	160°00.5	17.7
17	0°11.0	75°09.3	20.1	218°31.4	12.3	30°19.7	16.5	175°03.0	17.7
18	15°13.4	90°08.3	**S**23°19.8	233°34.3	**N**19°12.6	45°21.7	**S**13°16.3	190°05.4	**N**00°17.7
19	30°15.9	105°07.4	19.6	248°37.3	12.8	60°23.6	16.1	205°07.8	17.7
20	45°18.3	120°06.4	19.4	263°40.3	13.1	75°25.6	15.9	220°10.2	17.7
21	60°20.8	135°05.5	·· 19.1	278°43.3	·· 13.4	90°27.5	·· 15.7	235°12.7	·· 17.7
22	75°23.3	150°04.5	18.9	293°46.3	13.6	105°29.5	15.6	250°15.1	17.7
23	90°25.7	165°03.6	18.6	308°49.2	13.9	120°31.5	15.4	265°17.5	17.7
Mer.pass.:16:59		v-1.0 d0.2 m-3.8		v3.0 d0.3 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	105°28.2	180°02.6	**S**23°18.4	323°52.2	**N**19°14.1	135°33.4	**S**13°15.2	280°19.9	**N**00°17.7
1	120°30.7	195°01.7	18.2	338°55.2	14.4	150°35.4	15.0	295°22.4	17.7
2	135°33.1	210°00.7	17.9	353°58.2	14.7	165°37.3	14.8	310°24.8	17.7
3	150°35.6	224°59.8	·· 17.7	9°01.2	·· 14.9	180°39.3	·· 14.7	325°27.2	·· 17.7
4	165°38.1	239°58.8	17.4	24°04.2	15.2	195°41.3	14.5	340°29.7	17.7
5	180°40.5	254°57.9	17.2	39°07.2	15.5	210°43.2	14.3	355°32.1	17.7
6	195°43.0	269°56.9	**S**23°16.9	54°10.2	**N**19°15.7	225°45.2	**S**13°14.1	10°34.5	**N**00°17.7
7	210°45.5	284°56.0	16.7	69°13.2	16.0	240°47.1	13.9	25°36.9	17.7
8	225°47.9	299°55.0	16.4	84°16.2	16.3	255°49.1	13.7	40°39.4	17.6
9	240°50.4	314°54.1	·· 16.2	99°19.2	·· 16.5	270°51.1	·· 13.6	55°41.8	·· 17.6
10	255°52.8	329°53.1	15.9	114°22.2	16.8	285°53.0	13.4	70°44.2	17.6
11	270°55.3	344°52.2	15.6	129°25.2	17.1	300°55.0	13.2	85°46.7	17.6
12	285°57.8	359°51.2	**S**23°15.4	144°28.2	**N**19°17.3	315°56.9	**S**13°13.0	100°49.1	**N**00°17.6
13	301°00.2	14°50.3	15.1	159°31.2	17.6	330°58.9	12.8	115°51.5	17.6
14	316°02.7	29°49.3	14.9	174°34.2	17.9	346°00.9	12.7	130°53.9	17.6
15	331°05.2	44°48.4	·· 14.6	189°37.2	·· 18.1	1°02.8	·· 12.5	145°56.4	·· 17.6
16	346°07.6	59°47.4	14.3	204°40.2	18.4	16°04.8	12.3	160°58.8	17.6
17	1°10.1	74°46.5	14.1	219°43.2	18.7	31°06.7	12.1	176°01.2	17.6
18	16°12.6	89°45.5	**S**23°13.8	234°46.3	**N**19°18.9	46°08.7	**S**13°11.9	191°03.7	**N**00°17.6
19	31°15.0	104°44.6	13.5	249°49.3	19.2	61°10.7	11.7	206°06.1	17.6
20	46°17.5	119°43.6	13.3	264°52.3	19.5	76°12.6	11.6	221°08.5	17.6
21	61°20.0	134°42.7	·· 13.0	279°55.3	·· 19.8	91°14.6	·· 11.4	236°11.0	·· 17.6
22	76°22.4	149°41.7	12.7	294°58.3	20.0	106°16.5	11.2	251°13.4	17.6
23	91°24.9	164°40.8	12.5	310°01.3	20.3	121°18.5	11.0	266°15.8	17.6
Mer.pass.:16:55		v-1.0 d0.2 m-3.8		v3.0 d0.3 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

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°58.4	-17°55.9
Achernar	335°28.3	-57°11.4
Hamal	328°03.5	23°30.8
Polaris	318°47.8	89°18.9
Acamar	315°19.9	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.4
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	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°35.6	-16°43.8
Adhara	255°14.1	-28°59.2
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°18.5	-59°32.4
Suhail	222°54.0	-43°28.3
Miaplacidus	221°39.6	-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°36.1	14°30.7
Gienah	175°54.9	-17°35.9
Acrux	173°12.3	-63°09.1
Gacrux	172°03.8	-57°10.0
Alioth	166°22.7	55°53.9
Spica	158°34.0	-11°12.9
Alkaid	153°00.9	49°15.4
Hadar	148°51.9	-60°25.1
Menkent	148°10.7	-36°25.1
Arcturus	145°58.1	19°07.6
Rigil Kent.	139°55.6	-60°52.4
Kochab	137°20.2	74°06.5
Zuben'ubi	137°08.4	-16°05.0
Alphecca	126°13.3	26°40.6
Antares	112°29.7	-26°27.2
Atria	107°34.3	-69°02.6
Sabik	102°15.7	-15°44.3
Shaula	96°25.7	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.1
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.8	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.9
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.0	15°15.7

Jan 04 Mon	**SHA**	**Mer.pass**
Venus	77°18.6	11:58
Mars	218°00.5	02:33
Jupiter	30°29.2	15:02
Saturn	174°53.7	05:26

Jan 05 Tue	**SHA**	**Mer.pass**
Venus	75°56.5	11:59
Mars	218°11.9	02:29
Jupiter	30°17.3	14:59
Saturn	174°52.7	05:22

Jan 06 Wed	**SHA**	**Mer.pass**
Venus	74°34.4	12:01
Mars	218°24.0	02:24
Jupiter	30°05.2	14:56
Saturn	174°51.7	05:18

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.1116 sec ΔT = TT-UT1 = +66.0724 sec

2010 January 04 to Jan. 06 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°49.6	S22°45.2	314°13.2	9.4'	N09°04.7	-15.2'	60.5'
1	193°49.3	45.0	328°41.7	9.4'	08°49.6	-15.2'	60.4'
2	208°49.0	44.7	343°10.1	9.5'	08°34.3	-15.2'	60.4'
3	223°48.7	· · 44.4	357°38.7	9.6'	08°19.1	-15.3'	60.4'
4	238°48.5	44.2	12°07.3	9.7'	08°03.8	-15.3'	60.4'
5	253°48.2	43.9	26°36.0	9.7'	07°48.4	-15.3'	60.3'
6	268°47.9	S22°43.7	41°04.8	9.8'	N07°33.1	-15.4'	60.3'
7	283°47.6	43.4	55°33.6	9.9'	07°17.7	-15.4'	60.3'
8	298°47.3	43.1	70°02.6	10.0'	07°02.3	-15.4'	60.3'
9	313°47.0	· · 42.9	84°31.6	10.0'	06°46.9	-15.4'	60.2'
10	328°46.8	42.6	99°00.6	10.1'	06°31.4	-15.5'	60.2'
11	343°46.5	42.3	113°29.7	10.2'	06°15.9	-15.5'	60.2'
12	358°46.2	S22°42.1	127°58.9	10.2'	N06°00.4	-15.5'	60.1'
13	13°45.9	41.8	142°28.2	10.3'	05°44.9	-15.5'	60.1'
14	28°45.6	41.5	156°57.5	10.3'	05°29.4	-15.5'	60.1'
15	43°45.4	· · 41.3	171°26.9	10.4'	05°13.8	-15.6'	60.1'
16	58°45.1	41.0	185°56.3	10.5'	04°58.2	-15.6'	60.0'
17	73°44.8	40.7	200°25.8	10.5'	04°42.7	-15.6'	60.0'
18	88°44.5	S22°40.5	214°55.4	10.6'	N04°27.1	-15.6'	60.0'
19	103°44.2	40.2	229°25.0	10.6'	04°11.5	-15.6'	59.9'
20	118°43.9	39.9	243°54.7	10.7'	03°55.9	-15.6'	59.9'
21	133°43.7	· · 39.7	258°24.4	10.8'	03°40.3	-15.6'	59.9'
22	148°43.4	39.4	272°54.2	10.8'	03°24.7	-15.6'	59.9'
23	163°43.1	39.1	287°24.0	10.9'	03°09.1	-15.6'	59.8'
	SD.=16.3	d=0.3	S.D.=16.4				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°42.8	S22°38.8	301°53.9	10.9'	N02°53.5	-15.6'	59.8'
1	193°42.5	38.6	316°23.9	11.0'	02°37.9	-15.6'	59.8'
2	208°42.3	38.3	330°53.8	11.0'	02°22.3	-15.6'	59.7'
3	223°42.0	· · 38.0	345°23.9	11.1'	02°06.7	-15.6'	59.7'
4	238°41.7	37.7	359°54.0	11.1'	01°51.1	-15.6'	59.7'
5	253°41.4	37.4	14°24.1	11.2'	01°35.5	-15.6'	59.6'
6	268°41.1	S22°37.2	28°54.3	11.2'	N01°19.9	-15.6'	59.6'
7	283°40.9	36.9	43°24.5	11.2'	01°04.3	-15.6'	59.6'
8	298°40.6	36.6	57°54.7	11.3'	00°48.8	-15.5'	59.5'
9	313°40.3	· · 36.3	72°25.0	11.3'	00°33.2	-15.5'	59.5'
10	328°40.0	36.0	86°55.4	11.4'	00°17.7	-15.5'	59.5'
11	343°39.8	35.8	101°25.8	11.4'	N00°02.2	-15.5'	59.5'
12	358°39.5	S22°35.5	115°56.2	11.4'	S00°13.3	-15.5'	59.4'
13	13°39.2	35.2	130°26.6	11.5'	00°28.8	-15.5'	59.4'
14	28°38.9	34.9	144°57.1	11.5'	00°44.2	-15.4'	59.4'
15	43°38.6	· · 34.6	159°27.6	11.5'	00°59.6	-15.4'	59.3'
16	58°38.4	34.3	173°58.2	11.6'	01°15.0	-15.4'	59.3'
17	73°38.1	34.0	188°28.8	11.6'	01°30.4	-15.4'	59.3'
18	88°37.8	S22°33.7	202°59.4	11.6'	S01°45.8	-15.3'	59.2'
19	103°37.5	33.5	217°30.0	11.7'	02°01.1	-15.3'	59.2'
20	118°37.3	33.2	232°00.7	11.7'	02°16.4	-15.3'	59.2'
21	133°37.0	· · 32.9	246°31.4	11.7'	02°31.7	-15.3'	59.1'
22	148°36.7	32.6	261°02.1	11.7'	02°46.9	-15.2'	59.1'
23	163°36.4	32.3	275°32.9	11.8'	03°02.1	-15.2'	59.1'
	SD.=16.3	d=0.3	S.D.=16.2				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°36.2	S22°32.0	290°03.6	11.8'	S03°17.3	-15.2'	59.0'
1	193°35.9	31.7	304°34.4	11.8'	03°32.4	-15.1'	59.0'
2	208°35.6	31.4	319°05.2	11.8'	03°47.6	-15.1'	59.0'
3	223°35.3	· · 31.1	333°36.1	11.8'	04°02.6	-15.0'	58.9'
4	238°35.1	30.8	348°06.9	11.9'	04°17.6	-15.0'	58.9'
5	253°34.8	30.5	2°37.8	11.9'	04°32.6	-15.0'	58.9'
6	268°34.5	S22°30.2	17°08.6	11.9'	S04°47.6	-14.9'	58.8'
7	283°34.2	29.9	31°39.5	11.9'	05°02.5	-14.9'	58.8'
8	298°34.0	29.6	46°10.5	11.9'	05°17.4	-14.8'	58.7'
9	313°33.7	· · 29.3	60°41.4	11.9'	05°32.2	-14.8'	58.7'
10	328°33.4	29.0	75°12.3	11.9'	05°46.9	-14.7'	58.7'
11	343°33.1	28.7	89°43.3	11.9'	06°01.7	-14.7'	58.6'
12	358°32.9	S22°28.4	104°14.2	12.0'	S06°16.3	-14.7'	58.6'
13	13°32.6	28.1	118°45.2	12.0'	06°31.0	-14.6'	58.6'
14	28°32.3	27.8	133°16.1	12.0'	06°45.6	-14.6'	58.5'
15	43°32.0	· · 27.5	147°47.1	12.0'	07°00.1	-14.5'	58.5'
16	58°31.8	27.2	162°18.1	12.0'	07°14.6	-14.4'	58.5'
17	73°31.5	26.9	176°49.1	12.0'	07°29.0	-14.4'	58.4'
18	88°31.2	S22°26.6	191°20.1	12.0'	S07°43.4	-14.3'	58.4'
19	103°31.0	26.3	205°51.1	12.0'	07°57.7	-14.3'	58.4'
20	118°30.7	26.0	220°22.0	12.0'	08°11.9	-14.2'	58.3'
21	133°30.4	· · 25.7	234°53.0	12.0'	08°26.1	-14.2'	58.3'
22	148°30.1	25.3	249°24.0	12.0'	08°40.3	-14.1'	58.3'
23	163°29.9	25.0	263°55.0	12.0'	08°54.3	-14.0'	58.2'
	SD.=16.3	d=0.3	S.D.=16.0				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 19-21 81-60%
04	04:42	04:55	12:05	03:10	15:35	
05	05:09	05:22	12:05	04:00	16:25	
06	05:35	05:49	12:06	04:49	17:13	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	106°27.3	179°39.9	**S**23°12.2	325°04.4	**N**19°20.6	136°20.4	**S**13°10.8	281°18.2	**N**00°17.6
1	121°29.8	194°38.9	11.9	340°07.4	20.8	151°22.4	10.6	296°20.7	17.6
2	136°32.3	209°38.0	11.6	355°10.4	21.1	166°24.4	10.5	311°23.1	17.6
3	151°34.7	224°37.0	·· 11.4	10°13.4	·· 21.4	181°26.3	·· 10.3	326°25.5	·· 17.6
4	166°37.2	239°36.1	11.1	25°16.5	21.7	196°28.3	10.1	341°28.0	17.6
5	181°39.7	254°35.1	10.8	40°19.5	21.9	211°30.2	09.9	356°30.4	17.6
6	196°42.1	269°34.2	**S**23°10.5	55°22.5	**N**19°22.2	226°32.2	**S**13°09.7	11°32.8	**N**00°17.6
7	211°44.6	284°33.2	10.3	70°25.6	22.5	241°34.2	09.6	26°35.3	17.6
8	226°47.1	299°32.3	10.0	85°28.6	22.7	256°36.1	09.4	41°37.7	17.6
9	241°49.5	314°31.3	·· 09.7	100°31.6	·· 23.0	271°38.1	·· 09.2	56°40.1	·· 17.6
10	256°52.0	329°30.4	09.4	115°34.7	23.3	286°40.0	09.0	71°42.6	17.6
11	271°54.4	344°29.5	09.1	130°37.7	23.6	301°42.0	08.8	86°45.0	17.6
12	286°56.9	359°28.5	**S**23°08.8	145°40.7	**N**19°23.8	316°43.9	**S**13°08.6	101°47.4	**N**00°17.6
13	301°59.4	14°27.6	08.5	160°43.8	24.1	331°45.9	08.5	116°49.9	17.6
14	317°01.8	29°26.6	08.2	175°46.8	24.4	346°47.9	08.3	131°52.3	17.6
15	332°04.3	44°25.7	·· 08.0	190°49.9	·· 24.7	1°49.8	·· 08.1	146°54.7	·· 17.6
16	347°06.8	59°24.7	07.7	205°52.9	24.9	16°51.8	07.9	161°57.2	17.6
17	2°09.2	74°23.8	07.4	220°55.9	25.2	31°53.7	07.7	176°59.6	17.6
18	17°11.7	89°22.9	**S**23°07.1	235°59.0	**N**19°25.5	46°55.7	**S**13°07.5	192°02.0	**N**00°17.6
19	32°14.2	104°21.9	06.8	251°02.0	25.8	61°57.6	07.3	207°04.5	17.6
20	47°16.6	119°21.0	06.5	266°05.1	26.1	76°59.6	07.2	222°06.9	17.6
21	62°19.1	134°20.0	·· 06.2	281°08.1	·· 26.3	92°01.5	·· 07.0	237°09.3	·· 17.6
22	77°21.6	149°19.1	05.9	296°11.2	26.6	107°03.5	06.8	252°11.8	17.6
23	92°24.0	164°18.2	05.6	311°14.2	26.9	122°05.5	06.6	267°14.2	17.6
Mer.pass.:16:51		v-0.9 d0.3 m-3.8		v3.0 d0.3 m-0.9		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	107°26.5	179°17.2	**S**23°05.3	326°17.3	**N**19°27.2	137°07.4	**S**13°06.4	282°16.7	**N**00°17.6
1	122°28.9	194°16.3	05.0	341°20.4	27.4	152°09.4	06.2	297°19.1	17.6
2	137°31.4	209°15.3	04.7	356°23.4	27.7	167°11.3	06.1	312°21.5	17.6
3	152°33.9	224°14.4	·· 04.4	11°26.5	·· 28.0	182°13.3	·· 05.9	327°24.0	·· 17.6
4	167°36.3	239°13.5	04.1	26°29.5	28.3	197°15.2	05.7	342°26.4	17.6
5	182°38.8	254°12.5	03.7	41°32.6	28.6	212°17.2	05.5	357°28.8	17.6
6	197°41.3	269°11.6	**S**23°03.4	56°35.7	**N**19°28.8	227°19.1	**S**13°05.3	12°31.3	**N**00°17.6
7	212°43.7	284°10.6	03.1	71°38.7	29.1	242°21.1	05.1	27°33.7	17.6
8	227°46.2	299°09.7	02.8	86°41.8	29.4	257°23.0	05.0	42°36.1	17.6
9	242°48.7	314°08.8	·· 02.5	101°44.9	·· 29.7	272°25.0	·· 04.8	57°38.6	·· 17.6
10	257°51.1	329°07.8	02.2	116°47.9	30.0	287°27.0	04.6	72°41.0	17.6
11	272°53.6	344°06.9	01.9	131°51.0	30.3	302°28.9	04.4	87°43.5	17.6
12	287°56.1	359°05.9	**S**23°01.6	146°54.1	**N**19°30.5	317°30.9	**S**13°04.2	102°45.9	**N**00°17.6
13	302°58.5	14°05.0	01.2	161°57.1	30.8	332°32.8	04.0	117°48.3	17.6
14	318°01.0	29°04.1	00.9	177°00.2	31.1	347°34.8	03.8	132°50.8	17.6
15	333°03.4	44°03.1	·· 00.6	192°03.3	·· 31.4	2°36.7	·· 03.7	147°53.2	·· 17.6
16	348°05.9	59°02.2	23°00.3	207°06.4	31.7	17°38.7	03.5	162°55.6	17.6
17	3°08.4	74°01.3	22°59.9	222°09.5	32.0	32°40.6	03.3	177°58.1	17.6
18	18°10.8	89°00.3	**S**22°59.6	237°12.5	**N**19°32.2	47°42.6	**S**13°03.1	193°00.5	**N**00°17.6
19	33°13.3	103°59.4	59.3	252°15.6	32.5	62°44.5	02.9	208°03.0	17.6
20	48°15.8	118°58.5	59.0	267°18.7	32.8	77°46.5	02.7	223°05.4	17.7
21	63°18.2	133°57.5	·· 58.6	282°21.8	·· 33.1	92°48.4	·· 02.5	238°07.8	·· 17.7
22	78°20.7	148°56.6	58.3	297°24.9	33.4	107°50.4	02.4	253°10.3	17.7
23	93°23.2	163°55.7	58.0	312°28.0	33.7	122°52.4	02.2	268°12.7	17.7
Mer.pass.:16:47		v-0.9 d0.3 m-3.8		v3.1 d0.3 m-0.9		v2.0 d0.2 m-1.9		v2.4 d0.0 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	108°25.6	178°54.7	**S**22°57.6	327°31.0	**N**19°33.9	137°54.3	**S**13°02.0	283°15.2	**N**00°17.7
1	123°28.1	193°53.8	57.3	342°34.1	34.2	152°56.3	01.8	298°17.6	17.7
2	138°30.5	208°52.9	57.0	357°37.2	34.5	167°58.2	01.6	313°20.0	17.7
3	153°33.0	223°51.9	·· 56.6	12°40.3	·· 34.8	183°00.2	·· 01.4	328°22.5	·· 17.7
4	168°35.5	238°51.0	56.3	27°43.4	35.1	198°02.1	01.2	343°24.9	17.7
5	183°37.9	253°50.1	56.0	42°46.5	35.4	213°04.1	01.1	358°27.4	17.7
6	198°40.4	268°49.1	**S**22°55.6	57°49.6	**N**19°35.7	228°06.0	**S**13°00.9	13°29.8	**N**00°17.7
7	213°42.9	283°48.2	55.3	72°52.7	36.0	243°08.0	00.7	28°32.2	17.7
8	228°45.3	298°47.3	54.9	87°55.8	36.2	258°09.9	00.5	43°34.7	17.7
9	243°47.8	313°46.3	·· 54.6	102°58.9	·· 36.5	273°11.9	·· 00.3	58°37.1	·· 17.7
10	258°50.3	328°45.4	54.3	118°02.0	36.8	288°13.8	13°00.1	73°39.6	17.7
11	273°52.7	343°44.5	53.9	133°05.1	37.1	303°15.8	12°59.9	88°42.0	17.7
12	288°55.2	358°43.5	**S**22°53.6	148°08.2	**N**19°37.4	318°17.7	**S**12°59.8	103°44.5	**N**00°17.7
13	303°57.7	13°42.6	53.2	163°11.3	37.7	333°19.7	59.6	118°46.9	17.7
14	319°00.1	28°41.7	52.9	178°14.4	38.0	348°21.6	59.4	133°49.3	17.7
15	334°02.6	43°40.8	·· 52.5	193°17.5	·· 38.3	3°23.6	·· 59.2	148°51.8	·· 17.7
16	349°05.0	58°39.8	52.2	208°20.6	38.6	18°25.5	59.0	163°54.2	17.7
17	4°07.5	73°38.9	51.8	223°23.7	38.8	33°27.5	58.8	178°56.7	17.7
18	19°10.0	88°38.0	**S**22°51.5	238°26.9	**N**19°39.1	48°29.4	**S**12°58.6	193°59.1	**N**00°17.7
19	34°12.4	103°37.0	51.1	253°30.0	39.4	63°31.4	58.5	209°01.5	17.7
20	49°14.9	118°36.1	50.7	268°33.1	39.7	78°33.3	58.3	224°04.0	17.7
21	64°17.4	133°35.2	·· 50.4	283°36.2	·· 40.0	93°35.3	·· 58.1	239°06.4	·· 17.7
22	79°19.8	148°34.3	50.0	298°39.3	40.3	108°37.2	57.9	254°08.9	17.7
23	94°22.3	163°33.3	49.7	313°42.4	40.6	123°39.2	57.7	269°11.3	17.7
Mer.pass.:16:44		v-0.9 d0.3 m-3.8		v3.1 d0.3 m-0.9		v2.0 d0.2 m-1.9		v2.4 d0.0 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°09.0
Ankaa	353°18.1	-42°15.2
Schedar	349°43.6	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.4	-57°11.4
Hamal	328°03.5	23°30.8
Polaris	318°48.9	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.4
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	28°37.0
Alnilam	275°48.6	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.1
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.2
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°18.5	-59°32.5
Suhail	222°54.0	-43°28.4
Miaplacidus	221°39.6	-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°36.1	14°30.7
Gienah	175°54.8	-17°35.9
Acrux	173°12.3	-63°09.1
Gacrux	172°03.8	-57°10.0
Alioth	166°22.7	55°53.9
Spica	158°33.9	-11°12.9
Alkaid	153°00.8	49°15.4
Hadar	148°51.8	-60°25.1
Menkent	148°10.7	-36°25.1
Arcturus	145°58.1	19°07.6
Rigil Kent.	139°55.5	-60°52.4
Kochab	137°20.2	74°06.4
Zuben'ubi	137°08.4	-16°05.0
Alphecca	126°13.3	26°40.6
Antares	112°29.7	-26°27.2
Atria	107°34.3	-69°02.6
Sabik	102°15.7	-15°44.3
Shaula	96°25.7	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.1
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.8	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.9
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.0	15°15.7

Jan 07 Thu	**SHA**	**Mer.pass**
Venus	73°12.5	12:02
Mars	218°37.0	02:19
Jupiter	29°53.1	14:53
Saturn	174°50.9	05:14

Jan 08 Fri	**SHA**	**Mer.pass**
Venus	71°50.7	12:04
Mars	218°50.8	02:14
Jupiter	29°40.9	14:50
Saturn	174°50.2	05:10

Jan 09 Sat	**SHA**	**Mer.pass**
Venus	70°29.1	12:05
Mars	219°05.4	02:09
Jupiter	29°28.7	14:46
Saturn	174°49.5	05:06

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.1090 sec ΔT = TT-UT1 = +66.0750 sec

2010 January 07 to Jan. 09 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°29.6	S22°24.7	278°26.0	12.0'	S09°08.4	-14.0'	58.2'
1	193°29.3	24.4	292°57.0	12.0'	09°22.3	-13.9'	58.2'
2	208°29.1	24.1	307°27.9	12.0'	09°36.2	-13.9'	58.1'
3	223°28.8	·· 23.8	321°58.9	12.0'	09°50.0	-13.8'	58.1'
4	238°28.5	23.5	336°29.9	12.0'	10°03.8	-13.7'	58.1'
5	253°28.2	23.1	351°00.8	12.0'	10°17.5	-13.7'	58.0'
6	268°28.0	S22°22.8	5°31.8	11.9'	S10°31.1	-13.6'	58.0'
7	283°27.7	22.5	20°02.7	11.9'	10°44.7	-13.5'	58.0'
8	298°27.4	22.2	34°33.6	11.9'	10°58.2	-13.5'	57.9'
9	313°27.2	·· 21.9	49°04.6	11.9'	11°11.6	-13.4'	57.9'
10	328°26.9	21.6	63°35.5	11.9'	11°25.0	-13.3'	57.9'
11	343°26.6	21.2	78°06.3	11.9'	11°38.3	-13.2'	57.8'
12	358°26.4	S22°20.9	92°37.2	11.9'	S11°51.5	-13.2'	57.8'
13	13°26.1	20.6	107°08.1	11.9'	12°04.6	-13.1'	57.8'
14	28°25.8	20.3	121°38.9	11.8'	12°17.7	-13.0'	57.7'
15	43°25.6	·· 19.9	136°09.8	11.8'	12°30.7	-13.0'	57.7'
16	58°25.3	19.6	150°40.6	11.8'	12°43.6	-12.9'	57.7'
17	73°25.0	19.3	165°11.4	11.8'	12°56.4	-12.8'	57.6'
18	88°24.7	S22°19.0	179°42.1	11.8'	S13°09.2	-12.7'	57.6'
19	103°24.5	18.6	194°12.9	11.7'	13°21.9	-12.6'	57.6'
20	118°24.2	18.3	208°43.6	11.7'	13°34.5	-12.6'	57.5'
21	133°23.9	·· 18.0	223°14.4	11.7'	13°47.0	-12.5'	57.5'
22	148°23.7	17.7	237°45.0	11.7'	13°59.4	-12.4'	57.5'
23	163°23.4	17.3	252°15.7	11.7'	14°11.8	-12.3'	57.4'
	SD.=16.3	d=0.3	S.D.=15.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°23.1	S22°17.0	266°46.4	11.6'	S14°24.0	-12.2'	57.4'
1	193°22.9	16.7	281°17.0	11.6'	14°36.2	-12.1'	57.4'
2	208°22.6	16.3	295°47.6	11.6'	14°48.3	-12.1'	57.3'
3	223°22.4	·· 16.0	310°18.2	11.6'	15°00.3	-12.0'	57.3'
4	238°22.1	15.7	324°48.7	11.5'	15°12.3	-11.9'	57.3'
5	253°21.8	15.3	339°19.3	11.5'	15°24.1	-11.8'	57.2'
6	268°21.6	S22°15.0	353°49.8	11.5'	S15°35.9	-11.7'	57.2'
7	283°21.3	14.7	8°20.2	11.5'	15°47.5	-11.6'	57.2'
8	298°21.0	14.3	22°50.7	11.4'	15°59.1	-11.5'	57.2'
9	313°20.8	·· 14.0	37°21.1	11.4'	16°10.6	-11.4'	57.1'
10	328°20.5	13.7	51°51.5	11.4'	16°22.0	-11.3'	57.1'
11	343°20.2	13.3	66°21.9	11.4'	16°33.3	-11.2'	57.1'
12	358°20.0	S22°13.0	80°52.2	11.3'	S16°44.5	-11.2'	57.0'
13	13°19.7	12.6	95°22.5	11.3'	16°55.6	-11.1'	57.0'
14	28°19.4	12.3	109°52.8	11.3'	17°06.6	-11.0'	57.0'
15	43°19.2	·· 11.9	124°23.0	11.2'	17°17.5	-10.9'	56.9'
16	58°18.9	11.6	138°53.3	11.2'	17°28.3	-10.8'	56.9'
17	73°18.7	11.3	153°23.4	11.2'	17°39.0	-10.7'	56.9'
18	88°18.4	S22°10.9	167°53.6	11.1'	S17°49.7	-10.6'	56.8'
19	103°18.1	10.6	182°23.7	11.1'	18°00.2	-10.5'	56.8'
20	118°17.9	10.2	196°53.8	11.1'	18°10.6	-10.4'	56.8'
21	133°17.6	·· 09.9	211°23.9	11.0'	18°20.9	-10.3'	56.8'
22	148°17.3	09.5	225°53.9	11.0'	18°31.1	-10.2'	56.7'
23	163°17.1	09.2	240°23.9	11.0'	18°41.3	-10.1'	56.7'
	SD.=16.3	d=0.3	S.D.=15.5				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°16.8	S22°08.8	254°53.8	10.9'	S18°51.3	-10.0'	56.7'
1	193°16.6	08.5	269°23.8	10.9'	19°01.2	-9.9'	56.6'
2	208°16.3	08.1	283°53.7	10.9'	19°11.0	-9.8'	56.6'
3	223°16.0	·· 07.8	298°23.5	10.8'	19°20.7	-9.6'	56.6'
4	238°15.8	07.4	312°53.3	10.8'	19°30.3	-9.5'	56.6'
5	253°15.5	07.1	327°23.1	10.8'	19°39.8	-9.4'	56.5'
6	268°15.3	S22°06.7	341°52.9	10.7'	S19°49.2	-9.3'	56.5'
7	283°15.0	06.4	356°22.6	10.7'	19°58.4	-9.2'	56.5'
8	298°14.7	06.0	10°52.3	10.7'	20°07.6	-9.1'	56.4'
9	313°14.5	·· 05.7	25°22.0	10.6'	20°16.7	-9.0'	56.4'
10	328°14.2	05.3	39°51.6	10.6'	20°25.6	-8.9'	56.4'
11	343°14.0	05.0	54°21.2	10.6'	20°34.5	-8.8'	56.4'
12	358°13.7	S22°04.6	68°50.7	10.5'	S20°43.2	-8.7'	56.3'
13	13°13.5	04.2	83°20.3	10.5'	20°51.8	-8.6'	56.3'
14	28°13.2	03.9	97°49.8	10.5'	21°00.3	-8.4'	56.3'
15	43°12.9	·· 03.5	112°19.2	10.4'	21°08.7	-8.3'	56.3'
16	58°12.7	03.2	126°48.6	10.4'	21°16.9	-8.2'	56.2'
17	73°12.4	02.8	141°18.0	10.4'	21°25.1	-8.1'	56.2'
18	88°12.2	S22°02.4	155°47.4	10.3'	S21°33.1	-8.0'	56.2'
19	103°11.9	02.1	170°16.7	10.3'	21°41.1	-7.9'	56.2'
20	118°11.7	01.7	184°46.0	10.3'	21°48.9	-7.8'	56.1'
21	133°11.4	·· 01.3	199°15.3	10.2'	21°56.6	-7.6'	56.1'
22	148°11.1	01.0	213°44.5	10.2'	22°04.2	-7.5'	56.1'
23	163°10.9	00.6	228°13.7	10.2'	22°11.6	-7.4'	56.1'
	SD.=16.3	d=0.3	S.D.=15.4				

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	▬	▬	14:37	16:16
68°	07:44	09:08	11:10	13:04	15:06	16:30
66°	07:33	08:46	10:13	14:01	15:28	16:41
64°	07:23	08:29	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	16:22	17:14
56°	06:54	07:42	08:28	15:46	16:32	17:20
54°	06:48	07:34	08:16	15:57	16:40	17:25
52°	06:43	07:26	08:06	16:08	16:48	17:31
50°	06:38	07:19	07:57	16:17	16:54	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	05:23	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	19:06	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°	01:55	03:06	03:53	20:19	21:06	22:16
54°	01:22	02:50	03:42	20:31	21:22	22:49
56°	▭	02:30	03:29	20:44	21:42	▭
58°	▭	02:05	03:14	20:59	22:06	▭
S 60°	▭	01:29	02:55	21:17	22:41	▭

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

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 50-29%
07	06:02	06:15	12:06	05:37	18:01	
08	06:27	06:40	12:07	06:26	18:50	
09	06:53	07:05	12:07	07:15	19:40	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	109°24.8	178°32.4	**S**22°49.3	328°45.6	**N**19°40.9	138°41.1	**S**12°57.5	284°13.8	**N**00°17.7
1	124°27.2	193°31.5	48.9	343°48.7	41.2	153°43.1	57.3	299°16.2	17.7
2	139°29.7	208°30.5	48.6	358°51.8	41.5	168°45.0	57.1	314°18.7	17.8
3	154°32.2	223°29.6	·· 48.2	13°54.9	·· 41.8	183°47.0	·· 57.0	329°21.1	·· 17.8
4	169°34.6	238°28.7	47.9	28°58.1	42.1	198°48.9	56.8	344°23.5	17.8
5	184°37.1	253°27.8	47.5	44°01.2	42.4	213°50.9	56.6	359°26.0	17.8
6	199°39.5	268°26.8	**S**22°47.1	59°04.3	**N**19°42.6	228°52.8	**S**12°56.4	14°28.4	**N**00°17.8
7	214°42.0	283°25.9	46.7	74°07.4	42.9	243°54.8	56.2	29°30.9	17.8
8	229°44.5	298°25.0	46.4	89°10.6	43.2	258°56.7	56.0	44°33.3	17.8
9	244°46.9	313°24.1	·· 46.0	104°13.7	·· 43.5	273°58.7	·· 55.8	59°35.8	·· 17.8
10	259°49.4	328°23.2	45.6	119°16.8	43.8	289°00.6	55.6	74°38.2	17.8
11	274°51.9	343°22.2	45.3	134°20.0	44.1	304°02.6	55.5	89°40.7	17.8
12	289°54.3	358°21.3	**S**22°44.9	149°23.1	**N**19°44.4	319°04.5	**S**12°55.3	104°43.1	**N**00°17.8
13	304°56.8	13°20.4	44.5	164°26.3	44.7	334°06.5	55.1	119°45.6	17.8
14	319°59.3	28°19.5	44.1	179°29.4	45.0	349°08.4	54.9	134°48.0	17.8
15	335°01.7	43°18.5	·· 43.7	194°32.5	·· 45.3	4°10.4	·· 54.7	149°50.4	·· 17.8
16	350°04.2	58°17.6	43.4	209°35.7	45.6	19°12.3	54.5	164°52.9	17.8
17	5°06.7	73°16.7	43.0	224°38.8	45.9	34°14.3	54.3	179°55.3	17.8
18	20°09.1	88°15.8	**S**22°42.6	239°42.0	**N**19°46.2	49°16.2	**S**12°54.1	194°57.8	**N**00°17.8
19	35°11.6	103°14.9	42.2	254°45.1	46.5	64°18.2	54.0	210°00.2	17.8
20	50°14.0	118°13.9	41.8	269°48.3	46.8	79°20.1	53.8	225°02.7	17.8
21	65°16.5	133°13.0	·· 41.4	284°51.4	·· 47.1	94°22.1	·· 53.6	240°05.1	·· 17.9
22	80°19.0	148°12.1	41.1	299°54.6	47.4	109°24.0	53.4	255°07.6	17.9
23	95°21.4	163°11.2	40.7	314°57.7	47.7	124°26.0	53.2	270°10.0	17.9
Mer.pass.:16:40		v-0.9 d0.4 m-3.8		v3.1 d0.3 m-0.9		v2.0 d0.2 m-1.9		v2.4 d0.0 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	110°23.9	178°10.3	**S**22°40.3	330°00.9	**N**19°48.0	139°27.9	**S**12°53.0	285°12.5	**N**00°17.9
1	125°26.4	193°09.3	39.9	345°04.0	48.3	154°29.9	52.8	300°14.9	17.9
2	140°28.8	208°08.4	39.5	0°07.2	48.6	169°31.8	52.6	315°17.4	17.9
3	155°31.3	223°07.5	·· 39.1	15°10.3	·· 48.9	184°33.8	·· 52.4	330°19.8	·· 17.9
4	170°33.8	238°06.6	38.7	30°13.5	49.2	199°35.7	52.3	345°22.3	17.9
5	185°36.2	253°05.7	38.3	45°16.6	49.5	214°37.6	52.1	0°24.7	17.9
6	200°38.7	268°04.7	**S**22°37.9	60°19.8	**N**19°49.8	229°39.6	**S**12°51.9	15°27.2	**N**00°17.9
7	215°41.2	283°03.8	37.5	75°23.0	50.1	244°41.5	51.7	30°29.6	17.9
8	230°43.6	298°02.9	37.1	90°26.1	50.4	259°43.5	51.5	45°32.1	17.9
9	245°46.1	313°02.0	·· 36.7	105°29.3	·· 50.7	274°45.4	·· 51.3	60°34.5	·· 17.9
10	260°48.5	328°01.1	36.3	120°32.4	51.0	289°47.4	51.1	75°37.0	17.9
11	275°51.0	343°00.2	35.9	135°35.6	51.3	304°49.3	50.9	90°39.4	17.9
12	290°53.5	357°59.3	**S**22°35.5	150°38.8	**N**19°51.6	319°51.3	**S**12°50.8	105°41.9	**N**00°17.9
13	305°55.9	12°58.3	35.1	165°42.0	51.9	334°53.2	50.6	120°44.3	18.0
14	320°58.4	27°57.4	34.7	180°45.1	52.2	349°55.2	50.4	135°46.8	18.0
15	336°00.9	42°56.5	·· 34.3	195°48.3	·· 52.5	4°57.1	·· 50.2	150°49.2	·· 18.0
16	351°03.3	57°55.6	33.9	210°51.5	52.8	19°59.1	50.0	165°51.7	18.0
17	6°05.8	72°54.7	33.5	225°54.6	53.1	35°01.0	49.8	180°54.1	18.0
18	21°08.3	87°53.8	**S**22°33.0	240°57.8	**N**19°53.4	50°03.0	**S**12°49.6	195°56.6	**N**00°18.0
19	36°10.7	102°52.9	32.6	256°01.0	53.7	65°04.9	49.4	210°59.0	18.0
20	51°13.2	117°51.9	32.2	271°04.2	54.0	80°06.8	49.2	226°01.5	18.0
21	66°15.6	132°51.0	·· 31.8	286°07.4	·· 54.3	95°08.8	·· 49.0	241°03.9	·· 18.0
22	81°18.1	147°50.1	31.4	301°10.5	54.6	110°10.7	48.9	256°06.4	18.0
23	96°20.6	162°49.2	31.0	316°13.7	54.9	125°12.7	48.7	271°08.8	18.0
Mer.pass.:16:36		v-0.9 d0.4 m-3.8		v3.2 d0.3 m-0.9		v1.9 d0.2 m-1.9		v2.4 d0.0 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	111°23.0	177°48.3	**S**22°30.5	331°16.9	**N**19°55.2	140°14.6	**S**12°48.5	286°11.3	**N**00°18.0
1	126°25.5	192°47.4	30.1	346°20.1	55.5	155°16.6	48.3	301°13.7	18.0
2	141°28.0	207°46.5	29.7	1°23.3	55.8	170°18.5	48.1	316°16.2	18.1
3	156°30.4	222°45.6	·· 29.3	16°26.5	·· 56.1	185°20.5	·· 47.9	331°18.6	·· 18.1
4	171°32.9	237°44.7	28.9	31°29.6	56.4	200°22.4	47.7	346°21.1	18.1
5	186°35.4	252°43.8	28.4	46°32.8	56.7	215°24.3	47.5	1°23.5	18.1
6	201°37.8	267°42.8	**S**22°28.0	61°36.0	**N**19°57.0	230°26.3	**S**12°47.3	16°26.0	**N**00°18.1
7	216°40.3	282°41.9	27.6	76°39.2	57.3	245°28.2	47.2	31°28.5	18.1
8	231°42.8	297°41.0	27.1	91°42.4	57.6	260°30.2	47.0	46°30.9	18.1
9	246°45.2	312°40.1	·· 26.7	106°45.6	·· 57.9	275°32.1	·· 46.8	61°33.4	·· 18.1
10	261°47.7	327°39.2	26.3	121°48.8	58.3	290°34.1	46.6	76°35.8	18.1
11	276°50.1	342°38.3	25.8	136°52.0	58.6	305°36.0	46.4	91°38.3	18.1
12	291°52.6	357°37.4	**S**22°25.4	151°55.2	**N**19°58.9	320°38.0	**S**12°46.2	106°40.7	**N**00°18.1
13	306°55.1	12°36.5	25.0	166°58.4	59.2	335°39.9	46.0	121°43.2	18.1
14	321°57.5	27°35.6	24.5	182°01.6	59.5	350°41.8	45.8	136°45.6	18.2
15	337°00.0	42°34.7	·· 24.1	197°04.8	19°59.8	5°43.8	·· 45.6	151°48.1	·· 18.2
16	352°02.5	57°33.8	23.7	212°08.0	20°00.1	20°45.7	45.4	166°50.5	18.2
17	7°04.9	72°32.9	23.2	227°11.2	00.4	35°47.7	45.2	181°53.0	18.2
18	22°07.4	87°32.0	**S**22°22.8	242°14.4	**N**20°00.7	50°49.6	**S**12°45.1	196°55.5	**N**00°18.2
19	37°09.9	102°31.1	22.3	257°17.6	01.0	65°51.6	44.9	211°57.9	18.2
20	52°12.3	117°30.2	21.9	272°20.8	01.3	80°53.5	44.7	227°00.4	18.2
21	67°14.8	132°29.3	·· 21.5	287°24.0	·· 01.6	95°55.4	·· 44.5	242°02.8	·· 18.2
22	82°17.3	147°28.4	21.0	302°27.2	01.9	110°57.4	44.3	257°05.3	18.2
23	97°19.7	162°27.5	20.6	317°30.5	02.2	125°59.3	44.1	272°07.7	18.2
Mer.pass.:16:32		v-0.9 d0.4 m-3.8		v3.2 d0.3 m-1.0		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°09.0
Ankaa	353°18.1	-42°15.2
Schedar	349°43.7	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.4	-57°11.4
Hamal	328°03.5	23°30.8
Polaris	318°49.8	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.4
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	28°37.0
Alnilam	275°48.6	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.1
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.2
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°18.5	-59°32.5
Suhail	222°53.9	-43°28.4
Miaplacidus	221°39.6	-69°45.4
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.1	61°41.4
Denebola	182°36.0	14°30.7
Gienah	175°54.8	-17°35.9
Acrux	173°12.2	-63°09.1
Gacrux	172°03.7	-57°10.0
Alioth	166°22.6	55°53.9
Spica	158°33.9	-11°12.9
Alkaid	153°00.8	49°15.4
Hadar	148°51.8	-60°25.1
Menkent	148°10.7	-36°25.1
Arcturus	145°58.1	19°07.6
Rigil Kent.	139°55.5	-60°52.4
Kochab	137°20.1	74°06.4
Zuben'ubi	137°08.3	-16°05.1
Alphecca	126°13.3	26°40.6
Antares	112°29.6	-26°27.2
Atria	107°34.3	-69°02.6
Sabik	102°15.7	-15°44.3
Shaula	96°25.7	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.1
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.8	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.9
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.0	15°15.7

Jan 10 Sun	**SHA**	**Mer.pass**
Venus	69°07.6	12:07
Mars	219°20.8	02:05
Jupiter	29°16.4	14:43
Saturn	174°49.0	05:02

Jan 11 Mon	**SHA**	**Mer.pass**
Venus	67°46.4	12:08
Mars	219°37.0	02:00
Jupiter	29°04.0	14:40
Saturn	174°48.6	04:58

Jan 12 Tue	**SHA**	**Mer.pass**
Venus	66°25.3	12:10
Mars	219°53.9	01:54
Jupiter	28°51.6	14:37
Saturn	174°48.2	04:54

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°10.6	S22°00.2	242°42.9	10.2'	S22°18.9	-7.3'	56.0'
1	193°10.4	21°59.9	257°12.0	10.1'	22°26.2	-7.2'	56.0'
2	208°10.1	59.5	271°41.1	10.1'	22°33.3	-7.0'	56.0'
3	223°09.9	·· 59.1	286°10.2	10.1'	22°40.2	-6.9'	56.0'
4	238°09.6	58.8	300°39.3	10.0'	22°47.1	-6.8'	55.9'
5	253°09.4	58.4	315°08.3	10.0'	22°53.8	-6.7'	55.9'
6	268°09.1	S21°58.0	329°37.3	10.0'	S23°00.5	-6.6'	55.9'
7	283°08.8	57.7	344°06.2	9.9'	23°06.9	-6.4'	55.9'
8	298°08.6	57.3	358°35.2	9.9'	23°13.3	-6.3'	55.8'
9	313°08.3	·· 56.9	13°04.1	9.9'	23°19.6	-6.2'	55.8'
10	328°08.1	56.5	27°32.9	9.9'	23°25.7	-6.1'	55.8'
11	343°07.8	56.2	42°01.8	9.8'	23°31.7	-5.9'	55.8'
12	358°07.6	S21°55.8	56°30.6	9.8'	S23°37.6	-5.8'	55.7'
13	13°07.3	55.4	70°59.4	9.8'	23°43.3	-5.7'	55.7'
14	28°07.1	55.0	85°28.2	9.8'	23°48.9	-5.6'	55.7'
15	43°06.8	·· 54.7	99°57.0	9.7'	23°54.4	-5.4'	55.7'
16	58°06.6	54.3	114°25.7	9.7'	23°59.8	-5.3'	55.6'
17	73°06.3	53.9	128°54.4	9.7'	24°05.0	-5.2'	55.6'
18	88°06.1	S21°53.5	143°23.1	9.7'	S24°10.1	-5.1'	55.6'
19	103°05.8	53.1	157°51.8	9.7'	24°15.1	-4.9'	55.6'
20	118°05.6	52.7	172°20.4	9.6'	24°20.0	-4.8'	55.6'
21	133°05.3	·· 52.4	186°49.1	9.6'	24°24.7	-4.7'	55.5'
22	148°05.1	52.0	201°17.7	9.6'	24°29.3	-4.5'	55.5'
23	163°04.8	51.6	215°46.3	9.6'	24°33.8	-4.4'	55.5'
	SD.=16.3	d=0.4	S.D.=15.2				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°04.6	S21°51.2	230°14.8	9.6'	S24°38.1	-4.3'	55.5'
1	193°04.3	50.8	244°43.4	9.6'	24°42.4	-4.2'	55.5'
2	208°04.1	50.4	259°12.0	9.5'	24°46.4	-4.0'	55.4'
3	223°03.8	·· 50.1	273°40.5	9.5'	24°50.4	-3.9'	55.4'
4	238°03.6	49.7	288°09.0	9.5'	24°54.2	-3.8'	55.4'
5	253°03.3	49.3	302°37.5	9.5'	24°57.9	-3.6'	55.4'
6	268°03.1	S21°48.9	317°06.0	9.5'	S25°01.5	-3.5'	55.3'
7	283°02.8	48.5	331°34.5	9.5'	25°04.9	-3.4'	55.3'
8	298°02.6	48.1	346°03.0	9.5'	25°08.2	-3.2'	55.3'
9	313°02.3	·· 47.7	0°31.4	9.5'	25°11.4	-3.1'	55.3'
10	328°02.1	47.3	14°59.9	9.5'	25°14.4	-3.0'	55.3'
11	343°01.8	46.9	29°28.3	9.4'	25°17.3	-2.8'	55.2'
12	358°01.6	S21°46.5	43°56.8	9.4'	S25°20.1	-2.7'	55.2'
13	13°01.3	46.1	58°25.2	9.4'	25°22.8	-2.6'	55.2'
14	28°01.1	45.8	72°53.7	9.4'	25°25.3	-2.4'	55.2'
15	43°00.9	·· 45.4	87°22.1	9.4'	25°27.6	-2.3'	55.2'
16	58°00.6	45.0	101°50.5	9.4'	25°29.9	-2.2'	55.2'
17	73°00.4	44.6	116°19.0	9.4'	25°32.0	-2.0'	55.1'
18	88°00.1	S21°44.2	130°47.4	9.4'	S25°34.0	-1.9'	55.1'
19	102°59.9	43.8	145°15.8	9.4'	25°35.8	-1.8'	55.1'
20	117°59.6	43.4	159°44.3	9.4'	25°37.6	-1.7'	55.1'
21	132°59.4	·· 43.0	174°12.7	9.4'	25°39.1	-1.5'	55.1'
22	147°59.1	42.6	188°41.2	9.4'	25°40.6	-1.4'	55.0'
23	162°58.9	42.2	203°09.6	9.5'	25°41.9	-1.3'	55.0'
	SD.=16.3	d=0.4	S.D.=15.1				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°58.6	S21°41.8	217°38.1	9.5'	S25°43.1	-1.1'	55.0'
1	192°58.4	41.4	232°06.5	9.5'	25°44.2	-1.0'	55.0'
2	207°58.2	41.0	246°35.0	9.5'	25°45.1	-0.9'	55.0'
3	222°57.9	·· 40.6	261°03.5	9.5'	25°45.9	-0.7'	55.0'
4	237°57.7	40.1	275°32.0	9.5'	25°46.6	-0.6'	54.9'
5	252°57.4	39.7	290°00.5	9.5'	25°47.1	-0.5'	54.9'
6	267°57.2	S21°39.3	304°29.0	9.5'	S25°47.5	-0.3'	54.9'
7	282°57.0	38.9	318°57.5	9.5'	25°47.8	-0.2'	54.9'
8	297°56.7	38.5	333°26.1	9.6'	25°47.9	-0.1'	54.9'
9	312°56.5	·· 38.1	347°54.6	9.6'	25°47.9	0.1'	54.9'
10	327°56.2	37.7	2°23.2	9.6'	25°47.8	0.2'	54.8'
11	342°56.0	37.3	16°51.8	9.6'	25°47.5	0.3'	54.8'
12	357°55.7	S21°36.9	31°20.5	9.6'	S25°47.1	0.5'	54.8'
13	12°55.5	36.5	45°49.1	9.7'	25°46.6	0.6'	54.8'
14	27°55.3	36.1	60°17.8	9.7'	25°46.0	0.7'	54.8'
15	42°55.0	·· 35.6	74°46.4	9.7'	25°45.2	0.8'	54.8'
16	57°54.8	35.2	89°15.2	9.7'	25°44.3	1.0'	54.8'
17	72°54.5	34.8	103°43.9	9.7'	25°43.2	1.1'	54.7'
18	87°54.3	S21°34.4	118°12.7	9.8'	S25°42.1	1.2'	54.7'
19	102°54.1	34.0	132°41.4	9.8'	25°40.8	1.4'	54.7'
20	117°53.8	33.6	147°10.3	9.8'	25°39.4	1.5'	54.7'
21	132°53.6	·· 33.1	161°39.1	9.9'	25°37.8	1.6'	54.7'
22	147°53.4	32.7	176°08.0	9.9'	25°36.1	1.7'	54.7'
23	162°53.1	32.3	190°36.9	9.9'	25°34.3	1.9'	54.7'
	SD.=16.2	d=0.4	S.D.=14.9				

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

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

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 25-27 20-7%
10	07:17	07:30	12:07	08:06	20:32	
11	07:42	07:54	12:08	08:58	21:24	
12	08:05	08:17	12:08	09:50	22:16	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	112°22.2	177°26.5	S22°20.1	332°33.7	N20°02.6	141°01.3	S12°43.9	287°10.2	N00°18.3
1	127°24.6	192°25.6	19.7	347°36.9	02.9	156°03.2	43.7	302°12.7	18.3
2	142°27.1	207°24.7	19.2	2°40.1	03.2	171°05.2	43.5	317°15.1	18.3
3	157°29.6	222°23.8	·· 18.8	17°43.3	·· 03.5	186°07.1	·· 43.3	332°17.6	·· 18.3
4	172°32.0	237°22.9	18.3	32°46.5	03.8	201°09.0	43.1	347°20.0	18.3
5	187°34.5	252°22.0	17.9	47°49.8	04.1	216°11.0	43.0	2°22.5	18.3
6	202°37.0	267°21.1	S22°17.4	62°53.0	N20°04.4	231°12.9	S12°42.8	17°24.9	N00°18.3
7	217°39.4	282°20.2	17.0	77°56.2	04.7	246°14.9	42.6	32°27.4	18.3
8	232°41.9	297°19.3	16.5	92°59.4	05.0	261°16.8	42.4	47°29.9	18.3
9	247°44.4	312°18.4	·· 16.0	108°02.6	·· 05.3	276°18.8	·· 42.2	62°32.3	·· 18.3
10	262°46.8	327°17.5	15.6	123°05.9	05.7	291°20.7	42.0	77°34.8	18.4
11	277°49.3	342°16.7	15.1	138°09.1	06.0	306°22.6	41.8	92°37.2	18.4
12	292°51.8	357°15.8	S22°14.7	153°12.3	N20°06.3	321°24.6	S12°41.6	107°39.7	N00°18.4
13	307°54.2	12°14.9	14.2	168°15.6	06.6	336°26.5	41.4	122°42.1	18.4
14	322°56.7	27°14.0	13.7	183°18.8	06.9	351°28.5	41.2	137°44.6	18.4
15	337°59.1	42°13.1	·· 13.3	198°22.0	·· 07.2	6°30.4	·· 41.0	152°47.1	·· 18.4
16	353°01.6	57°12.2	12.8	213°25.2	07.5	21°32.3	40.9	167°49.5	18.4
17	8°04.1	72°11.3	12.3	228°28.5	07.8	36°34.3	40.7	182°52.0	18.4
18	23°06.5	87°10.4	S22°11.9	243°31.7	N20°08.1	51°36.2	S12°40.5	197°54.4	N00°18.4
19	38°09.0	102°09.5	11.4	258°34.9	08.5	66°38.2	40.3	212°56.9	18.4
20	53°11.5	117°08.6	10.9	273°38.2	08.8	81°40.1	40.1	227°59.4	18.5
21	68°13.9	132°07.7	·· 10.4	288°41.4	·· 09.1	96°42.1	·· 39.9	243°01.8	·· 18.5
22	83°16.4	147°06.8	10.0	303°44.7	09.4	111°44.0	39.7	258°04.3	18.5
23	98°18.9	162°05.9	09.5	318°47.9	09.7	126°45.9	39.5	273°06.7	18.5
Mer.pass.:16:28		v-0.9 d0.4 m-3.8		v3.2 d0.3 m-1.0		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	113°21.3	177°05.0	S22°09.0	333°51.1	N20°10.0	141°47.9	S12°39.3	288°09.2	N00°18.5
1	128°23.8	192°04.1	08.5	348°54.4	10.3	156°49.8	39.1	303°11.7	18.5
2	143°26.3	207°03.2	08.1	3°57.6	10.6	171°51.8	38.9	318°14.1	18.5
3	158°28.7	222°02.3	·· 07.6	19°00.9	·· 11.0	186°53.7	·· 38.7	333°16.6	·· 18.5
4	173°31.2	237°01.4	07.1	34°04.1	11.3	201°55.6	38.5	348°19.0	18.6
5	188°33.6	252°00.6	06.6	49°07.4	11.6	216°57.6	38.4	3°21.5	18.6
6	203°36.1	266°59.7	S22°06.1	64°10.6	N20°11.9	231°59.5	S12°38.2	18°24.0	N00°18.6
7	218°38.6	281°58.8	05.7	79°13.9	12.2	247°01.5	38.0	33°26.4	18.6
8	233°41.0	296°57.9	05.2	94°17.1	12.5	262°03.4	37.8	48°28.9	18.6
9	248°43.5	311°57.0	·· 04.7	109°20.4	·· 12.8	277°05.3	·· 37.6	63°31.4	·· 18.6
10	263°46.0	326°56.1	04.2	124°23.6	13.1	292°07.3	37.4	78°33.8	18.6
11	278°48.4	341°55.2	03.7	139°26.9	13.5	307°09.2	37.2	93°36.3	18.6
12	293°50.9	356°54.3	S22°03.2	154°30.1	N20°13.8	322°11.2	S12°37.0	108°38.7	N00°18.7
13	308°53.4	11°53.4	02.7	169°33.4	14.1	337°13.1	36.8	123°41.2	18.7
14	323°55.8	26°52.6	02.2	184°36.7	14.4	352°15.0	36.6	138°43.7	18.7
15	338°58.3	41°51.7	·· 01.7	199°39.9	·· 14.7	7°17.0	·· 36.4	153°46.1	·· 18.7
16	354°00.8	56°50.8	01.2	214°43.2	15.0	22°18.9	36.2	168°48.6	18.7
17	9°03.2	71°49.9	00.8	229°46.4	15.4	37°20.8	36.0	183°51.1	18.7
18	24°05.7	86°49.0	S22°00.3	244°49.7	N20°15.7	52°22.8	S12°35.9	198°53.5	N00°18.7
19	39°08.1	101°48.1	21°59.8	259°53.0	16.0	67°24.7	35.7	213°56.0	18.7
20	54°10.6	116°47.2	59.3	274°56.2	16.3	82°26.7	35.5	228°58.5	18.8
21	69°13.1	131°46.4	·· 58.8	289°59.5	·· 16.6	97°28.6	·· 35.3	244°00.9	·· 18.8
22	84°15.5	146°45.5	58.3	305°02.8	16.9	112°30.5	35.1	259°03.4	18.8
23	99°18.0	161°44.6	57.8	320°06.0	17.2	127°32.5	34.9	274°05.9	18.8
Mer.pass.:16:24		v-0.9 d0.5 m-3.8		v3.2 d0.3 m-1.0		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	114°20.5	176°43.7	S21°57.3	335°09.3	N20°17.6	142°34.4	S12°34.7	289°08.3	N00°18.8
1	129°22.9	191°42.8	56.7	350°12.6	17.9	157°36.4	34.5	304°10.8	18.8
2	144°25.4	206°41.9	56.2	5°15.9	18.2	172°38.3	34.3	319°13.2	18.8
3	159°27.9	221°41.1	·· 55.7	20°19.1	·· 18.5	187°40.2	·· 34.1	334°15.7	·· 18.8
4	174°30.3	236°40.2	55.2	35°22.4	18.8	202°42.2	33.9	349°18.2	18.9
5	189°32.8	251°39.3	54.7	50°25.7	19.1	217°44.1	33.7	4°20.6	18.9
6	204°35.2	266°38.4	S21°54.2	65°29.0	N20°19.5	232°46.0	S12°33.5	19°23.1	N00°18.9
7	219°37.7	281°37.5	53.7	80°32.2	19.8	247°48.0	33.3	34°25.6	18.9
8	234°40.2	296°36.7	53.2	95°35.5	20.1	262°49.9	33.1	49°28.0	18.9
9	249°42.6	311°35.8	·· 52.7	110°38.8	·· 20.4	277°51.9	·· 32.9	64°30.5	·· 18.9
10	264°45.1	326°34.9	52.1	125°42.1	20.7	292°53.8	32.8	79°33.0	18.9
11	279°47.6	341°34.0	51.6	140°45.4	21.0	307°55.7	32.6	94°35.4	19.0
12	294°50.0	356°33.1	S21°51.1	155°48.6	N20°21.4	322°57.7	S12°32.4	109°37.9	N00°19.0
13	309°52.5	11°32.3	50.6	170°51.9	21.7	337°59.6	32.2	124°40.4	19.0
14	324°55.0	26°31.4	50.1	185°55.2	22.0	353°01.5	32.0	139°42.8	19.0
15	339°57.4	41°30.5	·· 49.6	200°58.5	·· 22.3	8°03.5	·· 31.8	154°45.3	·· 19.0
16	354°59.9	56°29.6	49.0	216°01.8	22.6	23°05.4	31.6	169°47.8	19.0
17	10°02.4	71°28.8	48.5	231°05.1	23.0	38°07.3	31.4	184°50.2	19.0
18	25°04.8	86°27.9	S21°48.0	246°08.4	N20°23.3	53°09.3	S12°31.2	199°52.7	N00°19.1
19	40°07.3	101°27.0	47.5	261°11.6	23.6	68°11.2	31.0	214°55.2	19.1
20	55°09.7	116°26.1	46.9	276°14.9	23.9	83°13.2	30.8	229°57.7	19.1
21	70°12.2	131°25.3	·· 46.4	291°18.2	·· 24.2	98°15.1	·· 30.6	245°00.1	·· 19.1
22	85°14.7	146°24.4	45.9	306°21.5	24.6	113°17.0	30.4	260°02.6	19.1
23	100°17.1	161°23.5	45.3	321°24.8	24.9	128°19.0	30.2	275°05.1	19.1
Mer.pass.:16:20		v-0.9 d0.5 m-3.8		v3.3 d0.3 m-1.0		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°09.0
Ankaa	353°18.2	-42°15.2
Schedar	349°43.7	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.4	-57°11.4
Hamal	328°03.5	23°30.8
Polaris	318°50.9	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	28°37.0
Alnilam	275°48.6	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.2
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.2
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°18.5	-59°32.5
Suhail	222°53.9	-43°28.4
Miaplacidus	221°39.6	-69°45.4
Alphard	217°58.2	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.1	61°41.4
Denebola	182°36.0	14°30.7
Gienah	175°54.8	-17°35.9
Acrux	173°12.2	-63°09.1
Gacrux	172°03.7	-57°10.0
Alioth	166°22.6	55°53.9
Spica	158°33.9	-11°12.9
Alkaid	153°00.8	49°15.4
Hadar	148°51.7	-60°25.1
Menkent	148°10.6	-36°25.1
Arcturus	145°58.0	19°07.5
Rigil Kent.	139°55.4	-60°52.4
Kochab	137°20.0	74°06.4
Zuben'ubi	137°08.3	-16°05.1
Alphecca	126°13.3	26°40.6
Antares	112°29.6	-26°27.2
Atria	107°34.2	-69°02.6
Sabik	102°15.7	-15°44.3
Shaula	96°25.7	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.1
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.7	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.3
Al Na'ir	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 13 Wed	**SHA**	**Mer.pass**
Venus	65°04.4	12:11
Mars	220°11.5	01:49
Jupiter	28°39.1	14:34
Saturn	174°48.0	04:51

Jan 14 Thu	**SHA**	**Mer.pass**
Venus	63°43.7	12:12
Mars	220°29.8	01:44
Jupiter	28°26.6	14:31
Saturn	174°47.9	04:47

Jan 15 Fri	**SHA**	**Mer.pass**
Venus	62°23.2	12:14
Mars	220°48.8	01:39
Jupiter	28°14.0	14:28
Saturn	174°47.9	04:43

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.1040 sec ΔT = TT-UT1 = +66.0800 sec

2010 January 13 to Jan. 15 UT

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	177°52.9	S21°31.9	205°05.8	10.0′	S25°32.4	2.0′	54.6′
1	192°52.6	31.5	219°34.8	10.0′	25°30.4	2.1′	54.6′
2	207°52.4	31.0	234°03.8	10.0′	25°28.2	2.2′	54.6′
3	222°52.2	·· 30.6	248°32.8	10.1′	25°25.9	2.4′	54.6′
4	237°51.9	30.2	263°01.9	10.1′	25°23.4	2.5′	54.6′
5	252°51.7	29.8	277°31.0	10.1′	25°20.9	2.6′	54.6′
6	267°51.5	S21°29.4	292°00.2	10.2′	S25°18.2	2.7′	54.6′
7	282°51.2	28.9	306°29.4	10.2′	25°15.4	2.9′	54.5′
8	297°51.0	28.5	320°58.6	10.3′	25°12.5	3.0′	54.5′
9	312°50.8	·· 28.1	335°27.9	10.3′	25°09.4	3.1′	54.5′
10	327°50.5	27.7	349°57.2	10.3′	25°06.3	3.2′	54.5′
11	342°50.3	27.2	4°26.5	10.4′	25°03.0	3.4′	54.5′
12	357°50.1	S21°26.8	18°55.9	10.4′	S24°59.5	3.5′	54.5′
13	12°49.8	26.4	33°25.4	10.5′	24°56.0	3.6′	54.5′
14	27°49.6	25.9	47°54.9	10.5′	24°52.4	3.7′	54.5′
15	42°49.3	·· 25.5	62°24.4	10.6′	24°48.6	3.8′	54.4′
16	57°49.1	25.1	76°54.0	10.6′	24°44.7	3.9′	54.4′
17	72°48.9	24.6	91°23.6	10.6′	24°40.7	4.1′	54.4′
18	87°48.7	S21°24.2	105°53.3	10.7′	S24°36.6	4.2′	54.4′
19	102°48.4	23.8	120°23.0	10.7′	24°32.3	4.3′	54.4′
20	117°48.2	23.3	134°52.8	10.8′	24°28.0	4.4′	54.4′
21	132°48.0	·· 22.9	149°22.6	10.8′	24°23.5	4.5′	54.4′
22	147°47.7	22.5	163°52.5	10.9′	24°18.9	4.6′	54.4′
23	162°47.5	22.0	178°22.4	10.9′	24°14.2	4.8′	54.4′
	SD.=16.2	d=0.4	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	177°47.3	S21°21.6	192°52.4	11.0′	S24°09.4	4.9′	54.3′
1	192°47.0	21.2	207°22.4	11.1′	24°04.5	5.0′	54.3′
2	207°46.8	20.7	221°52.5	11.1′	23°59.4	5.1′	54.3′
3	222°46.6	·· 20.3	236°22.6	11.2′	23°54.3	5.2′	54.3′
4	237°46.3	19.8	250°52.8	11.2′	23°49.0	5.3′	54.3′
5	252°46.1	19.4	265°23.0	11.3′	23°43.6	5.4′	54.3′
6	267°45.9	S21°19.0	279°53.3	11.3′	S23°38.1	5.5′	54.3′
7	282°45.7	18.5	294°23.7	11.4′	23°32.6	5.6′	54.3′
8	297°45.4	18.1	308°54.1	11.4′	23°26.9	5.8′	54.3′
9	312°45.2	·· 17.6	323°24.5	11.5′	23°21.0	5.9′	54.3′
10	327°45.0	17.2	337°55.1	11.6′	23°15.1	6.0′	54.2′
11	342°44.7	16.7	352°25.6	11.6′	23°09.1	6.1′	54.2′
12	357°44.5	S21°16.3	6°56.3	11.7′	S23°03.0	6.2′	54.2′
13	12°44.3	15.8	21°27.0	11.7′	22°56.8	6.3′	54.2′
14	27°44.1	15.4	35°57.7	11.8′	22°50.4	6.4′	54.2′
15	42°43.8	·· 15.0	50°28.5	11.8′	22°44.0	6.5′	54.2′
16	57°43.6	14.5	64°59.4	11.9′	22°37.5	6.6′	54.2′
17	72°43.4	14.1	79°30.3	12.0′	22°30.8	6.7′	54.2′
18	87°43.2	S21°13.6	94°01.3	12.0′	S22°24.1	6.8′	54.2′
19	102°42.9	13.2	108°32.4	12.1′	22°17.3	6.9′	54.2′
20	117°42.7	12.7	123°03.5	12.1′	22°10.3	7.0′	54.2′
21	132°42.5	·· 12.3	137°34.7	12.2′	22°03.3	7.1′	54.2′
22	147°42.3	11.8	152°05.9	12.3′	21°56.2	7.2′	54.1′
23	162°42.0	11.3	166°37.2	12.3′	21°48.9	7.3′	54.1′
	SD.=16.2	d=0.4	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	177°41.8	S21°10.9	181°08.5	12.4′	S21°41.6	7.4′	54.1′
1	192°41.6	10.4	195°40.0	12.4′	21°34.2	7.5′	54.1′
2	207°41.4	10.0	210°11.4	12.5′	21°26.7	7.6′	54.1′
3	222°41.1	·· 09.5	224°43.0	12.6′	21°19.1	7.6′	54.1′
4	237°40.9	09.1	239°14.6	12.6′	21°11.4	7.7′	54.1′
5	252°40.7	08.6	253°46.2	12.7′	21°03.6	7.8′	54.1′
6	267°40.5	S21°08.2	268°17.9	12.8′	S20°55.8	7.9′	54.1′
7	282°40.2	07.7	282°49.7	12.8′	20°47.8	8.0′	54.1′
8	297°40.0	07.2	297°21.6	12.9′	20°39.7	8.1′	54.1′
9	312°39.8	·· 06.8	311°53.5	12.9′	20°31.6	8.2′	54.1′
10	327°39.6	06.3	326°25.4	13.0′	20°23.4	8.3′	54.1′
11	342°39.4	05.9	340°57.5	13.1′	20°15.1	8.4′	54.1′
12	357°39.1	S21°05.4	355°29.6	13.1′	S20°06.6	8.4′	54.1′
13	12°38.9	04.9	10°01.7	13.2′	19°58.2	8.5′	54.0′
14	27°38.7	04.5	24°33.9	13.2′	19°49.6	8.6′	54.0′
15	42°38.5	·· 04.0	39°06.2	13.3′	19°40.9	8.7′	54.0′
16	57°38.3	03.5	53°38.5	13.4′	19°32.2	8.8′	54.0′
17	72°38.0	03.1	68°10.9	13.4′	19°23.4	8.9′	54.0′
18	87°37.8	S21°02.6	82°43.4	13.5′	S19°14.5	8.9′	54.0′
19	102°37.6	02.1	97°15.9	13.5′	19°05.5	9.0′	54.0′
20	117°37.4	01.7	111°48.5	13.6′	18°56.5	9.1′	54.0′
21	132°37.2	·· 01.2	126°21.1	13.7′	18°47.3	9.2′	54.0′
22	147°36.9	00.7	140°53.8	13.7′	18°38.1	9.2′	54.0′
23	162°36.7	00.3	155°26.5	13.8′	18°28.8	9.3′	54.0′
	SD.=16.2	d=0.5	S.D.=14.7				

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

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

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 28-0 3-0%
13	08:28	08:40	12:09	10:42	23:07	●
14	08:51	09:02	12:09	11:31	23:55	
15	09:13	09:23	12:09	12:19	–:–	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	115°19.6	176°22.6	S21°44.8	336°28.1	N20°25.2	143°20.9	S12°30.0	290°07.5	N00°19.1
1	130°22.1	191°21.8	44.3	351°31.4	25.5	158°22.8	29.8	305°10.0	19.2
2	145°24.5	206°20.9	43.8	6°34.7	25.8	173°24.8	29.6	320°12.5	19.2
3	160°27.0	221°20.0	·· 43.2	21°38.0	·· 26.1	188°26.7	·· 29.5	335°14.9	·· 19.2
4	175°29.5	236°19.2	42.7	36°41.3	26.5	203°28.6	29.3	350°17.4	19.2
5	190°31.9	251°18.3	42.1	51°44.6	26.8	218°30.6	29.1	5°19.9	19.2
6	205°34.4	266°17.4	S21°41.6	66°47.9	N20°27.1	233°32.5	S12°28.9	20°22.3	N00°19.2
7	220°36.9	281°16.5	41.1	81°51.2	27.4	248°34.5	28.7	35°24.8	19.3
8	235°39.3	296°15.7	40.5	96°54.5	27.7	263°36.4	28.5	50°27.3	19.3
9	250°41.8	311°14.8	·· 40.0	111°57.8	·· 28.1	278°38.3	·· 28.3	65°29.8	·· 19.3
10	265°44.2	326°13.9	39.4	127°01.1	28.4	293°40.3	28.1	80°32.2	19.3
11	280°46.7	341°13.1	38.9	142°04.5	28.7	308°42.2	27.9	95°34.7	19.3
12	295°49.2	356°12.2	S21°38.4	157°07.8	N20°29.0	323°44.1	S12°27.7	110°37.2	N00°19.3
13	310°51.6	11°11.3	37.8	172°11.1	29.3	338°46.1	27.5	125°39.6	19.4
14	325°54.1	26°10.5	37.3	187°14.4	29.7	353°48.0	27.3	140°42.1	19.4
15	340°56.6	41°09.6	·· 36.7	202°17.7	·· 30.0	8°49.9	·· 27.1	155°44.6	·· 19.4
16	355°59.0	56°08.7	36.2	217°21.0	30.3	23°51.9	26.9	170°47.1	19.4
17	11°01.5	71°07.9	35.6	232°24.3	30.6	38°53.8	26.7	185°49.5	19.4
18	26°04.0	86°07.0	S21°35.1	247°27.6	N20°30.9	53°55.7	S12°26.5	200°52.0	N00°19.4
19	41°06.4	101°06.1	34.5	262°31.0	31.3	68°57.7	26.3	215°54.5	19.4
20	56°08.9	116°05.3	34.0	277°34.3	31.6	83°59.6	26.1	230°56.9	19.5
21	71°11.4	131°04.4	·· 33.4	292°37.6	·· 31.9	99°01.5	·· 25.9	245°59.4	·· 19.5
22	86°13.8	146°03.5	32.8	307°40.9	32.2	114°03.5	25.7	261°01.9	19.5
23	101°16.3	161°02.7	32.3	322°44.2	32.6	129°05.4	25.5	276°04.4	19.5
Mer.pass.:16:16		v-0.9 d0.5 m-3.8		v3.3 d0.3 m-1.0		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	116°18.7	176°01.8	S21°31.7	337°47.6	N20°32.9	144°07.3	S12°25.4	291°06.8	N00°19.5
1	131°21.2	191°01.0	31.2	352°50.9	33.2	159°09.3	25.2	306°09.3	19.5
2	146°23.7	206°00.1	30.6	7°54.2	33.5	174°11.2	25.0	321°11.8	19.6
3	161°26.1	220°59.2	·· 30.0	22°57.5	·· 33.8	189°13.1	·· 24.8	336°14.3	·· 19.6
4	176°28.6	235°58.4	29.5	38°00.9	34.2	204°15.1	24.6	351°16.7	19.6
5	191°31.1	250°57.5	28.9	53°04.2	34.5	219°17.0	24.4	6°19.2	19.6
6	206°33.5	265°56.7	S21°28.4	68°07.5	N20°34.8	234°18.9	S12°24.2	21°21.7	N00°19.6
7	221°36.0	280°55.8	27.8	83°10.8	35.1	249°20.9	24.0	36°24.2	19.7
8	236°38.5	295°54.9	27.2	98°14.2	35.4	264°22.8	23.8	51°26.6	19.7
9	251°40.9	310°54.1	·· 26.7	113°17.5	·· 35.8	279°24.7	·· 23.6	66°29.1	·· 19.7
10	266°43.4	325°53.2	26.1	128°20.8	36.1	294°26.7	23.4	81°31.6	19.7
11	281°45.8	340°52.4	25.5	143°24.2	36.4	309°28.6	23.2	96°34.1	19.7
12	296°48.3	355°51.5	S21°24.9	158°27.5	N20°36.7	324°30.5	S12°23.0	111°36.5	N00°19.7
13	311°50.8	10°50.7	24.4	173°30.8	37.1	339°32.5	22.8	126°39.0	19.8
14	326°53.2	25°49.8	23.8	188°34.2	37.4	354°34.4	22.6	141°41.5	19.8
15	341°55.7	40°48.9	·· 23.2	203°37.5	·· 37.7	9°36.3	·· 22.4	156°44.0	·· 19.8
16	356°58.2	55°48.1	22.6	218°40.8	38.0	24°38.3	22.2	171°46.4	19.8
17	12°00.6	70°47.2	22.1	233°44.2	38.3	39°40.2	22.0	186°48.9	19.8
18	27°03.1	85°46.4	S21°21.5	248°47.5	N20°38.7	54°42.1	S12°21.8	201°51.4	N00°19.8
19	42°05.6	100°45.5	20.9	263°50.9	39.0	69°44.1	21.6	216°53.9	19.9
20	57°08.0	115°44.7	20.3	278°54.2	39.3	84°46.0	21.4	231°56.3	19.9
21	72°10.5	130°43.8	·· 19.7	293°57.5	·· 39.6	99°47.9	·· 21.2	246°58.8	·· 19.9
22	87°13.0	145°43.0	19.2	309°00.9	40.0	114°49.9	21.0	262°01.3	19.9
23	102°15.4	160°42.1	18.6	324°04.2	40.3	129°51.8	20.8	277°03.8	19.9
Mer.pass.:16:12		v-0.9 d0.6 m-3.8		v3.3 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	117°17.9	175°41.3	S21°18.0	339°07.6	N20°40.6	144°53.7	S12°20.6	292°06.3	N00°20.0
1	132°20.3	190°40.4	17.4	354°10.9	40.9	159°55.7	20.4	307°08.7	20.0
2	147°22.8	205°39.6	16.8	9°14.3	41.2	174°57.6	20.2	322°11.2	20.0
3	162°25.3	220°38.7	·· 16.2	24°17.6	·· 41.6	189°59.5	·· 20.0	337°13.7	·· 20.0
4	177°27.7	235°37.9	15.6	39°21.0	41.9	205°01.5	19.9	352°16.2	20.0
5	192°30.2	250°37.0	15.1	54°24.3	42.2	220°03.4	19.7	7°18.6	20.1
6	207°32.7	265°36.2	S21°14.5	69°27.7	N20°42.5	235°05.3	S12°19.5	22°21.1	N00°20.1
7	222°35.1	280°35.3	13.9	84°31.0	42.9	250°07.2	19.3	37°23.6	20.1
8	237°37.6	295°34.5	13.3	99°34.4	43.2	265°09.2	19.1	52°26.1	20.1
9	252°40.1	310°33.6	·· 12.7	114°37.7	·· 43.5	280°11.1	·· 18.9	67°28.6	·· 20.1
10	267°42.5	325°32.8	12.1	129°41.1	43.8	295°13.0	18.7	82°31.0	20.1
11	282°45.0	340°31.9	11.5	144°44.4	44.2	310°15.0	18.5	97°33.5	20.2
12	297°47.5	355°31.1	S21°10.9	159°47.8	N20°44.5	325°16.9	S12°18.3	112°36.0	N00°20.2
13	312°49.9	10°30.2	10.3	174°51.2	44.8	340°18.8	18.1	127°38.5	20.2
14	327°52.4	25°29.4	09.7	189°54.5	45.1	355°20.8	17.9	142°41.0	20.2
15	342°54.8	40°28.5	·· 09.1	204°57.9	·· 45.4	10°22.7	·· 17.7	157°43.4	·· 20.2
16	357°57.3	55°27.7	08.5	220°01.2	45.8	25°24.6	17.5	172°45.9	20.3
17	12°59.8	70°26.9	07.9	235°04.6	46.1	40°26.6	17.3	187°48.4	20.3
18	28°02.2	85°26.0	S21°07.3	250°08.0	N20°46.4	55°28.5	S12°17.1	202°50.9	N00°20.3
19	43°04.7	100°25.2	06.7	265°11.3	46.7	70°30.4	16.9	217°53.4	20.3
20	58°07.2	115°24.3	06.1	280°14.7	47.1	85°32.3	16.7	232°55.8	20.3
21	73°09.6	130°23.5	·· 05.5	295°18.1	·· 47.4	100°34.3	·· 16.5	247°58.3	·· 20.4
22	88°12.1	145°22.6	04.8	310°21.4	47.7	115°36.2	16.3	263°00.8	20.4
23	103°14.6	160°21.8	04.2	325°24.8	48.0	130°38.1	16.1	278°03.3	20.4
Mer.pass.:16:08		v-0.9 d0.6 m-3.8		v3.3 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°09.0
Ankaa	353°18.2	-42°15.2
Schedar	349°43.7	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.4	-57°11.4
Hamal	328°03.6	23°30.8
Polaris	318°52.3	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.8	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	28°37.0
Alnilam	275°48.6	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.2
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.2
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.5
Suhail	222°53.9	-43°28.4
Miaplacidus	221°39.5	-69°45.5
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°54.0	61°41.4
Denebola	182°36.0	14°30.7
Gienah	175°54.8	-17°35.9
Acrux	173°12.1	-63°09.1
Gacrux	172°03.7	-57°10.0
Alioth	166°22.6	55°53.9
Spica	158°33.9	-11°12.9
Alkaid	153°00.7	49°15.4
Hadar	148°51.7	-60°25.1
Menkent	148°10.6	-36°25.1
Arcturus	145°58.0	19°07.5
Rigil Kent.	139°55.4	-60°52.4
Kochab	137°20.0	74°06.4
Zuben'ubi	137°08.3	-16°05.1
Alphecca	126°13.2	26°40.6
Antares	112°29.6	-26°27.2
Atria	107°34.1	-69°02.6
Sabik	102°15.7	-15°44.3
Shaula	96°25.6	-37°06.6
Rasalhague	96°09.0	12°33.0
Eltanin	90°47.8	51°29.1
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.7	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.3
Al Na'ir	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 16 Sat	**SHA**	**Mer.pass**
Venus	61°03.0	12:15
Mars	221°08.5	01:34
Jupiter	28°01.3	14:25
Saturn	174°47.9	04:39

Jan 17 Sun	**SHA**	**Mer.pass**
Venus	59°43.1	12:17
Mars	221°28.8	01:29
Jupiter	27°48.6	14:22
Saturn	174°48.1	04:35

Jan 18 Mon	**SHA**	**Mer.pass**
Venus	58°23.4	12:18
Mars	221°49.7	01:23
Jupiter	27°35.8	14:19
Saturn	174°48.4	04:31

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.1014 sec ΔT = TT-UT1 = +66.0826 sec

2010 January 16 to Jan. 18 UT

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°36.5	S20°59.8	169°59.4	13.8'	S18°19.5	9.4'	54.0'
1	192°36.3	59.3	184°32.2	13.9'	18°10.1	9.5'	54.0'
2	207°36.1	58.8	199°05.1	14.0'	18°00.5	9.5'	54.0'
3	222°35.9	·· 58.4	213°38.1	14.0'	17°51.0	9.6'	54.0'
4	237°35.6	57.9	228°11.2	14.1'	17°41.3	9.7'	54.0'
5	252°35.4	57.4	242°44.3	14.1'	17°31.6	9.8'	54.0'
6	267°35.2	S20°56.9	257°17.4	14.2'	S17°21.8	9.8'	54.0'
7	282°35.0	56.5	271°50.7	14.2'	17°11.9	9.9'	54.0'
8	297°34.8	56.0	286°23.9	14.3'	17°02.0	10.0'	54.0'
9	312°34.6	·· 55.5	300°57.3	14.4'	16°52.0	10.0'	54.0'
10	327°34.4	55.0	315°30.6	14.4'	16°41.9	10.1'	54.0'
11	342°34.1	54.6	330°04.1	14.5'	16°31.8	10.2'	54.0'
12	357°33.9	S20°54.1	344°37.6	14.5'	S16°21.6	10.2'	54.0'
13	12°33.7	53.6	359°11.1	14.6'	16°11.3	10.3'	54.0'
14	27°33.5	53.1	13°44.7	14.6'	16°01.0	10.4'	54.0'
15	42°33.3	·· 52.6	28°18.4	14.7'	15°50.6	10.4'	54.0'
16	57°33.1	52.2	42°52.1	14.7'	15°40.2	10.5'	53.9'
17	72°32.9	51.7	57°25.8	14.8'	15°29.6	10.5'	53.9'
18	87°32.7	S20°51.2	71°59.6	14.8'	S15°19.1	10.6'	53.9'
19	102°32.4	50.7	86°33.5	14.9'	15°08.4	10.7'	53.9'
20	117°32.2	50.2	101°07.4	14.9'	14°57.7	10.7'	53.9'
21	132°32.0	·· 49.7	115°41.4	15.0'	14°47.0	10.8'	53.9'
22	147°31.8	49.2	130°15.4	15.0'	14°36.2	10.8'	53.9'
23	162°31.6	48.8	144°49.4	15.1'	14°25.3	10.9'	53.9'
	SD.=16.2	d=0.5	S.D.=14.7				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°31.4	S20°48.3	159°23.6	15.1'	S14°14.4	10.9'	53.9'
1	192°31.2	47.8	173°57.7	15.2'	14°03.4	11.0'	53.9'
2	207°31.0	47.3	188°31.9	15.2'	13°52.4	11.1'	53.9'
3	222°30.8	·· 46.8	203°06.2	15.3'	13°41.3	11.1'	53.9'
4	237°30.6	46.3	217°40.5	15.3'	13°30.2	11.2'	53.9'
5	252°30.3	45.8	232°14.8	15.4'	13°19.0	11.2'	53.9'
6	267°30.1	S20°45.3	246°49.2	15.4'	S13°07.7	11.3'	53.9'
7	282°29.9	44.8	261°23.6	15.5'	12°56.4	11.3'	53.9'
8	297°29.7	44.3	275°58.1	15.5'	12°45.1	11.4'	53.9'
9	312°29.5	·· 43.9	290°32.6	15.5'	12°33.7	11.4'	53.9'
10	327°29.3	43.4	305°07.2	15.6'	12°22.3	11.5'	53.9'
11	342°29.1	42.9	319°41.7	15.6'	12°10.8	11.5'	53.9'
12	357°28.9	S20°42.4	334°16.4	15.7'	S11°59.3	11.6'	53.9'
13	12°28.7	41.9	348°51.1	15.7'	11°47.7	11.6'	54.0'
14	27°28.5	41.4	3°25.8	15.7'	11°36.1	11.6'	54.0'
15	42°28.3	·· 40.9	18°00.5	15.8'	11°24.4	11.7'	54.0'
16	57°28.1	40.4	32°35.3	15.8'	11°12.7	11.7'	54.0'
17	72°27.9	39.9	47°10.2	15.8'	11°01.0	11.8'	54.0'
18	87°27.7	S20°39.4	61°45.0	15.9'	S10°49.2	11.8'	54.0'
19	102°27.5	38.9	76°19.9	15.9'	10°37.3	11.9'	54.0'
20	117°27.3	38.4	90°54.9	16.0'	10°25.5	11.9'	54.0'
21	132°27.1	·· 37.9	105°29.8	16.0'	10°13.6	11.9'	54.0'
22	147°26.9	37.4	120°04.8	16.0'	10°01.6	12.0'	54.0'
23	162°26.7	36.9	134°39.9	16.1'	09°49.6	12.0'	54.0'
	SD.=16.2	d=0.5	S.D.=14.7				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°26.5	S20°36.4	149°14.9	16.1'	S09°37.6	12.0'	54.0'
1	192°26.2	35.9	163°50.0	16.1'	09°25.5	12.1'	54.0'
2	207°26.0	35.4	178°25.2	16.1'	09°13.4	12.1'	54.0'
3	222°25.8	·· 34.9	193°00.3	16.2'	09°01.3	12.2'	54.0'
4	237°25.6	34.3	207°35.5	16.2'	08°49.1	12.2'	54.0'
5	252°25.4	33.8	222°10.7	16.2'	08°36.9	12.2'	54.0'
6	267°25.2	S20°33.3	236°46.0	16.3'	S08°24.7	12.3'	54.0'
7	282°25.0	32.8	251°21.2	16.3'	08°12.4	12.3'	54.0'
8	297°24.8	32.3	265°56.5	16.3'	08°00.1	12.3'	54.0'
9	312°24.6	·· 31.8	280°31.8	16.3'	07°47.8	12.3'	54.0'
10	327°24.4	31.3	295°07.2	16.3'	07°35.4	12.4'	54.0'
11	342°24.2	30.8	309°42.5	16.4'	07°23.0	12.4'	54.0'
12	357°24.0	S20°30.3	324°17.9	16.4'	S07°10.6	12.4'	54.0'
13	12°23.8	29.8	338°53.3	16.4'	06°58.2	12.5'	54.0'
14	27°23.7	29.2	353°28.7	16.4'	06°45.7	12.5'	54.1'
15	42°23.5	·· 28.7	8°04.2	16.5'	06°33.2	12.5'	54.1'
16	57°23.3	28.2	22°39.6	16.5'	06°20.7	12.5'	54.1'
17	72°23.1	27.7	37°15.1	16.5'	06°08.1	12.6'	54.1'
18	87°22.9	S20°27.2	51°50.6	16.5'	S05°55.5	12.6'	54.1'
19	102°22.7	26.7	66°26.1	16.5'	05°42.9	12.6'	54.1'
20	117°22.5	26.1	81°01.6	16.5'	05°30.3	12.6'	54.1'
21	132°22.3	·· 25.6	95°37.2	16.5'	05°17.7	12.7'	54.1'
22	147°22.1	25.1	110°12.7	16.6'	05°05.0	12.7'	54.1'
23	162°21.9	24.6	124°48.3	16.6'	04°52.3	12.7'	54.1'
	SD.=16.2	d=0.5	S.D.=14.7				

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

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

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 1-3 1-9%
16	09:34	09:44	12:10	13:03	00:41	●
17	09:54	10:04	12:10	13:46	01:25	
18	10:14	10:24	12:10	14:27	02:07	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	118°17.0	175°21.0	S21°03.6	340°28.2	N20°48.4	145°40.1	S12°15.9	293°05.8	N00°20.4
1	133°19.5	190°20.1	03.0	355°31.5	48.7	160°42.0	15.7	308°08.3	20.4
2	148°21.9	205°19.3	02.4	10°34.9	49.0	175°43.9	15.5	323°10.7	20.5
3	163°24.4	220°18.4	·· 01.8	25°38.3	·· 49.3	190°45.9	·· 15.3	338°13.2	·· 20.5
4	178°26.9	235°17.6	01.2	40°41.6	49.6	205°47.8	15.1	353°15.7	20.5
5	193°29.3	250°16.8	21°00.5	55°45.0	50.0	220°49.7	14.9	8°18.2	20.5
6	208°31.8	265°15.9	S20°59.9	70°48.4	N20°50.3	235°51.6	S12°14.7	23°20.7	N00°20.6
7	223°34.3	280°15.1	59.3	85°51.8	50.6	250°53.6	14.5	38°23.1	20.6
8	238°36.7	295°14.3	58.7	100°55.1	50.9	265°55.5	14.3	53°25.6	20.6
9	253°39.2	310°13.4	·· 58.1	115°58.5	·· 51.3	280°57.4	·· 14.1	68°28.1	·· 20.6
10	268°41.7	325°12.6	57.4	131°01.9	51.6	295°59.4	13.9	83°30.6	20.6
11	283°44.1	340°11.8	56.8	146°05.3	51.9	311°01.3	13.7	98°33.1	20.7
12	298°46.6	355°10.9	S20°56.2	161°08.6	N20°52.2	326°03.2	S12°13.5	113°35.6	N00°20.7
13	313°49.1	10°10.1	55.6	176°12.0	52.6	341°05.1	13.3	128°38.0	20.7
14	328°51.5	25°09.3	55.0	191°15.4	52.9	356°07.1	13.1	143°40.5	20.7
15	343°54.0	40°08.4	·· 54.3	206°18.8	·· 53.2	11°09.0	·· 12.9	158°43.0	·· 20.7
16	358°56.4	55°07.6	53.7	221°22.2	53.5	26°10.9	12.7	173°45.5	20.8
17	13°58.9	70°06.8	53.1	236°25.6	53.8	41°12.9	12.5	188°48.0	20.8
18	29°01.4	85°05.9	S20°52.4	251°28.9	N20°54.2	56°14.8	S12°12.3	203°50.5	N00°20.8
19	44°03.8	100°05.1	51.8	266°32.3	54.5	71°16.7	12.1	218°53.0	20.8
20	59°06.3	115°04.3	51.2	281°35.7	54.8	86°18.6	11.9	233°55.4	20.9
21	74°08.8	130°03.4	·· 50.5	296°39.1	·· 55.1	101°20.6	·· 11.7	248°57.9	·· 20.9
22	89°11.2	145°02.6	49.9	311°42.5	55.5	116°22.5	11.5	264°00.4	20.9
23	104°13.7	160°01.8	49.3	326°45.9	55.8	131°24.4	11.3	279°02.9	20.9
Mer.pass.:16:04		v-0.8 d0.6 m-3.8		v3.4 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	119°16.2	175°00.9	S20°48.6	341°49.3	N20°56.1	146°26.4	S12°11.1	294°05.4	N00°20.9
1	134°18.6	190°00.1	48.0	356°52.6	56.4	161°28.3	10.9	309°07.9	21.0
2	149°21.1	204°59.3	47.3	11°56.0	56.8	176°30.2	10.7	324°10.4	21.0
3	164°23.5	219°58.5	·· 46.7	26°59.4	·· 57.1	191°32.1	·· 10.5	339°12.8	·· 21.0
4	179°26.0	234°57.6	46.1	42°02.8	57.4	206°34.1	10.3	354°15.3	21.0
5	194°28.5	249°56.8	45.4	57°06.2	57.7	221°36.0	10.1	9°17.8	21.1
6	209°30.9	264°56.0	S20°44.8	72°09.6	N20°58.0	236°37.9	S12°09.9	24°20.3	N00°21.1
7	224°33.4	279°55.2	44.1	87°13.0	58.4	251°39.8	09.7	39°22.8	21.1
8	239°35.9	294°54.3	43.5	102°16.4	58.7	266°41.8	09.5	54°25.3	21.1
9	254°38.3	309°53.5	·· 42.8	117°19.8	·· 59.0	281°43.7	·· 09.3	69°27.8	·· 21.1
10	269°40.8	324°52.7	42.2	132°23.2	59.3	296°45.6	09.1	84°30.2	21.2
11	284°43.3	339°51.9	41.5	147°26.6	20°59.7	311°47.6	08.9	99°32.7	21.2
12	299°45.7	354°51.0	S20°40.9	162°30.0	N21°00.0	326°49.5	S12°08.7	114°35.2	N00°21.2
13	314°48.2	9°50.2	40.2	177°33.4	00.3	341°51.4	08.5	129°37.7	21.2
14	329°50.7	24°49.4	39.6	192°36.8	00.6	356°53.3	08.3	144°40.2	21.3
15	344°53.1	39°48.6	·· 38.9	207°40.2	·· 01.0	11°55.3	·· 08.1	159°42.7	·· 21.3
16	359°55.6	54°47.8	38.3	222°43.6	01.3	26°57.2	07.9	174°45.2	21.3
17	14°58.0	69°46.9	37.6	237°47.0	01.6	41°59.1	07.7	189°47.7	21.3
18	30°00.5	84°46.1	S20°37.0	252°50.4	N21°01.9	57°01.0	S12°07.5	204°50.2	N00°21.4
19	45°03.0	99°45.3	36.3	267°53.8	02.2	72°03.0	07.3	219°52.6	21.4
20	60°05.4	114°44.5	35.7	282°57.2	02.6	87°04.9	07.1	234°55.1	21.4
21	75°07.9	129°43.7	·· 35.0	298°00.6	·· 02.9	102°06.8	·· 06.9	249°57.6	·· 21.4
22	90°10.4	144°42.8	34.3	313°04.0	03.2	117°08.7	06.7	265°00.1	21.4
23	105°12.8	159°42.0	33.7	328°07.4	03.5	132°10.7	06.5	280°02.6	21.5
Mer.pass.:16:00		v-0.8 d0.6 m-3.8		v3.4 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	120°15.3	174°41.2	S20°33.0	343°10.8	N21°03.9	147°12.6	S12°06.3	295°05.1	N00°21.5
1	135°17.8	189°40.4	32.3	358°14.2	04.2	162°14.5	06.1	310°07.6	21.5
2	150°20.2	204°39.6	31.7	13°17.6	04.5	177°16.4	05.9	325°10.1	21.5
3	165°22.7	219°38.8	·· 31.0	28°21.1	·· 04.8	192°18.4	·· 05.7	340°12.6	·· 21.6
4	180°25.2	234°37.9	30.4	43°24.5	05.1	207°20.3	05.5	355°15.1	21.6
5	195°27.6	249°37.1	29.7	58°27.9	05.5	222°22.2	05.3	10°17.5	21.6
6	210°30.1	264°36.3	S20°29.0	73°31.3	N21°05.8	237°24.2	S12°05.1	25°20.0	N00°21.6
7	225°32.5	279°35.5	28.3	88°34.7	06.1	252°26.1	04.9	40°22.5	21.7
8	240°35.0	294°34.7	27.7	103°38.1	06.4	267°28.0	04.7	55°25.0	21.7
9	255°37.5	309°33.9	·· 27.0	118°41.5	·· 06.8	282°29.9	·· 04.5	70°27.5	·· 21.7
10	270°39.9	324°33.1	26.3	133°44.9	07.1	297°31.9	04.3	85°30.0	21.7
11	285°42.4	339°32.3	25.7	148°48.4	07.4	312°33.8	04.1	100°32.5	21.8
12	300°44.9	354°31.4	S20°25.0	163°51.8	N21°07.7	327°35.7	S12°03.9	115°35.0	N00°21.8
13	315°47.3	9°30.6	24.3	178°55.2	08.0	342°37.6	03.7	130°37.5	21.8
14	330°49.8	24°29.8	23.6	193°58.6	08.4	357°39.6	03.5	145°40.0	21.8
15	345°52.3	39°29.0	·· 22.9	209°02.0	·· 08.7	12°41.5	·· 03.3	160°42.5	·· 21.9
16	0°54.7	54°28.2	22.3	224°05.5	09.0	27°43.4	03.1	175°45.0	21.9
17	15°57.2	69°27.4	21.6	239°08.9	09.3	42°45.3	02.9	190°47.5	21.9
18	30°59.6	84°26.6	S20°20.9	254°12.3	N21°09.6	57°47.3	S12°02.7	205°49.9	N00°21.9
19	46°02.1	99°25.8	20.2	269°15.7	10.0	72°49.2	02.5	220°52.4	22.0
20	61°04.6	114°25.0	19.5	284°19.1	10.3	87°51.1	02.3	235°54.9	22.0
21	76°07.0	129°24.2	·· 18.9	299°22.6	·· 10.6	102°53.0	·· 02.1	250°57.4	·· 22.0
22	91°09.5	144°23.4	18.2	314°26.0	10.9	117°55.0	01.9	265°59.9	22.0
23	106°12.0	159°22.6	17.5	329°29.4	11.2	132°56.9	01.7	281°02.4	22.1
Mer.pass.:15:56		v-0.8 d0.7 m-3.8		v3.4 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°09.0
Ankaa	353°18.2	-42°15.2
Schedar	349°43.7	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.5	-57°11.4
Hamal	328°03.6	23°30.8
Polaris	318°53.7	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.8	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
Capella	280°37.7	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.4	28°37.0
Alnilam	275°48.6	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.2
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.5
Suhail	222°53.9	-43°28.4
Miaplacidus	221°39.5	-69°45.5
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°54.0	61°41.4
Denebola	182°36.0	14°30.7
Gienah	175°54.7	-17°36.0
Acrux	173°12.1	-63°09.1
Gacrux	172°03.6	-57°10.1
Alioth	166°22.5	55°53.9
Spica	158°33.8	-11°12.9
Alkaid	153°00.7	49°15.4
Hadar	148°51.6	-60°25.1
Menkent	148°10.6	-36°25.1
Arcturus	145°58.0	19°07.5
Rigil Kent.	139°55.3	-60°52.4
Kochab	137°19.9	74°06.4
Zuben'ubi	137°08.3	-16°05.1
Alphecca	126°13.2	26°40.6
Antares	112°29.6	-26°27.2
Atria	107°34.1	-69°02.6
Sabik	102°15.6	-15°44.3
Shaula	96°25.6	-37°06.6
Rasalhague	96°09.0	12°33.0
Eltanin	90°47.8	51°29.1
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.7	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.0
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.7

Jan 19 Tue	**SHA**	**Mer.pass**
Venus	57°03.9	12:19
Mars	222°11.1	01:18
Jupiter	27°23.0	14:15
Saturn	174°48.7	04:27

Jan 20 Wed	**SHA**	**Mer.pass**
Venus	55°44.8	12:21
Mars	222°33.1	01:12
Jupiter	27°10.2	14:12
Saturn	174°49.2	04:23

Jan 21 Thu	**SHA**	**Mer.pass**
Venus	54°25.9	12:22
Mars	222°55.5	01:07
Jupiter	26°57.3	14:09
Saturn	174°49.8	04:19

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.0989 sec ΔT = TT-UT1 = +66.0851 sec

2010 January 19 to Jan. 21 UT

h — Sun — Moon

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°21.7	S20°24.1	139°23.9	16.6'	S04°39.6	12.7'	54.1'
1	192°21.5	23.6	153°59.4	16.6'	04°26.9	12.7'	54.1'
2	207°21.3	23.0	168°35.0	16.6'	04°14.1	12.8'	54.1'
3	222°21.1	·· 22.5	183°10.6	16.6'	04°01.4	12.8'	54.2'
4	237°20.9	22.0	197°46.2	16.6'	03°48.6	12.8'	54.2'
5	252°20.7	21.5	212°21.9	16.6'	03°35.8	12.8'	54.2'
6	267°20.5	S20°20.9	226°57.5	16.6'	S03°22.9	12.8'	54.2'
7	282°20.3	20.4	241°33.1	16.6'	03°10.1	12.8'	54.2'
8	297°20.1	19.9	256°08.7	16.6'	02°57.3	12.9'	54.2'
9	312°20.0	·· 19.4	270°44.4	16.6'	02°44.4	12.9'	54.2'
10	327°19.8	18.8	285°20.0	16.6'	02°31.5	12.9'	54.2'
11	342°19.6	18.3	299°55.6	16.6'	02°18.6	12.9'	54.2'
12	357°19.4	S20°17.8	314°31.3	16.6'	S02°05.7	12.9'	54.3'
13	12°19.2	17.3	329°06.9	16.6'	01°52.8	12.9'	54.3'
14	27°19.0	16.7	343°42.5	16.6'	01°39.9	12.9'	54.3'
15	42°18.8	·· 16.2	358°18.1	16.6'	01°26.9	12.9'	54.3'
16	57°18.6	15.7	12°53.8	16.6'	01°14.0	13.0'	54.3'
17	72°18.4	15.1	27°29.4	16.6'	01°01.0	13.0'	54.3'
18	87°18.2	S20°14.6	42°05.0	16.6'	S00°48.1	13.0'	54.3'
19	102°18.1	14.1	56°40.6	16.6'	00°35.1	13.0'	54.3'
20	117°17.9	13.5	71°16.2	16.6'	00°22.1	13.0'	54.3'
21	132°17.7	·· 13.0	85°51.8	16.6'	S00°09.1	13.0'	54.4'
22	147°17.5	12.5	100°27.3	16.6'	N00°03.9	13.0'	54.4'
23	162°17.3	11.9	115°02.9	16.6'	00°16.9	13.0'	54.4'
	SD.=16.2	d=0.5	S.D.=14.8				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.1	S20°11.4	129°38.5	16.5'	N00°29.9	13.0'	54.4'
1	192°16.9	10.9	144°14.0	16.5'	00°42.9	13.0'	54.4'
2	207°16.7	10.3	158°49.5	16.5'	00°55.9	13.0'	54.4'
3	222°16.6	·· 09.8	173°25.0	16.5'	01°08.9	13.0'	54.4'
4	237°16.4	09.2	188°00.5	16.5'	01°21.9	13.0'	54.5'
5	252°16.2	08.7	202°36.0	16.5'	01°34.9	13.0'	54.5'
6	267°16.0	S20°08.2	217°11.5	16.4'	N01°47.9	13.0'	54.5'
7	282°15.8	07.6	231°46.9	16.4'	02°00.9	13.0'	54.5'
8	297°15.6	07.1	246°22.3	16.4'	02°14.0	13.0'	54.5'
9	312°15.4	·· 06.5	260°57.7	16.4'	02°27.0	13.0'	54.5'
10	327°15.3	06.0	275°33.1	16.4'	02°40.0	13.0'	54.6'
11	342°15.1	05.5	290°08.4	16.3'	02°53.0	13.0'	54.6'
12	357°14.9	S20°04.9	304°43.7	16.3'	N03°06.0	13.0'	54.6'
13	12°14.7	04.4	319°19.0	16.3'	03°19.0	13.0'	54.6'
14	27°14.5	03.8	333°54.3	16.3'	03°32.0	13.0'	54.6'
15	42°14.3	·· 03.3	348°29.6	16.2'	03°44.9	13.0'	54.6'
16	57°14.2	02.7	3°04.8	16.2'	03°57.9	13.0'	54.7'
17	72°14.0	02.2	17°40.0	16.2'	04°10.9	13.0'	54.7'
18	87°13.8	S20°01.6	32°15.1	16.1'	N04°23.9	13.0'	54.7'
19	102°13.6	01.1	46°50.2	16.1'	04°36.8	12.9'	54.7'
20	117°13.4	00.5	61°25.3	16.1'	04°49.7	12.9'	54.7'
21	132°13.3	20°00.0	76°00.4	16.0'	05°02.7	12.9'	54.8'
22	147°13.1	19°59.4	90°35.4	16.0'	05°15.6	12.9'	54.8'
23	162°12.9	58.9	105°10.4	16.0'	05°28.5	12.9'	54.8'
	SD.=16.2	d=0.5	S.D.=14.9				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°12.7	S19°58.3	119°45.3	15.9'	N05°41.4	12.9'	54.8'
1	192°12.5	57.8	134°20.2	15.9'	05°54.3	12.9'	54.8'
2	207°12.4	57.2	148°55.1	15.8'	06°07.2	12.9'	54.8'
3	222°12.2	·· 56.7	163°29.9	15.8'	06°20.0	12.8'	54.9'
4	237°12.0	56.1	178°04.7	15.8'	06°32.9	12.8'	54.9'
5	252°11.8	55.6	192°39.5	15.7'	06°45.7	12.8'	54.9'
6	267°11.7	S19°55.0	207°14.2	15.7'	N06°58.5	12.8'	54.9'
7	282°11.5	54.5	221°48.8	15.6'	07°11.3	12.8'	55.0'
8	297°11.3	53.9	236°23.4	15.6'	07°24.0	12.8'	55.0'
9	312°11.1	·· 53.3	250°58.0	15.5'	07°36.8	12.7'	55.0'
10	327°11.0	52.8	265°32.5	15.5'	07°49.5	12.7'	55.0'
11	342°10.8	52.2	280°06.9	15.4'	08°02.2	12.7'	55.0'
12	357°10.6	S19°51.7	294°41.4	15.4'	N08°14.9	12.7'	55.1'
13	12°10.4	51.1	309°15.7	15.3'	08°27.6	12.7'	55.1'
14	27°10.3	50.5	323°50.0	15.3'	08°40.2	12.6'	55.1'
15	42°10.1	·· 50.0	338°24.3	15.2'	08°52.8	12.6'	55.1'
16	57°09.9	49.4	352°58.5	15.2'	09°05.4	12.6'	55.2'
17	72°09.7	48.9	7°32.6	15.1'	09°18.0	12.5'	55.2'
18	87°09.6	S19°48.3	22°06.7	15.1'	N09°30.5	12.5'	55.2'
19	102°09.4	47.7	36°40.7	15.0'	09°43.0	12.5'	55.2'
20	117°09.2	47.2	51°14.7	14.9'	09°55.5	12.5'	55.3'
21	132°09.0	·· 46.6	65°48.6	14.9'	10°07.9	12.4'	55.3'
22	147°08.9	46.0	80°22.4	14.8'	10°20.4	12.4'	55.3'
23	162°08.7	45.5	94°56.2	14.8'	10°32.7	12.4'	55.3'
	SD.=16.2	d=0.6	S.D.=15.0				

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

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

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 4-6 15-31%
19	10:33	10:42	12:11	15:07	02:47	
20	10:52	11:00	12:11	15:47	03:27	
21	11:09	11:18	12:11	16:29	04:08	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	121°14.4	174°21.8	S20°16.8	344°32.8	N21°11.6	147°58.8	S12°01.5	296°04.9	N00°22.1
1	136°16.9	189°21.0	16.1	359°36.3	11.9	163°00.7	01.3	311°07.4	22.1
2	151°19.4	204°20.2	15.4	14°39.7	12.2	178°02.6	01.1	326°09.9	22.1
3	166°21.8	219°19.3	·· 14.7	29°43.1	·· 12.5	193°04.6	·· 00.9	341°12.4	·· 22.2
4	181°24.3	234°18.5	14.0	44°46.5	12.9	208°06.5	00.7	356°14.9	22.2
5	196°26.8	249°17.7	13.3	59°50.0	13.2	223°08.4	00.5	11°17.4	22.2
6	211°29.2	264°16.9	S20°12.6	74°53.4	N21°13.5	238°10.3	S12°00.3	26°19.9	N00°22.2
7	226°31.7	279°16.1	11.9	89°56.8	13.8	253°12.3	12°00.1	41°22.4	22.3
8	241°34.1	294°15.3	11.3	105°00.3	14.1	268°14.2	11°59.9	56°24.9	22.3
9	256°36.6	309°14.5	·· 10.6	120°03.7	·· 14.5	283°16.1	·· 59.7	71°27.4	·· 22.3
10	271°39.1	324°13.7	09.9	135°07.1	14.8	298°18.0	59.5	86°29.9	22.3
11	286°41.5	339°12.9	09.2	150°10.6	15.1	313°20.0	59.3	101°32.4	22.4
12	301°44.0	354°12.1	S20°08.5	165°14.0	N21°15.4	328°21.9	S11°59.1	116°34.8	N00°22.4
13	316°46.5	9°11.3	07.8	180°17.4	15.7	343°23.8	58.9	131°37.3	22.4
14	331°48.9	24°10.5	07.1	195°20.9	16.1	358°25.7	58.7	146°39.8	22.5
15	346°51.4	39°09.8	·· 06.4	210°24.3	·· 16.4	13°27.7	·· 58.5	161°42.3	·· 22.5
16	1°53.9	54°09.0	05.6	225°27.7	16.7	28°29.6	58.3	176°44.8	22.5
17	16°56.3	69°08.2	04.9	240°31.2	17.0	43°31.5	58.1	191°47.3	22.5
18	31°58.8	84°07.4	S20°04.2	255°34.6	N21°17.3	58°33.4	S11°57.9	206°49.8	N00°22.6
19	47°01.3	99°06.6	03.5	270°38.0	17.6	73°35.3	57.7	221°52.3	22.6
20	62°03.7	114°05.8	02.8	285°41.5	18.0	88°37.3	57.5	236°54.8	22.6
21	77°06.2	129°05.0	·· 02.1	300°44.9	·· 18.3	103°39.2	·· 57.3	251°57.3	·· 22.6
22	92°08.6	144°04.2	01.4	315°48.4	18.6	118°41.1	57.1	266°59.8	22.7
23	107°11.1	159°03.4	00.7	330°51.8	18.9	133°43.0	56.9	282°02.3	22.7
Mer.pass.:15:52		v-0.8 d0.7 m-3.8		v3.4 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	122°13.6	174°02.6	S20°00.0	345°55.2	N21°19.2	148°45.0	S11°56.7	297°04.8	N00°22.7
1	137°16.0	189°01.8	19°59.3	0°58.7	19.6	163°46.9	56.5	312°07.3	22.8
2	152°18.5	204°01.0	58.5	16°02.1	19.9	178°48.8	56.3	327°09.8	22.8
3	167°21.0	219°00.2	·· 57.8	31°05.6	·· 20.2	193°50.7	·· 56.1	342°12.3	·· 22.8
4	182°23.4	233°59.4	57.1	46°09.0	20.5	208°52.7	55.9	357°14.8	22.8
5	197°25.9	248°58.7	56.4	61°12.5	20.8	223°54.6	55.7	12°17.3	22.9
6	212°28.4	263°57.9	S19°55.7	76°15.9	N21°21.1	238°56.5	S11°55.5	27°19.8	N00°22.9
7	227°30.8	278°57.1	55.0	91°19.3	21.5	253°58.4	55.3	42°22.3	22.9
8	242°33.3	293°56.3	54.2	106°22.8	21.8	269°00.3	55.1	57°24.8	22.9
9	257°35.7	308°55.5	·· 53.5	121°26.2	·· 22.1	284°02.3	·· 54.8	72°27.3	·· 23.0
10	272°38.2	323°54.7	52.8	136°29.7	22.4	299°04.2	54.6	87°29.8	23.0
11	287°40.7	338°53.9	52.1	151°33.1	22.7	314°06.1	54.4	102°32.3	23.0
12	302°43.1	353°53.1	S19°51.3	166°36.6	N21°23.1	329°08.0	S11°54.2	117°34.8	N00°23.1
13	317°45.6	8°52.4	50.6	181°40.0	23.4	344°09.9	54.0	132°37.3	23.1
14	332°48.1	23°51.6	49.9	196°43.5	23.7	359°11.9	53.8	147°39.8	23.1
15	347°50.5	38°50.8	·· 49.2	211°46.9	·· 24.0	14°13.8	·· 53.6	162°42.3	·· 23.1
16	2°53.0	53°50.0	48.4	226°50.4	24.3	29°15.7	53.4	177°44.8	23.2
17	17°55.5	68°49.2	47.7	241°53.8	24.6	44°17.6	53.2	192°47.3	23.2
18	32°57.9	83°48.4	S19°47.0	256°57.3	N21°25.0	59°19.6	S11°53.0	207°49.8	N00°23.2
19	48°00.4	98°47.7	46.2	272°00.7	25.3	74°21.5	52.8	222°52.3	23.3
20	63°02.9	113°46.9	45.5	287°04.2	25.6	89°23.4	52.6	237°54.8	23.3
21	78°05.3	128°46.1	·· 44.8	302°07.6	·· 25.9	104°25.3	·· 52.4	252°57.3	·· 23.3
22	93°07.8	143°45.3	44.0	317°11.1	26.2	119°27.2	52.2	267°59.8	23.3
23	108°10.2	158°44.5	43.3	332°14.5	26.5	134°29.2	52.0	283°02.3	23.4
Mer.pass.:15:48		v-0.8 d0.7 m-3.8		v3.4 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	123°12.7	173°43.7	S19°42.6	347°18.0	N21°26.8	149°31.1	S11°51.8	298°04.8	N00°23.4
1	138°15.2	188°43.0	41.8	2°21.5	27.2	164°33.0	51.6	313°07.3	23.4
2	153°17.6	203°42.2	41.1	17°24.9	27.5	179°34.9	51.4	328°09.8	23.5
3	168°20.1	218°41.4	·· 40.4	32°28.4	·· 27.8	194°36.8	·· 51.2	343°12.3	·· 23.5
4	183°22.6	233°40.6	39.6	47°31.8	28.1	209°38.8	51.0	358°14.8	23.5
5	198°25.0	248°39.9	38.9	62°35.3	28.4	224°40.7	50.8	13°17.3	23.5
6	213°27.5	263°39.1	S19°38.1	77°38.7	N21°28.7	239°42.6	S11°50.6	28°19.8	N00°23.6
7	228°30.0	278°38.3	37.4	92°42.2	29.0	254°44.5	50.4	43°22.3	23.6
8	243°32.4	293°37.5	36.6	107°45.7	29.4	269°46.4	50.2	58°24.8	23.6
9	258°34.9	308°36.8	·· 35.9	122°49.1	·· 29.7	284°48.4	·· 50.0	73°27.4	·· 23.7
10	273°37.4	323°36.0	35.2	137°52.6	30.0	299°50.3	49.8	88°29.9	23.7
11	288°39.8	338°35.2	34.4	152°56.0	30.3	314°52.2	49.6	103°32.4	23.7
12	303°42.3	353°34.4	S19°33.7	167°59.5	N21°30.6	329°54.1	S11°49.4	118°34.9	N00°23.8
13	318°44.7	8°33.7	32.9	183°03.0	30.9	344°56.0	49.2	133°37.4	23.8
14	333°47.2	23°32.9	32.2	198°06.4	31.2	359°58.0	48.9	148°39.9	23.8
15	348°49.7	38°32.1	·· 31.4	213°09.9	·· 31.6	14°59.9	·· 48.7	163°42.4	·· 23.8
16	3°52.1	53°31.3	30.7	228°13.3	31.9	30°01.8	48.5	178°44.9	23.9
17	18°54.6	68°30.6	29.9	243°16.8	32.2	45°03.7	48.3	193°47.4	23.9
18	33°57.1	83°29.8	S19°29.1	258°20.3	N21°32.5	60°05.6	S11°48.1	208°49.9	N00°23.9
19	48°59.5	98°29.0	28.4	273°23.7	32.8	75°07.6	47.9	223°52.4	24.0
20	64°02.0	113°28.3	27.6	288°27.2	33.1	90°09.5	47.7	238°54.9	24.0
21	79°04.5	128°27.5	·· 26.9	303°30.7	·· 33.4	105°11.4	·· 47.5	253°57.4	·· 24.0
22	94°06.9	143°26.7	26.1	318°34.1	33.7	120°13.3	47.3	268°59.9	24.1
23	109°09.4	158°26.0	25.4	333°37.6	34.1	135°15.2	47.1	284°02.4	24.1
Mer.pass.:15:45		v-0.8 d0.7 m-3.8		v3.5 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.2	-42°15.2
Schedar	349°43.7	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.5	-57°11.4
Hamal	328°03.6	23°30.8
Polaris	318°55.0	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.8	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.2
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.6
Suhail	222°53.9	-43°28.4
Miaplacidus	221°39.5	-69°45.5
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°54.0	61°41.5
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.0
Acrux	173°12.0	-63°09.2
Gacrux	172°03.6	-57°10.1
Alioth	166°22.5	55°53.9
Spica	158°33.8	-11°12.9
Alkaid	153°00.7	49°15.4
Hadar	148°51.6	-60°25.1
Menkent	148°10.6	-36°25.1
Arcturus	145°58.0	19°07.5
Rigil Kent.	139°55.3	-60°52.4
Kochab	137°19.8	74°06.4
Zuben'ubi	137°08.3	-16°05.1
Alphecca	126°13.2	26°40.6
Antares	112°29.5	-26°27.3
Atria	107°34.1	-69°02.6
Sabik	102°15.6	-15°44.3
Shaula	96°25.6	-37°06.6
Rasalhague	96°09.0	12°33.0
Eltanin	90°47.7	51°29.0
Kaus Aust.	83°47.4	-34°22.8
Vega	80°41.0	38°47.4
Nunki	76°01.7	-26°17.1
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.0
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.7

Jan 22 Fri	**SHA**	**Mer.pass**
Venus	53°07.3	12:23
Mars	223°18.4	01:02
Jupiter	26°44.4	14:06
Saturn	174°50.5	04:15

Jan 23 Sat	**SHA**	**Mer.pass**
Venus	51°49.0	12:24
Mars	223°41.7	00:56
Jupiter	26°31.4	14:03
Saturn	174°51.2	04:11

Jan 24 Sun	**SHA**	**Mer.pass**
Venus	50°31.0	12:26
Mars	224°05.3	00:51
Jupiter	26°18.4	14:00
Saturn	174°52.1	04:07

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.0964 sec ΔT = TT-UT1 = +66.0876 sec

2010 January 22 to Jan. 24 UT

h — Sun — Moon

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°08.5	S19°44.9	109°30.0	14.7'	N10°45.1	12.3'	55.4'
1	192°08.4	44.3	124°03.6	14.6'	10°57.4	12.3'	55.4'
2	207°08.2	43.8	138°37.2	14.6'	11°09.7	12.3'	55.4'
3	222°08.0	·· 43.2	153°10.7	14.5'	11°22.0	12.2'	55.4'
4	237°07.9	42.6	167°44.2	14.4'	11°34.2	12.2'	55.5'
5	252°07.7	42.1	182°17.6	14.3'	11°46.4	12.2'	55.5'
6	267°07.5	S19°41.5	196°50.9	14.3'	N11°58.5	12.1'	55.5'
7	282°07.3	40.9	211°24.1	14.2'	12°10.6	12.1'	55.5'
8	297°07.2	40.3	225°57.3	14.1'	12°22.7	12.0'	55.6'
9	312°07.0	·· 39.8	240°30.4	14.1'	12°34.7	12.0'	55.6'
10	327°06.8	39.2	255°03.4	14.0'	12°46.7	12.0'	55.6'
11	342°06.7	38.6	269°36.3	13.9'	12°58.6	11.9'	55.7'
12	357°06.5	S19°38.0	284°09.2	13.8'	N13°10.5	11.9'	55.7'
13	12°06.3	37.5	298°42.0	13.8'	13°22.3	11.8'	55.7'
14	27°06.2	36.9	313°14.7	13.7'	13°34.1	11.8'	55.7'
15	42°06.0	·· 36.3	327°47.3	13.6'	13°45.9	11.7'	55.8'
16	57°05.8	35.7	342°19.9	13.5'	13°57.6	11.7'	55.8'
17	72°05.7	35.2	356°52.4	13.4'	14°09.3	11.6'	55.8'
18	87°05.5	S19°34.6	11°24.8	13.3'	N14°20.9	11.6'	55.9'
19	102°05.3	34.0	25°57.1	13.3'	14°32.4	11.5'	55.9'
20	117°05.2	33.4	40°29.3	13.2'	14°44.0	11.5'	55.9'
21	132°05.0	·· 32.8	55°01.4	13.1'	14°55.4	11.4'	56.0'
22	147°04.9	32.3	69°33.5	13.0'	15°06.8	11.4'	56.0'
23	162°04.7	31.7	84°05.4	12.9'	15°18.1	11.3'	56.0'
	SD.=16.2	d=0.6	S.D.=15.2				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°04.5	S19°31.1	98°37.3	12.8'	N15°29.4	11.3'	56.1'
1	192°04.4	30.5	113°09.1	12.7'	15°40.7	11.2'	56.1'
2	207°04.2	29.9	127°40.7	12.6'	15°51.8	11.1'	56.1'
3	222°04.0	·· 29.4	142°12.3	12.5'	16°02.9	11.1'	56.2'
4	237°03.9	28.8	156°43.8	12.5'	16°14.0	11.0'	56.2'
5	252°03.7	28.2	171°15.2	12.4'	16°25.0	11.0'	56.2'
6	267°03.6	S19°27.6	185°46.6	12.3'	N16°35.9	10.9'	56.2'
7	282°03.4	27.0	200°17.8	12.2'	16°46.8	10.8'	56.3'
8	297°03.2	26.4	214°48.9	12.1'	16°57.6	10.8'	56.3'
9	312°03.1	·· 25.8	229°19.9	12.0'	17°08.3	10.7'	56.4'
10	327°02.9	25.2	243°50.9	11.9'	17°18.9	10.6'	56.4'
11	342°02.8	24.7	258°21.7	11.8'	17°29.5	10.6'	56.4'
12	357°02.6	S19°24.1	272°52.4	11.7'	N17°40.0	10.5'	56.5'
13	12°02.4	23.5	287°23.0	11.6'	17°50.5	10.4'	56.5'
14	27°02.3	22.9	301°53.6	11.5'	18°00.9	10.3'	56.5'
15	42°02.1	·· 22.3	316°24.0	11.4'	18°11.2	10.3'	56.6'
16	57°02.0	21.7	330°54.3	11.3'	18°21.4	10.2'	56.6'
17	72°01.8	21.1	345°24.5	11.2'	18°31.5	10.1'	56.6'
18	87°01.7	S19°20.5	359°54.6	11.1'	N18°41.6	10.0'	56.7'
19	102°01.5	19.9	14°24.6	11.0'	18°51.6	9.9'	56.7'
20	117°01.4	19.3	28°54.5	10.8'	19°01.5	9.9'	56.7'
21	132°01.2	·· 18.7	43°24.3	10.7'	19°11.3	9.8'	56.8'
22	147°01.0	18.1	57°54.0	10.6'	19°21.0	9.7'	56.8'
23	162°00.9	17.5	72°23.6	10.5'	19°30.7	9.6'	56.8'
	SD.=16.2	d=0.6	S.D.=15.4				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°00.7	S19°16.9	86°53.1	10.4'	N19°40.3	9.5'	56.9'
1	192°00.6	16.4	101°22.4	10.3'	19°49.7	9.4'	56.9'
2	207°00.4	15.8	115°51.7	10.2'	19°59.1	9.3'	57.0'
3	222°00.3	·· 15.2	130°20.8	10.1'	20°08.4	9.2'	57.0'
4	237°00.1	14.6	144°49.9	10.0'	20°17.6	9.2'	57.0'
5	252°00.0	14.0	159°18.8	9.9'	20°26.7	9.1'	57.1'
6	266°59.8	S19°13.4	173°47.6	9.8'	N20°35.7	9.0'	57.1'
7	281°59.7	12.8	188°16.3	9.6'	20°44.7	8.9'	57.1'
8	296°59.5	12.2	202°44.9	9.5'	20°53.5	8.8'	57.2'
9	311°59.4	·· 11.5	217°13.4	9.4'	21°02.2	8.7'	57.2'
10	326°59.2	10.9	231°41.7	9.3'	21°10.8	8.6'	57.3'
11	341°59.1	10.3	246°10.0	9.2'	21°19.3	8.5'	57.3'
12	356°58.9	S19°09.7	260°38.1	9.1'	N21°27.7	8.4'	57.3'
13	11°58.8	09.1	275°06.2	9.0'	21°36.0	8.3'	57.4'
14	26°58.6	08.5	289°34.1	8.9'	21°44.2	8.1'	57.4'
15	41°58.5	·· 07.9	304°01.9	8.7'	21°52.3	8.0'	57.5'
16	56°58.3	07.3	318°29.6	8.6'	22°00.3	7.9'	57.5'
17	71°58.2	06.7	332°57.1	8.5'	22°08.2	7.8'	57.5'
18	86°58.0	S19°06.1	347°24.6	8.4'	N22°15.9	7.7'	57.6'
19	101°57.9	05.5	1°51.9	8.3'	22°23.6	7.6'	57.6'
20	116°57.7	04.9	16°19.1	8.2'	22°31.1	7.5'	57.6'
21	131°57.6	·· 04.3	30°46.3	8.1'	22°38.5	7.3'	57.7'
22	146°57.4	03.7	45°13.3	7.9'	22°45.8	7.2'	57.7'
23	161°57.3	03.0	59°40.2	7.8'	22°53.0	7.1'	57.8'
	SD.=16.2	d=0.6	S.D.=15.6				

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

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

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 7-9 41-61%
22	11:26	11:34	12:12	17:13	04:51	
23	11:42	11:50	12:12	18:00	05:36	
24	11:57	12:04	12:12	18:52	06:26	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	124°11.8	173°25.2	**S**19°24.6	348°41.1	**N**21°34.4	150°17.2	**S**11°46.9	299°04.9	**N**00°24.1
1	139°14.3	188°24.4	23.8	3°44.5	34.7	165°19.1	46.7	314°07.4	24.1
2	154°16.8	203°23.7	23.1	18°48.0	35.0	180°21.0	46.5	329°09.9	24.2
3	169°19.2	218°22.9	·· 22.3	33°51.5	·· 35.3	195°22.9	·· 46.3	344°12.5	·· 24.2
4	184°21.7	233°22.1	21.6	48°54.9	35.6	210°24.8	46.1	359°15.0	24.2
5	199°24.2	248°21.4	20.8	63°58.4	35.9	225°26.8	45.9	14°17.5	24.3
6	214°26.6	263°20.6	**S**19°20.0	79°01.9	**N**21°36.2	240°28.7	**S**11°45.7	29°20.0	**N**00°24.3
7	229°29.1	278°19.8	19.3	94°05.3	36.5	255°30.6	45.5	44°22.5	24.3
8	244°31.6	293°19.1	18.5	109°08.8	36.9	270°32.5	45.3	59°25.0	24.4
9	259°34.0	308°18.3	·· 17.7	124°12.3	·· 37.2	285°34.4	·· 45.1	74°27.5	·· 24.4
10	274°36.5	323°17.6	16.9	139°15.8	37.5	300°36.4	44.9	89°30.0	24.4
11	289°39.0	338°16.8	16.2	154°19.2	37.8	315°38.3	44.7	104°32.5	24.5
12	304°41.4	353°16.0	**S**19°15.4	169°22.7	**N**21°38.1	330°40.2	**S**11°44.4	119°35.0	**N**00°24.5
13	319°43.9	8°15.3	14.6	184°26.2	38.4	345°42.1	44.2	134°37.5	24.5
14	334°46.3	23°14.5	13.9	199°29.6	38.7	0°44.0	44.0	149°40.0	24.6
15	349°48.8	38°13.8	·· 13.1	214°33.1	·· 39.0	15°45.9	·· 43.8	164°42.5	·· 24.6
16	4°51.3	53°13.0	12.3	229°36.6	39.3	30°47.9	43.6	179°45.1	24.6
17	19°53.7	68°12.2	11.5	244°40.1	39.6	45°49.8	43.4	194°47.6	24.6
18	34°56.2	83°11.5	**S**19°10.8	259°43.5	**N**21°40.0	60°51.7	**S**11°43.2	209°50.1	**N**00°24.7
19	49°58.7	98°10.7	10.0	274°47.0	40.3	75°53.6	43.0	224°52.6	24.7
20	65°01.1	113°10.0	09.2	289°50.5	40.6	90°55.5	42.8	239°55.1	24.7
21	80°03.6	128°09.2	·· 08.4	304°54.0	·· 40.9	105°57.5	·· 42.6	254°57.6	·· 24.8
22	95°06.1	143°08.5	07.6	319°57.4	41.2	120°59.4	42.4	270°00.1	24.8
23	110°08.5	158°07.7	06.8	335°00.9	41.5	136°01.3	42.2	285°02.6	24.8
Mer.pass.:15:41		v-0.8 d0.8 m-3.8		v3.5 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	125°11.0	173°07.0	**S**19°06.1	350°04.4	**N**21°41.8	151°03.2	**S**11°42.0	300°05.1	**N**00°24.9
1	140°13.5	188°06.2	05.3	5°07.9	42.1	166°05.1	41.8	315°07.6	24.9
2	155°15.9	203°05.5	04.5	20°11.3	42.4	181°07.0	41.6	330°10.2	24.9
3	170°18.4	218°04.7	·· 03.7	35°14.8	·· 42.7	196°09.0	·· 41.4	345°12.7	·· 25.0
4	185°20.8	233°03.9	02.9	50°18.3	43.0	211°10.9	41.2	0°15.2	25.0
5	200°23.3	248°03.2	02.1	65°21.8	43.3	226°12.8	41.0	15°17.7	25.0
6	215°25.8	263°02.4	**S**19°01.3	80°25.2	**N**21°43.6	241°14.7	**S**11°40.8	30°20.2	**N**00°25.1
7	230°28.2	278°01.7	19°00.6	95°28.7	43.9	256°16.6	40.5	45°22.7	25.1
8	245°30.7	293°00.9	18°59.8	110°32.2	44.3	271°18.5	40.3	60°25.2	25.1
9	260°33.2	308°00.2	·· 59.0	125°35.7	·· 44.6	286°20.5	·· 40.1	75°27.7	·· 25.2
10	275°35.6	322°59.4	58.2	140°39.2	44.9	301°22.4	39.9	90°30.2	25.2
11	290°38.1	337°58.7	57.4	155°42.6	45.2	316°24.3	39.7	105°32.8	25.2
12	305°40.6	352°58.0	**S**18°56.6	170°46.1	**N**21°45.5	331°26.2	**S**11°39.5	120°35.3	**N**00°25.3
13	320°43.0	7°57.2	55.8	185°49.6	45.8	346°28.1	39.3	135°37.8	25.3
14	335°45.5	22°56.5	55.0	200°53.1	46.1	1°30.0	39.1	150°40.3	25.3
15	350°48.0	37°55.7	·· 54.2	215°56.6	·· 46.4	16°32.0	·· 38.9	165°42.8	·· 25.4
16	5°50.4	52°55.0	53.4	231°00.1	46.7	31°33.9	38.7	180°45.3	25.4
17	20°52.9	67°54.2	52.6	246°03.5	47.0	46°35.8	38.5	195°47.8	25.4
18	35°55.3	82°53.5	**S**18°51.8	261°07.0	**N**21°47.3	61°37.7	**S**11°38.3	210°50.3	**N**00°25.5
19	50°57.8	97°52.7	51.0	276°10.5	47.6	76°39.6	38.1	225°52.9	25.5
20	66°00.3	112°52.0	50.2	291°14.0	47.9	91°41.6	37.9	240°55.4	25.5
21	81°02.7	127°51.3	·· 49.4	306°17.5	·· 48.2	106°43.5	·· 37.7	255°57.9	·· 25.6
22	96°05.2	142°50.5	48.6	321°20.9	48.5	121°45.4	37.5	271°00.4	25.6
23	111°07.7	157°49.8	47.8	336°24.4	48.8	136°47.3	37.2	286°02.9	25.6
Mer.pass.:15:37		v-0.8 d0.8 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	126°10.1	172°49.0	**S**18°47.0	351°27.9	**N**21°49.1	151°49.2	**S**11°37.0	301°05.4	**N**00°25.7
1	141°12.6	187°48.3	46.2	6°31.4	49.4	166°51.1	36.8	316°07.9	25.7
2	156°15.1	202°47.5	45.4	21°34.9	49.7	181°53.0	36.6	331°10.5	25.7
3	171°17.5	217°46.8	·· 44.6	36°38.4	·· 50.0	196°55.0	·· 36.4	346°13.0	·· 25.8
4	186°20.0	232°46.1	43.7	51°41.9	50.3	211°56.9	36.2	1°15.5	25.8
5	201°22.5	247°45.3	42.9	66°45.3	50.6	226°58.8	36.0	16°18.0	25.8
6	216°24.9	262°44.6	**S**18°42.1	81°48.8	**N**21°50.9	242°00.7	**S**11°35.8	31°20.5	**N**00°25.9
7	231°27.4	277°43.9	41.3	96°52.3	51.2	257°02.6	35.6	46°23.0	25.9
8	246°29.8	292°43.1	40.5	111°55.8	51.5	272°04.5	35.4	61°25.6	25.9
9	261°32.3	307°42.4	·· 39.7	126°59.3	·· 51.8	287°06.5	·· 35.2	76°28.1	·· 26.0
10	276°34.8	322°41.6	38.9	142°02.8	52.1	302°08.4	35.0	91°30.6	26.0
11	291°37.2	337°40.9	38.1	157°06.3	52.4	317°10.3	34.8	106°33.1	26.0
12	306°39.7	352°40.2	**S**18°37.2	172°09.7	**N**21°52.7	332°12.2	**S**11°34.6	121°35.6	**N**00°26.1
13	321°42.2	7°39.4	36.4	187°13.2	53.0	347°14.1	34.4	136°38.1	26.1
14	336°44.6	22°38.7	35.6	202°16.7	53.3	2°16.0	34.1	151°40.6	26.2
15	351°47.1	37°38.0	·· 34.8	217°20.2	·· 53.6	17°18.0	·· 33.9	166°43.2	·· 26.2
16	6°49.6	52°37.2	34.0	232°23.7	53.9	32°19.9	33.7	181°45.7	26.2
17	21°52.0	67°36.5	33.1	247°27.2	54.2	47°21.8	33.5	196°48.2	26.3
18	36°54.5	82°35.8	**S**18°32.3	262°30.7	**N**21°54.5	62°23.7	**S**11°33.3	211°50.7	**N**00°26.3
19	51°57.0	97°35.1	31.5	277°34.2	54.8	77°25.6	33.1	226°53.2	26.3
20	66°59.4	112°34.3	30.7	292°37.7	55.1	92°27.5	32.9	241°55.8	26.4
21	82°01.9	127°33.6	·· 29.8	307°41.1	·· 55.4	107°29.4	·· 32.7	256°58.3	·· 26.4
22	97°04.3	142°32.9	29.0	322°44.6	55.7	122°31.4	32.5	272°00.8	26.4
23	112°06.8	157°32.1	28.2	337°48.1	56.0	137°33.3	32.3	287°03.3	26.5
Mer.pass.:15:33		v-0.7 d0.8 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.2	-42°15.2
Schedar	349°43.8	56°35.9
Diphda	348°58.4	-17°55.9
Achernar	335°28.5	-57°11.4
Hamal	328°03.6	23°30.8
Polaris	318°56.1	89°18.9
Acamar	315°20.0	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.8	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.2
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.6
Suhail	222°53.9	-43°28.5
Miaplacidus	221°39.5	-69°45.5
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.5
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.0
Acrux	173°12.0	-63°09.2
Gacrux	172°03.6	-57°10.1
Alioth	166°22.5	55°53.9
Spica	158°33.8	-11°13.0
Alkaid	153°00.6	49°15.4
Hadar	148°51.5	-60°25.1
Menkent	148°10.5	-36°25.1
Arcturus	145°57.9	19°07.5
Rigil Kent.	139°55.3	-60°52.4
Kochab	137°19.8	74°06.4
Zuben'ubi	137°08.2	-16°05.1
Alphecca	126°13.2	26°40.6
Antares	112°29.5	-26°27.3
Atria	107°34.0	-69°02.6
Sabik	102°15.6	-15°44.3
Shaula	96°25.6	-37°06.6
Rasalhague	96°09.0	12°33.0
Eltanin	90°47.7	51°29.0
Kaus Aust.	83°47.4	-34°22.8
Vega	80°41.0	38°47.4
Nunki	76°01.7	-26°17.0
Altair	62°11.0	8°53.7
Peacock	53°23.6	-56°42.1
Deneb	49°33.7	45°19.0
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.7

Jan 25 Mon	**SHA**	**Mer.pass**
Venus	49°13.4	12:27
Mars	224°29.2	00:45
Jupiter	26°05.3	13:57
Saturn	174°53.1	04:03

Jan 26 Tue	**SHA**	**Mer.pass**
Venus	47°56.0	12:28
Mars	224°53.4	00:40
Jupiter	25°52.2	13:54
Saturn	174°54.1	03:59

Jan 27 Wed	**SHA**	**Mer.pass**
Venus	46°38.9	12:29
Mars	225°17.8	00:34
Jupiter	25°39.1	13:51
Saturn	174°55.3	03:55

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°57.1	**S**19°02.4	74°06.9	7.7′	**N**23°00.0	7.0′	57.8′
1	191°57.0	01.8	88°33.6	7.6′	23°07.0	6.9′	57.8′
2	206°56.8	01.2	103°00.1	7.5′	23°13.7	6.7′	57.9′
3	221°56.7	· · 00.6	117°26.6	7.4′	23°20.4	6.6′	57.9′
4	236°56.6	19°00.0	131°52.9	7.3′	23°27.0	6.5′	58.0′
5	251°56.4	18°59.4	146°19.1	7.2′	23°33.4	6.3′	58.0′
6	266°56.3	**S**18°58.8	160°45.2	7.0′	**N**23°39.7	6.2′	58.0′
7	281°56.1	58.1	175°11.2	6.9′	23°45.8	6.1′	58.1′
8	296°56.0	57.5	189°37.1	6.8′	23°51.8	5.9′	58.1′
9	311°55.8	· · 56.9	204°02.9	6.7′	23°57.7	5.8′	58.2′
10	326°55.7	56.3	218°28.5	6.6′	24°03.4	5.7′	58.2′
11	341°55.6	55.7	232°54.1	6.5′	24°09.0	5.5′	58.3′
12	356°55.4	**S**18°55.1	247°19.5	6.4′	**N**24°14.5	5.4′	58.3′
13	11°55.3	54.4	261°44.9	6.3′	24°19.8	5.3′	58.3′
14	26°55.1	53.8	276°10.1	6.2′	24°25.0	5.1′	58.4′
15	41°55.0	· · 53.2	290°35.2	6.1′	24°30.0	5.0′	58.4′
16	56°54.8	52.6	305°00.3	6.0′	24°34.9	4.8′	58.5′
17	71°54.7	51.9	319°25.2	5.9′	24°39.7	4.7′	58.5′
18	86°54.6	**S**18°51.3	333°50.0	5.8′	**N**24°44.3	4.5′	58.5′
19	101°54.4	50.7	348°14.7	5.7′	24°48.7	4.4′	58.6′
20	116°54.3	50.1	2°39.4	5.6′	24°53.0	4.2′	58.6′
21	131°54.2	· · 49.5	17°03.9	5.5′	24°57.1	4.1′	58.7′
22	146°54.0	48.8	31°28.3	5.4′	25°01.1	3.9′	58.7′
23	161°53.9	48.2	45°52.7	5.3′	25°04.9	3.7′	58.7′
	SD.=16.2	d=0.6	S.D.=15.9				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°53.7	**S**18°47.6	60°16.9	5.2′	**N**25°08.6	3.6′	58.8′
1	191°53.6	47.0	74°41.0	5.1′	25°12.1	3.4′	58.8′
2	206°53.5	46.3	89°05.1	5.0′	25°15.5	3.3′	58.9′
3	221°53.3	· · 45.7	103°29.1	4.9′	25°18.6	3.1′	58.9′
4	236°53.2	45.1	117°52.9	4.8′	25°21.7	2.9′	58.9′
5	251°53.1	44.4	132°16.7	4.7′	25°24.5	2.8′	59.0′
6	266°52.9	**S**18°43.8	146°40.4	4.7′	**N**25°27.2	2.6′	59.0′
7	281°52.8	43.2	161°04.0	4.6′	25°29.8	2.4′	59.1′
8	296°52.7	42.6	175°27.6	4.5′	25°32.1	2.3′	59.1′
9	311°52.5	· · 41.9	189°51.0	4.4′	25°34.3	2.1′	59.1′
10	326°52.4	41.3	204°14.4	4.3′	25°36.3	1.9′	59.2′
11	341°52.2	40.7	218°37.7	4.3′	25°38.2	1.8′	59.2′
12	356°52.1	**S**18°40.0	233°01.0	4.2′	**N**25°39.9	1.6′	59.3′
13	11°52.0	39.4	247°24.1	4.1′	25°41.4	1.4′	59.3′
14	26°51.9	38.8	261°47.2	4.0′	25°42.7	1.2′	59.3′
15	41°51.7	· · 38.1	276°10.2	4.0′	25°43.9	1.1′	59.4′
16	56°51.6	37.5	290°33.2	3.9′	25°44.9	0.9′	59.4′
17	71°51.5	36.8	304°56.0	3.9′	25°45.7	0.7′	59.5′
18	86°51.3	**S**18°36.2	319°18.9	3.8′	**N**25°46.3	0.5′	59.5′
19	101°51.2	35.6	333°41.6	3.7′	25°46.8	0.4′	59.5′
20	116°51.1	34.9	348°04.3	3.7′	25°47.0	0.2′	59.6′
21	131°50.9	· · 34.3	2°27.0	3.6′	25°47.1	0.0′	59.6′
22	146°50.8	33.7	16°49.6	3.6′	25°47.1	-0.2′	59.6′
23	161°50.7	33.0	31°12.1	3.5′	25°46.8	-0.4′	59.7′
	SD.=16.2	d=0.6	S.D.=16.2				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°50.5	**S**18°32.4	45°34.6	3.5′	**N**25°46.3	-0.5′	59.7′
1	191°50.4	31.7	59°57.0	3.4′	25°45.7	-0.7′	59.8′
2	206°50.3	31.1	74°19.4	3.4′	25°44.9	-0.9′	59.8′
3	221°50.2	· · 30.5	88°41.8	3.3′	25°43.9	-1.1′	59.8′
4	236°50.0	29.8	103°04.1	3.3′	25°42.7	-1.3′	59.9′
5	251°49.9	29.2	117°26.4	3.3′	25°41.3	-1.5′	59.9′
6	266°49.8	**S**18°28.5	131°48.6	3.2′	**N**25°39.8	-1.6′	59.9′
7	281°49.7	27.9	146°10.8	3.2′	25°38.0	-1.8′	60.0′
8	296°49.5	27.2	160°33.0	3.2′	25°36.1	-2.0′	60.0′
9	311°49.4	· · 26.6	174°55.2	3.1′	25°34.0	-2.2′	60.1′
10	326°49.3	25.9	189°17.3	3.1′	25°31.7	-2.4′	60.1′
11	341°49.2	25.3	203°39.4	3.1′	25°29.2	-2.6′	60.1′
12	356°49.0	**S**18°24.7	218°01.5	3.1′	**N**25°26.5	-2.8′	60.2′
13	11°48.9	24.0	232°23.5	3.1′	25°23.7	-3.0′	60.2′
14	26°48.8	23.4	246°45.6	3.0′	25°20.6	-3.1′	60.2′
15	41°48.7	· · 22.7	261°07.6	3.0′	25°17.4	-3.3′	60.3′
16	56°48.5	22.1	275°29.6	3.0′	25°13.9	-3.5′	60.3′
17	71°48.4	21.4	289°51.6	3.0′	25°10.3	-3.7′	60.3′
18	86°48.3	**S**18°20.8	304°13.6	3.0′	**N**25°06.5	-3.9′	60.4′
19	101°48.2	20.1	318°35.6	3.0′	25°02.5	-4.1′	60.4′
20	116°48.0	19.5	332°57.7	3.0′	24°58.4	-4.3′	60.4′
21	131°47.9	· · 18.8	347°19.7	3.0′	24°54.0	-4.5′	60.5′
22	146°47.8	18.2	1°41.7	3.0′	24°49.4	-4.6′	60.5′
23	161°47.7	17.5	16°03.7	3.0′	24°44.7	-4.8′	60.5′
	SD.=16.2	d=0.6	S.D.=16.4				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 10-12 71-89%
25	12:11	12:18	12:12	19:49	07:20	
26	12:25	12:32	12:13	20:50	08:19	
27	12:38	12:44	12:13	21:53	09:21	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	127°09.3	172°31.4	**S**18°27.4	352°51.6	**N**21°56.3	152°35.2	**S**11°32.1	302°05.8	**N**00°26.5
1	142°11.7	187°30.7	26.5	7°55.1	56.6	167°37.1	31.9	317°08.3	26.5
2	157°14.2	202°30.0	25.7	22°58.6	56.9	182°39.0	31.7	332°10.9	26.6
3	172°16.7	217°29.2	· · 24.9	38°02.1	· · 57.2	197°40.9	· · 31.5	347°13.4	· · 26.6
4	187°19.1	232°28.5	24.0	53°05.6	57.5	212°42.8	31.2	2°15.9	26.6
5	202°21.6	247°27.8	23.2	68°09.1	57.8	227°44.8	31.0	17°18.4	26.7
6	217°24.1	262°27.1	**S**18°22.4	83°12.6	**N**21°58.1	242°46.7	**S**11°30.8	32°20.9	**N**00°26.7
7	232°26.5	277°26.3	21.5	98°16.1	58.4	257°48.6	30.6	47°23.5	26.8
8	247°29.0	292°25.6	20.7	113°19.5	58.7	272°50.5	30.4	62°26.0	26.8
9	262°31.5	307°24.9	· · 19.9	128°23.0	· · 59.0	287°52.4	· · 30.2	77°28.5	· · 26.8
10	277°33.9	322°24.2	19.0	143°26.5	59.3	302°54.3	30.0	92°31.0	26.9
11	292°36.4	337°23.4	18.2	158°30.0	59.6	317°56.3	29.8	107°33.5	26.9
12	307°38.8	352°22.7	**S**18°17.3	173°33.5	**N**21°59.8	332°58.2	**S**11°29.6	122°36.1	**N**00°26.9
13	322°41.3	7°22.0	16.5	188°37.0	22°00.1	348°00.1	29.4	137°38.6	27.0
14	337°43.8	22°21.3	15.7	203°40.5	00.4	3°02.0	29.2	152°41.1	27.0
15	352°46.2	37°20.6	· · 14.8	218°44.0	· · 00.7	18°03.9	· · 29.0	167°43.6	· · 27.0
16	7°48.7	52°19.8	14.0	233°47.5	01.0	33°05.8	28.8	182°46.1	27.1
17	22°51.2	67°19.1	13.1	248°51.0	01.3	48°07.7	28.5	197°48.7	27.1
18	37°53.6	82°18.4	**S**18°12.3	263°54.5	**N**22°01.6	63°09.6	**S**11°28.3	212°51.2	**N**00°27.2
19	52°56.1	97°17.7	11.4	278°58.0	01.9	78°11.6	28.1	227°53.7	27.2
20	67°58.6	112°17.0	10.6	294°01.5	02.2	93°13.5	27.9	242°56.2	27.2
21	83°01.0	127°16.2	· · 09.7	309°05.0	· · 02.5	108°15.4	· · 27.7	257°58.7	· · 27.3
22	98°03.5	142°15.5	08.9	324°08.4	02.8	123°17.3	27.5	273°01.3	27.3
23	113°05.9	157°14.8	08.1	339°11.9	03.1	138°19.2	27.3	288°03.8	27.3
Mer.pass.:15:29		v-0.7 d0.8 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	128°08.4	172°14.1	**S**18°07.2	354°15.4	**N**22°03.4	153°21.1	**S**11°27.1	303°06.3	**N**00°27.4
1	143°10.9	187°13.4	06.4	9°18.9	03.6	168°23.0	26.9	318°08.8	27.4
2	158°13.3	202°12.7	05.5	24°22.4	03.9	183°25.0	26.7	333°11.4	27.4
3	173°15.8	217°12.0	· · 04.6	39°25.9	· · 04.2	198°26.9	· · 26.5	348°13.9	· · 27.5
4	188°18.3	232°11.3	03.8	54°29.4	04.5	213°28.8	26.3	3°16.4	27.5
5	203°20.7	247°10.5	02.9	69°32.9	04.8	228°30.7	26.0	18°18.9	27.6
6	218°23.2	262°09.8	**S**18°02.1	84°36.4	**N**22°05.1	243°32.6	**S**11°25.8	33°21.4	**N**00°27.6
7	233°25.7	277°09.1	01.2	99°39.9	05.4	258°34.5	25.6	48°24.0	27.6
8	248°28.1	292°08.4	18°00.4	114°43.4	05.7	273°36.4	25.4	63°26.5	27.7
9	263°30.6	307°07.7	17°59.5	129°46.9	· · 06.0	288°38.4	· · 25.2	78°29.0	· · 27.7
10	278°33.1	322°07.0	58.7	144°50.4	06.2	303°40.3	25.0	93°31.5	27.8
11	293°35.5	337°06.3	57.8	159°53.9	06.5	318°42.2	24.8	108°34.1	27.8
12	308°38.0	352°05.6	**S**17°56.9	174°57.4	**N**22°06.8	333°44.1	**S**11°24.6	123°36.6	**N**00°27.8
13	323°40.4	7°04.9	56.1	190°00.9	07.1	348°46.0	24.4	138°39.1	27.9
14	338°42.9	22°04.2	55.2	205°04.4	07.4	3°47.9	24.2	153°41.6	27.9
15	353°45.4	37°03.4	· · 54.3	220°07.9	· · 07.7	18°49.8	· · 24.0	168°44.2	· · 27.9
16	8°47.8	52°02.7	53.5	235°11.4	08.0	33°51.7	23.7	183°46.7	28.0
17	23°50.3	67°02.0	52.6	250°14.9	08.3	48°53.7	23.5	198°49.2	28.0
18	38°52.8	82°01.3	**S**17°51.7	265°18.3	**N**22°08.5	63°55.6	**S**11°23.3	213°51.7	**N**00°28.1
19	53°55.2	97°00.6	50.9	280°21.8	08.8	78°57.5	23.1	228°54.3	28.1
20	68°57.7	111°59.9	50.0	295°25.3	09.1	93°59.4	22.9	243°56.8	28.1
21	84°00.2	126°59.2	· · 49.1	310°28.8	· · 09.4	109°01.3	· · 22.7	258°59.3	· · 28.2
22	99°02.6	141°58.5	48.3	325°32.3	09.7	124°03.2	22.5	274°01.8	28.2
23	114°05.1	156°57.8	47.4	340°35.8	10.0	139°05.1	22.3	289°04.4	28.2
Mer.pass.:15:25		v-0.7 d0.9 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	129°07.6	171°57.1	**S**17°46.5	355°39.3	**N**22°10.2	154°07.0	**S**11°22.1	304°06.9	**N**00°28.3
1	144°10.0	186°56.4	45.7	10°42.8	10.5	169°09.0	21.9	319°09.4	28.3
2	159°12.5	201°55.7	44.8	25°46.3	10.8	184°10.9	21.7	334°11.9	28.4
3	174°14.9	216°55.0	· · 43.9	40°49.8	· · 11.1	199°12.8	· · 21.4	349°14.5	· · 28.4
4	189°17.4	231°54.3	43.0	55°53.3	11.4	214°14.7	21.2	4°17.0	28.4
5	204°19.9	246°53.6	42.2	70°56.8	11.7	229°16.6	21.0	19°19.5	28.5
6	219°22.3	261°52.9	**S**17°41.3	86°00.3	**N**22°11.9	244°18.5	**S**11°20.8	34°22.1	**N**00°28.5
7	234°24.8	276°52.2	40.4	101°03.8	12.2	259°20.4	20.6	49°24.6	28.6
8	249°27.3	291°51.5	39.5	116°07.3	12.5	274°22.3	20.4	64°27.1	28.6
9	264°29.7	306°50.8	· · 38.7	131°10.8	· · 12.8	289°24.2	· · 20.2	79°29.6	· · 28.6
10	279°32.2	321°50.1	37.8	146°14.3	13.1	304°26.2	20.0	94°32.2	28.7
11	294°34.7	336°49.4	36.9	161°17.8	13.4	319°28.1	19.8	109°34.7	28.7
12	309°37.1	351°48.7	**S**17°36.0	176°21.3	**N**22°13.6	334°30.0	**S**11°19.6	124°37.2	**N**00°28.8
13	324°39.6	6°48.0	35.1	191°24.8	13.9	349°31.9	19.4	139°39.7	28.8
14	339°42.1	21°47.4	34.2	206°28.3	14.2	4°33.8	19.1	154°42.3	28.8
15	354°44.5	36°46.7	· · 33.4	221°31.8	· · 14.5	19°35.7	· · 18.9	169°44.8	· · 28.9
16	9°47.0	51°46.0	32.5	236°35.3	14.7	34°37.6	18.7	184°47.3	28.9
17	24°49.4	66°45.3	31.6	251°38.8	15.0	49°39.5	18.5	199°49.9	29.0
18	39°51.9	81°44.6	**S**17°30.7	266°42.3	**N**22°15.3	64°41.5	**S**11°18.3	214°52.4	**N**00°29.0
19	54°54.4	96°43.9	29.8	281°45.8	15.6	79°43.4	18.1	229°54.9	29.0
20	69°56.8	111°43.2	28.9	296°49.3	15.9	94°45.3	17.9	244°57.5	29.1
21	84°59.3	126°42.5	· · 28.0	311°52.7	· · 16.1	109°47.2	· · 17.7	260°00.0	· · 29.1
22	100°01.8	141°41.8	27.1	326°56.2	16.4	124°49.1	17.5	275°02.5	29.2
23	115°04.2	156°41.1	26.3	341°59.7	16.7	139°51.0	17.3	290°05.0	29.2
Mer.pass.:15:21		v-0.7 d0.9 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.2	-42°15.2
Schedar	349°43.8	56°35.9
Diphda	348°58.5	-17°55.9
Achernar	335°28.5	-57°11.3
Hamal	328°03.6	23°30.8
Polaris	318°57.3	89°18.9
Acamar	315°20.1	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.8	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.2
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.6
Suhail	222°53.9	-43°28.5
Miaplacidus	221°39.5	-69°45.5
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.5
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.0
Acrux	173°11.9	-63°09.2
Gacrux	172°03.5	-57°10.1
Alioth	166°22.4	55°53.9
Spica	158°33.8	-11°13.0
Alkaid	153°00.6	49°15.4
Hadar	148°51.5	-60°25.1
Menkent	148°10.5	-36°25.1
Arcturus	145°57.9	19°07.5
Rigil Kent.	139°55.2	-60°52.4
Kochab	137°19.7	74°06.4
Zuben'ubi	137°08.2	-16°05.1
Alphecca	126°13.2	26°40.5
Antares	112°29.5	-26°27.3
Atria	107°33.9	-69°02.6
Sabik	102°15.6	-15°44.3
Shaula	96°25.5	-37°06.6
Rasalhague	96°09.0	12°33.0
Eltanin	90°47.7	51°29.0
Kaus Aust.	83°47.4	-34°22.8
Vega	80°41.0	38°47.4
Nunki	76°01.7	-26°17.0
Altair	62°11.0	8°53.6
Peacock	53°23.6	-56°42.1
Deneb	49°33.7	45°19.0
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.7

Jan 28 Thu	**SHA**	**Mer.pass**
Venus	45°22.1	12:31
Mars	225°42.3	00:28
Jupiter	25°25.9	13:48
Saturn	174°56.6	03:51

Jan 29 Fri	**SHA**	**Mer.pass**
Venus	44°05.7	12:32
Mars	226°07.0	00:23
Jupiter	25°12.7	13:45
Saturn	174°57.9	03:47

Jan 30 Sat	**SHA**	**Mer.pass**
Venus	42°49.6	12:33
Mars	226°31.8	00:17
Jupiter	24°59.5	13:42
Saturn	174°59.3	03:43

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°47.6	**S**18°16.8	30°25.7	3.0'	**N**24°39.8	-5.0'	60.5'
1	191°47.4	16.2	44°47.7	3.0'	24°34.7	-5.2'	60.6'
2	206°47.3	15.5	59°09.8	3.1'	24°29.4	-5.4'	60.6'
3	221°47.2	·· 14.9	73°31.8	3.1'	24°23.9	-5.6'	60.6'
4	236°47.1	14.2	87°53.9	3.1'	24°18.3	-5.8'	60.7'
5	251°47.0	13.6	102°16.0	3.1'	24°12.4	-5.9'	60.7'
6	266°46.8	**S**18°12.9	116°38.2	3.1'	**N**24°06.4	-6.1'	60.7'
7	281°46.7	12.3	131°00.3	3.2'	24°00.2	-6.3'	60.8'
8	296°46.6	11.6	145°22.5	3.2'	23°53.8	-6.5'	60.8'
9	311°46.5	·· 10.9	159°44.7	3.2'	23°47.2	-6.7'	60.8'
10	326°46.4	10.3	174°06.9	3.3'	23°40.5	-6.8'	60.8'
11	341°46.3	09.6	188°29.2	3.3'	23°33.5	-7.0'	60.9'
12	356°46.1	**S**18°09.0	202°51.5	3.3'	**N**23°26.4	-7.2'	60.9'
13	11°46.0	08.3	217°13.8	3.4'	23°19.1	-7.4'	60.9'
14	26°45.9	07.6	231°36.2	3.4'	23°11.7	-7.6'	60.9'
15	41°45.8	·· 07.0	245°58.6	3.4'	23°04.0	-7.7'	61.0'
16	56°45.7	06.3	260°21.1	3.5'	22°56.2	-7.9'	61.0'
17	71°45.6	05.6	274°43.6	3.5'	22°48.2	-8.1'	61.0'
18	86°45.5	**S**18°05.0	289°06.2	3.6'	**N**22°40.1	-8.2'	61.0'
19	101°45.3	04.3	303°28.8	3.6'	22°31.8	-8.4'	61.0'
20	116°45.2	03.7	317°51.4	3.7'	22°23.3	-8.6'	61.1'
21	131°45.1	·· 03.0	332°14.1	3.7'	22°14.6	-8.8'	61.1'
22	146°45.0	02.3	346°36.9	3.8'	22°05.8	-8.9'	61.1'
23	161°44.9	01.7	0°59.7	3.8'	21°56.8	-9.1'	61.1'
	SD.=16.2	d=0.7	S.D.=16.6				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°44.8	**S**18°01.0	15°22.6	3.9'	**N**21°47.6	-9.2'	61.2'
1	191°44.7	18°00.3	29°45.5	4.0'	21°38.3	-9.4'	61.2'
2	206°44.6	17°59.6	44°08.5	4.0'	21°28.8	-9.6'	61.2'
3	221°44.4	·· 59.0	58°31.5	4.1'	21°19.1	-9.7'	61.2'
4	236°44.3	58.3	72°54.7	4.1'	21°09.3	-9.9'	61.2'
5	251°44.2	57.6	87°17.8	4.2'	20°59.4	-10.0'	61.2'
6	266°44.1	**S**17°57.0	101°41.1	4.3'	**N**20°49.2	-10.2'	61.3'
7	281°44.0	56.3	116°04.4	4.3'	20°39.0	-10.4'	61.3'
8	296°43.9	55.6	130°27.8	4.4'	20°28.5	-10.5'	61.3'
9	311°43.8	·· 55.0	144°51.2	4.5'	20°18.0	-10.7'	61.3'
10	326°43.7	54.3	159°14.7	4.6'	20°07.2	-10.8'	61.3'
11	341°43.6	53.6	173°38.3	4.6'	19°56.4	-10.9'	61.3'
12	356°43.5	**S**17°52.9	188°02.0	4.7'	**N**19°45.3	-11.1'	61.3'
13	11°43.4	52.3	202°25.7	4.8'	19°34.2	-11.2'	61.4'
14	26°43.2	51.6	216°49.5	4.8'	19°22.9	-11.4'	61.4'
15	41°43.1	·· 50.9	231°13.4	4.9'	19°11.4	-11.5'	61.4'
16	56°43.0	50.2	245°37.4	5.0'	18°59.8	-11.7'	61.4'
17	71°42.9	49.6	260°01.4	5.1'	18°48.1	-11.8'	61.4'
18	86°42.8	**S**17°48.9	274°25.5	5.1'	**N**18°36.3	-11.9'	61.4'
19	101°42.7	48.2	288°49.7	5.2'	18°24.3	-12.1'	61.4'
20	116°42.6	47.5	303°13.9	5.3'	18°12.2	-12.2'	61.4'
21	131°42.5	·· 46.8	317°38.3	5.4'	17°59.9	-12.3'	61.4'
22	146°42.4	46.2	332°02.7	5.5'	17°47.5	-12.4'	61.4'
23	161°42.3	45.5	346°27.2	5.5'	17°35.0	-12.6'	61.4'
	SD.=16.2	d=0.7	S.D.=16.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°42.2	**S**17°44.8	0°51.8	5.6'	**N**17°22.4	-12.7'	61.5'
1	191°42.1	44.1	15°16.5	5.7'	17°09.7	-12.8'	61.5'
2	206°42.0	43.4	29°41.2	5.8'	16°56.8	-12.9'	61.5'
3	221°41.9	·· 42.8	44°06.0	5.9'	16°43.8	-13.0'	61.5'
4	236°41.8	42.1	58°30.9	5.9'	16°30.7	-13.1'	61.5'
5	251°41.7	41.4	72°55.9	6.0'	16°17.5	-13.3'	61.5'
6	266°41.6	**S**17°40.7	87°21.0	6.1'	**N**16°04.2	-13.4'	61.5'
7	281°41.5	40.0	101°46.1	6.2'	15°50.8	-13.5'	61.5'
8	296°41.4	39.3	116°11.3	6.3'	15°37.3	-13.6'	61.5'
9	311°41.3	·· 38.7	130°36.6	6.3'	15°23.6	-13.7'	61.5'
10	326°41.2	38.0	145°02.0	6.4'	15°09.9	-13.8'	61.5'
11	341°41.1	37.3	159°27.5	6.5'	14°56.1	-13.9'	61.5'
12	356°41.0	**S**17°36.6	173°53.1	6.6'	**N**14°42.1	-14.0'	61.5'
13	11°40.9	35.9	188°18.7	6.7'	14°28.1	-14.1'	61.5'
14	26°40.8	35.2	202°44.4	6.8'	14°14.0	-14.2'	61.5'
15	41°40.7	·· 34.5	217°10.2	6.8'	13°59.7	-14.3'	61.5'
16	56°40.6	33.8	231°36.1	6.9'	13°45.4	-14.4'	61.5'
17	71°40.5	33.1	246°02.0	7.0'	13°31.0	-14.4'	61.5'
18	86°40.4	**S**17°32.5	260°28.1	7.1'	**N**13°16.6	-14.5'	61.5'
19	101°40.3	31.8	274°54.2	7.2'	13°02.0	-14.6'	61.5'
20	116°40.2	31.1	289°20.4	7.2'	12°47.3	-14.7'	61.4'
21	131°40.1	·· 30.4	303°46.7	7.3'	12°32.6	-14.8'	61.4'
22	146°40.0	29.7	318°13.0	7.4'	12°17.8	-14.8'	61.4'
23	161°39.9	29.0	332°39.4	7.5'	12°02.9	-14.9'	61.4'
	SD.=16.2	d=0.7	S.D.=16.8				

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

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

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 13-15 95-100%
28	12:50	12:55	12:13	22:56	10:25	○
29	13:01	13:06	12:13	23:56	11:27	
30	13:11	13:16	12:13	–:–	12:25	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	130°06.7	171°40.4	**S**17°25.4	357°03.2	**N**22°17.0	154°52.9	**S**11°17.0	305°07.6	**N**00°29.2
1	145°09.2	186°39.8	24.5	12°06.7	17.2	169°54.8	16.8	320°10.1	29.3
2	160°11.6	201°39.1	23.6	27°10.2	17.5	184°56.7	16.6	335°12.6	29.3
3	175°14.1	216°38.4	·· 22.7	42°13.7	·· 17.8	199°58.7	·· 16.4	350°15.2	·· 29.4
4	190°16.5	231°37.7	21.8	57°17.2	18.1	215°00.6	16.2	5°17.7	29.4
5	205°19.0	246°37.0	20.9	72°20.7	18.4	230°02.5	16.0	20°20.2	29.4
6	220°21.5	261°36.3	**S**17°20.0	87°24.2	**N**22°18.6	245°04.4	**S**11°15.8	35°22.8	**N**00°29.5
7	235°23.9	276°35.6	19.1	102°27.7	18.9	260°06.3	15.6	50°25.3	29.5
8	250°26.4	291°35.0	18.2	117°31.2	19.2	275°08.2	15.4	65°27.8	29.6
9	265°28.9	306°34.3	·· 17.3	132°34.7	·· 19.4	290°10.1	·· 15.2	80°30.3	·· 29.6
10	280°31.3	321°33.6	16.4	147°38.2	19.7	305°12.0	14.9	95°32.9	29.6
11	295°33.8	336°32.9	15.5	162°41.7	20.0	320°13.9	14.7	110°35.4	29.7
12	310°36.3	351°32.2	**S**17°14.6	177°45.2	**N**22°20.3	335°15.8	**S**11°14.5	125°37.9	**N**00°29.7
13	325°38.7	6°31.5	13.7	192°48.7	20.5	350°17.8	14.3	140°40.5	29.8
14	340°41.2	21°30.9	12.8	207°52.2	20.8	5°19.7	14.1	155°43.0	29.8
15	355°43.7	36°30.2	·· 11.9	222°55.7	·· 21.1	20°21.6	·· 13.9	170°45.5	·· 29.9
16	10°46.1	51°29.5	11.0	237°59.2	21.4	35°23.5	13.7	185°48.1	29.9
17	25°48.6	66°28.8	10.1	253°02.7	21.6	50°25.4	13.5	200°50.6	29.9
18	40°51.0	81°28.1	**S**17°09.2	268°06.2	**N**22°21.9	65°27.3	**S**11°13.3	215°53.1	**N**00°30.0
19	55°53.5	96°27.5	08.3	283°09.7	22.2	80°29.2	13.0	230°55.7	30.0
20	70°56.0	111°26.8	07.3	298°13.2	22.4	95°31.1	12.8	245°58.2	30.1
21	85°58.4	126°26.1	·· 06.4	313°16.6	·· 22.7	110°33.0	·· 12.6	261°00.7	·· 30.1
22	101°00.9	141°25.4	05.5	328°20.1	23.0	125°34.9	12.4	276°03.3	30.1
23	116°03.4	156°24.8	04.6	343°23.6	23.3	140°36.9	12.2	291°05.8	30.2
Mer.pass.:15:17		v-0.7 d0.9 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	131°05.8	171°24.1	**S**17°03.7	358°27.1	**N**22°23.5	155°38.8	**S**11°12.0	306°08.3	**N**00°30.2
1	146°08.3	186°23.4	02.8	13°30.6	23.8	170°40.7	11.8	321°10.9	30.3
2	161°10.8	201°22.7	01.9	28°34.1	24.1	185°42.6	11.6	336°13.4	30.3
3	176°13.2	216°22.1	·· 01.0	43°37.6	·· 24.3	200°44.5	·· 11.4	351°15.9	·· 30.4
4	191°15.7	231°21.4	17°00.0	58°41.1	24.6	215°46.4	11.1	6°18.5	30.4
5	206°18.2	246°20.7	16°59.1	73°44.6	24.9	230°48.3	10.9	21°21.0	30.4
6	221°20.6	261°20.0	**S**16°58.2	88°48.1	**N**22°25.1	245°50.2	**S**11°10.7	36°23.5	**N**00°30.5
7	236°23.1	276°19.4	57.3	103°51.6	25.4	260°52.1	10.5	51°26.1	30.5
8	251°25.5	291°18.7	56.4	118°55.1	25.7	275°54.0	10.3	66°28.6	30.6
9	266°28.0	306°18.0	·· 55.5	133°58.6	·· 25.9	290°56.0	·· 10.1	81°31.2	·· 30.6
10	281°30.5	321°17.4	54.5	149°02.1	26.2	305°57.9	09.9	96°33.7	30.6
11	296°32.9	336°16.7	53.6	164°05.6	26.5	320°59.8	09.7	111°36.2	30.7
12	311°35.4	351°16.0	**S**16°52.7	179°09.1	**N**22°26.7	336°01.7	**S**11°09.5	126°38.8	**N**00°30.7
13	326°37.9	6°15.3	51.8	194°12.5	27.0	351°03.6	09.2	141°41.3	30.8
14	341°40.3	21°14.7	50.8	209°16.0	27.3	6°05.5	09.0	156°43.8	30.8
15	356°42.8	36°14.0	·· 49.9	224°19.5	·· 27.5	21°07.4	·· 08.8	171°46.4	·· 30.9
16	11°45.3	51°13.3	49.0	239°23.0	27.8	36°09.3	08.6	186°48.9	30.9
17	26°47.7	66°12.7	48.1	254°26.5	28.0	51°11.2	08.4	201°51.4	30.9
18	41°50.2	81°12.0	**S**16°47.1	269°30.0	**N**22°28.3	66°13.1	**S**11°08.2	216°54.0	**N**00°31.0
19	56°52.6	96°11.3	46.2	284°33.5	28.6	81°15.0	08.0	231°56.5	31.0
20	71°55.1	111°10.7	45.3	299°37.0	28.8	96°17.0	07.8	246°59.0	31.1
21	86°57.6	126°10.0	·· 44.4	314°40.5	·· 29.1	111°18.9	·· 07.6	262°01.6	·· 31.1
22	102°00.0	141°09.4	43.4	329°44.0	29.4	126°20.8	07.3	277°04.1	31.2
23	117°02.5	156°08.7	42.5	344°47.5	29.6	141°22.7	07.1	292°06.7	31.2
Mer.pass.:15:13		v-0.7 d0.9 m-3.8		v3.5 d0.3 m-1.2		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.8	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	132°05.0	171°08.0	**S**16°41.6	359°51.0	**N**22°29.9	156°24.6	**S**11°06.9	307°09.2	**N**00°31.3
1	147°07.4	186°07.4	40.6	14°54.4	30.1	171°26.5	06.7	322°11.7	31.3
2	162°09.9	201°06.7	39.7	29°57.9	30.4	186°28.4	06.5	337°14.3	31.3
3	177°12.4	216°06.0	·· 38.8	45°01.4	·· 30.7	201°30.3	·· 06.3	352°16.8	·· 31.4
4	192°14.8	231°05.4	37.8	60°04.9	30.9	216°32.2	06.1	7°19.4	31.4
5	207°17.3	246°04.7	36.9	75°08.4	31.2	231°34.1	05.9	22°21.9	31.5
6	222°19.8	261°04.1	**S**16°36.0	90°11.9	**N**22°31.4	246°36.0	**S**11°05.6	37°24.4	**N**00°31.5
7	237°22.2	276°03.4	35.0	105°15.4	31.7	261°38.0	05.4	52°27.0	31.6
8	252°24.7	291°02.8	34.1	120°18.9	32.0	276°39.9	05.2	67°29.5	31.6
9	267°27.1	306°02.1	·· 33.1	135°22.4	·· 32.2	291°41.8	·· 05.0	82°32.0	·· 31.6
10	282°29.6	321°01.4	32.2	150°25.9	32.5	306°43.7	04.8	97°34.6	31.7
11	297°32.1	336°00.8	31.3	165°29.3	32.7	321°45.6	04.6	112°37.1	31.7
12	312°34.5	351°00.1	**S**16°30.3	180°32.8	**N**22°33.0	336°47.5	**S**11°04.4	127°39.7	**N**00°31.8
13	327°37.0	5°59.5	29.4	195°36.3	33.2	351°49.4	04.2	142°42.2	31.8
14	342°39.5	20°58.8	28.4	210°39.8	33.5	6°51.3	04.0	157°44.7	31.9
15	357°41.9	35°58.2	·· 27.5	225°43.3	·· 33.7	21°53.2	·· 03.7	172°47.3	·· 31.9
16	12°44.4	50°57.5	26.5	240°46.8	34.0	36°55.1	03.5	187°49.8	32.0
17	27°46.9	65°56.9	25.6	255°50.3	34.3	51°57.0	03.3	202°52.4	32.0
18	42°49.3	80°56.2	**S**16°24.7	270°53.8	**N**22°34.5	66°58.9	**S**11°03.1	217°54.9	**N**00°32.0
19	57°51.8	95°55.5	23.7	285°57.2	34.8	82°00.8	02.9	232°57.4	32.1
20	72°54.2	110°54.9	22.8	301°00.7	35.0	97°02.8	02.7	248°00.0	32.1
21	87°56.7	125°54.2	·· 21.8	316°04.2	·· 35.3	112°04.7	·· 02.5	263°02.5	·· 32.2
22	102°59.2	140°53.6	20.9	331°07.7	35.5	127°06.6	02.3	278°05.1	32.2
23	118°01.6	155°52.9	19.9	346°11.2	35.8	142°08.5	02.0	293°07.6	32.3
Mer.pass.:15:09		v-0.7 d0.9 m-3.8		v3.5 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.2	-42°15.2
Schedar	349°43.8	56°35.9
Diphda	348°58.5	-17°55.9
Achernar	335°28.6	-57°11.3
Hamal	328°03.6	23°30.8
Polaris	318°58.7	89°18.9
Acamar	315°20.1	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.8	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.3
Sirius	258°35.6	-16°43.9
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.6
Suhail	222°53.9	-43°28.5
Miaplacidus	221°39.5	-69°45.6
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.5
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.0
Acrux	173°11.9	-63°09.2
Gacrux	172°03.5	-57°10.1
Alioth	166°22.4	55°53.9
Spica	158°33.7	-11°13.0
Alkaid	153°00.6	49°15.4
Hadar	148°51.5	-60°25.2
Menkent	148°10.5	-36°25.2
Arcturus	145°57.9	19°07.5
Rigil Kent.	139°55.2	-60°52.4
Kochab	137°19.7	74°06.4
Zuben'ubi	137°08.2	-16°05.1
Alphecca	126°13.1	26°40.5
Antares	112°29.4	-26°27.3
Atria	107°33.9	-69°02.6
Sabik	102°15.6	-15°44.3
Shaula	96°25.5	-37°06.6
Rasalhague	96°08.9	12°33.0
Eltanin	90°47.7	51°29.0
Kaus Aust.	83°47.4	-34°22.8
Vega	80°41.0	38°47.4
Nunki	76°01.7	-26°17.0
Altair	62°11.0	8°53.6
Peacock	53°23.6	-56°42.1
Deneb	49°33.7	45°19.0
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.6

Jan 31 Sun	**SHA**	**Mer.pass**
Venus	41°33.7	12:34
Mars	226°56.5	00:12
Jupiter	24°46.2	13:39
Saturn	175°00.9	03:39

Feb 01 Mon	**SHA**	**Mer.pass**
Venus	40°18.2	12:35
Mars	227°21.3	00:06
Jupiter	24°32.9	13:36
Saturn	175°02.5	03:35

Feb 02 Tue	**SHA**	**Mer.pass**
Venus	39°03.1	12:36
Mars	227°46.0	00:01
Jupiter	24°19.6	13:33
Saturn	175°04.2	03:31

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°39.8	S17°28.3	347°06.0	7.5'	N11°48.0	-15.0'	61.4'
1	191°39.7	27.6	1°32.5	7.6'	11°33.0	-15.1'	61.4'
2	206°39.6	26.9	15°59.2	7.7'	11°17.9	-15.1'	61.4'
3	221°39.5	· · 26.2	30°25.9	7.8'	11°02.7	-15.2'	61.4'
4	236°39.5	25.5	44°52.7	7.8'	10°47.5	-15.2'	61.4'
5	251°39.4	24.8	59°19.6	7.9'	10°32.3	-15.3'	61.4'
6	266°39.3	S17°24.1	73°46.6	8.0'	N10°16.9	-15.4'	61.4'
7	281°39.2	23.4	88°13.6	8.1'	10°01.5	-15.4'	61.3'
8	296°39.1	22.7	102°40.7	8.1'	09°46.1	-15.5'	61.3'
9	311°39.0	· · 22.0	117°07.9	8.2'	09°30.6	-15.5'	61.3'
10	326°38.9	21.3	131°35.2	8.3'	09°15.0	-15.6'	61.3'
11	341°38.8	20.6	146°02.5	8.4'	08°59.4	-15.6'	61.3'
12	356°38.7	S17°19.9	160°29.9	8.4'	N08°43.8	-15.7'	61.3'
13	11°38.6	19.2	174°57.3	8.5'	08°28.1	-15.7'	61.2'
14	26°38.5	18.5	189°24.8	8.6'	08°12.3	-15.8'	61.2'
15	41°38.4	· · 17.8	203°52.4	8.6'	07°56.6	-15.8'	61.2'
16	56°38.4	17.1	218°20.1	8.7'	07°40.8	-15.8'	61.2'
17	71°38.3	16.4	232°47.8	8.8'	07°24.9	-15.9'	61.2'
18	86°38.2	S17°15.7	247°15.6	8.8'	N07°09.0	-15.9'	61.2'
19	101°38.1	15.0	261°43.4	8.9'	06°53.1	-15.9'	61.1'
20	116°38.0	14.3	276°11.4	8.9'	06°37.2	-16.0'	61.1'
21	131°37.9	· · 13.6	290°39.3	9.0'	06°21.2	-16.0'	61.1'
22	146°37.8	12.9	305°07.4	9.1'	06°05.2	-16.0'	61.1'
23	161°37.7	12.2	319°35.5	9.1'	05°49.1	-16.0'	61.1'
	SD.=16.2	d=0.7	S.D.=16.7				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°37.7	S17°11.5	334°03.6	9.2'	N05°33.1	-16.1'	61.0'
1	191°37.6	10.8	348°31.8	9.2'	05°17.0	-16.1'	61.0'
2	206°37.5	10.1	3°00.1	9.3'	05°00.9	-16.1'	61.0'
3	221°37.4	· · 09.4	17°28.4	9.4'	04°44.8	-16.1'	61.0'
4	236°37.3	08.7	31°56.8	9.4'	04°28.7	-16.1'	60.9'
5	251°37.2	08.0	46°25.2	9.5'	04°12.6	-16.1'	60.9'
6	266°37.1	S17°07.2	60°53.7	9.5'	N03°56.5	-16.1'	60.9'
7	281°37.1	06.5	75°22.2	9.6'	03°40.3	-16.2'	60.9'
8	296°37.0	05.8	89°50.8	9.6'	03°24.1	-16.2'	60.8'
9	311°36.9	· · 05.1	104°19.5	9.7'	03°08.0	-16.2'	60.8'
10	326°36.8	04.4	118°48.2	9.7'	02°51.8	-16.2'	60.8'
11	341°36.7	03.7	133°16.9	9.8'	02°35.7	-16.2'	60.8'
12	356°36.7	S17°03.0	147°45.7	9.8'	N02°19.5	-16.2'	60.7'
13	11°36.6	02.3	162°14.5	9.8'	02°03.3	-16.2'	60.7'
14	26°36.5	01.5	176°43.4	9.9'	01°47.2	-16.2'	60.7'
15	41°36.4	· · 00.8	191°12.3	9.9'	01°31.0	-16.1'	60.7'
16	56°36.3	17°00.1	205°41.2	10.0'	01°14.9	-16.1'	60.6'
17	71°36.2	16°59.4	220°10.2	10.0'	00°58.7	-16.1'	60.6'
18	86°36.2	S16°58.7	234°39.3	10.1'	N00°42.6	-16.1'	60.6'
19	101°36.1	58.0	249°08.4	10.1'	00°26.5	-16.1'	60.5'
20	116°36.0	57.3	263°37.5	10.1'	N00°10.4	-16.1'	60.5'
21	131°35.9	· · 56.5	278°06.6	10.2'	S00°05.7	-16.1'	60.5'
22	146°35.8	55.8	292°35.8	10.2'	00°21.7	-16.0'	60.4'
23	161°35.8	55.1	307°05.0	10.2'	00°37.8	-16.0'	60.4'
	SD.=16.2	d=0.7	S.D.=16.6				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°35.7	S16°54.4	321°34.3	10.3'	S00°53.8	-16.0'	60.4'
1	191°35.6	53.7	336°03.6	10.3'	01°09.8	-16.0'	60.3'
2	206°35.5	52.9	350°32.9	10.3'	01°25.7	-16.0'	60.3'
3	221°35.5	· · 52.2	5°02.3	10.4'	01°41.7	-15.9'	60.3'
4	236°35.4	51.5	19°31.6	10.4'	01°57.6	-15.9'	60.3'
5	251°35.3	50.8	34°01.0	10.4'	02°13.5	-15.9'	60.2'
6	266°35.2	S16°50.1	48°30.5	10.5'	S02°29.3	-15.8'	60.2'
7	281°35.2	49.3	62°59.9	10.5'	02°45.2	-15.8'	60.1'
8	296°35.1	48.6	77°29.4	10.5'	03°00.9	-15.8'	60.1'
9	311°35.0	· · 47.9	91°59.0	10.5'	03°16.7	-15.7'	60.1'
10	326°34.9	47.2	106°28.5	10.5'	03°32.4	-15.7'	60.0'
11	341°34.9	46.4	120°58.0	10.6'	03°48.1	-15.7'	60.0'
12	356°34.8	S16°45.7	135°27.6	10.6'	S04°03.7	-15.6'	60.0'
13	11°34.7	45.0	149°57.2	10.6'	04°19.3	-15.6'	59.9'
14	26°34.6	44.3	164°26.8	10.6'	04°34.8	-15.5'	59.9'
15	41°34.6	· · 43.5	178°56.5	10.6'	04°50.4	-15.5'	59.9'
16	56°34.5	42.8	193°26.1	10.7'	05°05.8	-15.4'	59.8'
17	71°34.4	42.1	207°55.8	10.7'	05°21.2	-15.4'	59.8'
18	86°34.3	S16°41.3	222°25.5	10.7'	S05°36.6	-15.3'	59.8'
19	101°34.3	40.6	236°55.2	10.7'	05°51.9	-15.3'	59.7'
20	116°34.2	39.9	251°24.9	10.7'	06°07.1	-15.2'	59.7'
21	131°34.1	· · 39.2	265°54.6	10.7'	06°22.3	-15.2'	59.6'
22	146°34.1	38.4	280°24.4	10.7'	06°37.5	-15.1'	59.6'
23	161°34.0	37.7	294°54.1	10.8'	06°52.6	-15.1'	59.6'
	SD.=16.2	d=0.7	S.D.=16.3				

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

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

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 16-18 98-85%
31	13:21	13:25	12:13	00:54	13:21	
01	13:29	13:33	12:14	01:48	14:14	
02	13:37	13:41	12:14	02:39	15:04	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	133°04.1	170°52.3	S16°19.0	1°14.7	N22°36.0	157°10.4	S11°01.8	308°10.1	N00°32.3
1	148°06.6	185°51.6	18.0	16°18.2	36.3	172°12.3	01.6	323°12.7	32.4
2	163°09.0	200°51.0	17.1	31°21.6	36.5	187°14.2	01.4	338°15.2	32.4
3	178°11.5	215°50.3	·· 16.1	46°25.1	·· 36.8	202°16.1	·· 01.2	353°17.8	·· 32.4
4	193°14.0	230°49.7	15.1	61°28.6	37.0	217°18.0	01.0	8°20.3	32.5
5	208°16.4	245°49.1	14.2	76°32.1	37.3	232°19.9	00.8	23°22.9	32.5
6	223°18.9	260°48.4	S16°13.2	91°35.6	N22°37.5	247°21.8	S11°00.5	38°25.4	N00°32.6
7	238°21.4	275°47.8	12.3	106°39.1	37.8	262°23.7	00.3	53°27.9	32.6
8	253°23.8	290°47.1	11.3	121°42.5	38.0	277°25.6	11°00.1	68°30.5	32.7
9	268°26.3	305°46.5	·· 10.4	136°46.0	·· 38.3	292°27.6	10°59.9	83°33.0	·· 32.7
10	283°28.7	320°45.8	09.4	151°49.5	38.5	307°29.5	59.7	98°35.6	32.8
11	298°31.2	335°45.2	08.4	166°53.0	38.8	322°31.4	59.5	113°38.1	32.8
12	313°33.7	350°44.5	S16°07.5	181°56.5	N22°39.0	337°33.3	S10°59.3	128°40.7	N00°32.9
13	328°36.1	5°43.9	06.5	196°59.9	39.3	352°35.2	59.1	143°43.2	32.9
14	343°38.6	20°43.3	05.6	212°03.4	39.5	7°37.1	58.8	158°45.7	33.0
15	358°41.1	35°42.6	·· 04.6	227°06.9	·· 39.8	22°39.0	·· 58.6	173°48.3	·· 33.0
16	13°43.5	50°42.0	03.6	242°10.4	40.0	37°40.9	58.4	188°50.8	33.0
17	28°46.0	65°41.3	02.7	257°13.9	40.3	52°42.8	58.2	203°53.4	33.1
18	43°48.5	80°40.7	S16°01.7	272°17.3	N22°40.5	67°44.7	S10°58.0	218°55.9	N00°33.1
19	58°50.9	95°40.1	16°00.7	287°20.8	40.8	82°46.6	57.8	233°58.5	33.2
20	73°53.4	110°39.4	15°59.8	302°24.3	41.0	97°48.5	57.6	249°01.0	33.2
21	88°55.9	125°38.8	·· 58.8	317°27.8	·· 41.2	112°50.4	·· 57.4	264°03.6	·· 33.3
22	103°58.3	140°38.1	57.8	332°31.3	41.5	127°52.3	57.1	279°06.1	33.3
23	119°00.8	155°37.5	56.9	347°34.7	41.7	142°54.2	56.9	294°08.6	33.4
Mer.pass.:15:05		v-0.6 d1.0 m-3.8		v3.5 d0.3 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.7	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	134°03.2	170°36.9	S15°55.9	2°38.2	N22°42.0	157°56.2	S10°56.7	309°11.2	N00°33.4
1	149°05.7	185°36.2	54.9	17°41.7	42.2	172°58.1	56.5	324°13.7	33.5
2	164°08.2	200°35.6	54.0	32°45.2	42.5	188°00.0	56.3	339°16.3	33.5
3	179°10.6	215°35.0	·· 53.0	47°48.6	·· 42.7	203°01.9	·· 56.1	354°18.8	·· 33.6
4	194°13.1	230°34.3	52.0	62°52.1	42.9	218°03.8	55.9	9°21.4	33.6
5	209°15.6	245°33.7	51.0	77°55.6	43.2	233°05.7	55.6	24°23.9	33.6
6	224°18.0	260°33.1	S15°50.1	92°59.1	N22°43.4	248°07.6	S10°55.4	39°26.5	N00°33.7
7	239°20.5	275°32.4	49.1	108°02.5	43.7	263°09.5	55.2	54°29.0	33.7
8	254°23.0	290°31.8	48.1	123°06.0	43.9	278°11.4	55.0	69°31.6	33.8
9	269°25.4	305°31.2	·· 47.1	138°09.5	·· 44.1	293°13.3	·· 54.8	84°34.1	·· 33.8
10	284°27.9	320°30.5	46.2	153°13.0	44.4	308°15.2	54.6	99°36.7	33.9
11	299°30.3	335°29.9	45.2	168°16.4	44.6	323°17.1	54.4	114°39.2	33.9
12	314°32.8	350°29.3	S15°44.2	183°19.9	N22°44.9	338°19.0	S10°54.1	129°41.7	N00°34.0
13	329°35.3	5°28.6	43.2	198°23.4	45.1	353°20.9	53.9	144°44.3	34.0
14	344°37.7	20°28.0	42.2	213°26.9	45.3	8°22.8	53.7	159°46.8	34.1
15	359°40.2	35°27.4	·· 41.3	228°30.3	·· 45.6	23°24.7	·· 53.5	174°49.4	·· 34.1
16	14°42.7	50°26.7	40.3	243°33.8	45.8	38°26.7	53.3	189°51.9	34.2
17	29°45.1	65°26.1	39.3	258°37.3	46.1	53°28.6	53.1	204°54.5	34.2
18	44°47.6	80°25.5	S15°38.3	273°40.7	N22°46.3	68°30.5	S10°52.9	219°57.0	N00°34.3
19	59°50.1	95°24.9	37.3	288°44.2	46.5	83°32.4	52.6	234°59.6	34.3
20	74°52.5	110°24.2	36.3	303°47.7	46.8	98°34.3	52.4	250°02.1	34.4
21	89°55.0	125°23.6	·· 35.3	318°51.1	·· 47.0	113°36.2	·· 52.2	265°04.7	·· 34.4
22	104°57.5	140°23.0	34.4	333°54.6	47.2	128°38.1	52.0	280°07.2	34.5
23	119°59.9	155°22.4	33.4	348°58.1	47.5	143°40.0	51.8	295°09.8	34.5
Mer.pass.:15:01		v-0.6 d1.0 m-3.8		v3.5 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.7	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	135°02.4	170°21.7	S15°32.4	4°01.6	N22°47.7	158°41.9	S10°51.6	310°12.3	N00°34.5
1	150°04.8	185°21.1	31.4	19°05.0	47.9	173°43.8	51.4	325°14.9	34.6
2	165°07.3	200°20.5	30.4	34°08.5	48.2	188°45.7	51.1	340°17.4	34.6
3	180°09.8	215°19.9	·· 29.4	49°12.0	·· 48.4	203°47.6	·· 50.9	355°20.0	·· 34.7
4	195°12.2	230°19.2	28.4	64°15.4	48.6	218°49.5	50.7	10°22.5	34.7
5	210°14.7	245°18.6	27.4	79°18.9	48.9	233°51.4	50.5	25°25.1	34.8
6	225°17.2	260°18.0	S15°26.4	94°22.3	N22°49.1	248°53.3	S10°50.3	40°27.6	N00°34.8
7	240°19.6	275°17.4	25.5	109°25.8	49.3	263°55.2	50.1	55°30.2	34.9
8	255°22.1	290°16.8	24.5	124°29.3	49.6	278°57.1	49.9	70°32.7	34.9
9	270°24.6	305°16.1	·· 23.5	139°32.7	·· 49.8	293°59.0	·· 49.6	85°35.3	·· 35.0
10	285°27.0	320°15.5	22.5	154°36.2	50.0	309°01.0	49.4	100°37.8	35.0
11	300°29.5	335°14.9	21.5	169°39.7	50.2	324°02.9	49.2	115°40.4	35.1
12	315°32.0	350°14.3	S15°20.5	184°43.1	N22°50.5	339°04.8	S10°49.0	130°42.9	N00°35.1
13	330°34.4	5°13.7	19.5	199°46.6	50.7	354°06.7	48.8	145°45.5	35.2
14	345°36.9	20°13.1	18.5	214°50.0	50.9	9°08.6	48.6	160°48.0	35.2
15	0°39.3	35°12.4	·· 17.5	229°53.5	·· 51.2	24°10.5	·· 48.4	175°50.6	·· 35.3
16	15°41.8	50°11.8	16.5	244°57.0	51.4	39°12.4	48.1	190°53.1	35.3
17	30°44.3	65°11.2	15.5	260°00.4	51.6	54°14.3	47.9	205°55.7	35.4
18	45°46.7	80°10.6	S15°14.5	275°03.9	N22°51.8	69°16.2	S10°47.7	220°58.2	N00°35.4
19	60°49.2	95°10.0	13.5	290°07.3	52.1	84°18.1	47.5	236°00.8	35.5
20	75°51.7	110°09.4	12.5	305°10.8	52.3	99°20.0	47.3	251°03.3	35.5
21	90°54.1	125°08.8	·· 11.5	320°14.3	·· 52.5	114°21.9	·· 47.1	266°05.9	·· 35.6
22	105°56.6	140°08.1	10.5	335°17.7	52.7	129°23.8	46.9	281°08.4	35.6
23	120°59.1	155°07.5	09.5	350°21.2	53.0	144°25.7	46.6	296°11.0	35.7
Mer.pass.:14:57		v-0.6 d1.0 m-3.8		v3.5 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.5 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.2	-42°15.2
Schedar	349°43.8	56°35.9
Diphda	348°58.5	-17°55.9
Achernar	335°28.6	-57°11.3
Hamal	328°03.6	23°30.8
Polaris	319°00.1	89°18.9
Acamar	315°20.1	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.9	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.6
Suhail	222°53.9	-43°28.5
Miaplacidus	221°39.5	-69°45.6
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.5
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.0
Acrux	173°11.9	-63°09.2
Gacrux	172°03.5	-57°10.1
Alioth	166°22.3	55°53.9
Spica	158°33.7	-11°13.0
Alkaid	153°00.5	49°15.4
Hadar	148°51.4	-60°25.2
Menkent	148°10.4	-36°25.2
Arcturus	145°57.9	19°07.5
Rigil Kent.	139°55.1	-60°52.4
Kochab	137°19.6	74°06.4
Zuben'ubi	137°08.1	-16°05.1
Alphecca	126°13.1	26°40.5
Antares	112°29.4	-26°27.3
Atria	107°33.8	-69°02.5
Sabik	102°15.5	-15°44.3
Shaula	96°25.5	-37°06.6
Rasalhague	96°08.9	12°33.0
Eltanin	90°47.7	51°29.0
Kaus Aust.	83°47.4	-34°22.7
Vega	80°41.0	38°47.4
Nunki	76°01.6	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.5	-56°42.1
Deneb	49°33.7	45°19.0
Enif	33°49.9	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.6

Feb 03 Wed	**SHA**	**Mer.pass**
Venus	37°48.2	12:37
Mars	228°10.6	23:49
Jupiter	24°06.3	13:30
Saturn	175°06.0	03:27

Feb 04 Thu	**SHA**	**Mer.pass**
Venus	36°33.6	12:38
Mars	228°35.0	23:44
Jupiter	23°52.9	13:27
Saturn	175°07.9	03:23

Feb 05 Fri	**SHA**	**Mer.pass**
Venus	35°19.4	12:39
Mars	228°59.2	23:38
Jupiter	23°39.5	13:24
Saturn	175°09.9	03:19

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.9	S16°37.0	309°23.9	10.8'	S07°07.6	-15.0'	59.5'
1	191°33.9	36.2	323°53.7	10.8'	07°22.6	-14.9'	59.5'
2	206°33.8	35.5	338°23.4	10.8'	07°37.5	-14.9'	59.5'
3	221°33.7	·· 34.8	352°53.2	10.8'	07°52.4	-14.8'	59.4'
4	236°33.6	34.0	7°23.0	10.8'	08°07.2	-14.8'	59.4'
5	251°33.6	33.3	21°52.8	10.8'	08°21.9	-14.7'	59.3'
6	266°33.5	S16°32.6	36°22.6	10.8'	S08°36.6	-14.6'	59.3'
7	281°33.4	31.8	50°52.4	10.8'	08°51.1	-14.6'	59.3'
8	296°33.4	31.1	65°22.2	10.8'	09°05.7	-14.5'	59.2'
9	311°33.3	·· 30.4	79°52.0	10.8'	09°20.1	-14.4'	59.2'
10	326°33.2	29.6	94°21.8	10.8'	09°34.5	-14.4'	59.1'
11	341°33.2	28.9	108°51.6	10.8'	09°48.9	-14.3'	59.1'
12	356°33.1	S16°28.2	123°21.4	10.8'	S10°03.1	-14.2'	59.1'
13	11°33.1	27.4	137°51.2	10.8'	10°17.3	-14.1'	59.0'
14	26°33.0	26.7	152°21.0	10.8'	10°31.4	-14.1'	59.0'
15	41°32.9	·· 25.9	166°50.8	10.8'	10°45.4	-14.0'	59.0'
16	56°32.9	25.2	181°20.5	10.8'	10°59.3	-13.9'	58.9'
17	71°32.8	24.5	195°50.3	10.8'	11°13.2	-13.8'	58.9'
18	86°32.7	S16°23.7	210°20.1	10.8'	S11°27.0	-13.8'	58.8'
19	101°32.7	23.0	224°49.9	10.8'	11°40.7	-13.7'	58.8'
20	116°32.6	22.2	239°19.6	10.8'	11°54.3	-13.6'	58.8'
21	131°32.5	·· 21.5	253°49.4	10.7'	12°07.9	-13.5'	58.7'
22	146°32.5	20.8	268°19.1	10.7'	12°21.4	-13.4'	58.7'
23	161°32.4	20.0	282°48.9	10.7'	12°34.7	-13.3'	58.6'
	SD.=16.2	d=0.7	S.D.=16.1				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°32.4	S16°19.3	297°18.6	10.7'	S12°48.0	-13.3'	58.6'
1	191°32.3	18.5	311°48.3	10.7'	13°01.2	-13.2'	58.6'
2	206°32.2	17.8	326°18.0	10.7'	13°14.4	-13.1'	58.5'
3	221°32.2	·· 17.0	340°47.7	10.7'	13°27.4	-13.0'	58.5'
4	236°32.1	16.3	355°17.4	10.7'	13°40.3	-12.9'	58.4'
5	251°32.1	15.5	9°47.0	10.7'	13°53.2	-12.8'	58.4'
6	266°32.0	S16°14.8	24°16.7	10.6'	S14°06.0	-12.7'	58.4'
7	281°31.9	14.0	38°46.3	10.6'	14°18.6	-12.6'	58.3'
8	296°31.9	13.3	53°16.0	10.6'	14°31.2	-12.5'	58.3'
9	311°31.8	·· 12.6	67°45.6	10.6'	14°43.7	-12.4'	58.2'
10	326°31.8	11.8	82°15.2	10.6'	14°56.1	-12.3'	58.2'
11	341°31.7	11.1	96°44.7	10.6'	15°08.4	-12.2'	58.2'
12	356°31.6	S16°10.3	111°14.3	10.5'	S15°20.6	-12.1'	58.1'
13	11°31.6	09.6	125°43.8	10.5'	15°32.6	-12.0'	58.1'
14	26°31.5	08.8	140°13.3	10.5'	15°44.6	-11.9'	58.0'
15	41°31.5	·· 08.1	154°42.9	10.5'	15°56.5	-11.8'	58.0'
16	56°31.4	07.3	169°12.3	10.5'	16°08.3	-11.7'	58.0'
17	71°31.4	06.6	183°41.8	10.5'	16°20.0	-11.6'	57.9'
18	86°31.3	S16°05.8	198°11.3	10.4'	S16°31.6	-11.5'	57.9'
19	101°31.3	05.0	212°40.7	10.4'	16°43.1	-11.4'	57.8'
20	116°31.2	04.3	227°10.1	10.4'	16°54.5	-11.3'	57.8'
21	131°31.1	·· 03.5	241°39.5	10.4'	17°05.8	-11.2'	57.8'
22	146°31.1	02.8	256°08.9	10.4'	17°17.0	-11.1'	57.7'
23	161°31.0	02.0	270°38.2	10.3'	17°28.1	-11.0'	57.7'
	SD.=16.2	d=0.7	S.D.=15.8				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°31.0	S16°01.3	285°07.5	10.3'	S17°39.0	-10.9'	57.6'
1	191°30.9	16°00.5	299°36.8	10.3'	17°49.9	-10.8'	57.6'
2	206°30.9	15°59.8	314°06.1	10.3'	18°00.6	-10.7'	57.6'
3	221°30.8	·· 59.0	328°35.4	10.3'	18°11.3	-10.6'	57.5'
4	236°30.8	58.3	343°04.6	10.2'	18°21.8	-10.5'	57.5'
5	251°30.7	57.5	357°33.8	10.2'	18°32.2	-10.4'	57.5'
6	266°30.7	S15°56.7	12°03.0	10.2'	S18°42.5	-10.3'	57.4'
7	281°30.6	56.0	26°32.2	10.2'	18°52.7	-10.1'	57.4'
8	296°30.6	55.2	41°01.3	10.1'	19°02.8	-10.0'	57.3'
9	311°30.5	·· 54.5	55°30.5	10.1'	19°12.8	-9.9'	57.3'
10	326°30.5	53.7	69°59.6	10.1'	19°22.7	-9.8'	57.3'
11	341°30.4	52.9	84°28.7	10.1'	19°32.4	-9.7'	57.2'
12	356°30.4	S15°52.2	98°57.7	10.0'	S19°42.0	-9.6'	57.2'
13	11°30.3	51.4	113°26.8	10.0'	19°51.6	-9.5'	57.1'
14	26°30.3	50.7	127°55.8	10.0'	20°01.0	-9.3'	57.1'
15	41°30.2	·· 49.9	142°24.8	10.0'	20°10.2	-9.2'	57.1'
16	56°30.2	49.1	156°53.7	10.0'	20°19.4	-9.1'	57.0'
17	71°30.1	48.4	171°22.7	9.9'	20°28.5	-9.0'	57.0'
18	86°30.1	S15°47.6	185°51.6	9.9'	S20°37.4	-8.9'	57.0'
19	101°30.0	46.8	200°20.5	9.9'	20°46.2	-8.7'	56.9'
20	116°30.0	46.1	214°49.4	9.9'	20°54.9	-8.6'	56.9'
21	131°30.0	·· 45.3	229°18.2	9.8'	21°03.5	-8.5'	56.9'
22	146°29.9	44.5	243°47.1	9.8'	21°11.9	-8.4'	56.8'
23	161°29.9	43.8	258°15.9	9.8'	21°20.2	-8.3'	56.8'
	SD.=16.2	d=0.8	S.D.=15.6				

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 76-55%
03	13:44	13:48	12:14	03:29	15:54	
04	13:51	13:53	12:14	04:19	16:45	
05	13:56	13:58	12:14	05:10	17:36	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	136°01.5	170°06.9	S15°08.5	5°24.6	N22°53.2	159°27.6	S10°46.4	311°13.5	N00°35.7
1	151°04.0	185°06.3	07.4	20°28.1	53.4	174°29.5	46.2	326°16.1	35.8
2	166°06.4	200°05.7	06.4	35°31.5	53.6	189°31.4	46.0	341°18.6	35.8
3	181°08.9	215°05.1	·· 05.4	50°35.0	·· 53.9	204°33.3	·· 45.8	356°21.2	·· 35.9
4	196°11.4	230°04.5	04.4	65°38.4	54.1	219°35.2	45.6	11°23.8	35.9
5	211°13.8	245°03.9	03.4	80°41.9	54.3	234°37.1	45.3	26°26.3	36.0
6	226°16.3	260°03.3	S15°02.4	95°45.4	N22°54.5	249°39.0	S10°45.1	41°28.9	N00°36.0
7	241°18.8	275°02.7	01.4	110°48.8	54.8	264°40.9	44.9	56°31.4	36.1
8	256°21.2	290°02.0	15°00.4	125°52.3	55.0	279°42.9	44.7	71°34.0	36.1
9	271°23.7	305°01.4	14°59.4	140°55.7	·· 55.2	294°44.8	·· 44.5	86°36.5	·· 36.2
10	286°26.2	320°00.8	58.4	155°59.2	55.4	309°46.7	44.3	101°39.1	36.2
11	301°28.6	335°00.2	57.3	171°02.6	55.6	324°48.6	44.1	116°41.6	36.3
12	316°31.1	349°59.6	S14°56.3	186°06.1	N22°55.9	339°50.5	S10°43.8	131°44.2	N00°36.3
13	331°33.6	4°59.0	55.3	201°09.5	56.1	354°52.4	43.6	146°46.7	36.4
14	346°36.0	19°58.4	54.3	216°13.0	56.3	9°54.3	43.4	161°49.3	36.4
15	1°38.5	34°57.8	·· 53.3	231°16.4	·· 56.5	24°56.2	·· 43.2	176°51.8	·· 36.5
16	16°40.9	49°57.2	52.3	246°19.9	56.7	39°58.1	43.0	191°54.4	36.5
17	31°43.4	64°56.6	51.2	261°23.3	56.9	55°00.0	42.8	206°57.0	36.6
18	46°45.9	79°56.0	S14°50.2	276°26.7	N22°57.2	70°01.9	S10°42.5	221°59.5	N00°36.6
19	61°48.3	94°55.4	49.2	291°30.2	57.4	85°03.8	42.3	237°02.1	36.7
20	76°50.8	109°54.8	48.2	306°33.6	57.6	100°05.7	42.1	252°04.6	36.7
21	91°53.3	124°54.2	·· 47.2	321°37.1	·· 57.8	115°07.6	·· 41.9	267°07.2	·· 36.8
22	106°55.7	139°53.6	46.1	336°40.5	58.0	130°09.5	41.7	282°09.7	36.8
23	121°58.2	154°53.0	45.1	351°44.0	58.2	145°11.4	41.5	297°12.3	36.9
Mer.pass.:14:53		v-0.6 d1.0 m-3.8		v3.5 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.6 d0.0 m0.7	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	137°00.7	169°52.4	S14°44.1	6°47.4	N22°58.5	160°13.3	S10°41.3	312°14.8	N00°36.9
1	152°03.1	184°51.8	43.1	21°50.8	58.7	175°15.2	41.0	327°17.4	37.0
2	167°05.6	199°51.2	42.1	36°54.3	58.9	190°17.1	40.8	342°20.0	37.0
3	182°08.1	214°50.6	·· 41.0	51°57.7	·· 59.1	205°19.0	·· 40.6	357°22.5	·· 37.1
4	197°10.5	229°50.0	40.0	67°01.2	59.3	220°20.9	40.4	12°25.1	37.1
5	212°13.0	244°49.4	39.0	82°04.6	59.5	235°22.8	40.2	27°27.6	37.2
6	227°15.4	259°48.8	S14°38.0	97°08.0	N22°59.7	250°24.7	S10°40.0	42°30.2	N00°37.2
7	242°17.9	274°48.2	36.9	112°11.5	22°59.9	265°26.6	39.7	57°32.7	37.3
8	257°20.4	289°47.6	35.9	127°14.9	23°00.2	280°28.5	39.5	72°35.3	37.3
9	272°22.8	304°47.0	·· 34.9	142°18.4	·· 00.4	295°30.4	·· 39.3	87°37.9	·· 37.4
10	287°25.3	319°46.4	33.8	157°21.8	00.6	310°32.3	39.1	102°40.4	37.4
11	302°27.8	334°45.8	32.8	172°25.2	00.8	325°34.3	38.9	117°43.0	37.5
12	317°30.2	349°45.2	S14°31.8	187°28.7	N23°01.0	340°36.2	S10°38.7	132°45.5	N00°37.5
13	332°32.7	4°44.7	30.7	202°32.1	01.2	355°38.1	38.4	147°48.1	37.6
14	347°35.2	19°44.1	29.7	217°35.5	01.4	10°40.0	38.2	162°50.7	37.6
15	2°37.6	34°43.5	·· 28.7	232°39.0	·· 01.6	25°41.9	·· 38.0	177°53.2	·· 37.7
16	17°40.1	49°42.9	27.6	247°42.4	01.8	40°43.8	37.8	192°55.8	37.7
17	32°42.6	64°42.3	26.6	262°45.8	02.0	55°45.7	37.6	207°58.3	37.8
18	47°45.0	79°41.7	S14°25.6	277°49.3	N23°02.2	70°47.6	S10°37.4	223°00.9	N00°37.8
19	62°47.5	94°41.1	24.5	292°52.7	02.4	85°49.5	37.1	238°03.4	37.9
20	77°49.9	109°40.5	23.5	307°56.1	02.7	100°51.4	36.9	253°06.0	38.0
21	92°52.4	124°39.9	·· 22.5	322°59.5	·· 02.9	115°53.3	·· 36.7	268°08.6	·· 38.0
22	107°54.9	139°39.3	21.4	338°03.0	03.1	130°55.2	36.5	283°11.1	38.1
23	122°57.3	154°38.8	20.4	353°06.4	03.3	145°57.1	36.3	298°13.7	38.1
Mer.pass.:14:50		v-0.6 d1.0 m-3.8		v3.4 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	137°59.8	169°38.2	S14°19.3	8°09.8	N23°03.5	160°59.0	S10°36.1	313°16.2	N00°38.2
1	153°02.3	184°37.6	18.3	23°13.3	03.7	176°00.9	35.8	328°18.8	38.2
2	168°04.7	199°37.0	17.3	38°16.7	03.9	191°02.8	35.6	343°21.4	38.3
3	183°07.2	214°36.4	·· 16.2	53°20.1	·· 04.1	206°04.7	·· 35.4	358°23.9	·· 38.3
4	198°09.7	229°35.8	15.2	68°23.5	04.3	221°06.6	35.2	13°26.5	38.4
5	213°12.1	244°35.2	14.1	83°27.0	04.5	236°08.5	35.0	28°29.0	38.4
6	228°14.6	259°34.7	S14°13.1	98°30.4	N23°04.7	251°10.4	S10°34.8	43°31.6	N00°38.5
7	243°17.0	274°34.1	12.1	113°33.8	04.9	266°12.3	34.5	58°34.2	38.5
8	258°19.5	289°33.5	11.0	128°37.2	05.1	281°14.2	34.3	73°36.7	38.6
9	273°22.0	304°32.9	·· 10.0	143°40.6	·· 05.3	296°16.1	·· 34.1	88°39.3	·· 38.6
10	288°24.4	319°32.3	08.9	158°44.1	05.5	311°18.0	33.9	103°41.8	38.7
11	303°26.9	334°31.7	07.9	173°47.5	05.7	326°19.9	33.7	118°44.4	38.7
12	318°29.4	349°31.2	S14°06.8	188°50.9	N23°05.9	341°21.8	S10°33.5	133°47.0	N00°38.8
13	333°31.8	4°30.6	05.8	203°54.3	06.1	356°23.7	33.2	148°49.5	38.8
14	348°34.3	19°30.0	04.7	218°57.7	06.3	11°25.6	33.0	163°52.1	38.9
15	3°36.8	34°29.4	·· 03.7	234°01.1	·· 06.5	26°27.5	·· 32.8	178°54.7	·· 39.0
16	18°39.2	49°28.8	02.6	249°04.6	06.7	41°29.4	32.6	193°57.2	39.0
17	33°41.7	64°28.3	01.6	264°08.0	06.9	56°31.3	32.4	208°59.8	39.1
18	48°44.2	79°27.7	S14°00.5	279°11.4	N23°07.1	71°33.2	S10°32.2	224°02.3	N00°39.1
19	63°46.6	94°27.1	13°59.5	294°14.8	07.3	86°35.1	31.9	239°04.9	39.2
20	78°49.1	109°26.5	58.4	309°18.2	07.5	101°37.0	31.7	254°07.5	39.2
21	93°51.5	124°26.0	·· 57.4	324°21.6	·· 07.7	116°38.9	·· 31.5	269°10.0	·· 39.3
22	108°54.0	139°25.4	56.3	339°25.0	07.8	131°40.8	31.3	284°12.6	39.3
23	123°56.5	154°24.8	55.3	354°28.5	08.0	146°42.7	31.1	299°15.2	39.4
Mer.pass.:14:46		v-0.6 d1.0 m-3.8		v3.4 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.3	-42°15.2
Schedar	349°43.8	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.6	-57°11.3
Hamal	328°03.6	23°30.7
Polaris	319°01.3	89°18.9
Acamar	315°20.1	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.9	49°54.1
Aldebaran	290°52.0	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.7
Suhail	222°53.9	-43°28.5
Miaplacidus	221°39.5	-69°45.6
Alphard	217°58.2	-8°42.3
Regulus	207°45.8	11°54.9
Dubhe	193°53.8	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.6	-17°36.0
Acrux	173°11.8	-63°09.2
Gacrux	172°03.4	-57°10.1
Alioth	166°22.3	55°53.9
Spica	158°33.7	-11°13.0
Alkaid	153°00.5	49°15.4
Hadar	148°51.4	-60°25.2
Menkent	148°10.4	-36°25.2
Arcturus	145°57.8	19°07.5
Rigil Kent.	139°55.1	-60°52.4
Kochab	137°19.5	74°06.4
Zuben'ubi	137°08.1	-16°05.1
Alphecca	126°13.1	26°40.5
Antares	112°29.4	-26°27.3
Atria	107°33.8	-69°02.5
Sabik	102°15.5	-15°44.3
Shaula	96°25.5	-37°06.6
Rasalhague	96°08.9	12°33.0
Eltanin	90°47.6	51°29.0
Kaus Aust.	83°47.3	-34°22.7
Vega	80°41.0	38°47.4
Nunki	76°01.6	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.5	-56°42.1
Deneb	49°33.7	45°18.9
Enif	33°49.8	9°55.3
Al Na'ir	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.1	15°15.6

Feb 06 Sat	**SHA**	**Mer.pass**
Venus	34°05.4	12:40
Mars	229°23.1	23:33
Jupiter	23°26.1	13:20
Saturn	175°12.0	03:15

Feb 07 Sun	**SHA**	**Mer.pass**
Venus	32°51.7	12:41
Mars	229°46.7	23:27
Jupiter	23°12.7	13:17
Saturn	175°14.2	03:10

Feb 08 Mon	**SHA**	**Mer.pass**
Venus	31°38.4	12:42
Mars	230°10.0	23:22
Jupiter	22°59.2	13:14
Saturn	175°16.4	03:06

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°29.8	S15°43.0	272°44.7	9.8'	S21°28.4	-8.1'	56.8'
1	191°29.8	42.2	287°13.5	9.8'	21°36.5	-8.0'	56.7'
2	206°29.7	41.5	301°42.2	9.7'	21°44.5	-7.9'	56.7'
3	221°29.7	·· 40.7	316°11.0	9.7'	21°52.3	-7.8'	56.6'
4	236°29.6	39.9	330°39.7	9.7'	22°00.0	-7.6'	56.6'
5	251°29.6	39.2	345°08.4	9.7'	22°07.6	-7.5'	56.6'
6	266°29.6	S15°38.4	359°37.0	9.7'	S22°15.1	-7.4'	56.5'
7	281°29.5	37.6	14°05.7	9.6'	22°22.4	-7.3'	56.5'
8	296°29.5	36.9	28°34.3	9.6'	22°29.6	-7.1'	56.5'
9	311°29.4	·· 36.1	43°02.9	9.6'	22°36.7	-7.0'	56.4'
10	326°29.4	35.3	57°31.5	9.6'	22°43.7	-6.9'	56.4'
11	341°29.3	34.5	72°00.1	9.6'	22°50.5	-6.8'	56.4'
12	356°29.3	S15°33.8	86°28.7	9.6'	S22°57.2	-6.6'	56.3'
13	11°29.3	33.0	100°57.2	9.5'	23°03.8	-6.5'	56.3'
14	26°29.2	32.2	115°25.7	9.5'	23°10.2	-6.4'	56.3'
15	41°29.2	·· 31.5	129°54.3	9.5'	23°16.5	-6.3'	56.2'
16	56°29.1	30.7	144°22.8	9.5'	23°22.7	-6.1'	56.2'
17	71°29.1	29.9	158°51.2	9.5'	23°28.8	-6.0'	56.2'
18	86°29.1	S15°29.1	173°19.7	9.5'	S23°34.7	-5.9'	56.2'
19	101°29.0	28.4	187°48.2	9.5'	23°40.5	-5.7'	56.1'
20	116°29.0	27.6	202°16.6	9.4'	23°46.2	-5.6'	56.1'
21	131°29.0	·· 26.8	216°45.0	9.4'	23°51.7	-5.5'	56.1'
22	146°28.9	26.0	231°13.5	9.4'	23°57.1	-5.3'	56.0'
23	161°28.9	25.3	245°41.9	9.4'	24°02.4	-5.2'	56.0'
	SD.=16.2	d=0.8	S.D.=15.4				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°28.8	S15°24.5	260°10.3	9.4'	S24°07.6	-5.1'	56.0'
1	191°28.8	23.7	274°38.7	9.4'	24°12.6	-5.0'	55.9'
2	206°28.8	22.9	289°07.0	9.4'	24°17.5	-4.8'	55.9'
3	221°28.7	·· 22.1	303°35.4	9.4'	24°22.2	-4.7'	55.9'
4	236°28.7	21.4	318°03.8	9.4'	24°26.9	-4.6'	55.8'
5	251°28.7	20.6	332°32.1	9.4'	24°31.4	-4.4'	55.8'
6	266°28.6	S15°19.8	347°00.5	9.3'	S24°35.7	-4.3'	55.8'
7	281°28.6	19.0	1°28.8	9.3'	24°39.9	-4.2'	55.8'
8	296°28.6	18.2	15°57.2	9.3'	24°44.0	-4.0'	55.7'
9	311°28.5	·· 17.5	30°25.5	9.3'	24°48.0	-3.9'	55.7'
10	326°28.5	16.7	44°53.8	9.3'	24°51.8	-3.8'	55.7'
11	341°28.5	15.9	59°22.2	9.3'	24°55.5	-3.6'	55.7'
12	356°28.4	S15°15.1	73°50.5	9.3'	S24°59.1	-3.5'	55.6'
13	11°28.4	14.3	88°18.8	9.3'	25°02.5	-3.4'	55.6'
14	26°28.4	13.5	102°47.2	9.3'	25°05.8	-3.2'	55.6'
15	41°28.3	·· 12.8	117°15.5	9.3'	25°09.0	-3.1'	55.5'
16	56°28.3	12.0	131°43.8	9.3'	25°12.0	-3.0'	55.5'
17	71°28.3	11.2	146°12.2	9.3'	25°14.9	-2.8'	55.5'
18	86°28.2	S15°10.4	160°40.5	9.3'	S25°17.7	-2.7'	55.5'
19	101°28.2	09.6	175°08.9	9.3'	25°20.3	-2.6'	55.4'
20	116°28.2	08.8	189°37.2	9.4'	25°22.8	-2.4'	55.4'
21	131°28.1	·· 08.0	204°05.6	9.4'	25°25.2	-2.3'	55.4'
22	146°28.1	07.3	218°33.9	9.4'	25°27.4	-2.2'	55.4'
23	161°28.1	06.5	233°02.3	9.4'	25°29.5	-2.0'	55.3'
	SD.=16.2	d=0.8	S.D.=15.2				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°28.1	S15°05.7	247°30.7	9.4'	S25°31.5	-1.9'	55.3'
1	191°28.0	04.9	261°59.1	9.4'	25°33.3	-1.8'	55.3'
2	206°28.0	04.1	276°27.5	9.4'	25°35.0	-1.6'	55.3'
3	221°28.0	·· 03.3	290°55.9	9.4'	25°36.6	-1.5'	55.2'
4	236°27.9	02.5	305°24.3	9.4'	25°38.0	-1.4'	55.2'
5	251°27.9	01.7	319°52.8	9.4'	25°39.3	-1.2'	55.2'
6	266°27.9	S15°00.9	334°21.2	9.5'	S25°40.5	-1.1'	55.2'
7	281°27.9	15°00.1	348°49.7	9.5'	25°41.6	-1.0'	55.1'
8	296°27.8	14°59.3	3°18.2	9.5'	25°42.5	-0.8'	55.1'
9	311°27.8	·· 58.6	17°46.7	9.5'	25°43.2	-0.7'	55.1'
10	326°27.8	57.8	32°15.2	9.5'	25°43.9	-0.6'	55.1'
11	341°27.8	57.0	46°43.8	9.6'	25°44.4	-0.4'	55.1'
12	356°27.7	S14°56.2	61°12.3	9.6'	S25°44.8	-0.3'	55.0'
13	11°27.7	55.4	75°40.9	9.6'	25°45.0	-0.2'	55.0'
14	26°27.7	54.6	90°09.5	9.6'	25°45.2	-0.1'	55.0'
15	41°27.7	·· 53.8	104°38.2	9.6'	25°45.2	0.1'	55.0'
16	56°27.6	53.0	119°06.8	9.7'	25°45.0	0.2'	54.9'
17	71°27.6	52.2	133°35.5	9.7'	25°44.7	0.3'	54.9'
18	86°27.6	S14°51.4	148°04.2	9.7'	S25°44.3	0.5'	54.9'
19	101°27.6	50.6	162°32.9	9.7'	25°43.8	0.6'	54.9'
20	116°27.6	49.8	177°01.7	9.8'	25°43.2	0.7'	54.9'
21	131°27.5	·· 49.0	191°30.5	9.8'	25°42.4	0.8'	54.8'
22	146°27.5	48.2	205°59.3	9.8'	25°41.5	1.0'	54.8'
23	161°27.5	47.4	220°28.1	9.9'	25°40.4	1.1'	54.8'
	SD.=16.2	d=0.8	S.D.=15.0				

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

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

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 22-24 45-26%
06	14:01	14:03	12:14	06:02	18:28	
07	14:05	14:06	12:14	06:54	19:20	
08	14:08	14:09	12:14	07:46	20:12	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	138°58.9	169°24.2	S13°54.2	9°31.9	N23°08.2	161°44.6	S10°30.9	314°17.7	N00°39.4
1	154°01.4	184°23.7	53.1	24°35.3	08.4	176°46.5	30.6	329°20.3	39.5
2	169°03.9	199°23.1	52.1	39°38.7	08.6	191°48.5	30.4	344°22.8	39.5
3	184°06.3	214°22.5	·· 51.0	54°42.1	·· 08.8	206°50.4	·· 30.2	359°25.4	·· 39.6
4	199°08.8	229°21.9	50.0	69°45.5	09.0	221°52.3	30.0	14°28.0	39.6
5	214°11.3	244°21.4	48.9	84°48.9	09.2	236°54.2	29.8	29°30.5	39.7
6	229°13.7	259°20.8	S13°47.9	99°52.3	N23°09.4	251°56.1	S10°29.6	44°33.1	N00°39.8
7	244°16.2	274°20.2	46.8	114°55.7	09.6	266°58.0	29.3	59°35.7	39.8
8	259°18.7	289°19.6	45.7	129°59.1	09.8	281°59.9	29.1	74°38.2	39.9
9	274°21.1	304°19.1	·· 44.7	145°02.5	·· 10.0	297°01.8	·· 28.9	89°40.8	·· 39.9
10	289°23.6	319°18.5	43.6	160°05.9	10.1	312°03.7	28.7	104°43.4	40.0
11	304°26.0	334°17.9	42.6	175°09.3	10.3	327°05.6	28.5	119°45.9	40.0
12	319°28.5	349°17.4	S13°41.5	190°12.7	N23°10.5	342°07.5	S10°28.2	134°48.5	N00°40.1
13	334°31.0	4°16.8	40.4	205°16.1	10.7	357°09.4	28.0	149°51.1	40.1
14	349°33.4	19°16.2	39.4	220°19.5	10.9	12°11.3	27.8	164°53.6	40.2
15	4°35.9	34°15.7	·· 38.3	235°22.9	·· 11.1	27°13.2	·· 27.6	179°56.2	·· 40.2
16	19°38.4	49°15.1	37.2	250°26.3	11.3	42°15.1	27.4	194°58.8	40.3
17	34°40.8	64°14.5	36.2	265°29.7	11.5	57°17.0	27.2	210°01.3	40.4
18	49°43.3	79°14.0	S13°35.1	280°33.1	N23°11.6	72°18.9	S10°26.9	225°03.9	N00°40.4
19	64°45.8	94°13.4	34.0	295°36.5	11.8	87°20.8	26.7	240°06.5	40.5
20	79°48.2	109°12.8	33.0	310°39.9	12.0	102°22.7	26.5	255°09.0	40.5
21	94°50.7	124°12.3	·· 31.9	325°43.3	·· 12.2	117°24.6	·· 26.3	270°11.6	·· 40.6
22	109°53.2	139°11.7	30.8	340°46.7	12.4	132°26.5	26.1	285°14.2	40.6
23	124°55.6	154°11.1	29.8	355°50.1	12.6	147°28.4	25.9	300°16.7	40.7
Mer.pass.:14:42		v-0.6 d1.1 m-3.8		v3.4 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	139°58.1	169°10.6	S13°28.7	10°53.5	N23°12.7	162°30.3	S10°25.6	315°19.3	N00°40.7
1	155°00.5	184°10.0	27.6	25°56.8	12.9	177°32.2	25.4	330°21.9	40.8
2	170°03.0	199°09.5	26.5	41°00.2	13.1	192°34.1	25.2	345°24.4	40.8
3	185°05.5	214°08.9	·· 25.5	56°03.6	·· 13.3	207°36.0	·· 25.0	0°27.0	·· 40.9
4	200°07.9	229°08.3	24.4	71°07.0	13.5	222°37.9	24.8	15°29.6	41.0
5	215°10.4	244°07.8	23.3	86°10.4	13.7	237°39.8	24.5	30°32.1	41.0
6	230°12.9	259°07.2	S13°22.2	101°13.8	N23°13.8	252°41.7	S10°24.3	45°34.7	N00°41.1
7	245°15.3	274°06.7	21.2	116°17.2	14.0	267°43.6	24.1	60°37.3	41.1
8	260°17.8	289°06.1	20.1	131°20.5	14.2	282°45.5	23.9	75°39.8	41.2
9	275°20.3	304°05.5	·· 19.0	146°23.9	·· 14.4	297°47.4	·· 23.7	90°42.4	·· 41.2
10	290°22.7	319°05.0	17.9	161°27.3	14.6	312°49.3	23.5	105°45.0	41.3
11	305°25.2	334°04.4	16.9	176°30.7	14.7	327°51.2	23.2	120°47.5	41.3
12	320°27.7	349°03.9	S13°15.8	191°34.1	N23°14.9	342°53.1	S10°23.0	135°50.1	N00°41.4
13	335°30.1	4°03.3	14.7	206°37.5	15.1	357°55.0	22.8	150°52.7	41.5
14	350°32.6	19°02.7	13.6	221°40.8	15.3	12°56.9	22.6	165°55.2	41.5
15	5°35.0	34°02.2	·· 12.5	236°44.2	·· 15.4	27°58.8	·· 22.4	180°57.8	·· 41.6
16	20°37.5	49°01.6	11.5	251°47.6	15.6	43°00.7	22.1	196°00.4	41.6
17	35°40.0	64°01.1	10.4	266°51.0	15.8	58°02.6	21.9	211°02.9	41.7
18	50°42.4	79°00.5	S13°09.3	281°54.3	N23°16.0	73°04.5	S10°21.7	226°05.5	N00°41.7
19	65°44.9	94°00.0	08.2	296°57.7	16.1	88°06.4	21.5	241°08.1	41.8
20	80°47.4	108°59.4	07.1	312°01.1	16.3	103°08.3	21.3	256°10.7	41.9
21	95°49.8	123°58.9	·· 06.0	327°04.5	·· 16.5	118°10.2	·· 21.1	271°13.2	·· 41.9
22	110°52.3	138°58.3	05.0	342°07.8	16.7	133°12.1	20.8	286°15.8	42.0
23	125°54.8	153°57.8	03.9	357°11.2	16.8	148°14.0	20.6	301°18.4	42.0
Mer.pass.:14:38		v-0.6 d1.1 m-3.8		v3.4 d0.2 m-1.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	140°57.2	168°57.2	S13°02.8	12°14.6	N23°17.0	163°15.9	S10°20.4	316°20.9	N00°42.1
1	155°59.7	183°56.7	01.7	27°17.9	17.2	178°17.8	20.2	331°23.5	42.1
2	171°02.1	198°56.1	13°00.6	42°21.3	17.3	193°19.7	20.0	346°26.1	42.2
3	186°04.6	213°55.6	12°59.5	57°24.7	·· 17.5	208°21.6	·· 19.7	1°28.6	·· 42.2
4	201°07.1	228°55.0	58.4	72°28.0	17.7	223°23.5	19.5	16°31.2	42.3
5	216°09.5	243°54.5	57.4	87°31.4	17.9	238°25.4	19.3	31°33.8	42.4
6	231°12.0	258°53.9	S12°56.3	102°34.8	N23°18.0	253°27.3	S10°19.1	46°36.4	N00°42.4
7	246°14.5	273°53.4	55.2	117°38.1	18.2	268°29.2	18.9	61°38.9	42.5
8	261°16.9	288°52.8	54.1	132°41.5	18.4	283°31.1	18.6	76°41.5	42.5
9	276°19.4	303°52.3	·· 53.0	147°44.9	·· 18.5	298°33.0	·· 18.4	91°44.1	·· 42.6
10	291°21.9	318°51.7	51.9	162°48.2	18.7	313°34.9	18.2	106°46.6	42.6
11	306°24.3	333°51.2	50.8	177°51.6	18.9	328°36.8	18.0	121°49.2	42.7
12	321°26.8	348°50.6	S12°49.7	192°54.9	N23°19.0	343°38.7	S10°17.8	136°51.8	N00°42.8
13	336°29.3	3°50.1	48.6	207°58.3	19.2	358°40.6	17.6	151°54.4	42.8
14	351°31.7	18°49.5	47.5	223°01.7	19.4	13°42.5	17.3	166°56.9	42.9
15	6°34.2	33°49.0	·· 46.4	238°05.0	·· 19.5	28°44.4	·· 17.1	181°59.5	·· 42.9
16	21°36.6	48°48.4	45.3	253°08.4	19.7	43°46.3	16.9	197°02.1	43.0
17	36°39.1	63°47.9	44.2	268°11.7	19.9	58°48.2	16.7	212°04.6	43.0
18	51°41.6	78°47.4	S12°43.1	283°15.1	N23°20.0	73°50.1	S10°16.5	227°07.2	N00°43.1
19	66°44.0	93°46.8	42.1	298°18.4	20.2	88°52.0	16.2	242°09.8	43.2
20	81°46.5	108°46.3	41.0	313°21.8	20.4	103°53.9	16.0	257°12.4	43.2
21	96°49.0	123°45.7	·· 39.9	328°25.1	·· 20.5	118°55.8	·· 15.8	272°14.9	·· 43.3
22	111°51.4	138°45.2	38.8	343°28.5	20.7	133°57.7	15.6	287°17.5	43.3
23	126°53.9	153°44.7	37.7	358°31.8	20.8	148°59.6	15.4	302°20.1	43.4
Mer.pass.:14:34		v-0.6 d1.1 m-3.8		v3.4 d0.2 m-1.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.9
Ankaa	353°18.3	-42°15.2
Schedar	349°43.8	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.6	-57°11.3
Hamal	328°03.6	23°30.7
Polaris	319°02.5	89°18.9
Acamar	315°20.1	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.9	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.8	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.1	-28°59.3
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.7
Suhail	222°53.9	-43°28.6
Miaplacidus	221°39.5	-69°45.6
Alphard	217°58.2	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°53.8	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.6	-17°36.0
Acrux	173°11.8	-63°09.3
Gacrux	172°03.4	-57°10.2
Alioth	166°22.3	55°53.9
Spica	158°33.7	-11°13.0
Alkaid	153°00.5	49°15.4
Hadar	148°51.3	-60°25.2
Menkent	148°10.4	-36°25.2
Arcturus	145°57.8	19°07.5
Rigil Kent.	139°55.0	-60°52.4
Kochab	137°19.5	74°06.4
Zuben'ubi	137°08.1	-16°05.1
Alphecca	126°13.1	26°40.5
Antares	112°29.4	-26°27.3
Atria	107°33.7	-69°02.5
Sabik	102°15.5	-15°44.3
Shaula	96°25.4	-37°06.6
Rasalhague	96°08.9	12°33.0
Eltanin	90°47.6	51°29.0
Kaus Aust.	83°47.3	-34°22.7
Vega	80°40.9	38°47.4
Nunki	76°01.6	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.5	-56°42.1
Deneb	49°33.7	45°18.9
Enif	33°49.8	9°55.3
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 09 Tue	**SHA**	**Mer.pass**
Venus	30°25.3	12:43
Mars	230°32.9	23:17
Jupiter	22°45.7	13:11
Saturn	175°18.8	03:02

Feb 10 Wed	**SHA**	**Mer.pass**
Venus	29°12.5	12:44
Mars	230°55.4	23:11
Jupiter	22°32.2	13:08
Saturn	175°21.2	02:58

Feb 11 Thu	**SHA**	**Mer.pass**
Venus	28°00.0	12:45
Mars	231°17.3	23:06
Jupiter	22°18.7	13:05
Saturn	175°23.7	02:54

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°27.5	S14°46.6	234°57.0	9.9'	S25°39.3	1.2'	54.8'
1	191°27.5	45.8	249°25.9	9.9'	25°38.0	1.4'	54.8'
2	206°27.4	45.0	263°54.9	10.0'	25°36.5	1.5'	54.8'
3	221°27.4	· · 44.2	278°23.8	10.0'	25°35.0	1.6'	54.7'
4	236°27.4	43.4	292°52.8	10.0'	25°33.3	1.7'	54.7'
5	251°27.4	42.6	307°21.9	10.1'	25°31.5	1.9'	54.7'
6	266°27.4	S14°41.8	321°51.0	10.1'	S25°29.6	2.0'	54.7'
7	281°27.3	41.0	336°20.1	10.1'	25°27.6	2.1'	54.7'
8	296°27.3	40.2	350°49.2	10.2'	25°25.4	2.2'	54.6'
9	311°27.3	· · 39.4	5°18.4	10.2'	25°23.1	2.4'	54.6'
10	326°27.3	38.6	19°47.7	10.3'	25°20.7	2.5'	54.6'
11	341°27.3	37.8	34°16.9	10.3'	25°18.1	2.6'	54.6'
12	356°27.3	S14°37.0	48°46.2	10.3'	S25°15.5	2.7'	54.6'
13	11°27.2	36.2	63°15.6	10.4'	25°12.7	2.8'	54.6'
14	26°27.2	35.4	77°45.0	10.4'	25°09.8	3.0'	54.5'
15	41°27.2	· · 34.6	92°14.4	10.5'	25°06.7	3.1'	54.5'
16	56°27.2	33.8	106°43.9	10.5'	25°03.6	3.2'	54.5'
17	71°27.2	33.0	121°13.4	10.5'	25°00.3	3.3'	54.5'
18	86°27.2	S14°32.2	135°43.0	10.6'	S24°56.9	3.4'	54.5'
19	101°27.1	31.4	150°12.6	10.6'	24°53.4	3.6'	54.5'
20	116°27.1	30.5	164°42.3	10.7'	24°49.8	3.7'	54.5'
21	131°27.1	· · 29.7	179°12.0	10.7'	24°46.1	3.8'	54.4'
22	146°27.1	28.9	193°41.7	10.8'	24°42.2	3.9'	54.4'
23	161°27.1	28.1	208°11.5	10.8'	24°38.2	4.0'	54.4'
	SD.=16.2	d=0.8	S.D.=14.9				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°27.1	S14°27.3	222°41.4	10.9'	S24°34.1	4.1'	54.4'
1	191°27.1	26.5	237°11.3	10.9'	24°29.9	4.3'	54.4'
2	206°27.1	25.7	251°41.3	11.0'	24°25.6	4.4'	54.4'
3	221°27.0	· · 24.9	266°11.3	11.0'	24°21.2	4.5'	54.4'
4	236°27.0	24.1	280°41.3	11.1'	24°16.7	4.6'	54.4'
5	251°27.0	23.3	295°11.4	11.1'	24°12.0	4.7'	54.3'
6	266°27.0	S14°22.4	309°41.6	11.2'	S24°07.2	4.8'	54.3'
7	281°27.0	21.6	324°11.8	11.2'	24°02.3	4.9'	54.3'
8	296°27.0	20.8	338°42.0	11.3'	23°57.4	5.0'	54.3'
9	311°27.0	· · 20.0	353°12.3	11.3'	23°52.3	5.2'	54.3'
10	326°27.0	19.2	7°42.7	11.4'	23°47.0	5.3'	54.3'
11	341°27.0	18.4	22°13.1	11.4'	23°41.7	5.4'	54.3'
12	356°27.0	S14°17.6	36°43.6	11.5'	S23°36.3	5.5'	54.3'
13	11°26.9	16.7	51°14.1	11.6'	23°30.8	5.6'	54.2'
14	26°26.9	15.9	65°44.7	11.6'	23°25.1	5.7'	54.2'
15	41°26.9	· · 15.1	80°15.3	11.7'	23°19.4	5.8'	54.2'
16	56°26.9	14.3	94°46.0	11.7'	23°13.5	5.9'	54.2'
17	71°26.9	13.5	109°16.8	11.8'	23°07.6	6.0'	54.2'
18	86°26.9	S14°12.7	123°47.6	11.8'	S23°01.5	6.1'	54.2'
19	101°26.9	11.9	138°18.5	11.9'	22°55.4	6.2'	54.2'
20	116°26.9	11.0	152°49.4	11.9'	22°49.1	6.3'	54.2'
21	131°26.9	· · 10.2	167°20.3	12.0'	22°42.7	6.4'	54.2'
22	146°26.9	09.4	181°51.4	12.1'	22°36.3	6.5'	54.2'
23	161°26.9	08.6	196°22.5	12.1'	22°29.7	6.6'	54.1'
	SD.=16.2	d=0.8	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°26.9	S14°07.8	210°53.6	12.2'	S22°23.0	6.7'	54.1'
1	191°26.9	06.9	225°24.8	12.2'	22°16.3	6.8'	54.1'
2	206°26.9	06.1	239°56.1	12.3'	22°09.4	6.9'	54.1'
3	221°26.9	· · 05.3	254°27.4	12.3'	22°02.4	7.0'	54.1'
4	236°26.9	04.5	268°58.8	12.4'	21°55.4	7.1'	54.1'
5	251°26.9	03.7	283°30.2	12.5'	21°48.2	7.2'	54.1'
6	266°26.9	S14°02.8	298°01.7	12.5'	S21°41.0	7.3'	54.1'
7	281°26.9	02.0	312°33.3	12.6'	21°33.7	7.4'	54.1'
8	296°26.9	01.2	327°04.9	12.6'	21°26.2	7.5'	54.1'
9	311°26.9	14°00.4	341°36.5	12.7'	21°18.7	7.6'	54.1'
10	326°26.8	13°59.5	356°08.3	12.8'	21°11.1	7.7'	54.1'
11	341°26.8	58.7	10°40.0	12.8'	21°03.4	7.8'	54.1'
12	356°26.8	S13°57.9	25°11.9	12.9'	S20°55.6	7.8'	54.0'
13	11°26.8	57.1	39°43.8	12.9'	20°47.7	7.9'	54.0'
14	26°26.8	56.2	54°15.7	13.0'	20°39.7	8.0'	54.0'
15	41°26.8	· · 55.4	68°47.8	13.0'	20°31.7	8.1'	54.0'
16	56°26.8	54.6	83°19.8	13.1'	20°23.5	8.2'	54.0'
17	71°26.8	53.8	97°52.0	13.2'	20°15.3	8.3'	54.0'
18	86°26.9	S13°52.9	112°24.2	13.2'	S20°06.9	8.4'	54.0'
19	101°26.9	52.1	126°56.4	13.3'	19°58.5	8.4'	54.0'
20	116°26.9	51.3	141°28.7	13.3'	19°50.1	8.5'	54.0'
21	131°26.9	· · 50.5	156°01.1	13.4'	19°41.5	8.6'	54.0'
22	146°26.9	49.6	170°33.5	13.4'	19°32.8	8.7'	54.0'
23	161°26.9	48.8	185°06.0	13.5'	19°24.1	8.8'	54.0'
	SD.=16.2	d=0.8	S.D.=14.7				

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

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

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 18-6%
09	14:10	14:11	12:14	08:38	21:03	
10	14:12	14:12	12:14	09:28	21:52	
11	14:12	14:13	12:14	10:16	22:39	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	141°56.4	168°44.1	**S**12°36.6	13°35.2	**N**23°21.0	164°01.5	**S**10°15.1	317°22.7	**N**00°43.4
1	156°58.8	183°43.6	35.5	28°38.5	21.2	179°03.4	14.9	332°25.2	43.5
2	172°01.3	198°43.0	34.4	43°41.9	21.3	194°05.3	14.7	347°27.8	43.6
3	187°03.8	213°42.5	·· 33.3	58°45.2	·· 21.5	209°07.2	·· 14.5	2°30.4	·· 43.6
4	202°06.2	228°42.0	32.2	73°48.5	21.6	224°09.1	14.3	17°33.0	43.7
5	217°08.7	243°41.4	31.0	88°51.9	21.8	239°11.0	14.0	32°35.5	43.7
6	232°11.1	258°40.9	**S**12°29.9	103°55.2	**N**23°22.0	254°12.9	**S**10°13.8	47°38.1	**N**00°43.8
7	247°13.6	273°40.3	28.8	118°58.6	22.1	269°14.8	13.6	62°40.7	43.9
8	262°16.1	288°39.8	27.7	134°01.9	22.3	284°16.7	13.4	77°43.3	43.9
9	277°18.5	303°39.3	·· 26.6	149°05.3	·· 22.4	299°18.6	·· 13.2	92°45.8	·· 44.0
10	292°21.0	318°38.7	25.5	164°08.6	22.6	314°20.5	12.9	107°48.4	44.0
11	307°23.5	333°38.2	24.4	179°11.9	22.7	329°22.4	12.7	122°51.0	44.1
12	322°25.9	348°37.7	**S**12°23.3	194°15.3	**N**23°22.9	344°24.3	**S**10°12.5	137°53.6	**N**00°44.1
13	337°28.4	3°37.1	22.2	209°18.6	23.1	359°26.2	12.3	152°56.1	44.2
14	352°30.9	18°36.6	21.1	224°21.9	23.2	14°28.1	12.1	167°58.7	44.3
15	7°33.3	33°36.1	·· 20.0	239°25.3	·· 23.4	29°30.0	·· 11.8	183°01.3	·· 44.3
16	22°35.8	48°35.5	18.9	254°28.6	23.5	44°31.9	11.6	198°03.9	44.4
17	37°38.2	63°35.0	17.8	269°31.9	23.7	59°33.8	11.4	213°06.4	44.4
18	52°40.7	78°34.5	**S**12°16.7	284°35.3	**N**23°23.8	74°35.7	**S**10°11.2	228°09.0	**N**00°44.5
19	67°43.2	93°33.9	15.5	299°38.6	24.0	89°37.6	11.0	243°11.6	44.6
20	82°45.6	108°33.4	14.4	314°41.9	24.1	104°39.5	10.8	258°14.2	44.6
21	97°48.1	123°32.9	·· 13.3	329°45.2	·· 24.3	119°41.4	·· 10.5	273°16.7	·· 44.7
22	112°50.6	138°32.3	12.2	344°48.6	24.4	134°43.3	10.3	288°19.3	44.7
23	127°53.0	153°31.8	11.1	359°51.9	24.6	149°45.2	10.1	303°21.9	44.8
Mer.pass.:14:30		v-0.5 d1.1 m-3.8		v3.3 d0.2 m-1.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	142°55.5	168°31.3	**S**12°10.0	14°55.2	**N**23°24.7	164°47.1	**S**10°09.9	318°24.5	**N**00°44.8
1	157°58.0	183°30.8	08.9	29°58.5	24.9	179°49.0	09.7	333°27.0	44.9
2	173°00.4	198°30.2	07.8	45°01.9	25.0	194°50.9	09.4	348°29.6	45.0
3	188°02.9	213°29.7	·· 06.6	60°05.2	·· 25.2	209°52.8	·· 09.2	3°32.2	·· 45.0
4	203°05.4	228°29.2	05.5	75°08.5	25.3	224°54.7	09.0	18°34.8	45.1
5	218°07.8	243°28.6	04.4	90°11.8	25.5	239°56.6	08.8	33°37.4	45.1
6	233°10.3	258°28.1	**S**12°03.3	105°15.1	**N**23°25.6	254°58.5	**S**10°08.6	48°39.9	**N**00°45.2
7	248°12.7	273°27.6	02.2	120°18.4	25.8	270°00.4	08.3	63°42.5	45.3
8	263°15.2	288°27.1	12°01.0	135°21.8	25.9	285°02.3	08.1	78°45.1	45.3
9	278°17.7	303°26.5	11°59.9	150°25.1	·· 26.1	300°04.2	·· 07.9	93°47.7	·· 45.4
10	293°20.1	318°26.0	58.8	165°28.4	26.2	315°06.1	07.7	108°50.2	45.4
11	308°22.6	333°25.5	57.7	180°31.7	26.4	330°08.0	07.5	123°52.8	45.5
12	323°25.1	348°25.0	**S**11°56.6	195°35.0	**N**23°26.5	345°09.9	**S**10°07.2	138°55.4	**N**00°45.6
13	338°27.5	3°24.5	55.4	210°38.3	26.6	0°11.8	07.0	153°58.0	45.6
14	353°30.0	18°23.9	54.3	225°41.6	26.8	15°13.7	06.8	169°00.6	45.7
15	8°32.5	33°23.4	·· 53.2	240°44.9	·· 26.9	30°15.6	·· 06.6	184°03.1	·· 45.7
16	23°34.9	48°22.9	52.1	255°48.2	27.1	45°17.5	06.4	199°05.7	45.8
17	38°37.4	63°22.4	51.0	270°51.5	27.2	60°19.4	06.1	214°08.3	45.9
18	53°39.9	78°21.8	**S**11°49.8	285°54.9	**N**23°27.4	75°21.3	**S**10°05.9	229°10.9	**N**00°45.9
19	68°42.3	93°21.3	48.7	300°58.2	27.5	90°23.2	05.7	244°13.5	46.0
20	83°44.8	108°20.8	47.6	316°01.5	27.6	105°25.1	05.5	259°16.0	46.0
21	98°47.2	123°20.3	·· 46.5	331°04.8	·· 27.8	120°27.0	·· 05.2	274°18.6	·· 46.1
22	113°49.7	138°19.8	45.3	346°08.1	27.9	135°28.9	05.0	289°21.2	46.2
23	128°52.2	153°19.2	44.2	1°11.4	28.1	150°30.8	04.8	304°23.8	46.2
Mer.pass.:14:26		v-0.5 d1.1 m-3.8		v3.3 d0.1 m-1.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	143°54.6	168°18.7	**S**11°43.1	16°14.7	**N**23°28.2	165°32.7	**S**10°04.6	319°26.4	**N**00°46.3
1	158°57.1	183°18.2	42.0	31°18.0	28.3	180°34.6	04.4	334°28.9	46.3
2	173°59.6	198°17.7	40.8	46°21.3	28.5	195°36.5	04.1	349°31.5	46.4
3	189°02.0	213°17.2	·· 39.7	61°24.5	·· 28.6	210°38.4	·· 03.9	4°34.1	·· 46.5
4	204°04.5	228°16.7	38.6	76°27.8	28.8	225°40.3	03.7	19°36.7	46.5
5	219°07.0	243°16.1	37.4	91°31.1	28.9	240°42.2	03.5	34°39.3	46.6
6	234°09.4	258°15.6	**S**11°36.3	106°34.4	**N**23°29.0	255°44.1	**S**10°03.3	49°41.8	**N**00°46.6
7	249°11.9	273°15.1	35.2	121°37.7	29.2	270°46.0	03.0	64°44.4	46.7
8	264°14.3	288°14.6	34.0	136°41.0	29.3	285°47.9	02.8	79°47.0	46.8
9	279°16.8	303°14.1	·· 32.9	151°44.3	·· 29.4	300°49.8	·· 02.6	94°49.6	·· 46.8
10	294°19.3	318°13.6	31.8	166°47.6	29.6	315°51.7	02.4	109°52.2	46.9
11	309°21.7	333°13.1	30.6	181°50.9	29.7	330°53.6	02.2	124°54.7	46.9
12	324°24.2	348°12.5	**S**11°29.5	196°54.2	**N**23°29.8	345°55.5	**S**10°01.9	139°57.3	**N**00°47.0
13	339°26.7	3°12.0	28.4	211°57.4	30.0	0°57.4	01.7	154°59.9	47.1
14	354°29.1	18°11.5	27.2	227°00.7	30.1	15°59.3	01.5	170°02.5	47.1
15	9°31.6	33°11.0	·· 26.1	242°04.0	·· 30.2	31°01.2	·· 01.3	185°05.1	·· 47.2
16	24°34.1	48°10.5	25.0	257°07.3	30.4	46°03.1	01.1	200°07.7	47.3
17	39°36.5	63°10.0	23.8	272°10.6	30.5	61°05.0	00.8	215°10.2	47.3
18	54°39.0	78°09.5	**S**11°22.7	287°13.8	**N**23°30.6	76°06.9	**S**10°00.6	230°12.8	**N**00°47.4
19	69°41.5	93°09.0	21.6	302°17.1	30.8	91°08.8	00.4	245°15.4	47.4
20	84°43.9	108°08.5	20.4	317°20.4	30.9	106°10.7	00.2	260°18.0	47.5
21	99°46.4	123°07.9	·· 19.3	332°23.7	·· 31.0	121°12.6	10°00.0	275°20.6	·· 47.6
22	114°48.8	138°07.4	18.1	347°26.9	31.1	136°14.4	09°59.7	290°23.2	47.6
23	129°51.3	153°06.9	17.0	2°30.2	31.3	151°16.3	59.5	305°25.7	47.7
Mer.pass.:14:22		v-0.5 d1.1 m-3.8		v3.3 d0.1 m-1.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.2
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.7	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°03.9	89°18.9
Acamar	315°20.1	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.9	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.2	-8°11.5
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°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.9	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.1	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.7
Suhail	222°53.9	-43°28.6
Miaplacidus	221°39.5	-69°45.6
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°53.8	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.6	-17°36.0
Acrux	173°11.8	-63°09.3
Gacrux	172°03.4	-57°10.2
Alioth	166°22.3	55°53.9
Spica	158°33.7	-11°13.0
Alkaid	153°00.4	49°15.4
Hadar	148°51.3	-60°25.2
Menkent	148°10.4	-36°25.2
Arcturus	145°57.8	19°07.5
Rigil Kent.	139°55.0	-60°52.5
Kochab	137°19.4	74°06.4
Zuben'ubi	137°08.1	-16°05.1
Alphecca	126°13.0	26°40.5
Antares	112°29.3	-26°27.3
Atria	107°33.6	-69°02.5
Sabik	102°15.5	-15°44.3
Shaula	96°25.4	-37°06.6
Rasalhague	96°08.9	12°33.0
Eltanin	90°47.6	51°29.0
Kaus Aust.	83°47.3	-34°22.7
Vega	80°40.9	38°47.4
Nunki	76°01.6	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.5	-56°42.1
Deneb	49°33.7	45°18.9
Enif	33°49.8	9°55.3
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 12 Fri	**SHA**	**Mer.pass**
Venus	26°47.8	12:46
Mars	231°38.8	23:01
Jupiter	22°05.2	13:02
Saturn	175°26.3	02:50

Feb 13 Sat	**SHA**	**Mer.pass**
Venus	25°35.8	12:46
Mars	231°59.7	22:55
Jupiter	21°51.6	12:59
Saturn	175°29.0	02:46

Feb 14 Sun	**SHA**	**Mer.pass**
Venus	24°24.1	12:47
Mars	232°20.0	22:50
Jupiter	21°38.0	12:56
Saturn	175°31.7	02:42

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°26.9	S13°48.0	199°38.5	13.6'	S19°15.3	8.9'	54.0'
1	191°26.9	47.1	214°11.1	13.6'	19°06.4	8.9'	54.0'
2	206°26.9	46.3	228°43.7	13.7'	18°57.4	9.0'	54.0'
3	221°26.9	·· 45.5	243°16.4	13.7'	18°48.3	9.1'	54.0'
4	236°26.9	44.7	257°49.2	13.8'	18°39.2	9.2'	54.0'
5	251°26.9	43.8	272°22.0	13.8'	18°30.0	9.2'	54.0'
6	266°26.9	S13°43.0	286°54.9	13.9'	S18°20.7	9.3'	54.0'
7	281°26.9	42.2	301°27.8	13.9'	18°11.3	9.4'	54.0'
8	296°26.9	41.3	316°00.8	14.0'	18°01.9	9.5'	54.0'
9	311°26.9	·· 40.5	330°33.8	14.1'	17°52.4	9.5'	54.0'
10	326°26.9	39.7	345°06.9	14.1'	17°42.8	9.6'	54.0'
11	341°26.9	38.8	359°40.0	14.2'	17°33.2	9.7'	53.9'
12	356°26.9	S13°38.0	14°13.2	14.2'	S17°23.4	9.8'	53.9'
13	11°26.9	37.2	28°46.5	14.3'	17°13.6	9.8'	53.9'
14	26°26.9	36.3	43°19.8	14.3'	17°03.8	9.9'	53.9'
15	41°27.0	·· 35.5	57°53.1	14.4'	16°53.8	10.0'	53.9'
16	56°27.0	34.7	72°26.5	14.4'	16°43.8	10.0'	53.9'
17	71°27.0	33.8	87°00.0	14.5'	16°33.8	10.1'	53.9'
18	86°27.0	S13°33.0	101°33.5	14.5'	S16°23.6	10.2'	53.9'
19	101°27.0	32.1	116°07.0	14.6'	16°13.4	10.2'	53.9'
20	116°27.0	31.3	130°40.6	14.6'	16°03.2	10.3'	53.9'
21	131°27.0	·· 30.5	145°14.3	14.7'	15°52.8	10.4'	53.9'
22	146°27.0	29.6	159°48.0	14.7'	15°42.4	10.4'	53.9'
23	161°27.0	28.8	174°21.7	14.8'	15°32.0	10.5'	53.9'
	SD.=16.2	d=0.8	S.D.=14.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°27.0	S13°28.0	188°55.5	14.8'	S15°21.5	10.5'	53.9'
1	191°27.1	27.1	203°29.4	14.9'	15°10.9	10.6'	53.9'
2	206°27.1	26.3	218°03.2	14.9'	15°00.3	10.7'	53.9'
3	221°27.1	·· 25.4	232°37.2	15.0'	14°49.6	10.7'	53.9'
4	236°27.1	24.6	247°11.2	15.0'	14°38.8	10.8'	53.9'
5	251°27.1	23.8	261°45.2	15.1'	14°28.0	10.8'	53.9'
6	266°27.1	S13°22.9	276°19.3	15.1'	S14°17.1	10.9'	53.9'
7	281°27.1	22.1	290°53.4	15.1'	14°06.2	11.0'	53.9'
8	296°27.1	21.2	305°27.6	15.2'	13°55.2	11.0'	53.9'
9	311°27.2	·· 20.4	320°01.8	15.2'	13°44.2	11.1'	53.9'
10	326°27.2	19.6	334°36.0	15.3'	13°33.1	11.1'	53.9'
11	341°27.2	18.7	349°10.3	15.3'	13°21.9	11.2'	53.9'
12	356°27.2	S13°17.9	3°44.6	15.4'	S13°10.7	11.2'	53.9'
13	11°27.2	17.0	18°19.0	15.4'	12°59.5	11.3'	53.9'
14	26°27.2	16.2	32°53.4	15.4'	12°48.2	11.3'	53.9'
15	41°27.2	·· 15.3	47°27.9	15.5'	12°36.8	11.4'	53.9'
16	56°27.3	14.5	62°02.3	15.5'	12°25.4	11.4'	53.9'
17	71°27.3	13.7	76°36.9	15.5'	12°14.0	11.5'	53.9'
18	86°27.3	S13°12.8	91°11.4	15.6'	S12°02.5	11.5'	53.9'
19	101°27.3	12.0	105°46.0	15.6'	11°50.9	11.6'	54.0'
20	116°27.3	11.1	120°20.7	15.7'	11°39.3	11.6'	54.0'
21	131°27.3	·· 10.3	134°55.4	15.7'	11°27.7	11.7'	54.0'
22	146°27.4	09.4	149°30.1	15.7'	11°16.0	11.7'	54.0'
23	161°27.4	08.6	164°04.8	15.8'	11°04.3	11.7'	54.0'
	SD.=16.2	d=0.8	S.D.=14.7				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°27.4	S13°07.7	178°39.6	15.8'	S10°52.5	11.8'	54.0'
1	191°27.4	06.9	193°14.4	15.8'	10°40.7	11.8'	54.0'
2	206°27.4	06.0	207°49.2	15.9'	10°28.9	11.9'	54.0'
3	221°27.5	·· 05.2	222°24.1	15.9'	10°17.0	11.9'	54.0'
4	236°27.5	04.3	236°59.0	15.9'	10°05.0	12.0'	54.0'
5	251°27.5	03.5	251°34.0	15.9'	09°53.1	12.0'	54.0'
6	266°27.5	S13°02.6	266°08.9	16.0'	S09°41.1	12.0'	54.0'
7	281°27.5	01.8	280°43.9	16.0'	09°29.0	12.1'	54.0'
8	296°27.6	00.9	295°18.9	16.0'	09°16.9	12.1'	54.0'
9	311°27.6	13°00.1	309°54.0	16.1'	09°04.8	12.1'	54.0'
10	326°27.6	12°59.2	324°29.1	16.1'	08°52.7	12.2'	54.0'
11	341°27.6	58.4	339°04.2	16.1'	08°40.5	12.2'	54.0'
12	356°27.7	S12°57.5	353°39.3	16.1'	S08°28.2	12.2'	54.0'
13	11°27.7	56.7	8°14.4	16.2'	08°16.0	12.3'	54.0'
14	26°27.7	55.8	22°49.6	16.2'	08°03.7	12.3'	54.0'
15	41°27.7	·· 55.0	37°24.8	16.2'	07°51.4	12.3'	54.0'
16	56°27.7	54.1	52°00.0	16.2'	07°39.0	12.4'	54.0'
17	71°27.8	53.3	66°35.3	16.2'	07°26.6	12.4'	54.0'
18	86°27.8	S12°52.4	81°10.5	16.3'	S07°14.2	12.4'	54.0'
19	101°27.8	51.6	95°45.8	16.3'	07°01.7	12.5'	54.1'
20	116°27.8	50.7	110°21.1	16.3'	06°49.3	12.5'	54.1'
21	131°27.9	·· 49.8	124°56.4	16.3'	06°36.8	12.5'	54.1'
22	146°27.9	49.0	139°31.7	16.3'	06°24.2	12.5'	54.1'
23	161°27.9	48.1	154°07.1	16.4'	06°11.7	12.6'	54.1'
	SD.=16.2	d=0.8	S.D.=14.7				

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

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

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 2-0%
12	14:13	14:12	12:14	11:01	23:23	
13	14:12	14:11	12:14	11:45	–:–	
14	14:10	14:09	12:14	12:26	00:06	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	144°53.8	168°06.4	S11°15.9	17°33.5	N23°31.4	166°18.2	S09°59.3	320°28.3	N00°47.7
1	159°56.2	183°05.9	14.7	32°36.8	31.5	181°20.1	59.1	335°30.9	47.8
2	174°58.7	198°05.4	13.6	47°40.0	31.7	196°22.0	58.8	350°33.5	47.9
3	190°01.2	213°04.9	·· 12.4	62°43.3	·· 31.8	211°23.9	·· 58.6	5°36.1	·· 47.9
4	205°03.6	228°04.4	11.3	77°46.6	31.9	226°25.8	58.4	20°38.7	48.0
5	220°06.1	243°03.9	10.2	92°49.8	32.0	241°27.7	58.2	35°41.2	48.0
6	235°08.6	258°03.4	S11°09.0	107°53.1	N23°32.2	256°29.6	S09°58.0	50°43.8	N00°48.1
7	250°11.0	273°02.9	07.9	122°56.4	32.3	271°31.5	57.7	65°46.4	48.2
8	265°13.5	288°02.4	06.7	137°59.6	32.4	286°33.4	57.5	80°49.0	48.2
9	280°16.0	303°01.9	·· 05.6	153°02.9	·· 32.5	301°35.3	·· 57.3	95°51.6	·· 48.3
10	295°18.4	318°01.4	04.4	168°06.1	32.7	316°37.2	57.1	110°54.2	48.4
11	310°20.9	333°00.9	03.3	183°09.4	32.8	331°39.1	56.9	125°56.7	48.4
12	325°23.3	348°00.4	S11°02.2	198°12.7	N23°32.9	346°41.0	S09°56.6	140°59.3	N00°48.5
13	340°25.8	2°59.9	11°01.0	213°15.9	33.0	1°42.9	56.4	156°01.9	48.5
14	355°28.3	17°59.4	10°59.9	228°19.2	33.1	16°44.8	56.2	171°04.5	48.6
15	10°30.7	32°58.9	·· 58.7	243°22.4	·· 33.3	31°46.7	·· 56.0	186°07.1	·· 48.7
16	25°33.2	47°58.4	57.6	258°25.7	33.4	46°48.6	55.8	201°09.7	48.7
17	40°35.7	62°57.9	56.4	273°28.9	33.5	61°50.5	55.5	216°12.3	48.8
18	55°38.1	77°57.4	S10°55.3	288°32.2	N23°33.6	76°52.4	S09°55.3	231°14.8	N00°48.9
19	70°40.6	92°56.9	54.1	303°35.4	33.8	91°54.3	55.1	246°17.4	48.9
20	85°43.1	107°56.4	53.0	318°38.7	33.9	106°56.2	54.9	261°20.0	49.0
21	100°45.5	122°55.9	·· 51.8	333°41.9	·· 34.0	121°58.1	·· 54.6	276°22.6	·· 49.0
22	115°48.0	137°55.4	50.7	348°45.2	34.1	137°00.0	54.4	291°25.2	49.1
23	130°50.4	152°54.9	49.5	3°48.4	34.2	152°01.9	54.2	306°27.8	49.2
Mer.pass.:14:18		v-0.5 d1.1 m-3.8		v3.3 d0.1 m-0.9		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	145°52.9	167°54.4	S10°48.4	18°51.7	N23°34.3	167°03.8	S09°54.0	321°30.4	N00°49.2
1	160°55.4	182°53.9	47.2	33°54.9	34.5	182°05.7	53.8	336°32.9	49.3
2	175°57.8	197°53.4	46.1	48°58.1	34.6	197°07.6	53.5	351°35.5	49.4
3	191°00.3	212°52.9	·· 44.9	64°01.4	·· 34.7	212°09.5	·· 53.3	6°38.1	·· 49.4
4	206°02.8	227°52.4	43.7	79°04.6	34.8	227°11.4	53.1	21°40.7	49.5
5	221°05.2	242°51.9	42.6	94°07.9	34.9	242°13.3	52.9	36°43.3	49.5
6	236°07.7	257°51.4	S10°41.4	109°11.1	N23°35.0	257°15.2	S09°52.7	51°45.9	N00°49.6
7	251°10.2	272°50.9	40.3	124°14.3	35.1	272°17.1	52.4	66°48.5	49.7
8	266°12.6	287°50.4	39.1	139°17.6	35.3	287°19.0	52.2	81°51.1	49.7
9	281°15.1	302°49.9	·· 38.0	154°20.8	·· 35.4	302°20.9	·· 52.0	96°53.6	·· 49.8
10	296°17.6	317°49.4	36.8	169°24.0	35.5	317°22.8	51.8	111°56.2	49.9
11	311°20.0	332°48.9	35.7	184°27.3	35.6	332°24.7	51.5	126°58.8	49.9
12	326°22.5	347°48.4	S10°34.5	199°30.5	N23°35.7	347°26.6	S09°51.3	142°01.4	N00°50.0
13	341°24.9	2°47.9	33.3	214°33.7	35.8	2°28.5	51.1	157°04.0	50.1
14	356°27.4	17°47.5	32.2	229°36.9	35.9	17°30.4	50.9	172°06.6	50.1
15	11°29.9	32°47.0	·· 31.0	244°40.2	·· 36.0	32°32.3	·· 50.7	187°09.2	·· 50.2
16	26°32.3	47°46.5	29.9	259°43.4	36.2	47°34.2	50.4	202°11.8	50.2
17	41°34.8	62°46.0	28.7	274°46.6	36.3	62°36.1	50.2	217°14.4	50.3
18	56°37.3	77°45.5	S10°27.5	289°49.8	N23°36.4	77°38.0	S09°50.0	232°16.9	N00°50.4
19	71°39.7	92°45.0	26.4	304°53.1	36.5	92°39.9	49.8	247°19.5	50.4
20	86°42.2	107°44.5	25.2	319°56.3	36.6	107°41.8	49.5	262°22.1	50.5
21	101°44.7	122°44.0	·· 24.1	334°59.5	·· 36.7	122°43.7	·· 49.3	277°24.7	·· 50.6
22	116°47.1	137°43.5	22.9	350°02.7	36.8	137°45.6	49.1	292°27.3	50.6
23	131°49.6	152°43.0	21.7	5°05.9	36.9	152°47.5	48.9	307°29.9	50.7
Mer.pass.:14:14		v-0.5 d1.2 m-3.8		v3.2 d0.1 m-0.9		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	146°52.0	167°42.6	S10°20.6	20°09.1	N23°37.0	167°49.3	S09°48.7	322°32.5	N00°50.8
1	161°54.5	182°42.1	19.4	35°12.4	37.1	182°51.2	48.4	337°35.1	50.8
2	176°57.0	197°41.6	18.2	50°15.6	37.2	197°53.1	48.2	352°37.7	50.9
3	191°59.4	212°41.1	·· 17.1	65°18.8	·· 37.3	212°55.0	·· 48.0	7°40.2	·· 50.9
4	207°01.9	227°40.6	15.9	80°22.0	37.4	227°56.9	47.8	22°42.8	51.0
5	222°04.4	242°40.1	14.7	95°25.2	37.5	242°58.8	47.5	37°45.4	51.1
6	237°06.8	257°39.6	S10°13.6	110°28.4	N23°37.6	258°00.7	S09°47.3	52°48.0	N00°51.1
7	252°09.3	272°39.2	12.4	125°31.6	37.7	273°02.6	47.1	67°50.6	51.2
8	267°11.8	287°38.7	11.2	140°34.8	37.9	288°04.5	46.9	82°53.2	51.3
9	282°14.2	302°38.2	·· 10.1	155°38.0	·· 38.0	303°06.4	·· 46.7	97°55.8	·· 51.3
10	297°16.7	317°37.7	08.9	170°41.2	38.1	318°08.3	46.4	112°58.4	51.4
11	312°19.2	332°37.2	07.7	185°44.4	38.2	333°10.2	46.2	128°01.0	51.5
12	327°21.6	347°36.7	S10°06.6	200°47.6	N23°38.3	348°12.1	S09°46.0	143°03.6	N00°51.5
13	342°24.1	2°36.3	05.4	215°50.8	38.4	3°14.0	45.8	158°06.2	51.6
14	357°26.5	17°35.8	04.2	230°54.0	38.5	18°15.9	45.5	173°08.7	51.6
15	12°29.0	32°35.3	·· 03.1	245°57.2	·· 38.6	33°17.8	·· 45.3	188°11.3	·· 51.7
16	27°31.5	47°34.8	01.9	261°00.4	38.7	48°19.7	45.1	203°13.9	51.8
17	42°33.9	62°34.3	10°00.7	276°03.6	38.8	63°21.6	44.9	218°16.5	51.8
18	57°36.4	77°33.9	S09°59.5	291°06.8	N23°38.9	78°23.5	S09°44.7	233°19.1	N00°51.9
19	72°38.9	92°33.4	58.4	306°10.0	39.0	93°25.4	44.4	248°21.7	52.0
20	87°41.3	107°32.9	57.2	321°13.2	39.0	108°27.3	44.2	263°24.3	52.0
21	102°43.8	122°32.4	·· 56.0	336°16.4	·· 39.1	123°29.2	·· 44.0	278°26.9	·· 52.1
22	117°46.3	137°31.9	54.8	351°19.5	39.2	138°31.1	43.8	293°29.5	52.2
23	132°48.7	152°31.5	53.7	6°22.7	39.3	153°33.0	43.5	308°32.1	52.2
Mer.pass.:14:10		v-0.5 d1.2 m-3.8		v3.2 d0.1 m-0.9		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.2
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.7	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°05.4	89°18.9
Acamar	315°20.2	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°43.9	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.2	-8°11.5
Capella	280°37.8	46°00.6
Bellatrix	278°34.5	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.9	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.7
Suhail	222°53.9	-43°28.6
Miaplacidus	221°39.5	-69°45.7
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°53.8	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.6	-17°36.1
Acrux	173°11.8	-63°09.3
Gacrux	172°03.4	-57°10.2
Alioth	166°22.2	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.4	49°15.4
Hadar	148°51.3	-60°25.2
Menkent	148°10.3	-36°25.2
Arcturus	145°57.8	19°07.5
Rigil Kent.	139°55.0	-60°52.5
Kochab	137°19.3	74°06.4
Zuben'ubi	137°08.0	-16°05.1
Alphecca	126°13.0	26°40.5
Antares	112°29.3	-26°27.3
Atria	107°33.6	-69°02.5
Sabik	102°15.4	-15°44.3
Shaula	96°25.4	-37°06.6
Rasalhague	96°08.8	12°33.0
Eltanin	90°47.5	51°28.9
Kaus Aust.	83°47.3	-34°22.7
Vega	80°40.9	38°47.3
Nunki	76°01.6	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.5	-56°42.1
Deneb	49°33.6	45°18.9
Enif	33°49.8	9°55.3
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 15 Mon	**SHA**	**Mer.pass**
Venus	23°12.6	12:48
Mars	232°39.7	22:45
Jupiter	21°24.5	12:53
Saturn	175°34.5	02:38

Feb 16 Tue	**SHA**	**Mer.pass**
Venus	22°01.5	12:49
Mars	232°58.7	22:40
Jupiter	21°10.9	12:50
Saturn	175°37.5	02:34

Feb 17 Wed	**SHA**	**Mer.pass**
Venus	20°50.5	12:50
Mars	233°17.1	22:35
Jupiter	20°57.3	12:47
Saturn	175°40.4	02:29

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°28.0	S12°47.3	168°42.5	16.4'	S05°59.1	12.6'	54.1'
1	191°28.0	46.4	183°17.8	16.4'	05°46.5	12.6'	54.1'
2	206°28.0	45.6	197°53.2	16.4'	05°33.9	12.6'	54.1'
3	221°28.0	· · 44.7	212°28.6	16.4'	05°21.2	12.7'	54.1'
4	236°28.1	43.9	227°04.1	16.4'	05°08.5	12.7'	54.1'
5	251°28.1	43.0	241°39.5	16.4'	04°55.8	12.7'	54.1'
6	266°28.1	S12°42.1	256°14.9	16.4'	S04°43.1	12.7'	54.1'
7	281°28.1	41.3	270°50.4	16.5'	04°30.4	12.7'	54.1'
8	296°28.2	40.4	285°25.8	16.5'	04°17.6	12.8'	54.1'
9	311°28.2	· · 39.6	300°01.3	16.5'	04°04.9	12.8'	54.1'
10	326°28.2	38.7	314°36.8	16.5'	03°52.1	12.8'	54.2'
11	341°28.3	37.8	329°12.3	16.5'	03°39.3	12.8'	54.2'
12	356°28.3	S12°37.0	343°47.7	16.5'	S03°26.4	12.8'	54.2'
13	11°28.3	36.1	358°23.2	16.5'	03°13.6	12.9'	54.2'
14	26°28.4	35.3	12°58.7	16.5'	03°00.7	12.9'	54.2'
15	41°28.4	· · 34.4	27°34.2	16.5'	02°47.9	12.9'	54.2'
16	56°28.4	33.5	42°09.7	16.5'	02°35.0	12.9'	54.2'
17	71°28.4	32.7	56°45.2	16.5'	02°22.1	12.9'	54.2'
18	86°28.5	S12°31.8	71°20.8	16.5'	S02°09.2	12.9'	54.2'
19	101°28.5	30.9	85°56.3	16.5'	01°56.2	12.9'	54.2'
20	116°28.5	30.1	100°31.8	16.5'	01°43.3	12.9'	54.2'
21	131°28.6	· · 29.2	115°07.3	16.5'	01°30.4	12.9'	54.3'
22	146°28.6	28.4	129°42.8	16.5'	01°17.4	13.0'	54.3'
23	161°28.6	27.5	144°18.2	16.5'	01°04.4	13.0'	54.3'
	SD.=16.2	d=0.9	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°28.7	S12°26.6	158°53.7	16.5'	S00°51.5	13.0'	54.3'
1	191°28.7	25.8	173°29.2	16.5'	00°38.5	13.0'	54.3'
2	206°28.7	24.9	188°04.7	16.5'	00°25.5	13.0'	54.3'
3	221°28.8	· · 24.0	202°40.2	16.5'	S00°12.5	13.0'	54.3'
4	236°28.8	23.2	217°15.6	16.5'	N00°00.5	13.0'	54.3'
5	251°28.9	22.3	231°51.1	16.4'	00°13.5	13.0'	54.3'
6	266°28.9	S12°21.4	246°26.5	16.4'	N00°26.5	13.0'	54.3'
7	281°28.9	20.6	261°02.0	16.4'	00°39.5	13.0'	54.4'
8	296°29.0	19.7	275°37.4	16.4'	00°52.5	13.0'	54.4'
9	311°29.0	· · 18.8	290°12.8	16.4'	01°05.5	13.0'	54.4'
10	326°29.0	18.0	304°48.2	16.4'	01°18.5	13.0'	54.4'
11	341°29.1	17.1	319°23.6	16.4'	01°31.5	13.0'	54.4'
12	356°29.1	S12°16.2	333°58.9	16.4'	N01°44.5	13.0'	54.4'
13	11°29.2	15.4	348°34.3	16.3'	01°57.5	13.0'	54.4'
14	26°29.2	14.5	3°09.6	16.3'	02°10.5	13.0'	54.4'
15	41°29.2	· · 13.6	17°44.9	16.3'	02°23.5	13.0'	54.5'
16	56°29.3	12.7	32°20.2	16.3'	02°36.5	13.0'	54.5'
17	71°29.3	11.9	46°55.5	16.3'	02°49.5	13.0'	54.5'
18	86°29.3	S12°11.0	61°30.7	16.2'	N03°02.4	13.0'	54.5'
19	101°29.4	10.1	76°05.9	16.2'	03°15.4	13.0'	54.5'
20	116°29.4	09.3	90°41.1	16.2'	03°28.4	13.0'	54.5'
21	131°29.5	· · 08.4	105°16.3	16.2'	03°41.3	13.0'	54.5'
22	146°29.5	07.5	119°51.5	16.1'	03°54.3	12.9'	54.5'
23	161°29.5	06.6	134°26.6	16.1'	04°07.2	12.9'	54.6'
	SD.=16.2	d=0.9	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°29.6	S12°05.8	149°01.7	16.1'	N04°20.2	12.9'	54.6'
1	191°29.6	04.9	163°36.8	16.1'	04°33.1	12.9'	54.6'
2	206°29.7	04.0	178°11.8	16.0'	04°46.0	12.9'	54.6'
3	221°29.7	· · 03.2	192°46.9	16.0'	04°58.9	12.9'	54.6'
4	236°29.8	02.3	207°21.9	16.0'	05°11.8	12.9'	54.6'
5	251°29.8	01.4	221°56.8	15.9'	05°24.6	12.9'	54.6'
6	266°29.8	S12°00.5	236°31.7	15.9'	N05°37.5	12.8'	54.7'
7	281°29.9	11°59.7	251°06.6	15.9'	05°50.3	12.8'	54.7'
8	296°29.9	58.8	265°41.5	15.8'	06°03.2	12.8'	54.7'
9	311°30.0	· · 57.9	280°16.3	15.8'	06°16.0	12.8'	54.7'
10	326°30.0	57.0	294°51.1	15.8'	06°28.7	12.8'	54.7'
11	341°30.1	56.2	309°25.8	15.7'	06°41.5	12.8'	54.7'
12	356°30.1	S11°55.3	324°00.6	15.7'	N06°54.3	12.7'	54.8'
13	11°30.2	54.4	338°35.2	15.7'	07°07.0	12.7'	54.8'
14	26°30.2	53.5	353°09.9	15.6'	07°19.7	12.7'	54.8'
15	41°30.2	· · 52.6	7°44.5	15.6'	07°32.4	12.7'	54.8'
16	56°30.3	51.8	22°19.0	15.5'	07°45.0	12.6'	54.8'
17	71°30.3	50.9	36°53.5	15.5'	07°57.7	12.6'	54.8'
18	86°30.4	S11°50.0	51°28.0	15.4'	N08°10.3	12.6'	54.9'
19	101°30.4	49.1	66°02.4	15.4'	08°22.8	12.6'	54.9'
20	116°30.5	48.3	80°36.8	15.4'	08°35.4	12.5'	54.9'
21	131°30.5	· · 47.4	95°11.1	15.3'	08°47.9	12.5'	54.9'
22	146°30.6	46.5	109°45.4	15.3'	09°00.4	12.5'	54.9'
23	161°30.6	45.6	124°19.6	15.2'	09°12.9	12.5'	54.9'
	SD.=16.2	d=0.9	S.D.=14.9				

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

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

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 2-10%
15	14:08	14:07	12:14	13:07	00:46	
16	14:05	14:04	12:14	13:47	01:27	
17	14:02	14:00	12:14	14:28	02:07	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	147°51.2	167°31.0	S09°52.5	21°25.9	N23°39.4	168°34.9	S09°43.3	323°34.7	N00°52.3
1	162°53.6	182°30.5	51.3	36°29.1	39.5	183°36.8	43.1	338°37.3	52.4
2	177°56.1	197°30.0	50.1	51°32.3	39.6	198°38.7	42.9	353°39.8	52.4
3	192°58.6	212°29.6	·· 49.0	66°35.5	·· 39.7	213°40.6	·· 42.7	8°42.4	·· 52.5
4	208°01.0	227°29.1	47.8	81°38.6	39.8	228°42.5	42.4	23°45.0	52.6
5	223°03.5	242°28.6	46.6	96°41.8	39.9	243°44.4	42.2	38°47.6	52.6
6	238°06.0	257°28.1	S09°45.4	111°45.0	N23°40.0	258°46.3	S09°42.0	53°50.2	N00°52.7
7	253°08.4	272°27.7	44.3	126°48.2	40.1	273°48.2	41.8	68°52.8	52.8
8	268°10.9	287°27.2	43.1	141°51.3	40.2	288°50.1	41.5	83°55.4	52.8
9	283°13.4	302°26.7	·· 41.9	156°54.5	·· 40.3	303°52.0	·· 41.3	98°58.0	·· 52.9
10	298°15.8	317°26.2	40.7	171°57.7	40.4	318°53.9	41.1	114°00.6	52.9
11	313°18.3	332°25.8	39.5	187°00.9	40.5	333°55.8	40.9	129°03.2	53.0
12	328°20.8	347°25.3	S09°38.4	202°04.0	N23°40.5	348°57.7	S09°40.7	144°05.8	N00°53.1
13	343°23.2	2°24.8	37.2	217°07.2	40.6	3°59.6	40.4	159°08.4	53.1
14	358°25.7	17°24.3	36.0	232°10.4	40.7	19°01.4	40.2	174°11.0	53.2
15	13°28.1	32°23.9	·· 34.8	247°13.5	·· 40.8	34°03.3	·· 40.0	189°13.6	·· 53.3
16	28°30.6	47°23.4	33.6	262°16.7	40.9	49°05.2	39.8	204°16.2	53.3
17	43°33.1	62°22.9	32.5	277°19.9	41.0	64°07.1	39.5	219°18.8	53.4
18	58°35.5	77°22.5	S09°31.3	292°23.0	N23°41.1	79°09.0	S09°39.3	234°21.4	N00°53.5
19	73°38.0	92°22.0	30.1	307°26.2	41.2	94°10.9	39.1	249°23.9	53.5
20	88°40.5	107°21.5	28.9	322°29.3	41.2	109°12.8	38.9	264°26.5	53.6
21	103°42.9	122°21.0	·· 27.7	337°32.5	·· 41.3	124°14.7	·· 38.6	279°29.1	·· 53.7
22	118°45.4	137°20.6	26.5	352°35.6	41.4	139°16.6	38.4	294°31.7	53.7
23	133°47.9	152°20.1	25.4	7°38.8	41.5	154°18.5	38.2	309°34.3	53.8
Mer.pass.:14:06		v-0.5 d1.2 m-3.8		v3.2 d0.1 m-0.9		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	148°50.3	167°19.6	S09°24.2	22°42.0	N23°41.6	169°20.4	S09°38.0	324°36.9	N00°53.9
1	163°52.8	182°19.2	23.0	37°45.1	41.7	184°22.3	37.8	339°39.5	53.9
2	178°55.3	197°18.7	21.8	52°48.3	41.8	199°24.2	37.5	354°42.1	54.0
3	193°57.7	212°18.2	·· 20.6	67°51.4	·· 41.8	214°26.1	·· 37.3	9°44.7	·· 54.1
4	209°00.2	227°17.8	19.4	82°54.6	41.9	229°28.0	37.1	24°47.3	54.1
5	224°02.6	242°17.3	18.2	97°57.7	42.0	244°29.9	36.9	39°49.9	54.2
6	239°05.1	257°16.8	S09°17.0	113°00.9	N23°42.1	259°31.8	S09°36.6	54°52.5	N00°54.3
7	254°07.6	272°16.4	15.9	128°04.0	42.2	274°33.7	36.4	69°55.1	54.3
8	269°10.0	287°15.9	14.7	143°07.1	42.3	289°35.6	36.2	84°57.7	54.4
9	284°12.5	302°15.4	·· 13.5	158°10.3	·· 42.3	304°37.5	·· 36.0	100°00.3	·· 54.5
10	299°15.0	317°15.0	12.3	173°13.4	42.4	319°39.4	35.7	115°02.9	54.5
11	314°17.4	332°14.5	11.1	188°16.6	42.5	334°41.3	35.5	130°05.5	54.6
12	329°19.9	347°14.1	S09°09.9	203°19.7	N23°42.6	349°43.2	S09°35.3	145°08.1	N00°54.7
13	344°22.4	2°13.6	08.7	218°22.8	42.6	4°45.1	35.1	160°10.7	54.7
14	359°24.8	17°13.1	07.5	233°26.0	42.7	19°47.0	34.9	175°13.3	54.8
15	14°27.3	32°12.7	·· 06.3	248°29.1	·· 42.8	34°48.9	·· 34.6	190°15.9	·· 54.9
16	29°29.7	47°12.2	05.1	263°32.2	42.9	49°50.8	34.4	205°18.5	54.9
17	44°32.2	62°11.7	04.0	278°35.4	43.0	64°52.7	34.2	220°21.1	55.0
18	59°34.7	77°11.3	S09°02.8	293°38.5	N23°43.0	79°54.6	S09°34.0	235°23.7	N00°55.1
19	74°37.1	92°10.8	01.6	308°41.6	43.1	94°56.5	33.7	250°26.3	55.1
20	89°39.6	107°10.4	09°00.4	323°44.8	43.2	109°58.4	33.5	265°28.9	55.2
21	104°42.1	122°09.9	08°59.2	338°47.9	·· 43.3	125°00.3	·· 33.3	280°31.5	·· 55.3
22	119°44.5	137°09.4	58.0	353°51.0	43.3	140°02.2	33.1	295°34.1	55.3
23	134°47.0	152°09.0	56.8	8°54.1	43.4	155°04.1	32.8	310°36.7	55.4
Mer.pass.:14:02		v-0.5 d1.2 m-3.8		v3.2 d0.1 m-0.8		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	149°49.5	167°08.5	S08°55.6	23°57.2	N23°43.5	170°05.9	S09°32.6	325°39.2	N00°55.5
1	164°51.9	182°08.1	54.4	39°00.4	43.6	185°07.8	32.4	340°41.8	55.5
2	179°54.4	197°07.6	53.2	54°03.5	43.6	200°09.7	32.2	355°44.4	55.6
3	194°56.9	212°07.1	·· 52.0	69°06.6	·· 43.7	215°11.6	·· 32.0	10°47.0	·· 55.7
4	209°59.3	227°06.7	50.8	84°09.7	43.8	230°13.5	31.7	25°49.6	55.7
5	225°01.8	242°06.2	49.6	99°12.8	43.9	245°15.4	31.5	40°52.2	55.8
6	240°04.2	257°05.8	S08°48.4	114°15.9	N23°43.9	260°17.3	S09°31.3	55°54.8	N00°55.9
7	255°06.7	272°05.3	47.2	129°19.1	44.0	275°19.2	31.1	70°57.4	55.9
8	270°09.2	287°04.9	46.0	144°22.2	44.1	290°21.1	30.8	86°00.0	56.0
9	285°11.6	302°04.4	·· 44.8	159°25.3	·· 44.1	305°23.0	·· 30.6	101°02.6	·· 56.1
10	300°14.1	317°03.9	43.6	174°28.4	44.2	320°24.9	30.4	116°05.2	56.1
11	315°16.6	332°03.5	42.4	189°31.5	44.3	335°26.8	30.2	131°07.8	56.2
12	330°19.0	347°03.0	S08°41.2	204°34.6	N23°44.3	350°28.7	S09°29.9	146°10.4	N00°56.3
13	345°21.5	2°02.6	40.0	219°37.7	44.4	5°30.6	29.7	161°13.0	56.3
14	0°24.0	17°02.1	38.8	234°40.8	44.5	20°32.5	29.5	176°15.6	56.4
15	15°26.4	32°01.7	·· 37.6	249°43.9	·· 44.5	35°34.4	·· 29.3	191°18.2	·· 56.5
16	30°28.9	47°01.2	36.4	264°47.0	44.6	50°36.3	29.0	206°20.8	56.5
17	45°31.4	62°00.8	35.2	279°50.1	44.7	65°38.2	28.8	221°23.4	56.6
18	60°33.8	77°00.3	S08°34.0	294°53.2	N23°44.7	80°40.1	S09°28.6	236°26.0	N00°56.7
19	75°36.3	91°59.9	32.8	309°56.3	44.8	95°42.0	28.4	251°28.6	56.7
20	90°38.7	106°59.4	31.6	324°59.4	44.9	110°43.9	28.2	266°31.2	56.8
21	105°41.2	121°59.0	·· 30.4	340°02.5	·· 44.9	125°45.8	·· 27.9	281°33.8	·· 56.9
22	120°43.7	136°58.5	29.2	355°05.6	45.0	140°47.7	27.7	296°36.4	56.9
23	135°46.1	151°58.1	28.0	10°08.7	45.1	155°49.6	27.5	311°39.0	57.0
Mer.pass.:13:58		v-0.5 d1.2 m-3.8		v3.1 d0.1 m-0.8		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.2
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.7	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°06.7	89°18.9
Acamar	315°20.2	-40°16.0
Menkar	314°17.6	4°07.8
Mirfak	308°44.0	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°37.9	46°00.6
Bellatrix	278°34.5	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.9	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.5	-59°32.7
Suhail	222°53.9	-43°28.6
Miaplacidus	221°39.5	-69°45.7
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.8	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.7	-63°09.3
Gacrux	172°03.3	-57°10.2
Alioth	166°22.2	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.4	49°15.4
Hadar	148°51.2	-60°25.2
Menkent	148°10.3	-36°25.2
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.9	-60°52.5
Kochab	137°19.3	74°06.4
Zuben'ubi	137°08.0	-16°05.2
Alphecca	126°13.0	26°40.5
Antares	112°29.3	-26°27.3
Atria	107°33.5	-69°02.5
Sabik	102°15.4	-15°44.3
Shaula	96°25.4	-37°06.6
Rasalhague	96°08.8	12°33.0
Eltanin	90°47.5	51°28.9
Kaus Aust.	83°47.2	-34°22.7
Vega	80°40.9	38°47.3
Nunki	76°01.5	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.4	-56°42.1
Deneb	49°33.6	45°18.9
Enif	33°49.8	9°55.3
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 18 Thu	**SHA**	**Mer.pass**
Venus	19°39.8	12:50
Mars	233°34.7	22:30
Jupiter	20°43.7	12:44
Saturn	175°43.5	02:25

Feb 19 Fri	**SHA**	**Mer.pass**
Venus	18°29.3	12:51
Mars	233°51.6	22:25
Jupiter	20°30.1	12:41
Saturn	175°46.6	02:21

Feb 20 Sat	**SHA**	**Mer.pass**
Venus	17°19.1	12:52
Mars	234°07.8	22:20
Jupiter	20°16.5	12:38
Saturn	175°49.8	02:17

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°30.7	S11°44.7	138°53.8	15.2'	N09°25.4	12.4'	55.0'
1	191°30.7	43.9	153°27.9	15.1'	09°37.8	12.4'	55.0'
2	206°30.8	43.0	168°02.0	15.1'	09°50.1	12.4'	55.0'
3	221°30.8	·· 42.1	182°36.0	15.0'	10°02.5	12.3'	55.0'
4	236°30.9	41.2	197°10.0	14.9'	10°14.8	12.3'	55.0'
5	251°30.9	40.3	211°43.9	14.9'	10°27.1	12.3'	55.1'
6	266°31.0	S11°39.4	226°17.8	14.8'	N10°39.3	12.2'	55.1'
7	281°31.0	38.6	240°51.6	14.8'	10°51.5	12.2'	55.1'
8	296°31.1	37.7	255°25.4	14.7'	11°03.7	12.2'	55.1'
9	311°31.1	·· 36.8	269°59.1	14.7'	11°15.9	12.1'	55.1'
10	326°31.2	35.9	284°32.7	14.6'	11°28.0	12.1'	55.1'
11	341°31.2	35.0	299°06.3	14.5'	11°40.0	12.0'	55.2'
12	356°31.3	S11°34.1	313°39.8	14.5'	N11°52.0	12.0'	55.2'
13	11°31.3	33.3	328°13.3	14.4'	12°04.0	12.0'	55.2'
14	26°31.4	32.4	342°46.7	14.4'	12°15.9	11.9'	55.2'
15	41°31.4	·· 31.5	357°20.0	14.3'	12°27.8	11.9'	55.3'
16	56°31.5	30.6	11°53.3	14.2'	12°39.7	11.8'	55.3'
17	71°31.6	29.7	26°26.5	14.2'	12°51.5	11.8'	55.3'
18	86°31.6	S11°28.8	40°59.6	14.1'	N13°03.2	11.7'	55.3'
19	101°31.7	27.9	55°32.7	14.0'	13°14.9	11.7'	55.3'
20	116°31.7	27.1	70°05.7	14.0'	13°26.6	11.6'	55.4'
21	131°31.8	·· 26.2	84°38.6	13.9'	13°38.2	11.6'	55.4'
22	146°31.8	25.3	99°11.5	13.8'	13°49.7	11.5'	55.4'
23	161°31.9	24.4	113°44.3	13.8'	14°01.2	11.5'	55.4'
	SD.=16.2	d=0.9	S.D.=15.0				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°31.9	S11°23.5	128°17.0	13.7'	N14°12.7	11.4'	55.4'
1	191°32.0	22.6	142°49.7	13.6'	14°24.1	11.4'	55.5'
2	206°32.1	21.7	157°22.2	13.5'	14°35.4	11.3'	55.5'
3	221°32.1	·· 20.8	171°54.7	13.5'	14°46.7	11.3'	55.5'
4	236°32.2	19.9	186°27.2	13.4'	14°58.0	11.2'	55.5'
5	251°32.2	19.1	200°59.5	13.3'	15°09.1	11.1'	55.6'
6	266°32.3	S11°18.2	215°31.8	13.2'	N15°20.3	11.1'	55.6'
7	281°32.3	17.3	230°04.0	13.2'	15°31.3	11.0'	55.6'
8	296°32.4	16.4	244°36.1	13.1'	15°42.3	11.0'	55.6'
9	311°32.5	·· 15.5	259°08.2	13.0'	15°53.3	10.9'	55.7'
10	326°32.5	14.6	273°40.2	12.9'	16°04.1	10.8'	55.7'
11	341°32.6	13.7	288°12.0	12.8'	16°14.9	10.8'	55.7'
12	356°32.6	S11°12.8	302°43.9	12.8'	N16°25.7	10.7'	55.7'
13	11°32.7	11.9	317°15.6	12.7'	16°36.4	10.6'	55.8'
14	26°32.8	11.0	331°47.2	12.6'	16°47.0	10.6'	55.8'
15	41°32.8	·· 10.1	346°18.8	12.5'	16°57.5	10.5'	55.8'
16	56°32.9	09.3	0°50.3	12.4'	17°08.0	10.4'	55.8'
17	71°32.9	08.4	15°21.7	12.4'	17°18.4	10.4'	55.9'
18	86°33.0	S11°07.5	29°53.0	12.3'	N17°28.7	10.3'	55.9'
19	101°33.1	06.6	44°24.2	12.2'	17°39.0	10.2'	55.9'
20	116°33.1	05.7	58°55.3	12.1'	17°49.2	10.2'	55.9'
21	131°33.2	·· 04.8	73°26.4	12.0'	17°59.3	10.1'	56.0'
22	146°33.2	03.9	87°57.3	11.9'	18°09.3	10.0'	56.0'
23	161°33.3	03.0	102°28.2	11.8'	18°19.3	9.9'	56.0'
	SD.=16.2	d=0.9	S.D.=15.2				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	176°33.4	S11°02.1	116°59.0	11.7'	N18°29.2	9.8'	56.0'
1	191°33.4	01.2	131°29.7	11.7'	18°39.0	9.8'	56.1'
2	206°33.5	11°00.3	146°00.3	11.6'	18°48.7	9.7'	56.1'
3	221°33.6	10°59.4	160°30.8	11.5'	18°58.4	9.6'	56.1'
4	236°33.6	58.5	175°01.2	11.4'	19°07.9	9.5'	56.1'
5	251°33.7	57.6	189°31.6	11.3'	19°17.4	9.4'	56.2'
6	266°33.8	S10°56.7	204°01.8	11.2'	N19°26.8	9.3'	56.2'
7	281°33.8	55.8	218°32.0	11.1'	19°36.1	9.3'	56.2'
8	296°33.9	54.9	233°02.0	11.0'	19°45.3	9.2'	56.3'
9	311°34.0	·· 54.0	247°32.0	10.9'	19°54.4	9.1'	56.3'
10	326°34.0	53.1	262°01.8	10.8'	20°03.5	9.0'	56.3'
11	341°34.1	52.2	276°31.6	10.7'	20°12.4	8.9'	56.3'
12	356°34.2	S10°51.3	291°01.3	10.6'	N20°21.3	8.8'	56.4'
13	11°34.2	50.4	305°30.9	10.5'	20°30.0	8.7'	56.4'
14	26°34.3	49.5	320°00.4	10.4'	20°38.7	8.6'	56.4'
15	41°34.4	·· 48.6	334°29.8	10.3'	20°47.3	8.5'	56.5'
16	56°34.4	47.7	348°59.1	10.3'	20°55.7	8.4'	56.5'
17	71°34.5	46.8	3°28.3	10.2'	21°04.1	8.3'	56.5'
18	86°34.6	S10°45.9	17°57.4	10.1'	N21°12.4	8.2'	56.6'
19	101°34.6	45.0	32°26.4	10.0'	21°20.6	8.1'	56.6'
20	116°34.7	44.1	46°55.3	9.9'	21°28.6	8.0'	56.6'
21	131°34.8	·· 43.2	61°24.1	9.8'	21°36.6	7.9'	56.6'
22	146°34.8	42.3	75°52.9	9.7'	21°44.5	7.8'	56.7'
23	161°34.9	41.4	90°21.5	9.6'	21°52.2	7.7'	56.7'
	SD.=16.2	d=0.9	S.D.=15.4				

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

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

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 4-6 17-34%
18	13:57	13:55	12:14	15:11	02:49	
19	13:52	13:49	12:14	15:57	03:33	
20	13:46	13:43	12:14	16:46	04:21	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	150°48.6	166°57.6	S08°26.8	25°11.8	N23°45.1	170°51.5	S09°27.3	326°41.6	N00°57.1
1	165°51.1	181°57.2	25.6	40°14.8	45.2	185°53.4	27.0	341°44.2	57.2
2	180°53.5	196°56.7	24.4	55°17.9	45.3	200°55.3	26.8	356°46.8	57.2
3	195°56.0	211°56.3	·· 23.2	70°21.0	·· 45.3	215°57.2	·· 26.6	11°49.4	·· 57.3
4	210°58.5	226°55.8	22.0	85°24.1	45.4	230°59.1	26.4	26°52.0	57.4
5	226°00.9	241°55.4	20.8	100°27.2	45.4	246°01.0	26.1	41°54.7	57.4
6	241°03.4	256°54.9	S08°19.5	115°30.3	N23°45.5	261°02.9	S09°25.9	56°57.3	N00°57.5
7	256°05.8	271°54.5	18.3	130°33.3	45.6	276°04.8	25.7	71°59.9	57.6
8	271°08.3	286°54.0	17.1	145°36.4	45.6	291°06.6	25.5	87°02.5	57.6
9	286°10.8	301°53.6	·· 15.9	160°39.5	·· 45.7	306°08.5	·· 25.2	102°05.1	·· 57.7
10	301°13.2	316°53.1	14.7	175°42.6	45.8	321°10.4	25.0	117°07.7	57.8
11	316°15.7	331°52.7	13.5	190°45.6	45.8	336°12.3	24.8	132°10.3	57.8
12	331°18.2	346°52.2	S08°12.3	205°48.7	N23°45.9	351°14.2	S09°24.6	147°12.9	N00°57.9
13	346°20.6	1°51.8	11.1	220°51.8	45.9	6°16.1	24.3	162°15.5	58.0
14	1°23.1	16°51.3	09.9	235°54.9	46.0	21°18.0	24.1	177°18.1	58.0
15	16°25.6	31°50.9	·· 08.7	250°57.9	·· 46.0	36°19.9	·· 23.9	192°20.7	·· 58.1
16	31°28.0	46°50.4	07.5	266°01.0	46.1	51°21.8	23.7	207°23.3	58.2
17	46°30.5	61°50.0	06.2	281°04.1	46.2	66°23.7	23.4	222°25.9	58.2
18	61°33.0	76°49.6	S08°05.0	296°07.1	N23°46.2	81°25.6	S09°23.2	237°28.5	N00°58.3
19	76°35.4	91°49.1	03.8	311°10.2	46.3	96°27.5	23.0	252°31.1	58.4
20	91°37.9	106°48.7	02.6	326°13.3	46.3	111°29.4	22.8	267°33.7	58.5
21	106°40.3	121°48.2	·· 01.4	341°16.3	·· 46.4	126°31.3	·· 22.6	282°36.3	·· 58.5
22	121°42.8	136°47.8	08°00.2	356°19.4	46.4	141°33.2	22.3	297°38.9	58.6
23	136°45.3	151°47.3	07°59.0	11°22.4	46.5	156°35.1	22.1	312°41.5	58.7
Mer.pass.:13:54		v-0.5 d1.2 m-3.8		v3.1 d0.1 m-0.8		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	151°47.7	166°46.9	S07°57.8	26°25.5	N23°46.5	171°37.0	S09°21.9	327°44.1	N00°58.7
1	166°50.2	181°46.5	56.5	41°28.5	46.6	186°38.9	21.7	342°46.7	58.8
2	181°52.7	196°46.0	55.3	56°31.6	46.6	201°40.8	21.4	357°49.3	58.9
3	196°55.1	211°45.6	·· 54.1	71°34.6	·· 46.7	216°42.7	·· 21.2	12°51.9	·· 58.9
4	211°57.6	226°45.1	52.9	86°37.7	46.7	231°44.6	21.0	27°54.5	59.0
5	227°00.1	241°44.7	51.7	101°40.7	46.8	246°46.5	20.8	42°57.1	59.1
6	242°02.5	256°44.3	S07°50.5	116°43.8	N23°46.8	261°48.4	S09°20.5	57°59.7	N00°59.1
7	257°05.0	271°43.8	49.2	131°46.8	46.9	276°50.3	20.3	73°02.3	59.2
8	272°07.5	286°43.4	48.0	146°49.9	46.9	291°52.2	20.1	88°04.9	59.3
9	287°09.9	301°42.9	·· 46.8	161°52.9	·· 47.0	306°54.1	·· 19.9	103°07.5	·· 59.4
10	302°12.4	316°42.5	45.6	176°56.0	47.0	321°56.0	19.6	118°10.1	59.4
11	317°14.8	331°42.1	44.4	191°59.0	47.1	336°57.9	19.4	133°12.8	59.5
12	332°17.3	346°41.6	S07°43.2	207°02.0	N23°47.1	351°59.8	S09°19.2	148°15.4	N00°59.6
13	347°19.8	1°41.2	41.9	222°05.1	47.2	7°01.7	19.0	163°18.0	59.6
14	2°22.2	16°40.7	40.7	237°08.1	47.2	22°03.6	18.7	178°20.6	59.7
15	17°24.7	31°40.3	·· 39.5	252°11.2	·· 47.3	37°05.4	·· 18.5	193°23.2	·· 59.8
16	32°27.2	46°39.9	38.3	267°14.2	47.3	52°07.3	18.3	208°25.8	59.8
17	47°29.6	61°39.4	37.1	282°17.2	47.4	67°09.2	18.1	223°28.4	00°59.9
18	62°32.1	76°39.0	S07°35.8	297°20.3	N23°47.4	82°11.1	S09°17.8	238°31.0	N01°00.0
19	77°34.6	91°38.6	34.6	312°23.3	47.5	97°13.0	17.6	253°33.6	00.0
20	92°37.0	106°38.1	33.4	327°26.3	47.5	112°14.9	17.4	268°36.2	00.1
21	107°39.5	121°37.7	·· 32.2	342°29.3	·· 47.6	127°16.8	·· 17.2	283°38.8	·· 00.2
22	122°42.0	136°37.3	31.0	357°32.4	47.6	142°18.7	16.9	298°41.4	00.3
23	137°44.4	151°36.8	29.7	12°35.4	47.7	157°20.6	16.7	313°44.0	00.3
Mer.pass.:13:51		v-0.4 d1.2 m-3.8		v3.1 d0.1 m-0.8		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	152°46.9	166°36.4	S07°28.5	27°38.4	N23°47.7	172°22.5	S09°16.5	328°46.6	N01°00.4
1	167°49.3	181°35.9	27.3	42°41.4	47.7	187°24.4	16.3	343°49.2	00.5
2	182°51.8	196°35.5	26.1	57°44.4	47.8	202°26.3	16.0	358°51.8	00.5
3	197°54.3	211°35.1	·· 24.8	72°47.5	·· 47.8	217°28.2	·· 15.8	13°54.4	·· 00.6
4	212°56.7	226°34.6	23.6	87°50.5	47.9	232°30.1	15.6	28°57.1	00.7
5	227°59.2	241°34.2	22.4	102°53.5	47.9	247°32.0	15.4	43°59.7	00.7
6	243°01.7	256°33.8	S07°21.2	117°56.5	N23°47.9	262°33.9	S09°15.1	59°02.3	N01°00.8
7	258°04.1	271°33.4	20.0	132°59.5	48.0	277°35.8	14.9	74°04.9	00.9
8	273°06.6	286°32.9	18.7	148°02.5	48.0	292°37.7	14.7	89°07.5	01.0
9	288°09.1	301°32.5	·· 17.5	163°05.5	·· 48.1	307°39.6	·· 14.5	104°10.1	·· 01.0
10	303°11.5	316°32.1	16.3	178°08.6	48.1	322°41.5	14.2	119°12.7	01.1
11	318°14.0	331°31.6	15.1	193°11.6	48.1	337°43.4	14.0	134°15.3	01.2
12	333°16.4	346°31.2	S07°13.8	208°14.6	N23°48.2	352°45.3	S09°13.8	149°17.9	N01°01.2
13	348°18.9	1°30.8	12.6	223°17.6	48.2	7°47.2	13.6	164°20.5	01.3
14	3°21.4	16°30.3	11.4	238°20.6	48.3	22°49.1	13.3	179°23.1	01.4
15	18°23.8	31°29.9	·· 10.1	253°23.6	·· 48.3	37°51.0	·· 13.1	194°25.7	·· 01.4
16	33°26.3	46°29.5	08.9	268°26.6	48.3	52°52.9	12.9	209°28.3	01.5
17	48°28.8	61°29.0	07.7	283°29.6	48.4	67°54.8	12.7	224°30.9	01.6
18	63°31.2	76°28.6	S07°06.5	298°32.6	N23°48.4	82°56.7	S09°12.5	239°33.6	N01°01.7
19	78°33.7	91°28.2	05.2	313°35.6	48.4	97°58.6	12.2	254°36.2	01.7
20	93°36.2	106°27.8	04.0	328°38.6	48.5	113°00.5	12.0	269°38.8	01.8
21	108°38.6	121°27.3	·· 02.8	343°41.5	·· 48.5	128°02.4	·· 11.8	284°41.4	·· 01.9
22	123°41.1	136°26.9	01.5	358°44.5	48.5	143°04.2	11.6	299°44.0	01.9
23	138°43.6	151°26.5	00.3	13°47.5	48.6	158°06.1	11.3	314°46.6	02.0
Mer.pass.:13:47		v-0.4 d1.2 m-3.8		v3.0 d0.0 m-0.8		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.2
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.7	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°07.8	89°18.9
Acamar	315°20.2	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.0	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°37.9	46°00.6
Bellatrix	278°34.5	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°56.9	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.6	-59°32.7
Suhail	222°53.9	-43°28.6
Miaplacidus	221°39.5	-69°45.7
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.7	-63°09.3
Gacrux	172°03.3	-57°10.2
Alioth	166°22.2	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.4	49°15.4
Hadar	148°51.2	-60°25.2
Menkent	148°10.3	-36°25.2
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.9	-60°52.5
Kochab	137°19.2	74°06.4
Zuben'ubi	137°08.0	-16°05.2
Alphecca	126°13.0	26°40.5
Antares	112°29.3	-26°27.3
Atria	107°33.5	-69°02.5
Sabik	102°15.4	-15°44.3
Shaula	96°25.3	-37°06.6
Rasalhague	96°08.8	12°32.9
Eltanin	90°47.5	51°28.9
Kaus Aust.	83°47.2	-34°22.7
Vega	80°40.9	38°47.3
Nunki	76°01.5	-26°17.0
Altair	62°10.9	8°53.6
Peacock	53°23.4	-56°42.0
Deneb	49°33.6	45°18.9
Enif	33°49.8	9°55.3
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 21 Sun	**SHA**	**Mer.pass**
Venus	16°09.0	12:53
Mars	234°23.2	22:15
Jupiter	20°02.9	12:35
Saturn	175°53.0	02:13

Feb 22 Mon	**SHA**	**Mer.pass**
Venus	14°59.2	12:53
Mars	234°37.7	22:10
Jupiter	19°49.3	12:32
Saturn	175°56.4	02:09

Feb 23 Tue	**SHA**	**Mer.pass**
Venus	13°49.5	12:54
Mars	234°51.5	22:05
Jupiter	19°35.6	12:29
Saturn	175°59.7	02:05

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.0	S10°40.5	104°50.0	9.5'	N21°59.9	7.6'	56.7'
1	191°35.1	39.6	119°18.4	9.4'	22°07.4	7.5'	56.8'
2	206°35.1	38.7	133°46.8	9.3'	22°14.8	7.4'	56.8'
3	221°35.2	·· 37.8	148°15.0	9.2'	22°22.1	7.3'	56.8'
4	236°35.3	36.9	162°43.2	9.1'	22°29.3	7.1'	56.9'
5	251°35.3	36.0	177°11.2	9.0'	22°36.4	7.0'	56.9'
6	266°35.4	S10°35.1	191°39.1	8.9'	N22°43.4	6.9'	56.9'
7	281°35.5	34.2	206°07.0	8.8'	22°50.3	6.8'	57.0'
8	296°35.6	33.3	220°34.7	8.7'	22°57.0	6.7'	57.0'
9	311°35.6	·· 32.4	235°02.4	8.6'	23°03.6	6.6'	57.0'
10	326°35.7	31.5	249°30.0	8.5'	23°10.1	6.4'	57.1'
11	341°35.8	30.6	263°57.4	8.4'	23°16.5	6.3'	57.1'
12	356°35.8	S10°29.7	278°24.8	8.3'	N23°22.8	6.2'	57.1'
13	11°35.9	28.8	292°52.1	8.2'	23°28.9	6.1'	57.2'
14	26°36.0	27.9	307°19.3	8.1'	23°34.9	5.9'	57.2'
15	41°36.1	·· 27.0	321°46.4	8.0'	23°40.8	5.8'	57.2'
16	56°36.1	26.0	336°13.4	7.9'	23°46.6	5.7'	57.3'
17	71°36.2	25.1	350°40.3	7.9'	23°52.2	5.6'	57.3'
18	86°36.3	S10°24.2	5°07.1	7.8'	N23°57.7	5.4'	57.3'
19	101°36.4	23.3	19°33.8	7.7'	24°03.1	5.3'	57.4'
20	116°36.4	22.4	34°00.4	7.6'	24°08.3	5.2'	57.4'
21	131°36.5	·· 21.5	48°27.0	7.5'	24°13.4	5.0'	57.4'
22	146°36.6	20.6	62°53.4	7.4'	24°18.4	4.9'	57.5'
23	161°36.7	19.7	77°19.8	7.3'	24°23.2	4.8'	57.5'
	SD.=16.2	d=0.9	S.D.=15.6				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.8	S10°18.8	91°46.0	7.2'	N24°27.9	4.6'	57.5'
1	191°36.8	17.9	106°12.2	7.1'	24°32.5	4.5'	57.6'
2	206°36.9	17.0	120°38.3	7.1'	24°36.9	4.3'	57.6'
3	221°37.0	·· 16.1	135°04.3	7.0'	24°41.1	4.2'	57.6'
4	236°37.1	15.1	149°30.2	6.9'	24°45.3	4.1'	57.7'
5	251°37.1	14.2	163°56.1	6.8'	24°49.3	3.9'	57.7'
6	266°37.2	S10°13.3	178°21.8	6.7'	N24°53.1	3.8'	57.7'
7	281°37.3	12.4	192°47.5	6.6'	24°56.8	3.6'	57.8'
8	296°37.4	11.5	207°13.1	6.6'	25°00.4	3.5'	57.8'
9	311°37.5	·· 10.6	221°38.6	6.5'	25°03.8	3.3'	57.8'
10	326°37.5	09.7	236°04.0	6.4'	25°07.0	3.2'	57.9'
11	341°37.6	08.8	250°29.4	6.3'	25°10.1	3.0'	57.9'
12	356°37.7	S10°07.9	264°54.7	6.2'	N25°13.1	2.9'	58.0'
13	11°37.8	06.9	279°19.9	6.2'	25°15.9	2.7'	58.0'
14	26°37.9	06.0	293°45.0	6.1'	25°18.5	2.6'	58.0'
15	41°37.9	·· 05.1	308°10.1	6.0'	25°21.0	2.4'	58.1'
16	56°38.0	04.2	322°35.0	5.9'	25°23.4	2.3'	58.1'
17	71°38.1	03.3	336°59.9	5.9'	25°25.6	2.1'	58.1'
18	86°38.2	S10°02.4	351°24.8	5.8'	N25°27.6	2.0'	58.2'
19	101°38.3	01.5	5°49.6	5.7'	25°29.5	1.8'	58.2'
20	116°38.3	10°00.5	20°14.3	5.7'	25°31.2	1.6'	58.2'
21	131°38.4	09°59.6	34°38.9	5.6'	25°32.7	1.5'	58.3'
22	146°38.5	58.7	49°03.5	5.5'	25°34.1	1.3'	58.3'
23	161°38.6	57.8	63°28.0	5.5'	25°35.4	1.2'	58.3'
	SD.=16.2	d=0.9	S.D.=15.8				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°38.7	S09°56.9	77°52.5	5.4'	N25°36.4	1.0'	58.4'
1	191°38.8	56.0	92°16.9	5.4'	25°37.4	0.8'	58.4'
2	206°38.9	55.1	106°41.2	5.3'	25°38.1	0.7'	58.5'
3	221°38.9	·· 54.1	121°05.5	5.3'	25°38.7	0.5'	58.5'
4	236°39.0	53.2	135°29.7	5.2'	25°39.1	0.3'	58.5'
5	251°39.1	52.3	149°53.9	5.2'	25°39.4	0.2'	58.6'
6	266°39.2	S09°51.4	164°18.0	5.1'	N25°39.4	0.0'	58.6'
7	281°39.3	50.5	178°42.1	5.1'	25°39.4	-0.2'	58.6'
8	296°39.4	49.6	193°06.1	5.0'	25°39.1	-0.3'	58.7'
9	311°39.4	·· 48.6	207°30.1	5.0'	25°38.7	-0.5'	58.7'
10	326°39.5	47.7	221°54.1	4.9'	25°38.1	-0.7'	58.7'
11	341°39.6	46.8	236°18.0	4.9'	25°37.3	-0.8'	58.8'
12	356°39.7	S09°45.9	250°41.8	4.8'	N25°36.4	-1.0'	58.8'
13	11°39.8	45.0	265°05.6	4.8'	25°35.3	-1.2'	58.9'
14	26°39.9	44.0	279°29.4	4.8'	25°34.1	-1.4'	58.9'
15	41°40.0	·· 43.1	293°53.2	4.7'	25°32.6	-1.5'	58.9'
16	56°40.1	42.2	308°16.9	4.7'	25°31.0	-1.7'	59.0'
17	71°40.1	41.3	322°40.6	4.7'	25°29.2	-1.9'	59.0'
18	86°40.2	S09°40.4	337°04.2	4.6'	N25°27.3	-2.0'	59.0'
19	101°40.3	39.4	351°27.9	4.6'	25°25.2	-2.2'	59.1'
20	116°40.4	38.5	5°51.5	4.6'	25°22.9	-2.4'	59.1'
21	131°40.5	·· 37.6	20°15.1	4.6'	25°20.4	-2.6'	59.1'
22	146°40.6	36.7	34°38.6	4.6'	25°17.7	-2.7'	59.2'
23	161°40.7	35.8	49°02.2	4.5'	25°14.9	-2.9'	59.2'
	SD.=16.2	d=0.9	S.D.=16.0				

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 44-66%
21	13:40	13:37	12:14	17:39	05:12	
22	13:33	13:29	12:13	18:36	06:07	
23	13:25	13:21	12:13	19:36	07:05	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	153°46.0	166°26.1	S06°59.1	28°50.5	N23°48.6	173°08.0	S09°11.1	329°49.2	N01°02.1
1	168°48.5	181°25.6	57.9	43°53.5	48.6	188°09.9	10.9	344°51.8	02.2
2	183°50.9	196°25.2	56.6	58°56.5	48.7	203°11.8	10.7	359°54.4	02.2
3	198°53.4	211°24.8	·· 55.4	73°59.5	·· 48.7	218°13.7	·· 10.4	14°57.0	·· 02.3
4	213°55.9	226°24.4	54.2	89°02.5	48.7	233°15.6	10.2	29°59.6	02.4
5	228°58.3	241°23.9	52.9	104°05.4	48.8	248°17.5	10.0	45°02.3	02.4
6	244°00.8	256°23.5	S06°51.7	119°08.4	N23°48.8	263°19.4	S09°09.8	60°04.9	N01°02.5
7	259°03.3	271°23.1	50.5	134°11.4	48.8	278°21.3	09.5	75°07.5	02.6
8	274°05.7	286°22.7	49.2	149°14.4	48.9	293°23.2	09.3	90°10.1	02.7
9	289°08.2	301°22.2	·· 48.0	164°17.3	·· 48.9	308°25.1	·· 09.1	105°12.7	·· 02.7
10	304°10.7	316°21.8	46.8	179°20.3	48.9	323°27.0	08.9	120°15.3	02.8
11	319°13.1	331°21.4	45.5	194°23.3	49.0	338°28.9	08.6	135°17.9	02.9
12	334°15.6	346°21.0	S06°44.3	209°26.3	N23°49.0	353°30.8	S09°08.4	150°20.5	N01°02.9
13	349°18.1	1°20.5	43.1	224°29.2	49.0	8°32.7	08.2	165°23.1	03.0
14	4°20.5	16°20.1	41.8	239°32.2	49.0	23°34.6	08.0	180°25.7	03.1
15	19°23.0	31°19.7	·· 40.6	254°35.2	·· 49.1	38°36.5	·· 07.7	195°28.4	·· 03.2
16	34°25.4	46°19.3	39.4	269°38.1	49.1	53°38.4	07.5	210°31.0	03.2
17	49°27.9	61°18.8	38.1	284°41.1	49.1	68°40.3	07.3	225°33.6	03.3
18	64°30.4	76°18.4	S06°36.9	299°44.1	N23°49.1	83°42.2	S09°07.1	240°36.2	N01°03.4
19	79°32.8	91°18.0	35.7	314°47.0	49.2	98°44.1	06.8	255°38.8	03.4
20	94°35.3	106°17.6	34.4	329°50.0	49.2	113°46.0	06.6	270°41.4	03.5
21	109°37.8	121°17.2	·· 33.2	344°52.9	·· 49.2	128°47.9	·· 06.4	285°44.0	·· 03.6
22	124°40.2	136°16.7	31.9	359°55.9	49.3	143°49.8	06.2	300°46.6	03.7
23	139°42.7	151°16.3	30.7	14°58.9	49.3	158°51.7	05.9	315°49.2	03.7
Mer.pass.:13:43		v-0.4 d1.2 m-3.8		v3.0 d0.0 m-0.7		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	154°45.2	166°15.9	S06°29.5	30°01.8	N23°49.3	173°53.6	S09°05.7	330°51.9	N01°03.8
1	169°47.6	181°15.5	28.2	45°04.8	49.3	188°55.5	05.5	345°54.5	03.9
2	184°50.1	196°15.1	27.0	60°07.7	49.3	203°57.4	05.3	0°57.1	03.9
3	199°52.6	211°14.6	·· 25.8	75°10.7	·· 49.4	218°59.3	·· 05.0	15°59.7	·· 04.0
4	214°55.0	226°14.2	24.5	90°13.6	49.4	234°01.2	04.8	31°02.3	04.1
5	229°57.5	241°13.8	23.3	105°16.6	49.4	249°03.0	04.6	46°04.9	04.2
6	244°59.9	256°13.4	S06°22.0	120°19.5	N23°49.4	264°04.9	S09°04.3	61°07.5	N01°04.2
7	260°02.4	271°13.0	20.8	135°22.4	49.5	279°06.8	04.1	76°10.1	04.3
8	275°04.9	286°12.6	19.6	150°25.4	49.5	294°08.7	03.9	91°12.7	04.4
9	290°07.3	301°12.1	·· 18.3	165°28.3	·· 49.5	309°10.6	·· 03.7	106°15.4	·· 04.4
10	305°09.8	316°11.7	17.1	180°31.3	49.5	324°12.5	03.4	121°18.0	04.5
11	320°12.3	331°11.3	15.8	195°34.2	49.5	339°14.4	03.2	136°20.6	04.6
12	335°14.7	346°10.9	S06°14.6	210°37.1	N23°49.6	354°16.3	S09°03.0	151°23.2	N01°04.7
13	350°17.2	1°10.5	13.4	225°40.1	49.6	9°18.2	02.8	166°25.8	04.7
14	5°19.7	16°10.1	12.1	240°43.0	49.6	24°20.1	02.5	181°28.4	04.8
15	20°22.1	31°09.6	·· 10.9	255°45.9	·· 49.6	39°22.0	·· 02.3	196°31.0	·· 04.9
16	35°24.6	46°09.2	09.6	270°48.9	49.6	54°23.9	02.1	211°33.6	04.9
17	50°27.1	61°08.8	08.4	285°51.8	49.6	69°25.8	01.9	226°36.3	05.0
18	65°29.5	76°08.4	S06°07.1	300°54.7	N23°49.7	84°27.7	S09°01.6	241°38.9	N01°05.1
19	80°32.0	91°08.0	05.9	315°57.7	49.7	99°29.6	01.4	256°41.5	05.2
20	95°34.4	106°07.6	04.7	331°00.6	49.7	114°31.5	01.2	271°44.1	05.2
21	110°36.9	121°07.2	·· 03.4	346°03.5	·· 49.7	129°33.4	·· 01.0	286°46.7	·· 05.3
22	125°39.4	136°06.7	02.2	1°06.4	49.7	144°35.3	00.7	301°49.3	05.4
23	140°41.8	151°06.3	00.9	16°09.4	49.7	159°37.2	00.5	316°51.9	05.4
Mer.pass.:13:39		v-0.4 d1.2 m-3.8		v3.0 d0.0 m-0.7		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	155°44.3	166°05.9	S05°59.7	31°12.3	N23°49.8	174°39.1	S09°00.3	331°54.6	N01°05.5
1	170°46.8	181°05.5	58.4	46°15.2	49.8	189°41.0	09°00.1	346°57.2	05.6
2	185°49.2	196°05.1	57.2	61°18.1	49.8	204°42.9	08°59.8	1°59.8	05.7
3	200°51.7	211°04.7	·· 56.0	76°21.0	·· 49.8	219°44.8	·· 59.6	17°02.4	·· 05.7
4	215°54.2	226°04.3	54.7	91°23.9	49.8	234°46.7	59.4	32°05.0	05.8
5	230°56.6	241°03.9	53.5	106°26.8	49.8	249°48.6	59.2	47°07.6	05.9
6	245°59.1	256°03.4	S05°52.2	121°29.8	N23°49.8	264°50.5	S08°58.9	62°10.2	N01°06.0
7	261°01.5	271°03.0	51.0	136°32.7	49.9	279°52.4	58.7	77°12.9	06.0
8	276°04.0	286°02.6	49.7	151°35.6	49.9	294°54.3	58.5	92°15.5	06.1
9	291°06.5	301°02.2	·· 48.5	166°38.5	·· 49.9	309°56.2	·· 58.3	107°18.1	·· 06.2
10	306°08.9	316°01.8	47.2	181°41.4	49.9	324°58.1	58.0	122°20.7	06.2
11	321°11.4	331°01.4	46.0	196°44.3	49.9	340°00.0	57.8	137°23.3	06.3
12	336°13.9	346°01.0	S05°44.7	211°47.2	N23°49.9	355°01.9	S08°57.6	152°25.9	N01°06.4
13	351°16.3	1°00.6	43.5	226°50.1	49.9	10°03.7	57.4	167°28.5	06.5
14	6°18.8	16°00.2	42.2	241°53.0	49.9	25°05.6	57.1	182°31.2	06.5
15	21°21.3	30°59.8	·· 41.0	256°55.9	·· 49.9	40°07.5	·· 56.9	197°33.8	·· 06.6
16	36°23.7	45°59.4	39.7	271°58.8	49.9	55°09.4	56.7	212°36.4	06.7
17	51°26.2	60°58.9	38.5	287°01.7	49.9	70°11.3	56.5	227°39.0	06.8
18	66°28.7	75°58.5	S05°37.2	302°04.6	N23°50.0	85°13.2	S08°56.2	242°41.6	N01°06.8
19	81°31.1	90°58.1	36.0	317°07.5	50.0	100°15.1	56.0	257°44.2	06.9
20	96°33.6	105°57.7	34.7	332°10.4	50.0	115°17.0	55.8	272°46.8	07.0
21	111°36.0	120°57.3	·· 33.5	347°13.2	·· 50.0	130°18.9	·· 55.6	287°49.5	·· 07.1
22	126°38.5	135°56.9	32.2	2°16.1	50.0	145°20.8	55.3	302°52.1	07.1
23	141°41.0	150°56.5	31.0	17°19.0	50.0	160°22.7	55.1	317°54.7	07.2
Mer.pass.:13:35		v-0.4 d1.2 m-3.8		v2.9 d0.0 m-0.7		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.1
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.7	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°08.9	89°18.9
Acamar	315°20.2	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.0	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°37.9	46°00.7
Bellatrix	278°34.5	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.0	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.6	-59°32.8
Suhail	222°53.9	-43°28.6
Miaplacidus	221°39.5	-69°45.7
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.5
Denebola	182°35.8	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.7	-63°09.3
Gacrux	172°03.3	-57°10.2
Alioth	166°22.2	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.3	49°15.4
Hadar	148°51.1	-60°25.2
Menkent	148°10.3	-36°25.2
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.8	-60°52.5
Kochab	137°19.2	74°06.4
Zuben'ubi	137°08.0	-16°05.2
Alphecca	126°12.9	26°40.5
Antares	112°29.2	-26°27.3
Atria	107°33.4	-69°02.5
Sabik	102°15.4	-15°44.3
Shaula	96°25.3	-37°06.6
Rasalhague	96°08.8	12°32.9
Eltanin	90°47.5	51°28.9
Kaus Aust.	83°47.2	-34°22.7
Vega	80°40.8	38°47.3
Nunki	76°01.5	-26°17.0
Altair	62°10.8	8°53.6
Peacock	53°23.4	-56°42.0
Deneb	49°33.6	45°18.9
Enif	33°49.8	9°55.2
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 24 Wed	**SHA**	**Mer.pass**
Venus	12°40.0	12:55
Mars	235°04.5	22:00
Jupiter	19°22.0	12:26
Saturn	176°03.2	02:00

Feb 25 Thu	**SHA**	**Mer.pass**
Venus	11°30.7	12:55
Mars	235°16.6	21:56
Jupiter	19°08.4	12:23
Saturn	176°06.7	01:56

Feb 26 Fri	**SHA**	**Mer.pass**
Venus	10°21.6	12:56
Mars	235°28.0	21:51
Jupiter	18°54.8	12:20
Saturn	176°10.3	01:52

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°40.8	S09°34.8	63°25.7	4.5'	N25°11.9	-3.1'	59.2'
1	191°40.9	33.9	77°49.2	4.5'	25°08.8	-3.3'	59.3'
2	206°41.0	33.0	92°12.7	4.5'	25°05.4	-3.4'	59.3'
3	221°41.0	·· 32.1	106°36.2	4.5'	25°01.9	-3.6'	59.4'
4	236°41.1	31.2	120°59.6	4.5'	24°58.2	-3.8'	59.4'
5	251°41.2	30.2	135°23.1	4.5'	24°54.4	-3.9'	59.4'
6	266°41.3	S09°29.3	149°46.6	4.5'	N24°50.3	-4.1'	59.5'
7	281°41.4	28.4	164°10.0	4.5'	24°46.1	-4.3'	59.5'
8	296°41.5	27.5	178°33.5	4.4'	24°41.7	-4.5'	59.5'
9	311°41.6	·· 26.5	192°56.9	4.4'	24°37.2	-4.6'	59.6'
10	326°41.7	25.6	207°20.4	4.5'	24°32.4	-4.8'	59.6'
11	341°41.8	24.7	221°43.8	4.5'	24°27.5	-5.0'	59.6'
12	356°41.9	S09°23.8	236°07.3	4.5'	N24°22.5	-5.2'	59.7'
13	11°42.0	22.8	250°30.7	4.5'	24°17.2	-5.3'	59.7'
14	26°42.1	21.9	264°54.2	4.5'	24°11.8	-5.5'	59.7'
15	41°42.2	·· 21.0	279°17.7	4.5'	24°06.2	-5.7'	59.8'
16	56°42.3	20.1	293°41.2	4.5'	24°00.5	-5.8'	59.8'
17	71°42.3	19.1	308°04.7	4.5'	23°54.5	-6.0'	59.8'
18	86°42.4	S09°18.2	322°28.2	4.5'	N23°48.4	-6.2'	59.9'
19	101°42.5	17.3	336°51.7	4.5'	23°42.1	-6.4'	59.9'
20	116°42.6	16.4	351°15.3	4.6'	23°35.7	-6.5'	59.9'
21	131°42.7	·· 15.4	5°38.9	4.6'	23°29.1	-6.7'	60.0'
22	146°42.8	14.5	20°02.5	4.6'	23°22.3	-6.9'	60.0'
23	161°42.9	13.6	34°26.1	4.6'	23°15.4	-7.0'	60.0'
	SD.=16.1	d=0.9	S.D.=16.3				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°43.0	S09°12.7	48°49.7	4.7'	N23°08.3	-7.2'	60.0'
1	191°43.1	11.7	63°13.4	4.7'	23°01.0	-7.4'	60.1'
2	206°43.2	10.8	77°37.1	4.7'	22°53.5	-7.5'	60.1'
3	221°43.3	·· 09.9	92°00.9	4.7'	22°45.9	-7.7'	60.1'
4	236°43.4	08.9	106°24.6	4.8'	22°38.2	-7.9'	60.2'
5	251°43.5	08.0	120°48.4	4.8'	22°30.2	-8.0'	60.2'
6	266°43.6	S09°07.1	135°12.2	4.8'	N22°22.1	-8.2'	60.2'
7	281°43.7	06.2	149°36.1	4.9'	22°13.9	-8.3'	60.3'
8	296°43.8	05.2	164°00.0	4.9'	22°05.5	-8.5'	60.3'
9	311°43.9	·· 04.3	178°23.9	5.0'	21°56.9	-8.7'	60.3'
10	326°44.0	03.4	192°47.9	5.0'	21°48.1	-8.8'	60.3'
11	341°44.1	02.4	207°11.9	5.0'	21°39.2	-9.0'	60.4'
12	356°44.2	S09°01.5	221°36.0	5.1'	N21°30.2	-9.1'	60.4'
13	11°44.3	09°00.6	236°00.1	5.1'	21°21.0	-9.3'	60.4'
14	26°44.4	08°59.6	250°24.2	5.2'	21°11.6	-9.4'	60.5'
15	41°44.5	·· 58.7	264°48.4	5.2'	21°02.1	-9.6'	60.5'
16	56°44.6	57.8	279°12.7	5.3'	20°52.5	-9.7'	60.5'
17	71°44.7	56.9	293°36.9	5.3'	20°42.7	-9.9'	60.5'
18	86°44.8	S08°55.9	308°01.3	5.4'	N20°32.7	-10.0'	60.6'
19	101°44.9	55.0	322°25.6	5.4'	20°22.6	-10.2'	60.6'
20	116°45.0	54.1	336°50.1	5.5'	20°12.3	-10.3'	60.6'
21	131°45.1	·· 53.1	351°14.5	5.5'	20°01.9	-10.5'	60.6'
22	146°45.2	52.2	5°39.1	5.6'	19°51.4	-10.6'	60.7'
23	161°45.3	51.3	20°03.6	5.6'	19°40.7	-10.8'	60.7'
	SD.=16.1	d=0.9	S.D.=16.5				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°45.4	S08°50.3	34°28.3	5.7'	N19°29.9	-10.9'	60.7'
1	191°45.5	49.4	48°53.0	5.7'	19°18.9	-11.0'	60.7'
2	206°45.6	48.5	63°17.7	5.8'	19°07.8	-11.2'	60.8'
3	221°45.7	·· 47.5	77°42.5	5.8'	18°56.6	-11.3'	60.8'
4	236°45.8	46.6	92°07.3	5.9'	18°45.2	-11.4'	60.8'
5	251°45.9	45.7	106°32.2	5.9'	18°33.7	-11.6'	60.8'
6	266°46.0	S08°44.7	120°57.2	6.0'	N18°22.0	-11.7'	60.8'
7	281°46.1	43.8	135°22.2	6.0'	18°10.3	-11.8'	60.9'
8	296°46.2	42.9	149°47.3	6.1'	17°58.4	-12.0'	60.9'
9	311°46.4	·· 41.9	164°12.4	6.2'	17°46.3	-12.1'	60.9'
10	326°46.5	41.0	178°37.6	6.2'	17°34.2	-12.2'	60.9'
11	341°46.6	40.1	193°02.9	6.3'	17°21.9	-12.3'	60.9'
12	356°46.7	S08°39.1	207°28.2	6.3'	N17°09.5	-12.5'	61.0'
13	11°46.8	38.2	221°53.5	6.4'	16°57.0	-12.6'	61.0'
14	26°46.9	37.2	236°18.9	6.5'	16°44.3	-12.7'	61.0'
15	41°47.0	·· 36.3	250°44.4	6.5'	16°31.6	-12.8'	61.0'
16	56°47.1	35.4	265°10.0	6.6'	16°18.7	-12.9'	61.0'
17	71°47.2	34.4	279°35.6	6.6'	16°05.7	-13.0'	61.0'
18	86°47.3	S08°33.5	294°01.2	6.7'	N15°52.6	-13.2'	61.1'
19	101°47.4	32.6	308°27.0	6.8'	15°39.4	-13.3'	61.1'
20	116°47.5	31.6	322°52.7	6.8'	15°26.1	-13.4'	61.1'
21	131°47.6	·· 30.7	337°18.6	6.9'	15°12.7	-13.5'	61.1'
22	146°47.7	29.8	351°44.5	6.9'	14°59.1	-13.6'	61.1'
23	161°47.8	28.8	6°10.4	7.0'	14°45.5	-13.7'	61.1'
	SD.=16.1	d=0.9	S.D.=16.6				

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

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

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 10-12 76-93%
24	13:17	13:12	12:13	20:36	08:06	
25	13:08	13:03	12:13	21:36	09:07	
26	12:58	12:53	12:13	22:34	10:06	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	156°43.4	165°56.1	S05°29.7	32°21.9	N23°50.0	175°24.6	S08°54.9	332°57.3	N01°07.3
1	171°45.9	180°55.7	28.5	47°24.8	50.0	190°26.5	54.7	347°59.9	07.3
2	186°48.4	195°55.3	27.2	62°27.7	50.0	205°28.4	54.4	3°02.5	07.4
3	201°50.8	210°54.9	·· 26.0	77°30.6	·· 50.0	220°30.3	·· 54.2	18°05.2	·· 07.5
4	216°53.3	225°54.5	24.7	92°33.4	50.0	235°32.2	54.0	33°07.8	07.6
5	231°55.8	240°54.1	23.5	107°36.3	50.0	250°34.1	53.8	48°10.4	07.6
6	246°58.2	255°53.7	S05°22.2	122°39.2	N23°50.0	265°36.0	S08°53.5	63°13.0	N01°07.7
7	262°00.7	270°53.3	21.0	137°42.1	50.0	280°37.9	53.3	78°15.6	07.8
8	277°03.2	285°52.8	19.7	152°44.9	50.0	295°39.8	53.1	93°18.2	07.9
9	292°05.6	300°52.4	·· 18.5	167°47.8	·· 50.0	310°41.7	·· 52.8	108°20.9	·· 07.9
10	307°08.1	315°52.0	17.2	182°50.7	50.0	325°43.6	52.6	123°23.5	08.0
11	322°10.5	330°51.6	16.0	197°53.5	50.0	340°45.5	52.4	138°26.1	08.1
12	337°13.0	345°51.2	S05°14.7	212°56.4	N23°50.0	355°47.4	S08°52.2	153°28.7	N01°08.2
13	352°15.5	0°50.8	13.5	227°59.3	50.0	10°49.3	51.9	168°31.3	08.2
14	7°17.9	15°50.4	12.2	243°02.1	50.0	25°51.2	51.7	183°33.9	08.3
15	22°20.4	30°50.0	·· 11.0	258°05.0	·· 50.0	40°53.1	·· 51.5	198°36.6	·· 08.4
16	37°22.9	45°49.6	09.7	273°07.9	50.0	55°55.0	51.3	213°39.2	08.4
17	52°25.3	60°49.2	08.4	288°10.7	50.0	70°56.9	51.0	228°41.8	08.5
18	67°27.8	75°48.8	S05°07.2	303°13.6	N23°50.0	85°58.8	S08°50.8	243°44.4	N01°08.6
19	82°30.3	90°48.4	05.9	318°16.4	50.0	101°00.7	50.6	258°47.0	08.7
20	97°32.7	105°48.0	04.7	333°19.3	50.0	116°02.6	50.4	273°49.6	08.7
21	112°35.2	120°47.6	·· 03.4	348°22.2	·· 50.0	131°04.5	·· 50.1	288°52.3	·· 08.8
22	127°37.6	135°47.2	02.2	3°25.0	50.0	146°06.4	49.9	303°54.9	08.9
23	142°40.1	150°46.8	00.9	18°27.9	50.0	161°08.3	49.7	318°57.5	09.0
Mer.pass.:13:31		v-0.4 d1.3 m-3.8		v2.9 d0.0 m-0.7		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	157°42.6	165°46.4	S04°59.7	33°30.7	N23°50.0	176°10.2	S08°49.5	334°00.1	N01°09.0
1	172°45.0	180°46.0	58.4	48°33.6	50.0	191°12.0	49.2	349°02.7	09.1
2	187°47.5	195°45.6	57.1	63°36.4	50.0	206°13.9	49.0	4°05.4	09.2
3	202°50.0	210°45.2	·· 55.9	78°39.2	·· 50.0	221°15.8	·· 48.8	19°08.0	·· 09.3
4	217°52.4	225°44.8	54.6	93°42.1	50.0	236°17.7	48.6	34°10.6	09.3
5	232°54.9	240°44.4	53.4	108°44.9	50.0	251°19.6	48.3	49°13.2	09.4
6	247°57.4	255°44.0	S04°52.1	123°47.8	N23°50.0	266°21.5	S08°48.1	64°15.8	N01°09.5
7	262°59.8	270°43.6	50.9	138°50.6	50.0	281°23.4	47.9	79°18.5	09.6
8	278°02.3	285°43.2	49.6	153°53.5	50.0	296°25.3	47.7	94°21.1	09.6
9	293°04.8	300°42.8	·· 48.3	168°56.3	·· 50.0	311°27.2	·· 47.4	109°23.7	·· 09.7
10	308°07.2	315°42.4	47.1	183°59.1	50.0	326°29.1	47.2	124°26.3	09.8
11	323°09.7	330°42.0	45.8	199°02.0	50.0	341°31.0	47.0	139°28.9	09.9
12	338°12.1	345°41.6	S04°44.6	214°04.8	N23°49.9	356°32.9	S08°46.8	154°31.5	N01°09.9
13	353°14.6	0°41.2	43.3	229°07.6	49.9	11°34.8	46.5	169°34.2	10.0
14	8°17.1	15°40.8	42.0	244°10.5	49.9	26°36.7	46.3	184°36.8	10.1
15	23°19.5	30°40.4	·· 40.8	259°13.3	·· 49.9	41°38.6	·· 46.1	199°39.4	·· 10.2
16	38°22.0	45°40.0	39.5	274°16.1	49.9	56°40.5	45.8	214°42.0	10.2
17	53°24.5	60°39.6	38.3	289°18.9	49.9	71°42.4	45.6	229°44.6	10.3
18	68°26.9	75°39.2	S04°37.0	304°21.8	N23°49.9	86°44.3	S08°45.4	244°47.3	N01°10.4
19	83°29.4	90°38.8	35.7	319°24.6	49.9	101°46.2	45.2	259°49.9	10.5
20	98°31.9	105°38.4	34.5	334°27.4	49.9	116°48.1	44.9	274°52.5	10.5
21	113°34.3	120°38.1	·· 33.2	349°30.2	·· 49.9	131°50.0	·· 44.7	289°55.1	·· 10.6
22	128°36.8	135°37.7	32.0	4°33.0	49.9	146°51.9	44.5	304°57.7	10.7
23	143°39.2	150°37.3	30.7	19°35.9	49.8	161°53.8	44.3	320°00.4	10.7
Mer.pass.:13:27		v-0.4 d1.3 m-3.8		v2.8 d-0.0 m-0.6		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	158°41.7	165°36.9	S04°29.4	34°38.7	N23°49.8	176°55.7	S08°44.0	335°03.0	N01°10.8
1	173°44.2	180°36.5	28.2	49°41.5	49.8	191°57.6	43.8	350°05.6	10.9
2	188°46.6	195°36.1	26.9	64°44.3	49.8	206°59.5	43.6	5°08.2	11.0
3	203°49.1	210°35.7	·· 25.7	79°47.1	·· 49.8	222°01.4	·· 43.4	20°10.8	·· 11.0
4	218°51.6	225°35.3	24.4	94°49.9	49.8	237°03.3	43.1	35°13.5	11.1
5	233°54.0	240°34.9	23.1	109°52.7	49.8	252°05.2	42.9	50°16.1	11.2
6	248°56.5	255°34.5	S04°21.9	124°55.5	N23°49.7	267°07.1	S08°42.7	65°18.7	N01°11.3
7	263°59.0	270°34.1	20.6	139°58.3	49.7	282°09.0	42.5	80°21.3	11.3
8	279°01.4	285°33.7	19.3	155°01.1	49.7	297°10.9	42.2	95°23.9	11.4
9	294°03.9	300°33.3	·· 18.1	170°03.9	·· 49.7	312°12.8	·· 42.0	110°26.6	·· 11.5
10	309°06.4	315°32.9	16.8	185°06.8	49.7	327°14.7	41.8	125°29.2	11.6
11	324°08.8	330°32.5	15.6	200°09.6	49.7	342°16.6	41.5	140°31.8	11.6
12	339°11.3	345°32.1	S04°14.3	215°12.3	N23°49.7	357°18.5	S08°41.3	155°34.4	N01°11.7
13	354°13.7	0°31.7	13.0	230°15.1	49.6	12°20.4	41.1	170°37.1	11.8
14	9°16.2	15°31.4	11.8	245°17.9	49.6	27°22.3	40.9	185°39.7	11.9
15	24°18.7	30°31.0	·· 10.5	260°20.7	·· 49.6	42°24.2	·· 40.6	200°42.3	·· 11.9
16	39°21.1	45°30.6	09.2	275°23.5	49.6	57°26.1	40.4	215°44.9	12.0
17	54°23.6	60°30.2	08.0	290°26.3	49.6	72°28.0	40.2	230°47.5	12.1
18	69°26.1	75°29.8	S04°06.7	305°29.1	N23°49.6	87°29.9	S08°40.0	245°50.2	N01°12.2
19	84°28.5	90°29.4	05.4	320°31.9	49.5	102°31.8	39.7	260°52.8	12.2
20	99°31.0	105°29.0	04.2	335°34.7	49.5	117°33.7	39.5	275°55.4	12.3
21	114°33.5	120°28.6	·· 02.9	350°37.5	·· 49.5	132°35.5	·· 39.3	290°58.0	·· 12.4
22	129°35.9	135°28.2	01.6	5°40.3	49.5	147°37.4	39.1	306°00.7	12.5
23	144°38.4	150°27.8	00.4	20°43.0	49.5	162°39.3	38.8	321°03.3	12.6
Mer.pass.:13:23		v-0.4 d1.3 m-3.8		v2.8 d-0.0 m-0.6		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.1
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.8	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°10.2	89°18.9
Acamar	315°20.2	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.0	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°37.9	46°00.7
Bellatrix	278°34.5	6°21.5
Elnath	278°15.6	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.0	-52°42.3
Sirius	258°35.6	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.3	28°00.0
Avior	234°18.6	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.6	-69°45.7
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.7	-63°09.4
Gacrux	172°03.3	-57°10.3
Alioth	166°22.1	55°53.9
Spica	158°33.6	-11°13.1
Alkaid	153°00.3	49°15.4
Hadar	148°51.1	-60°25.3
Menkent	148°10.2	-36°25.2
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.8	-60°52.5
Kochab	137°19.1	74°06.4
Zuben'ubi	137°08.0	-16°05.2
Alphecca	126°12.9	26°40.5
Antares	112°29.2	-26°27.3
Atria	107°33.3	-69°02.5
Sabik	102°15.3	-15°44.3
Shaula	96°25.3	-37°06.6
Rasalhague	96°08.8	12°32.9
Eltanin	90°47.4	51°28.9
Kaus Aust.	83°47.1	-34°22.7
Vega	80°40.8	38°47.3
Nunki	76°01.5	-26°17.0
Altair	62°10.8	8°53.6
Peacock	53°23.4	-56°42.0
Deneb	49°33.6	45°18.9
Enif	33°49.8	9°55.2
Al Na'ir	27°47.1	-46°54.7
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Feb 27 Sat	**SHA**	**Mer.pass**
Venus	9°12.7	12:57
Mars	235°38.5	21:46
Jupiter	18°41.2	12:17
Saturn	176°13.9	01:48

Feb 28 Sun	**SHA**	**Mer.pass**
Venus	8°03.8	12:57
Mars	235°48.1	21:42
Jupiter	18°27.6	12:14
Saturn	176°17.5	01:44

Mar 01 Mon	**SHA**	**Mer.pass**
Venus	6°55.2	12:58
Mars	235°57.0	21:37
Jupiter	18°14.0	12:11
Saturn	176°21.3	01:40

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°48.0	S08°27.9	20°36.5	7.0'	N14°31.7	-13.8'	61.1'
1	191°48.1	26.9	35°02.5	7.1'	14°17.9	-13.9'	61.1'
2	206°48.2	26.0	49°28.7	7.2'	14°04.0	-14.0'	61.2'
3	221°48.3	·· 25.1	63°54.9	7.2'	13°49.9	-14.1'	61.2'
4	236°48.4	24.1	78°21.1	7.3'	13°35.8	-14.2'	61.2'
5	251°48.5	23.2	92°47.4	7.3'	13°21.6	-14.3'	61.2'
6	266°48.6	S08°22.2	107°13.8	7.4'	N13°07.3	-14.3'	61.2'
7	281°48.7	21.3	121°40.2	7.5'	12°52.9	-14.4'	61.2'
8	296°48.8	20.4	136°06.7	7.5'	12°38.4	-14.5'	61.2'
9	311°48.9	·· 19.4	150°33.3	7.6'	12°23.9	-14.6'	61.2'
10	326°49.1	18.5	164°59.9	7.6'	12°09.2	-14.7'	61.2'
11	341°49.2	17.5	179°26.5	7.7'	11°54.5	-14.8'	61.2'
12	356°49.3	S08°16.6	193°53.3	7.7'	N11°39.7	-14.8'	61.2'
13	11°49.4	15.7	208°20.0	7.8'	11°24.8	-14.9'	61.2'
14	26°49.5	14.7	222°46.9	7.9'	11°09.8	-15.0'	61.3'
15	41°49.6	·· 13.8	237°13.7	7.9'	10°54.8	-15.1'	61.3'
16	56°49.7	12.8	251°40.7	8.0'	10°39.7	-15.1'	61.3'
17	71°49.8	11.9	266°07.7	8.0'	10°24.6	-15.2'	61.3'
18	86°50.0	S08°11.0	280°34.7	8.1'	N10°09.3	-15.3'	61.3'
19	101°50.1	10.0	295°01.8	8.1'	09°54.0	-15.3'	61.3'
20	116°50.2	09.1	309°29.0	8.2'	09°38.7	-15.4'	61.3'
21	131°50.3	·· 08.1	323°56.2	8.2'	09°23.2	-15.5'	61.3'
22	146°50.4	07.2	338°23.4	8.3'	09°07.8	-15.5'	61.3'
23	161°50.5	06.2	352°50.7	8.3'	08°52.2	-15.6'	61.3'
	SD.=16.1	d=0.9			S.D.=16.7		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°50.6	S08°05.3	7°18.1	8.4'	N08°36.6	-15.6'	61.3'
1	191°50.7	04.4	21°45.5	8.4'	08°21.0	-15.7'	61.3'
2	206°50.9	03.4	36°12.9	8.5'	08°05.3	-15.7'	61.3'
3	221°51.0	·· 02.5	50°40.4	8.5'	07°49.6	-15.8'	61.3'
4	236°51.1	01.5	65°07.9	8.6'	07°33.8	-15.8'	61.3'
5	251°51.2	08°00.6	79°35.5	8.6'	07°17.9	-15.9'	61.3'
6	266°51.3	S07°59.6	94°03.2	8.7'	N07°02.1	-15.9'	61.2'
7	281°51.4	58.7	108°30.8	8.7'	06°46.2	-15.9'	61.2'
8	296°51.6	57.7	122°58.6	8.7'	06°30.2	-16.0'	61.2'
9	311°51.7	·· 56.8	137°26.3	8.8'	06°14.2	-16.0'	61.2'
10	326°51.8	55.9	151°54.1	8.8'	05°58.2	-16.0'	61.2'
11	341°51.9	54.9	166°22.0	8.9'	05°42.1	-16.1'	61.2'
12	356°52.0	S07°54.0	180°49.9	8.9'	N05°26.0	-16.1'	61.2'
13	11°52.1	53.0	195°17.8	8.9'	05°09.9	-16.1'	61.2'
14	26°52.3	52.1	209°45.8	9.0'	04°53.8	-16.2'	61.2'
15	41°52.4	·· 51.1	224°13.8	9.0'	04°37.6	-16.2'	61.2'
16	56°52.5	50.2	238°41.8	9.1'	04°21.4	-16.2'	61.2'
17	71°52.6	49.2	253°09.9	9.1'	04°05.2	-16.2'	61.2'
18	86°52.7	S07°48.3	267°38.0	9.1'	N03°49.0	-16.2'	61.2'
19	101°52.9	47.3	282°06.1	9.2'	03°32.8	-16.2'	61.1'
20	116°53.0	46.4	296°34.3	9.2'	03°16.5	-16.3'	61.1'
21	131°53.1	·· 45.4	311°02.5	9.2'	03°00.3	-16.3'	61.1'
22	146°53.2	44.5	325°30.8	9.3'	02°44.0	-16.3'	61.1'
23	161°53.3	43.5	339°59.1	9.3'	02°27.7	-16.3'	61.1'
	SD.=16.1	d=0.9			S.D.=16.7		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°53.4	S07°42.6	354°27.4	9.3'	N02°11.4	-16.3'	61.1'
1	191°53.6	41.7	8°55.7	9.4'	01°55.1	-16.3'	61.1'
2	206°53.7	40.7	23°24.1	9.4'	01°38.8	-16.3'	61.0'
3	221°53.8	·· 39.8	37°52.5	9.4'	01°22.5	-16.3'	61.0'
4	236°53.9	38.8	52°20.9	9.4'	01°06.2	-16.3'	61.0'
5	251°54.0	37.9	66°49.3	9.5'	00°49.9	-16.3'	61.0'
6	266°54.2	S07°36.9	81°17.8	9.5'	N00°33.6	-16.3'	61.0'
7	281°54.3	36.0	95°46.3	9.5'	00°17.3	-16.3'	61.0'
8	296°54.4	35.0	110°14.8	9.5'	N00°01.1	-16.3'	60.9'
9	311°54.5	·· 34.1	124°43.3	9.5'	S00°15.2	-16.3'	60.9'
10	326°54.7	33.1	139°11.9	9.6'	00°31.5	-16.2'	60.9'
11	341°54.8	32.2	153°40.5	9.6'	00°47.7	-16.2'	60.9'
12	356°54.9	S07°31.2	168°09.1	9.6'	S01°03.9	-16.2'	60.9'
13	11°55.0	30.3	182°37.7	9.6'	01°20.1	-16.2'	60.8'
14	26°55.1	29.3	197°06.3	9.6'	01°36.3	-16.2'	60.8'
15	41°55.3	·· 28.4	211°35.0	9.7'	01°52.5	-16.1'	60.8'
16	56°55.4	27.4	226°03.6	9.7'	02°08.6	-16.1'	60.8'
17	71°55.5	26.5	240°32.3	9.7'	02°24.7	-16.1'	60.7'
18	86°55.6	S07°25.5	255°01.0	9.7'	S02°40.8	-16.1'	60.7'
19	101°55.8	24.6	269°29.7	9.7'	02°56.8	-16.0'	60.7'
20	116°55.9	23.6	283°58.4	9.7'	03°12.9	-16.0'	60.7'
21	131°56.0	·· 22.7	298°27.2	9.7'	03°28.9	-16.0'	60.6'
22	146°56.1	21.7	312°55.9	9.7'	03°44.8	-15.9'	60.6'
23	161°56.3	20.7	327°24.7	9.8'	04°00.7	-15.9'	60.6'
	SD.=16.1	d=0.9			S.D.=16.6		

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 98-99%
27	12:48	12:43	12:13	23:30	11:02	
28	12:37	12:32	12:13	–:–	11:57	
01	12:26	12:20	12:12	00:23	12:49	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	159°40.9	165°27.4	S03°59.1	35°45.8	N23°49.4	177°41.2	S08°38.6	336°05.9	N01°12.6
1	174°43.3	180°27.1	57.8	50°48.6	49.4	192°43.1	38.4	351°08.5	12.7
2	189°45.8	195°26.7	56.6	65°51.4	49.4	207°45.0	38.2	6°11.1	12.8
3	204°48.2	210°26.3	·· 55.3	80°54.1	·· 49.4	222°46.9	·· 37.9	21°13.8	·· 12.9
4	219°50.7	225°25.9	54.0	95°56.9	49.3	237°48.8	37.7	36°16.4	12.9
5	234°53.2	240°25.5	52.8	110°59.7	49.3	252°50.7	37.5	51°19.0	13.0
6	249°55.6	255°25.1	S03°51.5	126°02.5	N23°49.3	267°52.6	S08°37.2	66°21.6	N01°13.1
7	264°58.1	270°24.7	50.2	141°05.2	49.3	282°54.5	37.0	81°24.3	13.2
8	280°00.6	285°24.3	49.0	156°08.0	49.3	297°56.4	36.8	96°26.9	13.2
9	295°03.0	300°23.9	·· 47.7	171°10.8	·· 49.2	312°58.3	·· 36.6	111°29.5	·· 13.3
10	310°05.5	315°23.6	46.4	186°13.5	49.2	328°00.2	36.3	126°32.1	13.4
11	325°08.0	330°23.2	45.2	201°16.3	49.2	343°02.1	36.1	141°34.7	13.5
12	340°10.4	345°22.8	S03°43.9	216°19.1	N23°49.2	358°04.0	S08°35.9	156°37.4	N01°13.5
13	355°12.9	0°22.4	42.6	231°21.8	49.1	13°05.9	35.7	171°40.0	13.6
14	10°15.3	15°22.0	41.4	246°24.6	49.1	28°07.8	35.4	186°42.6	13.7
15	25°17.8	30°21.6	·· 40.1	261°27.4	·· 49.1	43°09.7	·· 35.2	201°45.2	·· 13.8
16	40°20.3	45°21.2	38.8	276°30.1	49.1	58°11.6	35.0	216°47.9	13.8
17	55°22.7	60°20.8	37.5	291°32.9	49.0	73°13.5	34.8	231°50.5	13.9
18	70°25.2	75°20.5	S03°36.3	306°35.6	N23°49.0	88°15.4	S08°34.5	246°53.1	N01°14.0
19	85°27.7	90°20.1	35.0	321°38.4	49.0	103°17.3	34.3	261°55.7	14.1
20	100°30.1	105°19.7	33.7	336°41.1	49.0	118°19.2	34.1	276°58.4	14.1
21	115°32.6	120°19.3	·· 32.5	351°43.9	·· 48.9	133°21.1	·· 33.8	292°01.0	·· 14.2
22	130°35.1	135°18.9	31.2	6°46.6	48.9	148°23.0	33.6	307°03.6	14.3
23	145°37.5	150°18.5	29.9	21°49.4	48.9	163°24.9	33.4	322°06.2	14.4
Mer.pass.:13:19		v-0.4 d1.3 m-3.8		v2.8 d-0.0 m-0.6		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	160°40.0	165°18.1	S03°28.7	36°52.1	N23°48.8	178°26.8	S08°33.2	337°08.9	N01°14.4
1	175°42.5	180°17.8	27.4	51°54.9	48.8	193°28.7	32.9	352°11.5	14.5
2	190°44.9	195°17.4	26.1	66°57.6	48.8	208°30.6	32.7	7°14.1	14.6
3	205°47.4	210°17.0	·· 24.8	82°00.4	·· 48.8	223°32.5	·· 32.5	22°16.7	·· 14.7
4	220°49.8	225°16.6	23.6	97°03.1	48.7	238°34.4	32.3	37°19.4	14.7
5	235°52.3	240°16.2	22.3	112°05.8	48.7	253°36.3	32.0	52°22.0	14.8
6	250°54.8	255°15.8	S03°21.0	127°08.6	N23°48.7	268°38.2	S08°31.8	67°24.6	N01°14.9
7	265°57.2	270°15.4	19.8	142°11.3	48.6	283°40.1	31.6	82°27.2	15.0
8	280°59.7	285°15.1	18.5	157°14.0	48.6	298°42.0	31.4	97°29.9	15.1
9	296°02.2	300°14.7	·· 17.2	172°16.8	·· 48.6	313°43.9	·· 31.1	112°32.5	·· 15.1
10	311°04.6	315°14.3	15.9	187°19.5	48.5	328°45.8	30.9	127°35.1	15.2
11	326°07.1	330°13.9	14.7	202°22.2	48.5	343°47.7	30.7	142°37.7	15.3
12	341°09.6	345°13.5	S03°13.4	217°25.0	N23°48.5	358°49.6	S08°30.4	157°40.4	N01°15.4
13	356°12.0	0°13.1	12.1	232°27.7	48.4	13°51.5	30.2	172°43.0	15.4
14	11°14.5	15°12.8	10.8	247°30.4	48.4	28°53.4	30.0	187°45.6	15.5
15	26°16.9	30°12.4	·· 09.6	262°33.1	·· 48.4	43°55.3	·· 29.8	202°48.2	·· 15.6
16	41°19.4	45°12.0	08.3	277°35.9	48.3	58°57.2	29.5	217°50.9	15.7
17	56°21.9	60°11.6	07.0	292°38.6	48.3	73°59.1	29.3	232°53.5	15.7
18	71°24.3	75°11.2	S03°05.8	307°41.3	N23°48.3	89°01.0	S08°29.1	247°56.1	N01°15.8
19	86°26.8	90°10.8	04.5	322°44.0	48.2	104°02.9	28.9	262°58.7	15.9
20	101°29.3	105°10.5	03.2	337°46.7	48.2	119°04.8	28.6	278°01.4	16.0
21	116°31.7	120°10.1	·· 01.9	352°49.5	·· 48.2	134°06.7	·· 28.4	293°04.0	·· 16.0
22	131°34.2	135°09.7	03°00.7	7°52.2	48.1	149°08.6	28.2	308°06.6	16.1
23	146°36.7	150°09.3	02°59.4	22°54.9	48.1	164°10.5	28.0	323°09.2	16.2
Mer.pass.:13:15		v-0.4 d1.3 m-3.8		v2.7 d-0.0 m-0.6		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	161°39.1	165°08.9	S02°58.1	37°57.6	N23°48.0	179°12.4	S08°27.7	338°11.9	N01°16.3
1	176°41.6	180°08.6	56.8	53°00.3	48.0	194°14.3	27.5	353°14.5	16.4
2	191°44.1	195°08.2	55.6	68°03.0	48.0	209°16.2	27.3	8°17.1	16.4
3	206°46.5	210°07.8	·· 54.3	83°05.7	·· 47.9	224°18.1	·· 27.0	23°19.7	·· 16.5
4	221°49.0	225°07.4	53.0	98°08.4	47.9	239°19.9	26.8	38°22.4	16.6
5	236°51.4	240°07.0	51.7	113°11.1	47.9	254°21.8	26.6	53°25.0	16.7
6	251°53.9	255°06.6	S02°50.5	128°13.8	N23°47.8	269°23.7	S08°26.4	68°27.6	N01°16.7
7	266°56.4	270°06.3	49.2	143°16.5	47.8	284°25.6	26.1	83°30.2	16.8
8	281°58.8	285°05.9	47.9	158°19.2	47.7	299°27.5	25.9	98°32.9	16.9
9	297°01.3	300°05.5	·· 46.6	173°21.9	·· 47.7	314°29.4	·· 25.7	113°35.5	·· 17.0
10	312°03.8	315°05.1	45.4	188°24.6	47.7	329°31.3	25.5	128°38.1	17.0
11	327°06.2	330°04.7	44.1	203°27.3	47.6	344°33.2	25.2	143°40.8	17.1
12	342°08.7	345°04.4	S02°42.8	218°30.0	N23°47.6	359°35.1	S08°25.0	158°43.4	N01°17.2
13	357°11.2	0°04.0	41.5	233°32.7	47.5	14°37.0	24.8	173°46.0	17.3
14	12°13.6	15°03.6	40.2	248°35.4	47.5	29°38.9	24.6	188°48.6	17.3
15	27°16.1	30°03.2	·· 39.0	263°38.1	·· 47.5	44°40.8	·· 24.3	203°51.3	·· 17.4
16	42°18.5	45°02.9	37.7	278°40.8	47.4	59°42.7	24.1	218°53.9	17.5
17	57°21.0	60°02.5	36.4	293°43.5	47.4	74°44.6	23.9	233°56.5	17.6
18	72°23.5	75°02.1	S02°35.1	308°46.2	N23°47.3	89°46.5	S08°23.6	248°59.1	N01°17.7
19	87°25.9	90°01.7	33.9	323°48.9	47.3	104°48.4	23.4	264°01.8	17.7
20	102°28.4	105°01.3	32.6	338°51.5	47.2	119°50.3	23.2	279°04.4	17.8
21	117°30.9	120°01.0	·· 31.3	353°54.2	·· 47.2	134°52.2	·· 23.0	294°07.0	·· 17.9
22	132°33.3	135°00.6	30.0	8°56.9	47.2	149°54.1	22.7	309°09.7	18.0
23	147°35.8	150°00.2	28.8	23°59.6	47.1	164°56.0	22.5	324°12.3	18.0
Mer.pass.:13:11		v-0.4 d1.3 m-3.8		v2.7 d-0.0 m-0.5		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.9
Ankaa	353°18.3	-42°15.1
Schedar	349°43.9	56°35.8
Diphda	348°58.5	-17°55.9
Achernar	335°28.8	-57°11.3
Hamal	328°03.7	23°30.7
Polaris	319°11.5	89°18.9
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.0	49°54.1
Aldebaran	290°52.1	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°37.9	46°00.7
Bellatrix	278°34.5	6°21.5
Elnath	278°15.6	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.0	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.4	28°00.0
Avior	234°18.6	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.6	-69°45.8
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.6	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.1	55°53.9
Spica	158°33.5	-11°13.1
Alkaid	153°00.3	49°15.4
Hadar	148°51.1	-60°25.3
Menkent	148°10.2	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.8	-60°52.5
Kochab	137°19.0	74°06.4
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.5
Antares	112°29.2	-26°27.3
Atria	107°33.3	-69°02.5
Sabik	102°15.3	-15°44.3
Shaula	96°25.3	-37°06.6
Rasalhague	96°08.7	12°32.9
Eltanin	90°47.4	51°28.9
Kaus Aust.	83°47.1	-34°22.7
Vega	80°40.8	38°47.3
Nunki	76°01.4	-26°17.0
Altair	62°10.8	8°53.6
Peacock	53°23.3	-56°42.0
Deneb	49°33.6	45°18.8
Enif	33°49.8	9°55.2
Al Na'ir	27°47.0	-46°54.7
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Mar 02 Tue	**SHA**	**Mer.pass**
Venus	5°46.6	12:59
Mars	236°05.0	21:33
Jupiter	18°00.4	12:08
Saturn	176°25.0	01:35

Mar 03 Wed	**SHA**	**Mer.pass**
Venus	4°38.2	12:59
Mars	236°12.1	21:29
Jupiter	17°46.8	12:05
Saturn	176°28.9	01:31

Mar 04 Thu	**SHA**	**Mer.pass**
Venus	3°29.8	13:00
Mars	236°18.5	21:24
Jupiter	17°33.2	12:02
Saturn	176°32.7	01:27

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.0518 sec ΔT = TT-UT1 = +66.1322 sec

2010 March 02 to Mar. 04 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°56.4	S07°19.8	341°53.4	9.8'	S04°16.6	-15.9'	60.6'
1	191°56.5	18.8	356°22.2	9.8'	04°32.5	-15.8'	60.5'
2	206°56.6	17.9	10°51.0	9.8'	04°48.3	-15.8'	60.5'
3	221°56.8	· · 16.9	25°19.7	9.8'	05°04.0	-15.7'	60.5'
4	236°56.9	16.0	39°48.5	9.8'	05°19.7	-15.7'	60.5'
5	251°57.0	15.0	54°17.3	9.8'	05°35.4	-15.6'	60.4'
6	266°57.1	S07°14.1	68°46.1	9.8'	S05°51.0	-15.6'	60.4'
7	281°57.3	13.1	83°14.9	9.8'	06°06.6	-15.5'	60.4'
8	296°57.4	12.2	97°43.7	9.8'	06°22.1	-15.5'	60.3'
9	311°57.5	· · 11.2	112°12.5	9.8'	06°37.6	-15.4'	60.3'
10	326°57.7	10.3	126°41.3	9.8'	06°53.0	-15.4'	60.3'
11	341°57.8	09.3	141°10.1	9.8'	07°08.3	-15.3'	60.3'
12	356°57.9	S07°08.3	155°38.9	9.8'	S07°23.6	-15.3'	60.2'
13	11°58.0	07.4	170°07.7	9.8'	07°38.9	-15.2'	60.2'
14	26°58.2	06.4	184°36.5	9.8'	07°54.1	-15.1'	60.2'
15	41°58.3	· · 05.5	199°05.3	9.8'	08°09.2	-15.1'	60.1'
16	56°58.4	04.5	213°34.1	9.8'	08°24.2	-15.0'	60.1'
17	71°58.5	03.6	228°02.8	9.8'	08°39.2	-15.0'	60.1'
18	86°58.7	S07°02.6	242°31.6	9.8'	S08°54.1	-14.9'	60.0'
19	101°58.8	01.7	257°00.4	9.8'	09°09.0	-14.8'	60.0'
20	116°58.9	07°00.7	271°29.1	9.8'	09°23.8	-14.7'	60.0'
21	131°59.1	06°59.7	285°57.9	9.7'	09°38.5	-14.7'	59.9'
22	146°59.2	58.8	300°26.6	9.7'	09°53.1	-14.6'	59.9'
23	161°59.3	57.8	314°55.4	9.7'	10°07.7	-14.5'	59.9'
	SD.=16.1	d=1.0			S.D.=16.4		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°59.5	S06°56.9	329°24.1	9.7'	S10°22.2	-14.5'	59.8'
1	191°59.6	55.9	343°52.8	9.7'	10°36.6	-14.4'	59.8'
2	206°59.7	55.0	358°21.5	9.7'	10°50.9	-14.3'	59.8'
3	221°59.8	· · 54.0	12°50.2	9.7'	11°05.2	-14.2'	59.7'
4	237°00.0	53.1	27°18.9	9.7'	11°19.3	-14.1'	59.7'
5	252°00.1	52.1	41°47.6	9.7'	11°33.4	-14.0'	59.6'
6	267°00.2	S06°51.1	56°16.2	9.7'	S11°47.4	-14.0'	59.6'
7	282°00.4	50.2	70°44.9	9.6'	12°01.4	-13.9'	59.6'
8	297°00.5	49.2	85°13.5	9.6'	12°15.2	-13.8'	59.5'
9	312°00.6	· · 48.3	99°42.1	9.6'	12°29.0	-13.7'	59.5'
10	327°00.8	47.3	114°10.7	9.6'	12°42.6	-13.6'	59.5'
11	342°00.9	46.3	128°39.3	9.6'	12°56.2	-13.5'	59.4'
12	357°01.0	S06°45.4	143°07.9	9.6'	S13°09.7	-13.4'	59.4'
13	12°01.2	44.4	157°36.4	9.5'	13°23.0	-13.3'	59.3'
14	27°01.3	43.5	172°05.0	9.5'	13°36.3	-13.2'	59.3'
15	42°01.4	· · 42.5	186°33.5	9.5'	13°49.5	-13.1'	59.3'
16	57°01.6	41.5	201°02.0	9.5'	14°02.6	-13.1'	59.2'
17	72°01.7	40.6	215°30.5	9.5'	14°15.6	-13.0'	59.2'
18	87°01.8	S06°39.6	229°59.0	9.5'	S14°28.5	-12.9'	59.2'
19	102°02.0	38.7	244°27.4	9.4'	14°41.3	-12.8'	59.1'
20	117°02.1	37.7	258°55.8	9.4'	14°54.1	-12.7'	59.1'
21	132°02.2	· · 36.7	273°24.2	9.4'	15°06.7	-12.6'	59.0'
22	147°02.4	35.8	287°52.6	9.4'	15°19.2	-12.4'	59.0'
23	162°02.5	34.8	302°21.0	9.4'	15°31.6	-12.3'	59.0'
	SD.=16.1	d=1.0			S.D.=16.2		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°02.6	S06°33.9	316°49.4	9.3'	S15°43.8	-12.2'	58.9'
1	192°02.8	32.9	331°17.7	9.3'	15°56.0	-12.1'	58.9'
2	207°02.9	31.9	345°46.0	9.3'	16°08.1	-12.0'	58.8'
3	222°03.0	· · 31.0	0°14.3	9.3'	16°20.1	-11.9'	58.8'
4	237°03.2	30.0	14°42.6	9.3'	16°31.9	-11.8'	58.8'
5	252°03.3	29.1	29°10.8	9.2'	16°43.7	-11.7'	58.7'
6	267°03.4	S06°28.1	43°39.0	9.2'	S16°55.3	-11.6'	58.7'
7	282°03.6	27.1	58°07.3	9.2'	17°06.9	-11.5'	58.6'
8	297°03.7	26.2	72°35.4	9.2'	17°18.3	-11.4'	58.6'
9	312°03.9	· · 25.2	87°03.6	9.2'	17°29.6	-11.2'	58.6'
10	327°04.0	24.2	101°31.8	9.1'	17°40.8	-11.1'	58.5'
11	342°04.1	23.3	115°59.9	9.1'	17°51.8	-11.0'	58.5'
12	357°04.3	S06°22.3	130°28.0	9.1'	S18°02.8	-10.9'	58.4'
13	12°04.4	21.4	144°56.1	9.1'	18°13.6	-10.8'	58.4'
14	27°04.5	20.4	159°24.1	9.1'	18°24.3	-10.7'	58.4'
15	42°04.7	· · 19.4	173°52.2	9.0'	18°34.9	-10.5'	58.3'
16	57°04.8	18.5	188°20.2	9.0'	18°45.4	-10.4'	58.3'
17	72°05.0	17.5	202°48.2	9.0'	18°55.8	-10.3'	58.2'
18	87°05.1	S06°16.5	217°16.2	9.0'	S19°06.0	-10.2'	58.2'
19	102°05.2	15.6	231°44.2	9.0'	19°16.1	-10.1'	58.2'
20	117°05.4	14.6	246°12.1	8.9'	19°26.1	-9.9'	58.1'
21	132°05.5	· · 13.7	260°40.0	8.9'	19°36.0	-9.8'	58.1'
22	147°05.6	12.7	275°07.9	8.9'	19°45.7	-9.7'	58.0'
23	162°05.8	11.7	289°35.8	8.9'	19°55.3	-9.6'	58.0'
	SD.=16.1	d=1.0			S.D.=15.9		

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

Lat.	**Moonrise** Tue	Wed	Thu	**Moonset** Tue	Wed	Thu
N 72°	22:12	–:–	01:06	06:09	05:33	04:30
N 70°	21:54	–:–	00:20	06:17	05:53	05:17
68°	21:41	23:51	–:–	06:24	06:08	05:48
66°	21:30	23:29	–:–	06:30	06:21	06:11
64°	21:21	23:12	–:–	06:35	06:32	06:29
62°	21:13	22:58	–:–	06:39	06:41	06:44
60°	21:06	22:46	–:–	06:43	06:49	06:57
N 58°	21:01	22:36	–:–	06:46	06:56	07:08
56°	20:55	22:27	23:56	06:49	07:02	07:18
54°	20:51	22:19	23:45	06:52	07:08	07:26
52°	20:47	22:12	23:35	06:54	07:13	07:34
50°	20:43	22:06	23:26	06:57	07:17	07:41
45°	20:35	21:53	23:08	07:02	07:27	07:56
N 40°	20:28	21:42	22:53	07:06	07:36	08:08
35°	20:23	21:32	22:40	07:09	07:43	08:19
30°	20:18	21:24	22:29	07:12	07:49	08:28
20°	20:09	21:10	22:11	07:18	08:00	08:44
N 10°	20:01	20:58	21:54	07:23	08:10	08:58
0°	19:55	20:47	21:39	07:27	08:19	09:12
S 10°	19:48	20:35	21:24	07:32	08:28	09:25
20°	19:40	20:23	21:08	07:37	08:38	09:39
30°	19:32	20:10	20:50	07:42	08:49	09:55
35°	19:27	20:02	20:40	07:46	08:56	10:05
40°	19:22	19:53	20:28	07:49	09:03	10:16
45°	19:16	19:43	20:14	07:53	09:12	10:29
S 50°	19:09	19:31	19:57	07:59	09:23	10:45
52°	19:06	19:25	19:49	08:01	09:28	10:52
54°	19:02	19:19	19:40	08:04	09:33	11:00
56°	18:58	19:12	19:30	08:06	09:39	11:10
58°	18:53	19:04	19:19	08:10	09:46	11:20
S 60°	18:48	18:55	19:05	08:13	09:53	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 16-18 95-81%
02	12:14	12:08	12:12	01:15	13:41	
03	12:02	11:56	12:12	02:07	14:33	
04	11:49	11:43	12:12	02:59	15:25	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	162°38.3	164°59.8	S02°27.5	39°02.3	N23°47.1	179°57.9	S08°22.3	339°14.9	N01°18.1
1	177°40.7	179°59.4	26.2	54°04.9	47.0	194°59.8	22.1	354°17.5	18.2
2	192°43.2	194°59.1	24.9	69°07.6	47.0	210°01.7	21.8	9°20.2	18.3
3	207°45.7	209°58.7	·· 23.6	84°10.3	·· 46.9	225°03.6	·· 21.6	24°22.8	·· 18.4
4	222°48.1	224°58.3	22.4	99°13.0	46.9	240°05.5	21.4	39°25.4	18.4
5	237°50.6	239°57.9	21.1	114°15.6	46.8	255°07.4	21.1	54°28.1	18.5
6	252°53.0	254°57.6	S02°19.8	129°18.3	N23°46.8	270°09.3	S08°20.9	69°30.7	N01°18.6
7	267°55.5	269°57.2	18.5	144°21.0	46.7	285°11.2	20.7	84°33.3	18.7
8	282°58.0	284°56.8	17.2	159°23.6	46.7	300°13.1	20.5	99°35.9	18.7
9	298°00.4	299°56.4	·· 16.0	174°26.3	·· 46.7	315°15.0	·· 20.2	114°38.6	·· 18.8
10	313°02.9	314°56.1	14.7	189°29.0	46.6	330°16.9	20.0	129°41.2	18.9
11	328°05.4	329°55.7	13.4	204°31.6	46.6	345°18.8	19.8	144°43.8	19.0
12	343°07.8	344°55.3	S02°12.1	219°34.3	N23°46.5	0°20.7	S08°19.6	159°46.5	N01°19.0
13	358°10.3	359°54.9	10.9	234°36.9	46.5	15°22.6	19.3	174°49.1	19.1
14	13°12.8	14°54.5	09.6	249°39.6	46.4	30°24.5	19.1	189°51.7	19.2
15	28°15.2	29°54.2	·· 08.3	264°42.3	·· 46.4	45°26.4	·· 18.9	204°54.3	·· 19.3
16	43°17.7	44°53.8	07.0	279°44.9	46.3	60°28.3	18.7	219°57.0	19.4
17	58°20.2	59°53.4	05.7	294°47.6	46.3	75°30.2	18.4	234°59.6	19.4
18	73°22.6	74°53.0	S02°04.5	309°50.2	N23°46.2	90°32.1	S08°18.2	250°02.2	N01°19.5
19	88°25.1	89°52.7	03.2	324°52.9	46.2	105°34.0	18.0	265°04.9	19.6
20	103°27.5	104°52.3	01.9	339°55.5	46.1	120°35.9	17.7	280°07.5	19.7
21	118°30.0	119°51.9	02°00.6	354°58.2	·· 46.1	135°37.8	·· 17.5	295°10.1	·· 19.7
22	133°32.5	134°51.5	01°59.3	10°00.8	46.0	150°39.7	17.3	310°12.7	19.8
23	148°34.9	149°51.2	58.1	25°03.4	46.0	165°41.6	17.1	325°15.4	19.9
Mer.pass.:13:07		v-0.4 d1.3 m-3.8		v2.7 d-0.0 m-0.5		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	163°37.4	164°50.8	S01°56.8	40°06.1	N23°45.9	180°43.5	S08°16.8	340°18.0	N01°20.0
1	178°39.9	179°50.4	55.5	55°08.7	45.8	195°45.4	16.6	355°20.6	20.1
2	193°42.3	194°50.0	54.2	70°11.4	45.8	210°47.3	16.4	10°23.3	20.1
3	208°44.8	209°49.7	·· 52.9	85°14.0	·· 45.7	225°49.2	·· 16.2	25°25.9	·· 20.2
4	223°47.3	224°49.3	51.6	100°16.7	45.7	240°51.1	15.9	40°28.5	20.3
5	238°49.7	239°48.9	50.4	115°19.3	45.6	255°53.0	15.7	55°31.2	20.4
6	253°52.2	254°48.5	S01°49.1	130°21.9	N23°45.6	270°54.9	S08°15.5	70°33.8	N01°20.4
7	268°54.7	269°48.2	47.8	145°24.6	45.5	285°56.8	15.2	85°36.4	20.5
8	283°57.1	284°47.8	46.5	160°27.2	45.5	300°58.7	15.0	100°39.0	20.6
9	298°59.6	299°47.4	·· 45.2	175°29.8	·· 45.4	316°00.6	·· 14.8	115°41.7	·· 20.7
10	314°02.0	314°47.1	44.0	190°32.5	45.4	331°02.5	14.6	130°44.3	20.8
11	329°04.5	329°46.7	42.7	205°35.1	45.3	346°04.4	14.3	145°46.9	20.8
12	344°07.0	344°46.3	S01°41.4	220°37.7	N23°45.2	1°06.3	S08°14.1	160°49.6	N01°20.9
13	359°09.4	359°45.9	40.1	235°40.3	45.2	16°08.2	13.9	175°52.2	21.0
14	14°11.9	14°45.6	38.8	250°43.0	45.1	31°10.1	13.7	190°54.8	21.1
15	29°14.4	29°45.2	·· 37.6	265°45.6	·· 45.1	46°12.0	·· 13.4	205°57.5	·· 21.1
16	44°16.8	44°44.8	36.3	280°48.2	45.0	61°13.9	13.2	221°00.1	21.2
17	59°19.3	59°44.4	35.0	295°50.8	45.0	76°15.8	13.0	236°02.7	21.3
18	74°21.8	74°44.1	S01°33.7	310°53.4	N23°44.9	91°17.7	S08°12.7	251°05.4	N01°21.4
19	89°24.2	89°43.7	32.4	325°56.1	44.8	106°19.6	12.5	266°08.0	21.5
20	104°26.7	104°43.3	31.1	340°58.7	44.8	121°21.5	12.3	281°10.6	21.5
21	119°29.1	119°43.0	·· 29.9	356°01.3	·· 44.7	136°23.4	·· 12.1	296°13.2	·· 21.6
22	134°31.6	134°42.6	28.6	11°03.9	44.7	151°25.3	11.8	311°15.9	21.7
23	149°34.1	149°42.2	27.3	26°06.5	44.6	166°27.2	11.6	326°18.5	21.8
Mer.pass.:13:03		v-0.4 d1.3 m-3.8		v2.6 d-0.1 m-0.5		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	164°36.5	164°41.8	S01°26.0	41°09.1	N23°44.5	181°29.1	S08°11.4	341°21.1	N01°21.8
1	179°39.0	179°41.5	24.7	56°11.7	44.5	196°31.0	11.2	356°23.8	21.9
2	194°41.5	194°41.1	23.4	71°14.3	44.4	211°32.9	10.9	11°26.4	22.0
3	209°43.9	209°40.7	·· 22.2	86°16.9	·· 44.4	226°34.8	·· 10.7	26°29.0	·· 22.1
4	224°46.4	224°40.3	20.9	101°19.5	44.3	241°36.7	10.5	41°31.7	22.2
5	239°48.9	239°40.0	19.6	116°22.1	44.2	256°38.6	10.2	56°34.3	22.2
6	254°51.3	254°39.6	S01°18.3	131°24.7	N23°44.2	271°40.5	S08°10.0	71°36.9	N01°22.3
7	269°53.8	269°39.2	17.0	146°27.3	44.1	286°42.4	09.8	86°39.6	22.4
8	284°56.3	284°38.9	15.7	161°29.9	44.1	301°44.3	09.6	101°42.2	22.5
9	299°58.7	299°38.5	·· 14.5	176°32.5	·· 44.0	316°46.2	·· 09.3	116°44.8	·· 22.6
10	315°01.2	314°38.1	13.2	191°35.1	43.9	331°48.1	09.1	131°47.5	22.6
11	330°03.6	329°37.7	11.9	206°37.7	43.9	346°50.0	08.9	146°50.1	22.7
12	345°06.1	344°37.4	S01°10.6	221°40.3	N23°43.8	1°51.9	S08°08.7	161°52.7	N01°22.8
13	0°08.6	359°37.0	09.3	236°42.9	43.7	16°53.8	08.4	176°55.4	22.9
14	15°11.0	14°36.6	08.0	251°45.5	43.7	31°55.7	08.2	191°58.0	22.9
15	30°13.5	29°36.3	·· 06.8	266°48.1	·· 43.6	46°57.6	·· 08.0	207°00.6	·· 23.0
16	45°16.0	44°35.9	05.5	281°50.7	43.5	61°59.5	07.7	222°03.3	23.1
17	60°18.4	59°35.5	04.2	296°53.3	43.5	77°01.4	07.5	237°05.9	23.2
18	75°20.9	74°35.2	S01°02.9	311°55.8	N23°43.4	92°03.3	S08°07.3	252°08.5	N01°23.3
19	90°23.4	89°34.8	01.6	326°58.4	43.4	107°05.2	07.1	267°11.1	23.3
20	105°25.8	104°34.4	01°00.3	342°01.0	43.3	122°07.1	06.8	282°13.8	23.4
21	120°28.3	119°34.0	00°59.1	357°03.6	·· 43.2	137°09.0	·· 06.6	297°16.4	·· 23.5
22	135°30.8	134°33.7	57.8	12°06.2	43.2	152°10.9	06.4	312°19.0	23.6
23	150°33.2	149°33.3	56.5	27°08.7	43.1	167°12.8	06.2	327°21.7	23.6
Mer.pass.:12:59		v-0.4 d1.3 m-3.8		v2.6 d-0.1 m-0.5		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.1
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.8	-57°11.2
Hamal	328°03.7	23°30.7
Polaris	319°12.4	89°18.9
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°54.1
Aldebaran	290°52.2	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°38.0	46°00.7
Bellatrix	278°34.5	6°21.5
Elnath	278°15.6	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.0	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.4	28°00.0
Avior	234°18.6	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.6	-69°45.8
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.6	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.1	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.3	49°15.4
Hadar	148°51.0	-60°25.3
Menkent	148°10.2	-36°25.3
Arcturus	145°57.6	19°07.5
Rigil Kent.	139°54.7	-60°52.5
Kochab	137°19.0	74°06.4
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.5
Antares	112°29.2	-26°27.3
Atria	107°33.2	-69°02.5
Sabik	102°15.3	-15°44.3
Shaula	96°25.2	-37°06.6
Rasalhague	96°08.7	12°32.9
Eltanin	90°47.4	51°28.9
Kaus Aust.	83°47.1	-34°22.7
Vega	80°40.8	38°47.3
Nunki	76°01.4	-26°17.0
Altair	62°10.8	8°53.6
Peacock	53°23.3	-56°42.0
Deneb	49°33.6	45°18.8
Enif	33°49.8	9°55.2
Al Na'ir	27°47.0	-46°54.6
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Mar 05 Fri	**SHA**	**Mer.pass**
Venus	2°21.6	13:00
Mars	236°24.0	21:20
Jupiter	17°19.7	11:59
Saturn	176°36.7	01:23

Mar 06 Sat	**SHA**	**Mer.pass**
Venus	1°13.4	13:01
Mars	236°28.7	21:16
Jupiter	17°06.1	11:56
Saturn	176°40.6	01:19

Mar 07 Sun	**SHA**	**Mer.pass**
Venus	0°05.3	13:02
Mars	236°32.6	21:12
Jupiter	16°52.6	11:53
Saturn	176°44.6	01:14

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°05.9	S06°10.8	304°03.7	8.9′	S20°04.8	-9.4′	57.9′
1	192°06.1	09.8	318°31.5	8.8′	20°14.2	-9.3′	57.9′
2	207°06.2	08.8	332°59.3	8.8′	20°23.4	-9.2′	57.9′
3	222°06.3	·· 07.9	347°27.2	8.8′	20°32.6	-9.0′	57.8′
4	237°06.5	06.9	1°54.9	8.8′	20°41.5	-8.9′	57.8′
5	252°06.6	05.9	16°22.7	8.8′	20°50.4	-8.8′	57.7′
6	267°06.8	S06°05.0	30°50.5	8.7′	S20°59.1	-8.7′	57.7′
7	282°06.9	04.0	45°18.2	8.7′	21°07.7	-8.5′	57.7′
8	297°07.0	03.0	59°45.9	8.7′	21°16.2	-8.4′	57.6′
9	312°07.2	·· 02.1	74°13.7	8.7′	21°24.5	-8.3′	57.6′
10	327°07.3	01.1	88°41.3	8.7′	21°32.7	-8.1′	57.5′
11	342°07.5	06°00.1	103°09.0	8.7′	21°40.8	-8.0′	57.5′
12	357°07.6	S05°59.2	117°36.7	8.7′	S21°48.7	-7.9′	57.5′
13	12°07.8	58.2	132°04.3	8.6′	21°56.5	-7.7′	57.4′
14	27°07.9	57.2	146°32.0	8.6′	22°04.2	-7.6′	57.4′
15	42°08.0	·· 56.3	160°59.6	8.6′	22°11.7	-7.5′	57.3′
16	57°08.2	55.3	175°27.2	8.6′	22°19.1	-7.3′	57.3′
17	72°08.3	54.3	189°54.8	8.6′	22°26.4	-7.2′	57.3′
18	87°08.5	S05°53.4	204°22.4	8.6′	S22°33.5	-7.1′	57.2′
19	102°08.6	52.4	218°50.0	8.6′	22°40.5	-6.9′	57.2′
20	117°08.7	51.4	233°17.6	8.6′	22°47.4	-6.8′	57.2′
21	132°08.9	·· 50.5	247°45.1	8.6′	22°54.1	-6.7′	57.1′
22	147°09.0	49.5	262°12.7	8.6′	23°00.7	-6.5′	57.1′
23	162°09.2	48.5	276°40.2	8.5′	23°07.2	-6.4′	57.0′
	SD.=16.1	d=1.0			S.D.=15.7		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°09.3	S05°47.6	291°07.8	8.5′	S23°13.5	-6.2′	57.0′
1	192°09.5	46.6	305°35.3	8.5′	23°19.7	-6.1′	57.0′
2	207°09.6	45.6	320°02.8	8.5′	23°25.7	-6.0′	56.9′
3	222°09.8	·· 44.7	334°30.4	8.5′	23°31.6	-5.8′	56.9′
4	237°09.9	43.7	348°57.9	8.5′	23°37.4	-5.7′	56.8′
5	252°10.0	42.7	3°25.4	8.5′	23°43.0	-5.6′	56.8′
6	267°10.2	S05°41.8	17°52.9	8.5′	S23°48.5	-5.4′	56.8′
7	282°10.3	40.8	32°20.4	8.5′	23°53.8	-5.3′	56.7′
8	297°10.5	39.8	46°48.0	8.5′	23°59.0	-5.1′	56.7′
9	312°10.6	·· 38.8	61°15.5	8.5′	24°04.1	-5.0′	56.7′
10	327°10.8	37.9	75°43.0	8.5′	24°09.0	-4.9′	56.6′
11	342°10.9	36.9	90°10.5	8.5′	24°13.8	-4.7′	56.6′
12	357°11.1	S05°35.9	104°38.0	8.5′	S24°18.5	-4.6′	56.6′
13	12°11.2	35.0	119°05.6	8.5′	24°23.0	-4.4′	56.5′
14	27°11.3	34.0	133°33.1	8.5′	24°27.4	-4.3′	56.5′
15	42°11.5	·· 33.0	148°00.6	8.5′	24°31.6	-4.2′	56.4′
16	57°11.6	32.1	162°28.2	8.5′	24°35.7	-4.0′	56.4′
17	72°11.8	31.1	176°55.7	8.6′	24°39.6	-3.9′	56.4′
18	87°11.9	S05°30.1	191°23.3	8.6′	S24°43.5	-3.7′	56.3′
19	102°12.1	29.1	205°50.8	8.6′	24°47.1	-3.6′	56.3′
20	117°12.2	28.2	220°18.4	8.6′	24°50.7	-3.5′	56.3′
21	132°12.4	·· 27.2	234°46.0	8.6′	24°54.1	-3.3′	56.2′
22	147°12.5	26.2	249°13.6	8.6′	24°57.3	-3.2′	56.2′
23	162°12.7	25.3	263°41.2	8.6′	25°00.5	-3.1′	56.2′
	SD.=16.1	d=1.0			S.D.=15.4		

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°12.8	S05°24.3	278°08.8	8.6′	S25°03.4	-2.9′	56.1′
1	192°13.0	23.3	292°36.5	8.6′	25°06.3	-2.8′	56.1′
2	207°13.1	22.3	307°04.1	8.7′	25°09.0	-2.6′	56.1′
3	222°13.3	·· 21.4	321°31.8	8.7′	25°11.5	-2.5′	56.0′
4	237°13.4	20.4	335°59.5	8.7′	25°14.0	-2.4′	56.0′
5	252°13.6	19.4	350°27.2	8.7′	25°16.3	-2.2′	56.0′
6	267°13.7	S05°18.5	4°54.9	8.7′	S25°18.4	-2.1′	55.9′
7	282°13.9	17.5	19°22.7	8.8′	25°20.4	-1.9′	55.9′
8	297°14.0	16.5	33°50.5	8.8′	25°22.3	-1.8′	55.9′
9	312°14.2	·· 15.5	48°18.3	8.8′	25°24.0	-1.7′	55.8′
10	327°14.3	14.6	62°46.1	8.8′	25°25.6	-1.5′	55.8′
11	342°14.5	13.6	77°13.9	8.9′	25°27.1	-1.4′	55.8′
12	357°14.6	S05°12.6	91°41.8	8.9′	S25°28.4	-1.3′	55.8′
13	12°14.8	11.6	106°09.7	8.9′	25°29.6	-1.1′	55.7′
14	27°14.9	10.7	120°37.6	8.9′	25°30.6	-1.0′	55.7′
15	42°15.1	·· 09.7	135°05.5	9.0′	25°31.6	-0.8′	55.7′
16	57°15.2	08.7	149°33.5	9.0′	25°32.3	-0.7′	55.6′
17	72°15.4	07.8	164°01.5	9.0′	25°33.0	-0.6′	55.6′
18	87°15.5	S05°06.8	178°29.6	9.1′	S25°33.5	-0.4′	55.6′
19	102°15.7	05.8	192°57.6	9.1′	25°33.9	-0.3′	55.5′
20	117°15.8	04.8	207°25.7	9.1′	25°34.1	-0.2′	55.5′
21	132°16.0	·· 03.9	221°53.9	9.2′	25°34.2	-0.0′	55.5′
22	147°16.1	02.9	236°22.0	9.2′	25°34.2	0.1′	55.5′
23	162°16.3	01.9	250°50.2	9.2′	25°34.0	0.2′	55.4′
	SD.=16.1	d=1.0			S.D.=15.2		

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

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

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 19-21 72-52%
05	11:36	11:30	12:11	03:52	16:19	
06	11:23	11:16	12:11	04:46	17:13	
07	11:09	11:02	12:11	05:40	18:06	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	165°35.7	164°32.9	S00°55.2	42°11.3	N23°43.0	182°14.7	S08°05.9	342°24.3	N01°23.7
1	180°38.1	179°32.6	53.9	57°13.9	43.0	197°16.6	05.7	357°26.9	23.8
2	195°40.6	194°32.2	52.6	72°16.5	42.9	212°18.5	05.5	12°29.6	23.9
3	210°43.1	209°31.8	·· 51.3	87°19.0	·· 42.8	227°20.4	·· 05.2	27°32.2	·· 24.0
4	225°45.5	224°31.5	50.1	102°21.6	42.7	242°22.3	05.0	42°34.8	24.0
5	240°48.0	239°31.1	48.8	117°24.2	42.7	257°24.2	04.8	57°37.5	24.1
6	255°50.5	254°30.7	S00°47.5	132°26.7	N23°42.6	272°26.1	S08°04.6	72°40.1	N01°24.2
7	270°52.9	269°30.3	46.2	147°29.3	42.5	287°28.0	04.3	87°42.7	24.3
8	285°55.4	284°30.0	44.9	162°31.9	42.5	302°29.9	04.1	102°45.4	24.4
9	300°57.9	299°29.6	·· 43.6	177°34.4	·· 42.4	317°31.8	·· 03.9	117°48.0	·· 24.4
10	316°00.3	314°29.2	42.3	192°37.0	42.3	332°33.7	03.7	132°50.6	24.5
11	331°02.8	329°28.9	41.1	207°39.6	42.3	347°35.6	03.4	147°53.3	24.6
12	346°05.3	344°28.5	S00°39.8	222°42.1	N23°42.2	2°37.5	S08°03.2	162°55.9	N01°24.7
13	1°07.7	359°28.1	38.5	237°44.7	42.1	17°39.4	03.0	177°58.5	24.8
14	16°10.2	14°27.8	37.2	252°47.2	42.0	32°41.3	02.7	193°01.2	24.8
15	31°12.6	29°27.4	·· 35.9	267°49.8	·· 42.0	47°43.2	·· 02.5	208°03.8	·· 24.9
16	46°15.1	44°27.0	34.6	282°52.3	41.9	62°45.1	02.3	223°06.4	25.0
17	61°17.6	59°26.7	33.4	297°54.9	41.8	77°47.0	02.1	238°09.1	25.1
18	76°20.0	74°26.3	S00°32.1	312°57.4	N23°41.8	92°48.9	S08°01.8	253°11.7	N01°25.1
19	91°22.5	89°25.9	30.8	328°00.0	41.7	107°50.8	01.6	268°14.3	25.2
20	106°25.0	104°25.6	29.5	343°02.5	41.6	122°52.7	01.4	283°17.0	25.3
21	121°27.4	119°25.2	·· 28.2	358°05.1	·· 41.5	137°54.6	·· 01.2	298°19.6	·· 25.4
22	136°29.9	134°24.8	26.9	13°07.6	41.5	152°56.5	00.9	313°22.3	25.5
23	151°32.4	149°24.5	25.6	28°10.2	41.4	167°58.4	00.7	328°24.9	25.5
Mer.pass.:12:55		v-0.4 d1.3 m-3.8		v2.6 d-0.1 m-0.4		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	166°34.8	164°24.1	S00°24.4	43°12.7	N23°41.3	183°00.3	S08°00.5	343°27.5	N01°25.6
1	181°37.3	179°23.7	23.1	58°15.3	41.2	198°02.2	00.2	358°30.2	25.7
2	196°39.7	194°23.3	21.8	73°17.8	41.2	213°04.1	08°00.0	13°32.8	25.8
3	211°42.2	209°23.0	·· 20.5	88°20.3	·· 41.1	228°06.0	07°59.8	28°35.4	·· 25.9
4	226°44.7	224°22.6	19.2	103°22.9	41.0	243°07.9	59.6	43°38.1	25.9
5	241°47.1	239°22.2	17.9	118°25.4	40.9	258°09.8	59.3	58°40.7	26.0
6	256°49.6	254°21.9	S00°16.6	133°27.9	N23°40.9	273°11.7	S07°59.1	73°43.3	N01°26.1
7	271°52.1	269°21.5	15.3	148°30.5	40.8	288°13.6	58.9	88°46.0	26.2
8	286°54.5	284°21.1	14.1	163°33.0	40.7	303°15.5	58.7	103°48.6	26.3
9	301°57.0	299°20.8	·· 12.8	178°35.5	·· 40.6	318°17.4	·· 58.4	118°51.2	·· 26.3
10	316°59.5	314°20.4	11.5	193°38.1	40.6	333°19.3	58.2	133°53.9	26.4
11	332°01.9	329°20.0	10.2	208°40.6	40.5	348°21.2	58.0	148°56.5	26.5
12	347°04.4	344°19.7	S00°08.9	223°43.1	N23°40.4	3°23.1	S07°57.7	163°59.1	N01°26.6
13	2°06.9	359°19.3	07.6	238°45.7	40.3	18°25.0	57.5	179°01.8	26.6
14	17°09.3	14°18.9	06.3	253°48.2	40.2	33°26.9	57.3	194°04.4	26.7
15	32°11.8	29°18.6	·· 05.1	268°50.7	·· 40.2	48°28.8	·· 57.1	209°07.0	·· 26.8
16	47°14.2	44°18.2	03.8	283°53.2	40.1	63°30.7	56.8	224°09.7	26.9
17	62°16.7	59°17.8	02.5	298°55.7	40.0	78°32.6	56.6	239°12.3	27.0
18	77°19.2	74°17.5	S00°01.2	313°58.3	N23°39.9	93°34.5	S07°56.4	254°14.9	N01°27.0
19	92°21.6	89°17.1	N00°00.1	329°00.8	39.9	108°36.4	56.2	269°17.6	27.1
20	107°24.1	104°16.7	01.4	344°03.3	39.8	123°38.3	55.9	284°20.2	27.2
21	122°26.6	119°16.4	·· 02.7	359°05.8	·· 39.7	138°40.2	·· 55.7	299°22.9	·· 27.3
22	137°29.0	134°16.0	03.9	14°08.3	39.6	153°42.1	55.5	314°25.5	27.4
23	152°31.5	149°15.6	05.2	29°10.8	39.5	168°44.0	55.2	329°28.1	27.4
Mer.pass.:12:52		v-0.4 d1.3 m-3.8		v2.5 d-0.1 m-0.4		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	167°34.0	164°15.3	N00°06.5	44°13.3	N23°39.4	183°45.9	S07°55.0	344°30.8	N01°27.5
1	182°36.4	179°14.9	07.8	59°15.8	39.4	198°47.8	54.8	359°33.4	27.6
2	197°38.9	194°14.5	09.1	74°18.3	39.3	213°49.7	54.6	14°36.0	27.7
3	212°41.4	209°14.2	·· 10.4	89°20.8	·· 39.2	228°51.6	·· 54.3	29°38.7	·· 27.8
4	227°43.8	224°13.8	11.7	104°23.4	39.1	243°53.5	54.1	44°41.3	27.8
5	242°46.3	239°13.4	13.0	119°25.9	39.0	258°55.5	53.9	59°43.9	27.9
6	257°48.7	254°13.1	N00°14.2	134°28.4	N23°39.0	273°57.4	S07°53.7	74°46.6	N01°28.0
7	272°51.2	269°12.7	15.5	149°30.9	38.9	288°59.3	53.4	89°49.2	28.1
8	287°53.7	284°12.3	16.8	164°33.4	38.8	304°01.2	53.2	104°51.8	28.2
9	302°56.1	299°12.0	·· 18.1	179°35.9	·· 38.7	319°03.1	·· 53.0	119°54.5	·· 28.2
10	317°58.6	314°11.6	19.4	194°38.3	38.6	334°05.0	52.7	134°57.1	28.3
11	333°01.1	329°11.2	20.7	209°40.8	38.5	349°06.9	52.5	149°59.8	28.4
12	348°03.5	344°10.9	N00°22.0	224°43.3	N23°38.5	4°08.8	S07°52.3	165°02.4	N01°28.5
13	3°06.0	359°10.5	23.2	239°45.8	38.4	19°10.7	52.1	180°05.0	28.5
14	18°08.5	14°10.1	24.5	254°48.3	38.3	34°12.6	51.8	195°07.7	28.6
15	33°10.9	29°09.8	·· 25.8	269°50.8	·· 38.2	49°14.5	·· 51.6	210°10.3	·· 28.7
16	48°13.4	44°09.4	27.1	284°53.3	38.1	64°16.4	51.4	225°12.9	28.8
17	63°15.9	59°09.0	28.4	299°55.8	38.0	79°18.3	51.2	240°15.6	28.9
18	78°18.3	74°08.7	N00°29.7	314°58.3	N23°37.9	94°20.2	S07°50.9	255°18.2	N01°28.9
19	93°20.8	89°08.3	31.0	330°00.7	37.9	109°22.1	50.7	270°20.8	29.0
20	108°23.2	104°07.9	32.3	345°03.2	37.8	124°24.0	50.5	285°23.5	29.1
21	123°25.7	119°07.6	·· 33.5	0°05.7	·· 37.7	139°25.9	·· 50.2	300°26.1	·· 29.2
22	138°28.2	134°07.2	34.8	15°08.2	37.6	154°27.8	50.0	315°28.8	29.3
23	153°30.6	149°06.9	36.1	30°10.7	37.5	169°29.7	49.8	330°31.4	29.3
Mer.pass.:12:48		v-0.4 d1.3 m-3.8		v2.5 d-0.1 m-0.4		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.1
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.8	-57°11.2
Hamal	328°03.7	23°30.7
Polaris	319°13.4	89°18.8
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°38.0	46°00.7
Bellatrix	278°34.5	6°21.5
Elnath	278°15.6	28°37.0
Alnilam	275°48.7	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.1	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.2	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.4	28°00.0
Avior	234°18.6	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.6	-69°45.8
Alphard	217°58.1	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.6	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.1	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.3	49°15.4
Hadar	148°51.0	-60°25.3
Menkent	148°10.2	-36°25.3
Arcturus	145°57.6	19°07.5
Rigil Kent.	139°54.7	-60°52.5
Kochab	137°18.9	74°06.4
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°29.1	-26°27.3
Atria	107°33.2	-69°02.5
Sabik	102°15.3	-15°44.3
Shaula	96°25.2	-37°06.6
Rasalhague	96°08.7	12°32.9
Eltanin	90°47.3	51°28.9
Kaus Aust.	83°47.1	-34°22.7
Vega	80°40.7	38°47.3
Nunki	76°01.4	-26°17.0
Altair	62°10.8	8°53.6
Peacock	53°23.3	-56°42.0
Deneb	49°33.5	45°18.8
Enif	33°49.8	9°55.2
Al Na'ir	27°47.0	-46°54.6
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.1	15°15.6

Mar 08 Mon	**SHA**	**Mer.pass**
Venus	358°57.3	13:02
Mars	236°35.6	21:08
Jupiter	16°39.0	11:50
Saturn	176°48.6	01:10

Mar 09 Tue	**SHA**	**Mer.pass**
Venus	357°49.3	13:03
Mars	236°37.9	21:04
Jupiter	16°25.5	11:46
Saturn	176°52.7	01:06

Mar 10 Wed	**SHA**	**Mer.pass**
Venus	356°41.3	13:03
Mars	236°39.4	21:00
Jupiter	16°12.0	11:43
Saturn	176°56.8	01:02

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.0446 sec ΔT = TT-UT1 = +66.1394 sec

2010 March 08 to Mar. 10 UT

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°16.4	S05°00.9	265°18.5	9.3'	S25°33.7	0.4'	55.4'
1	192°16.6	05°00.0	279°46.8	9.3'	25°33.3	0.5'	55.4'
2	207°16.7	04°59.0	294°15.1	9.3'	25°32.8	0.6'	55.4'
3	222°16.9	·· 58.0	308°43.4	9.4'	25°32.1	0.8'	55.3'
4	237°17.0	57.0	323°11.8	9.4'	25°31.3	0.9'	55.3'
5	252°17.2	56.1	337°40.2	9.5'	25°30.3	1.0'	55.3'
6	267°17.3	S04°55.1	352°08.7	9.5'	S25°29.2	1.1'	55.2'
7	282°17.5	54.1	6°37.2	9.5'	25°28.0	1.3'	55.2'
8	297°17.6	53.1	21°05.8	9.6'	25°26.7	1.4'	55.2'
9	312°17.8	·· 52.2	35°34.4	9.6'	25°25.2	1.5'	55.2'
10	327°17.9	51.2	50°03.0	9.7'	25°23.6	1.7'	55.1'
11	342°18.1	50.2	64°31.7	9.7'	25°21.9	1.8'	55.1'
12	357°18.2	S04°49.2	79°00.5	9.8'	S25°20.1	1.9'	55.1'
13	12°18.4	48.3	93°29.3	9.8'	25°18.1	2.0'	55.1'
14	27°18.5	47.3	107°58.1	9.9'	25°16.0	2.2'	55.0'
15	42°18.7	·· 46.3	122°27.0	9.9'	25°13.8	2.3'	55.0'
16	57°18.9	45.3	136°55.9	10.0'	25°11.4	2.4'	55.0'
17	72°19.0	44.4	151°24.9	10.0'	25°09.0	2.5'	55.0'
18	87°19.2	S04°43.4	165°53.9	10.1'	S25°06.4	2.7'	55.0'
19	102°19.3	42.4	180°23.0	10.1'	25°03.7	2.8'	54.9'
20	117°19.5	41.4	194°52.1	10.2'	25°00.8	2.9'	54.9'
21	132°19.6	·· 40.4	209°21.3	10.2'	24°57.9	3.0'	54.9'
22	147°19.8	39.5	223°50.5	10.3'	24°54.8	3.1'	54.9'
23	162°19.9	38.5	238°19.8	10.3'	24°51.6	3.3'	54.8'
	SD.=16.1	d=1.0	S.D.=15.0				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°20.1	S04°37.5	252°49.1	10.4'	S24°48.3	3.4'	54.8'
1	192°20.3	36.5	267°18.5	10.4'	24°44.8	3.5'	54.8'
2	207°20.4	35.6	281°48.0	10.5'	24°41.3	3.6'	54.8'
3	222°20.6	·· 34.6	296°17.5	10.5'	24°37.6	3.7'	54.8'
4	237°20.7	33.6	310°47.0	10.6'	24°33.8	3.8'	54.7'
5	252°20.9	32.6	325°16.6	10.6'	24°29.9	4.0'	54.7'
6	267°21.0	S04°31.7	339°46.3	10.7'	S24°25.9	4.1'	54.7'
7	282°21.2	30.7	354°16.0	10.8'	24°21.7	4.2'	54.7'
8	297°21.3	29.7	8°45.8	10.8'	24°17.5	4.3'	54.7'
9	312°21.5	·· 28.7	23°15.7	10.9'	24°13.1	4.4'	54.6'
10	327°21.7	27.7	37°45.6	10.9'	24°08.7	4.5'	54.6'
11	342°21.8	26.8	52°15.5	11.0'	24°04.1	4.6'	54.6'
12	357°22.0	S04°25.8	66°45.5	11.0'	S23°59.4	4.8'	54.6'
13	12°22.1	24.8	81°15.6	11.1'	23°54.6	4.9'	54.6'
14	27°22.3	23.8	95°45.7	11.2'	23°49.6	5.0'	54.6'
15	42°22.4	·· 22.9	110°15.9	11.2'	23°44.6	5.1'	54.5'
16	57°22.6	21.9	124°46.2	11.3'	23°39.5	5.2'	54.5'
17	72°22.8	20.9	139°16.5	11.3'	23°34.2	5.3'	54.5'
18	87°22.9	S04°19.9	153°46.9	11.4'	S23°28.9	5.4'	54.5'
19	102°23.1	18.9	168°17.3	11.5'	23°23.4	5.5'	54.5'
20	117°23.2	18.0	182°47.8	11.5'	23°17.8	5.6'	54.5'
21	132°23.4	·· 17.0	197°18.3	11.6'	23°12.2	5.7'	54.4'
22	147°23.5	16.0	211°49.0	11.6'	23°06.4	5.8'	54.4'
23	162°23.7	15.0	226°19.6	11.7'	23°00.5	5.9'	54.4'
	SD.=16.1	d=1.0	S.D.=14.9				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°23.9	S04°14.0	240°50.4	11.8'	S22°54.5	6.0'	54.4'
1	192°24.0	13.1	255°21.2	11.8'	22°48.5	6.1'	54.4'
2	207°24.2	12.1	269°52.0	11.9'	22°42.3	6.2'	54.4'
3	222°24.3	·· 11.1	284°22.9	12.0'	22°36.0	6.3'	54.4'
4	237°24.5	10.1	298°53.9	12.0'	22°29.6	6.4'	54.3'
5	252°24.7	09.1	313°25.0	12.1'	22°23.1	6.5'	54.3'
6	267°24.8	S04°08.2	327°56.1	12.1'	S22°16.5	6.6'	54.3'
7	282°25.0	07.2	342°27.2	12.2'	22°09.9	6.7'	54.3'
8	297°25.1	06.2	356°58.5	12.3'	22°03.1	6.8'	54.3'
9	312°25.3	·· 05.2	11°29.8	12.3'	21°56.2	6.9'	54.3'
10	327°25.5	04.2	26°01.1	12.4'	21°49.2	7.0'	54.3'
11	342°25.6	03.3	40°32.5	12.4'	21°42.2	7.1'	54.3'
12	357°25.8	S04°02.3	55°04.0	12.5'	S21°35.0	7.2'	54.2'
13	12°25.9	01.3	69°35.5	12.6'	21°27.8	7.3'	54.2'
14	27°26.1	04°00.3	84°07.1	12.6'	21°20.4	7.4'	54.2'
15	42°26.3	03°59.3	98°38.8	12.7'	21°13.0	7.5'	54.2'
16	57°26.4	58.4	113°10.5	12.7'	21°05.5	7.6'	54.2'
17	72°26.6	57.4	127°42.3	12.8'	20°57.9	7.7'	54.2'
18	87°26.7	S03°56.4	142°14.1	12.9'	S20°50.2	7.7'	54.2'
19	102°26.9	55.4	156°46.0	12.9'	20°42.4	7.8'	54.2'
20	117°27.1	54.4	171°18.0	13.0'	20°34.5	7.9'	54.2'
21	132°27.2	·· 53.5	185°50.0	13.1'	20°26.6	8.0'	54.2'
22	147°27.4	52.5	200°22.1	13.1'	20°18.5	8.1'	54.2'
23	162°27.6	51.5	214°54.2	13.2'	20°10.4	8.2'	54.1'
	SD.=16.1	d=1.0	S.D.=14.8				

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

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

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 42-24%
08	10:54	10:47	12:11	06:33	18:58	
09	10:40	10:32	12:11	07:24	19:48	
10	10:25	10:17	12:10	08:13	20:36	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	168°33.1	164°06.5	N00°37.4	45°13.1	N23°37.4	184°31.6	S07°49.6	345°34.0	N01°29.4
1	183°35.6	179°06.1	38.7	60°15.6	37.3	199°33.5	49.3	0°36.7	29.5
2	198°38.0	194°05.8	40.0	75°18.1	37.2	214°35.4	49.1	15°39.3	29.6
3	213°40.5	209°05.4	·· 41.3	90°20.6	·· 37.1	229°37.3	·· 48.9	30°41.9	·· 29.7
4	228°43.0	224°05.0	42.5	105°23.0	37.1	244°39.2	48.7	45°44.6	29.7
5	243°45.4	239°04.7	43.8	120°25.5	37.0	259°41.1	48.4	60°47.2	29.8
6	258°47.9	254°04.3	N00°45.1	135°28.0	N23°36.9	274°43.0	S07°48.2	75°49.9	N01°29.9
7	273°50.3	269°03.9	46.4	150°30.4	36.8	289°44.9	48.0	90°52.5	30.0
8	288°52.8	284°03.6	47.7	165°32.9	36.7	304°46.8	47.7	105°55.1	30.1
9	303°55.3	299°03.2	·· 49.0	180°35.4	·· 36.6	319°48.7	·· 47.5	120°57.8	·· 30.1
10	318°57.7	314°02.8	50.3	195°37.8	36.5	334°50.6	47.3	136°00.4	30.2
11	334°00.2	329°02.5	51.6	210°40.3	36.4	349°52.5	47.1	151°03.0	30.3
12	349°02.7	344°02.1	N00°52.8	225°42.8	N23°36.3	4°54.4	S07°46.8	166°05.7	N01°30.4
13	4°05.1	359°01.7	54.1	240°45.2	36.2	19°56.3	46.6	181°08.3	30.5
14	19°07.6	14°01.4	55.4	255°47.7	36.1	34°58.2	46.4	196°11.0	30.5
15	34°10.1	29°01.0	·· 56.7	270°50.1	·· 36.1	50°00.1	·· 46.2	211°13.6	·· 30.6
16	49°12.5	44°00.6	58.0	285°52.6	36.0	65°02.0	45.9	226°16.2	30.7
17	64°15.0	59°00.3	00°59.3	300°55.0	35.9	80°03.9	45.7	241°18.9	30.8
18	79°17.5	73°59.9	N01°00.6	315°57.5	N23°35.8	95°05.8	S07°45.5	256°21.5	N01°30.9
19	94°19.9	88°59.5	01.8	330°59.9	35.7	110°07.7	45.2	271°24.1	30.9
20	109°22.4	103°59.2	03.1	346°02.4	35.6	125°09.6	45.0	286°26.8	31.0
21	124°24.8	118°58.8	·· 04.4	1°04.8	·· 35.5	140°11.5	·· 44.8	301°29.4	·· 31.1
22	139°27.3	133°58.4	05.7	16°07.3	35.4	155°13.4	44.6	316°32.1	31.2
23	154°29.8	148°58.1	07.0	31°09.7	35.3	170°15.3	44.3	331°34.7	31.3
Mer.pass.:12:44		v-0.4 d1.3 m-3.8		v2.5 d-0.1 m-0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	169°32.2	163°57.7	N01°08.3	46°12.2	N23°35.2	185°17.3	S07°44.1	346°37.3	N01°31.3
1	184°34.7	178°57.4	09.6	61°14.6	35.1	200°19.2	43.9	1°40.0	31.4
2	199°37.2	193°57.0	10.9	76°17.1	35.0	215°21.1	43.7	16°42.6	31.5
3	214°39.6	208°56.6	·· 12.1	91°19.5	·· 34.9	230°23.0	·· 43.4	31°45.2	·· 31.6
4	229°42.1	223°56.3	13.4	106°21.9	34.8	245°24.9	43.2	46°47.9	31.7
5	244°44.6	238°55.9	14.7	121°24.4	34.7	260°26.8	43.0	61°50.5	31.7
6	259°47.0	253°55.5	N01°16.0	136°26.8	N23°34.6	275°28.7	S07°42.7	76°53.2	N01°31.8
7	274°49.5	268°55.2	17.3	151°29.3	34.5	290°30.6	42.5	91°55.8	31.9
8	289°51.9	283°54.8	18.6	166°31.7	34.4	305°32.5	42.3	106°58.4	32.0
9	304°54.4	298°54.4	·· 19.9	181°34.1	·· 34.3	320°34.4	·· 42.1	122°01.1	·· 32.1
10	319°56.9	313°54.1	21.1	196°36.5	34.2	335°36.3	41.8	137°03.7	32.1
11	334°59.3	328°53.7	22.4	211°39.0	34.2	350°38.2	41.6	152°06.4	32.2
12	350°01.8	343°53.3	N01°23.7	226°41.4	N23°34.1	5°40.1	S07°41.4	167°09.0	N01°32.3
13	5°04.3	358°53.0	25.0	241°43.8	34.0	20°42.0	41.2	182°11.6	32.4
14	20°06.7	13°52.6	26.3	256°46.3	33.9	35°43.9	40.9	197°14.3	32.5
15	35°09.2	28°52.2	·· 27.6	271°48.7	·· 33.8	50°45.8	·· 40.7	212°16.9	·· 32.5
16	50°11.7	43°51.9	28.9	286°51.1	33.7	65°47.7	40.5	227°19.5	32.6
17	65°14.1	58°51.5	30.1	301°53.5	33.6	80°49.6	40.2	242°22.2	32.7
18	80°16.6	73°51.1	N01°31.4	316°55.9	N23°33.5	95°51.5	S07°40.0	257°24.8	N01°32.8
19	95°19.1	88°50.8	32.7	331°58.4	33.4	110°53.4	39.8	272°27.5	32.9
20	110°21.5	103°50.4	34.0	347°00.8	33.3	125°55.3	39.6	287°30.1	32.9
21	125°24.0	118°50.1	·· 35.3	2°03.2	·· 33.2	140°57.2	·· 39.3	302°32.7	·· 33.0
22	140°26.4	133°49.7	36.6	17°05.6	33.1	155°59.1	39.1	317°35.4	33.1
23	155°28.9	148°49.3	37.9	32°08.0	33.0	171°01.0	38.9	332°38.0	33.2
Mer.pass.:12:40		v-0.4 d1.3 m-3.8		v2.4 d-0.1 m-0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	170°31.4	163°49.0	N01°39.1	47°10.4	N23°32.9	186°02.9	S07°38.7	347°40.7	N01°33.3
1	185°33.8	178°48.6	40.4	62°12.9	32.8	201°04.8	38.4	2°43.3	33.3
2	200°36.3	193°48.2	41.7	77°15.3	32.7	216°06.7	38.2	17°45.9	33.4
3	215°38.8	208°47.9	·· 43.0	92°17.7	·· 32.5	231°08.6	·· 38.0	32°48.6	·· 33.5
4	230°41.2	223°47.5	44.3	107°20.1	32.4	246°10.5	37.7	47°51.2	33.6
5	245°43.7	238°47.1	45.6	122°22.5	32.3	261°12.5	37.5	62°53.9	33.7
6	260°46.2	253°46.8	N01°46.9	137°24.9	N23°32.2	276°14.4	S07°37.3	77°56.5	N01°33.7
7	275°48.6	268°46.4	48.1	152°27.3	32.1	291°16.3	37.1	92°59.1	33.8
8	290°51.1	283°46.0	49.4	167°29.7	32.0	306°18.2	36.8	108°01.8	33.9
9	305°53.6	298°45.7	·· 50.7	182°32.1	·· 31.9	321°20.1	·· 36.6	123°04.4	·· 34.0
10	320°56.0	313°45.3	52.0	197°34.5	31.8	336°22.0	36.4	138°07.1	34.1
11	335°58.5	328°44.9	53.3	212°36.9	31.7	351°23.9	36.2	153°09.7	34.1
12	351°00.9	343°44.6	N01°54.6	227°39.3	N23°31.6	6°25.8	S07°35.9	168°12.3	N01°34.2
13	6°03.4	358°44.2	55.8	242°41.7	31.5	21°27.7	35.7	183°15.0	34.3
14	21°05.9	13°43.8	57.1	257°44.1	31.4	36°29.6	35.5	198°17.6	34.4
15	36°08.3	28°43.5	·· 58.4	272°46.5	·· 31.3	51°31.5	·· 35.2	213°20.3	·· 34.5
16	51°10.8	43°43.1	01°59.7	287°48.9	31.2	66°33.4	35.0	228°22.9	34.5
17	66°13.3	58°42.7	02°01.0	302°51.2	31.1	81°35.3	34.8	243°25.5	34.6
18	81°15.7	73°42.4	N02°02.3	317°53.6	N23°31.0	96°37.2	S07°34.6	258°28.2	N01°34.7
19	96°18.2	88°42.0	03.6	332°56.0	30.9	111°39.1	34.3	273°30.8	34.8
20	111°20.7	103°41.7	04.8	347°58.4	30.8	126°41.0	34.1	288°33.4	34.9
21	126°23.1	118°41.3	·· 06.1	3°00.8	·· 30.7	141°42.9	·· 33.9	303°36.1	·· 34.9
22	141°25.6	133°40.9	07.4	18°03.2	30.6	156°44.8	33.7	318°38.7	35.0
23	156°28.0	148°40.6	08.7	33°05.6	30.4	171°46.7	33.4	333°41.4	35.1
Mer.pass.:12:36		v-0.4 d1.3 m-3.8		v2.4 d-0.1 m-0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.1
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.8	-57°11.2
Hamal	328°03.7	23°30.7
Polaris	319°14.5	89°18.8
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.3	-8°11.5
Capella	280°38.0	46°00.7
Bellatrix	278°34.5	6°21.5
Elnath	278°15.6	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.1	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.3	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.4	28°00.1
Avior	234°18.7	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.7	-69°45.8
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.6	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.1	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.2	49°15.4
Hadar	148°51.0	-60°25.3
Menkent	148°10.2	-36°25.3
Arcturus	145°57.6	19°07.5
Rigil Kent.	139°54.7	-60°52.6
Kochab	137°18.9	74°06.4
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°29.1	-26°27.3
Atria	107°33.1	-69°02.5
Sabik	102°15.2	-15°44.3
Shaula	96°25.2	-37°06.6
Rasalhague	96°08.7	12°32.9
Eltanin	90°47.3	51°28.9
Kaus Aust.	83°47.0	-34°22.7
Vega	80°40.7	38°47.3
Nunki	76°01.4	-26°17.0
Altair	62°10.7	8°53.6
Peacock	53°23.2	-56°42.0
Deneb	49°33.5	45°18.8
Enif	33°49.8	9°55.2
Al Na'ir	27°47.0	-46°54.6
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.0	15°15.6

Mar 11 Thu	**SHA**	**Mer.pass**
Venus	355°33.4	13:04
Mars	236°40.0	20:56
Jupiter	15°58.5	11:40
Saturn	177°00.9	00:58

Mar 12 Fri	**SHA**	**Mer.pass**
Venus	354°25.5	13:04
Mars	236°39.9	20:52
Jupiter	15°45.0	11:37
Saturn	177°05.1	00:53

Mar 13 Sat	**SHA**	**Mer.pass**
Venus	353°17.6	13:05
Mars	236°39.1	20:48
Jupiter	15°31.6	11:34
Saturn	177°09.3	00:49

Horizontal parallax	
Venus:	0.1
Mars:	0.2

DUT1 = UT1-UTC = +0.0410 sec ΔT = TT-UT1 = +66.1430 sec

2010 March 11 to Mar. 13 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°27.7	S03°50.5	229°26.4	13.2'	S20°02.2	8.3'	54.1'
1	192°27.9	49.5	243°58.7	13.3'	19°53.9	8.3'	54.1'
2	207°28.0	48.5	258°31.0	13.3'	19°45.5	8.4'	54.1'
3	222°28.2	·· 47.6	273°03.4	13.4'	19°37.0	8.5'	54.1'
4	237°28.4	46.6	287°35.8	13.5'	19°28.5	8.6'	54.1'
5	252°28.5	45.6	302°08.3	13.5'	19°19.8	8.7'	54.1'
6	267°28.7	S03°44.6	316°40.9	13.6'	S19°11.1	8.7'	54.1'
7	282°28.9	43.6	331°13.5	13.6'	19°02.4	8.8'	54.1'
8	297°29.0	42.7	345°46.1	13.7'	18°53.5	8.9'	54.1'
9	312°29.2	·· 41.7	0°18.9	13.7'	18°44.5	9.0'	54.1'
10	327°29.3	40.7	14°51.6	13.8'	18°35.5	9.1'	54.1'
11	342°29.5	39.7	29°24.5	13.9'	18°26.4	9.1'	54.1'
12	357°29.7	S03°38.7	43°57.4	13.9'	S18°17.3	9.2'	54.1'
13	12°29.8	37.7	58°30.3	14.0'	18°08.0	9.3'	54.1'
14	27°30.0	36.8	73°03.3	14.0'	17°58.7	9.4'	54.0'
15	42°30.2	·· 35.8	87°36.4	14.1'	17°49.3	9.4'	54.0'
16	57°30.3	34.8	102°09.5	14.1'	17°39.8	9.5'	54.0'
17	72°30.5	33.8	116°42.6	14.2'	17°30.3	9.6'	54.0'
18	87°30.7	S03°32.8	131°15.8	14.2'	S17°20.7	9.6'	54.0'
19	102°30.8	31.8	145°49.1	14.3'	17°11.0	9.7'	54.0'
20	117°31.0	30.9	160°22.4	14.3'	17°01.3	9.8'	54.0'
21	132°31.2	·· 29.9	174°55.8	14.4'	16°51.5	9.8'	54.0'
22	147°31.3	28.9	189°29.2	14.4'	16°41.6	9.9'	54.0'
23	162°31.5	27.9	204°02.7	14.5'	16°31.6	10.0'	54.0'
	SD.=16.1	d=1.0	S.D.=14.7				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°31.6	S03°26.9	218°36.2	14.5'	S16°21.6	10.0'	54.0'
1	192°31.8	25.9	233°09.8	14.6'	16°11.5	10.1'	54.0'
2	207°32.0	25.0	247°43.4	14.6'	16°01.4	10.2'	54.0'
3	222°32.1	·· 24.0	262°17.0	14.7'	15°51.2	10.2'	54.0'
4	237°32.3	23.0	276°50.8	14.7'	15°40.9	10.3'	54.0'
5	252°32.5	22.0	291°24.5	14.8'	15°30.6	10.4'	54.0'
6	267°32.6	S03°21.0	305°58.3	14.8'	S15°20.2	10.4'	54.0'
7	282°32.8	20.0	320°32.2	14.9'	15°09.7	10.5'	54.0'
8	297°33.0	19.1	335°06.1	14.9'	14°59.2	10.5'	54.0'
9	312°33.1	·· 18.1	349°40.0	15.0'	14°48.6	10.6'	54.0'
10	327°33.3	17.1	4°14.0	15.0'	14°38.0	10.7'	54.0'
11	342°33.5	16.1	18°48.0	15.1'	14°27.3	10.7'	54.0'
12	357°33.6	S03°15.1	33°22.1	15.1'	S14°16.5	10.8'	54.0'
13	12°33.8	14.1	47°56.2	15.1'	14°05.7	10.8'	54.0'
14	27°34.0	13.1	62°30.4	15.2'	13°54.9	10.9'	54.0'
15	42°34.1	·· 12.2	77°04.6	15.2'	13°43.9	10.9'	54.0'
16	57°34.3	11.2	91°38.8	15.3'	13°33.0	11.0'	54.0'
17	72°34.5	10.2	106°13.1	15.3'	13°21.9	11.1'	54.0'
18	87°34.6	S03°09.2	120°47.4	15.3'	S13°10.8	11.1'	54.0'
19	102°34.8	08.2	135°21.8	15.4'	12°59.7	11.2'	54.0'
20	117°35.0	07.2	149°56.1	15.4'	12°48.5	11.2'	54.0'
21	132°35.1	·· 06.3	164°30.6	15.4'	12°37.3	11.3'	54.0'
22	147°35.3	05.3	179°05.0	15.5'	12°26.0	11.3'	54.0'
23	162°35.5	04.3	193°39.5	15.5'	12°14.7	11.4'	54.0'
	SD.=16.1	d=1.0	S.D.=14.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°35.6	S03°03.3	208°14.1	15.6'	S12°03.3	11.4'	54.0'
1	192°35.8	02.3	222°48.6	15.6'	11°51.8	11.5'	54.0'
2	207°36.0	01.3	237°23.2	15.6'	11°40.4	11.5'	54.0'
3	222°36.2	03°00.3	251°57.9	15.7'	11°28.8	11.6'	54.0'
4	237°36.3	02°59.4	266°32.6	15.7'	11°17.3	11.6'	54.0'
5	252°36.5	58.4	281°07.3	15.7'	11°05.6	11.6'	54.0'
6	267°36.7	S02°57.4	295°42.0	15.7'	S10°54.0	11.7'	54.0'
7	282°36.8	56.4	310°16.7	15.8'	10°42.3	11.7'	54.0'
8	297°37.0	55.4	324°51.5	15.8'	10°30.5	11.8'	54.0'
9	312°37.2	·· 54.4	339°26.4	15.8'	10°18.7	11.8'	54.1'
10	327°37.3	53.4	354°01.2	15.9'	10°06.9	11.9'	54.1'
11	342°37.5	52.5	8°36.1	15.9'	09°55.0	11.9'	54.1'
12	357°37.7	S02°51.5	23°11.0	15.9'	S09°43.1	11.9'	54.1'
13	12°37.8	50.5	37°45.9	15.9'	09°31.1	12.0'	54.1'
14	27°38.0	49.5	52°20.9	16.0'	09°19.1	12.0'	54.1'
15	42°38.2	·· 48.5	66°55.8	16.0'	09°07.1	12.1'	54.1'
16	57°38.4	47.5	81°30.8	16.0'	08°55.0	12.1'	54.1'
17	72°38.5	46.5	96°05.8	16.0'	08°42.9	12.1'	54.1'
18	87°38.7	S02°45.6	110°40.9	16.1'	S08°30.8	12.2'	54.1'
19	102°38.9	44.6	125°15.9	16.1'	08°18.6	12.2'	54.1'
20	117°39.0	43.6	139°51.0	16.1'	08°06.4	12.2'	54.1'
21	132°39.2	·· 42.6	154°26.1	16.1'	07°54.2	12.3'	54.1'
22	147°39.4	41.6	169°01.3	16.1'	07°41.9	12.3'	54.1'
23	162°39.5	40.6	183°36.4	16.1'	07°29.6	12.3'	54.1'
	SD.=16.1	d=1.0	S.D.=14.7				

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

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

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 25-27 16-5%
11	10:09	10:01	12:10	08:59	21:21	
12	09:53	09:45	12:10	09:43	22:04	
13	09:37	09:29	12:09	10:25	22:45	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	171°30.5	163°40.2	N02°10.0	48°07.9	N23°30.3	186°48.6	S07°33.2	348°44.0	N01°35.2
1	186°33.0	178°39.8	11.3	63°10.3	30.2	201°50.5	33.0	3°46.6	35.3
2	201°35.4	193°39.5	12.5	78°12.7	30.1	216°52.4	32.8	18°49.3	35.3
3	216°37.9	208°39.1	·· 13.8	93°15.1	·· 30.0	231°54.3	·· 32.5	33°51.9	·· 35.4
4	231°40.4	223°38.7	15.1	108°17.4	29.9	246°56.3	32.3	48°54.6	35.5
5	246°42.8	238°38.4	16.4	123°19.8	29.8	261°58.2	32.1	63°57.2	35.6
6	261°45.3	253°38.0	N02°17.7	138°22.2	N23°29.7	277°00.1	S07°31.8	78°59.9	N01°35.7
7	276°47.8	268°37.6	19.0	153°24.6	29.6	292°02.0	31.6	94°02.5	35.7
8	291°50.2	283°37.3	20.3	168°26.9	29.5	307°03.9	31.4	109°05.1	35.8
9	306°52.7	298°36.9	·· 21.5	183°29.3	·· 29.4	322°05.8	·· 31.2	124°07.8	·· 35.9
10	321°55.2	313°36.5	22.8	198°31.7	29.2	337°07.7	30.9	139°10.4	36.0
11	336°57.6	328°36.2	24.1	213°34.0	29.1	352°09.6	30.7	154°13.1	36.1
12	352°00.1	343°35.8	N02°25.4	228°36.4	N23°29.0	7°11.5	S07°30.5	169°15.7	N01°36.1
13	7°02.5	358°35.4	26.7	243°38.8	28.9	22°13.4	30.3	184°18.3	36.2
14	22°05.0	13°35.1	28.0	258°41.1	28.8	37°15.3	30.0	199°21.0	36.3
15	37°07.5	28°34.7	·· 29.2	273°43.5	·· 28.7	52°17.2	·· 29.8	214°23.6	·· 36.4
16	52°09.9	43°34.3	30.5	288°45.9	28.6	67°19.1	29.6	229°26.3	36.5
17	67°12.4	58°34.0	31.8	303°48.2	28.5	82°21.0	29.3	244°28.9	36.5
18	82°14.9	73°33.6	N02°33.1	318°50.6	N23°28.4	97°22.9	S07°29.1	259°31.5	N01°36.6
19	97°17.3	88°33.2	34.4	333°52.9	28.2	112°24.8	28.9	274°34.2	36.7
20	112°19.8	103°32.9	35.6	348°55.3	28.1	127°26.7	28.7	289°36.8	36.8
21	127°22.3	118°32.5	·· 36.9	3°57.6	·· 28.0	142°28.6	·· 28.4	304°39.5	·· 36.9
22	142°24.7	133°32.1	38.2	19°00.0	27.9	157°30.5	28.2	319°42.1	36.9
23	157°27.2	148°31.8	39.5	34°02.3	27.8	172°32.4	28.0	334°44.7	37.0
Mer.pass.:12:32		v-0.4 d1.3 m-3.8		v2.4 d-0.1 m-0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	172°29.6	163°31.4	N02°40.8	49°04.7	N23°27.7	187°34.4	S07°27.8	349°47.4	N01°37.1
1	187°32.1	178°31.0	42.1	64°07.0	27.6	202°36.3	27.5	4°50.0	37.2
2	202°34.6	193°30.7	43.3	79°09.4	27.4	217°38.2	27.3	19°52.7	37.3
3	217°37.0	208°30.3	·· 44.6	94°11.7	·· 27.3	232°40.1	·· 27.1	34°55.3	·· 37.4
4	232°39.5	223°29.9	45.9	109°14.1	27.2	247°42.0	26.8	49°57.9	37.4
5	247°42.0	238°29.6	47.2	124°16.4	27.1	262°43.9	26.6	65°00.6	37.5
6	262°44.4	253°29.2	N02°48.5	139°18.8	N23°27.0	277°45.8	S07°26.4	80°03.2	N01°37.6
7	277°46.9	268°28.8	49.8	154°21.1	26.9	292°47.7	26.2	95°05.9	37.7
8	292°49.4	283°28.5	51.0	169°23.4	26.7	307°49.6	25.9	110°08.5	37.8
9	307°51.8	298°28.1	·· 52.3	184°25.8	·· 26.6	322°51.5	·· 25.7	125°11.2	·· 37.8
10	322°54.3	313°27.7	53.6	199°28.1	26.5	337°53.4	25.5	140°13.8	37.9
11	337°56.8	328°27.4	54.9	214°30.4	26.4	352°55.3	25.3	155°16.4	38.0
12	352°59.2	343°27.0	N02°56.2	229°32.8	N23°26.3	7°57.2	S07°25.0	170°19.1	N01°38.1
13	8°01.7	358°26.6	57.4	244°35.1	26.2	22°59.1	24.8	185°21.7	38.2
14	23°04.1	13°26.3	02°58.7	259°37.4	26.0	38°01.0	24.6	200°24.4	38.2
15	38°06.6	28°25.9	03°00.0	274°39.8	·· 25.9	53°02.9	·· 24.4	215°27.0	·· 38.3
16	53°09.1	43°25.5	01.3	289°42.1	25.8	68°04.8	24.1	230°29.6	38.4
17	68°11.5	58°25.2	02.6	304°44.4	25.7	83°06.8	23.9	245°32.3	38.5
18	83°14.0	73°24.8	N03°03.8	319°46.8	N23°25.6	98°08.7	S07°23.7	260°34.9	N01°38.6
19	98°16.5	88°24.4	05.1	334°49.1	25.5	113°10.6	23.4	275°37.6	38.6
20	113°18.9	103°24.1	06.4	349°51.4	25.3	128°12.5	23.2	290°40.2	38.7
21	128°21.4	118°23.7	·· 07.7	4°53.7	·· 25.2	143°14.4	·· 23.0	305°42.8	·· 38.8
22	143°23.9	133°23.3	09.0	19°56.0	25.1	158°16.3	22.8	320°45.5	38.9
23	158°26.3	148°23.0	10.2	34°58.4	25.0	173°18.2	22.5	335°48.1	39.0
Mer.pass.:12:28		v-0.4 d1.3 m-3.8		v2.3 d-0.1 m-0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	173°28.8	163°22.6	N03°11.5	50°00.7	N23°24.9	188°20.1	S07°22.3	350°50.8	N01°39.0
1	188°31.2	178°22.2	12.8	65°03.0	24.7	203°22.0	22.1	5°53.4	39.1
2	203°33.7	193°21.9	14.1	80°05.3	24.6	218°23.9	21.9	20°56.1	39.2
3	218°36.2	208°21.5	·· 15.4	95°07.6	·· 24.5	233°25.8	·· 21.6	35°58.7	·· 39.3
4	233°38.6	223°21.1	16.6	110°09.9	24.4	248°27.7	21.4	51°01.3	39.4
5	248°41.1	238°20.8	17.9	125°12.3	24.2	263°29.6	21.2	66°04.0	39.4
6	263°43.6	253°20.4	N03°19.2	140°14.6	N23°24.1	278°31.5	S07°21.0	81°06.6	N01°39.5
7	278°46.0	268°20.0	20.5	155°16.9	24.0	293°33.4	20.7	96°09.3	39.6
8	293°48.5	283°19.7	21.8	170°19.2	23.9	308°35.3	20.5	111°11.9	39.7
9	308°51.0	298°19.3	·· 23.0	185°21.5	·· 23.8	323°37.3	·· 20.3	126°14.6	·· 39.8
10	323°53.4	313°18.9	24.3	200°23.8	23.6	338°39.2	20.0	141°17.2	39.8
11	338°55.9	328°18.6	25.6	215°26.1	23.5	353°41.1	19.8	156°19.8	39.9
12	353°58.4	343°18.2	N03°26.9	230°28.4	N23°23.4	8°43.0	S07°19.6	171°22.5	N01°40.0
13	9°00.8	358°17.8	28.2	245°30.7	23.3	23°44.9	19.4	186°25.1	40.1
14	24°03.3	13°17.5	29.4	260°33.0	23.1	38°46.8	19.1	201°27.8	40.2
15	39°05.7	28°17.1	·· 30.7	275°35.3	·· 23.0	53°48.7	·· 18.9	216°30.4	·· 40.2
16	54°08.2	43°16.7	32.0	290°37.6	22.9	68°50.6	18.7	231°33.0	40.3
17	69°10.7	58°16.3	33.3	305°39.9	22.8	83°52.5	18.5	246°35.7	40.4
18	84°13.1	73°16.0	N03°34.5	320°42.2	N23°22.6	98°54.4	S07°18.2	261°38.3	N01°40.5
19	99°15.6	88°15.6	35.8	335°44.5	22.5	113°56.3	18.0	276°41.0	40.6
20	114°18.1	103°15.2	37.1	350°46.8	22.4	128°58.2	17.8	291°43.6	40.6
21	129°20.5	118°14.9	·· 38.4	5°49.1	·· 22.3	144°00.1	·· 17.5	306°46.3	·· 40.7
22	144°23.0	133°14.5	39.7	20°51.4	22.1	159°02.0	17.3	321°48.9	40.8
23	159°25.5	148°14.1	40.9	35°53.7	22.0	174°04.0	17.1	336°51.5	40.9
Mer.pass.:12:24		v-0.4 d1.3 m-3.8		v2.3 d-0.1 m-0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.1
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.8	-57°11.2
Hamal	328°03.7	23°30.7
Polaris	319°15.6	89°18.8
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.0	46°00.7
Bellatrix	278°34.6	6°21.5
Elnath	278°15.6	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.8	7°24.5
Canopus	263°57.1	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.3	-28°59.4
Procyon	245°02.0	5°11.8
Pollux	243°30.4	28°00.1
Avior	234°18.7	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.7	-69°45.8
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.6	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.0	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.2	49°15.4
Hadar	148°51.0	-60°25.3
Menkent	148°10.1	-36°25.3
Arcturus	145°57.6	19°07.5
Rigil Kent.	139°54.6	-60°52.6
Kochab	137°18.8	74°06.4
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°29.1	-26°27.3
Atria	107°33.1	-69°02.6
Sabik	102°15.2	-15°44.3
Shaula	96°25.1	-37°06.6
Rasalhague	96°08.6	12°32.9
Eltanin	90°47.3	51°28.9
Kaus Aust.	83°47.0	-34°22.7
Vega	80°40.7	38°47.3
Nunki	76°01.3	-26°17.0
Altair	62°10.7	8°53.6
Peacock	53°23.2	-56°42.0
Deneb	49°33.5	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°47.0	-46°54.6
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.3
Markab	13°41.0	15°15.6

Mar 14 Sun	**SHA**	**Mer.pass**
Venus	352°09.7	13:06
Mars	236°37.4	20:44
Jupiter	15°18.1	11:31
Saturn	177°13.5	00:45

Mar 15 Mon	**SHA**	**Mer.pass**
Venus	351°01.8	13:06
Mars	236°35.0	20:40
Jupiter	15°04.7	11:28
Saturn	177°17.7	00:41

Mar 16 Tue	**SHA**	**Mer.pass**
Venus	349°53.8	13:07
Mars	236°31.9	20:37
Jupiter	14°51.3	11:25
Saturn	177°22.0	00:37

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°39.7	S02°39.6	198°11.5	16.2'	S07°17.2	12.4'	54.1'
1	192°39.9	38.7	212°46.7	16.2'	07°04.9	12.4'	54.1'
2	207°40.1	37.7	227°21.9	16.2'	06°52.5	12.4'	54.2'
3	222°40.2	· · 36.7	241°57.1	16.2'	06°40.0	12.4'	54.2'
4	237°40.4	35.7	256°32.3	16.2'	06°27.6	12.5'	54.2'
5	252°40.6	34.7	271°07.6	16.2'	06°15.1	12.5'	54.2'
6	267°40.7	S02°33.7	285°42.8	16.2'	S06°02.6	12.5'	54.2'
7	282°40.9	32.7	300°18.0	16.3'	05°50.0	12.6'	54.2'
8	297°41.1	31.8	314°53.3	16.3'	05°37.4	12.6'	54.2'
9	312°41.3	· · 30.8	329°28.6	16.3'	05°24.9	12.6'	54.2'
10	327°41.4	29.8	344°03.9	16.3'	05°12.2	12.6'	54.2'
11	342°41.6	28.8	358°39.2	16.3'	04°59.6	12.7'	54.2'
12	357°41.8	S02°27.8	13°14.5	16.3'	S04°46.9	12.7'	54.2'
13	12°41.9	26.8	27°49.8	16.3'	04°34.2	12.7'	54.2'
14	27°42.1	25.8	42°25.1	16.3'	04°21.5	12.7'	54.3'
15	42°42.3	· · 24.8	57°00.4	16.3'	04°08.8	12.7'	54.3'
16	57°42.5	23.9	71°35.7	16.3'	03°56.1	12.8'	54.3'
17	72°42.6	22.9	86°11.0	16.3'	03°43.3	12.8'	54.3'
18	87°42.8	S02°21.9	100°46.3	16.3'	S03°30.5	12.8'	54.3'
19	102°43.0	20.9	115°21.7	16.3'	03°17.7	12.8'	54.3'
20	117°43.2	19.9	129°57.0	16.3'	03°04.9	12.8'	54.3'
21	132°43.3	· · 18.9	144°32.3	16.3'	02°52.0	12.8'	54.3'
22	147°43.5	17.9	159°07.6	16.3'	02°39.2	12.9'	54.3'
23	162°43.7	16.9	173°43.0	16.3'	02°26.3	12.9'	54.3'
	SD.=16.1	d=1.0	S.D.=14.8				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°43.9	S02°16.0	188°18.3	16.3'	S02°13.4	12.9'	54.4'
1	192°44.0	15.0	202°53.6	16.3'	02°00.5	12.9'	54.4'
2	207°44.2	14.0	217°28.9	16.3'	01°47.6	12.9'	54.4'
3	222°44.4	· · 13.0	232°04.2	16.3'	01°34.7	12.9'	54.4'
4	237°44.5	12.0	246°39.5	16.3'	01°21.8	12.9'	54.4'
5	252°44.7	11.0	261°14.8	16.3'	01°08.8	12.9'	54.4'
6	267°44.9	S02°10.0	275°50.1	16.3'	S00°55.9	13.0'	54.4'
7	282°45.1	09.0	290°25.4	16.3'	00°42.9	13.0'	54.4'
8	297°45.2	08.1	305°00.6	16.3'	00°30.0	13.0'	54.4'
9	312°45.4	· · 07.1	319°35.9	16.3'	00°17.0	13.0'	54.5'
10	327°45.6	06.1	334°11.1	16.2'	S00°04.0	13.0'	54.5'
11	342°45.8	05.1	348°46.4	16.2'	N00°09.0	13.0'	54.5'
12	357°45.9	S02°04.1	3°21.6	16.2'	N00°22.0	13.0'	54.5'
13	12°46.1	03.1	17°56.8	16.2'	00°35.0	13.0'	54.5'
14	27°46.3	02.1	32°32.0	16.2'	00°48.0	13.0'	54.5'
15	42°46.5	· · 01.1	47°07.2	16.2'	01°01.0	13.0'	54.5'
16	57°46.6	02°00.2	61°42.3	16.2'	01°14.0	13.0'	54.5'
17	72°46.8	01°59.2	76°17.5	16.1'	01°27.0	13.0'	54.5'
18	87°47.0	S01°58.2	90°52.6	16.1'	N01°40.0	13.0'	54.6'
19	102°47.2	57.2	105°27.7	16.1'	01°53.0	13.0'	54.6'
20	117°47.3	56.2	120°02.8	16.1'	02°06.0	13.0'	54.6'
21	132°47.5	· · 55.2	134°37.9	16.1'	02°19.0	13.0'	54.6'
22	147°47.7	54.2	149°12.9	16.0'	02°32.0	13.0'	54.6'
23	162°47.9	53.2	163°47.9	16.0'	02°45.0	13.0'	54.6'
	SD.=16.1	d=1.0	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°48.0	S01°52.2	178°22.9	16.0'	N02°58.0	13.0'	54.6'
1	192°48.2	51.3	192°57.9	16.0'	03°10.9	13.0'	54.7'
2	207°48.4	50.3	207°32.8	15.9'	03°23.9	13.0'	54.7'
3	222°48.6	· · 49.3	222°07.8	15.9'	03°36.9	13.0'	54.7'
4	237°48.7	48.3	236°42.7	15.9'	03°49.8	13.0'	54.7'
5	252°48.9	47.3	251°17.5	15.9'	04°02.8	12.9'	54.7'
6	267°49.1	S01°46.3	265°52.4	15.8'	N04°15.7	12.9'	54.7'
7	282°49.3	45.3	280°27.2	15.8'	04°28.7	12.9'	54.7'
8	297°49.5	44.3	295°01.9	15.8'	04°41.6	12.9'	54.7'
9	312°49.6	· · 43.4	309°36.7	15.7'	04°54.5	12.9'	54.8'
10	327°49.8	42.4	324°11.4	15.7'	05°07.4	12.9'	54.8'
11	342°50.0	41.4	338°46.1	15.7'	05°20.3	12.9'	54.8'
12	357°50.2	S01°40.4	353°20.7	15.6'	N05°33.2	12.9'	54.8'
13	12°50.3	39.4	7°55.3	15.6'	05°46.0	12.8'	54.8'
14	27°50.5	38.4	22°29.9	15.6'	05°58.8	12.8'	54.8'
15	42°50.7	· · 37.4	37°04.5	15.5'	06°11.7	12.8'	54.9'
16	57°50.9	36.4	51°39.0	15.5'	06°24.5	12.8'	54.9'
17	72°51.0	35.4	66°13.4	15.4'	06°37.3	12.8'	54.9'
18	87°51.2	S01°34.5	80°47.9	15.4'	N06°50.0	12.8'	54.9'
19	102°51.4	33.5	95°22.2	15.4'	07°02.8	12.7'	54.9'
20	117°51.6	32.5	109°56.6	15.3'	07°15.5	12.7'	54.9'
21	132°51.8	· · 31.5	124°30.9	15.3'	07°28.2	12.7'	54.9'
22	147°51.9	30.5	139°05.2	15.2'	07°40.8	12.7'	55.0'
23	162°52.1	29.5	153°39.4	15.2'	07°53.5	12.6'	55.0'
	SD.=16.1	d=1.0	S.D.=14.9				

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

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

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 28-1 2-1%
14	09:21	09:13	12:09	11:06	23:26	
15	09:05	08:56	12:09	11:46	–:–	
16	08:48	08:39	12:09	12:27	00:07	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	174°27.9	163°13.8	N03°42.2	50°56.0	N23°21.9	189°05.9	S07°16.9	351°54.2	N01°41.0
1	189°30.4	178°13.4	43.5	65°58.2	21.8	204°07.8	16.6	6°56.8	41.1
2	204°32.9	193°13.0	44.8	81°00.5	21.6	219°09.7	16.4	21°59.5	41.1
3	219°35.3	208°12.7	·· 46.0	96°02.8	·· 21.5	234°11.6	·· 16.2	37°02.1	·· 41.2
4	234°37.8	223°12.3	47.3	111°05.1	21.4	249°13.5	16.0	52°04.8	41.3
5	249°40.2	238°11.9	48.6	126°07.4	21.3	264°15.4	15.7	67°07.4	41.4
6	264°42.7	253°11.6	N03°49.9	141°09.7	N23°21.1	279°17.3	S07°15.5	82°10.0	N01°41.5
7	279°45.2	268°11.2	51.1	156°11.9	21.0	294°19.2	15.3	97°12.7	41.5
8	294°47.6	283°10.8	52.4	171°14.2	20.9	309°21.1	15.1	112°15.3	41.6
9	309°50.1	298°10.4	·· 53.7	186°16.5	·· 20.7	324°23.0	·· 14.8	127°18.0	·· 41.7
10	324°52.6	313°10.1	55.0	201°18.8	20.6	339°24.9	14.6	142°20.6	41.8
11	339°55.0	328°09.7	56.2	216°21.1	20.5	354°26.8	14.4	157°23.3	41.9
12	354°57.5	343°09.3	N03°57.5	231°23.3	N23°20.3	9°28.8	S07°14.2	172°25.9	N01°41.9
13	10°00.0	358°09.0	03°58.8	246°25.6	20.2	24°30.7	13.9	187°28.5	42.0
14	25°02.4	13°08.6	04°00.1	261°27.9	20.1	39°32.6	13.7	202°31.2	42.1
15	40°04.9	28°08.2	·· 01.3	276°30.1	·· 20.0	54°34.5	·· 13.5	217°33.8	·· 42.2
16	55°07.3	43°07.9	02.6	291°32.4	19.8	69°36.4	13.2	232°36.5	42.3
17	70°09.8	58°07.5	03.9	306°34.7	19.7	84°38.3	13.0	247°39.1	42.3
18	85°12.3	73°07.1	N04°05.2	321°36.9	N23°19.6	99°40.2	S07°12.8	262°41.7	N01°42.4
19	100°14.7	88°06.7	06.4	336°39.2	19.4	114°42.1	12.6	277°44.4	42.5
20	115°17.2	103°06.4	07.7	351°41.5	19.3	129°44.0	12.3	292°47.0	42.6
21	130°19.7	118°06.0	·· 09.0	6°43.7	·· 19.2	144°45.9	·· 12.1	307°49.7	·· 42.7
22	145°22.1	133°05.6	10.3	21°46.0	19.0	159°47.8	11.9	322°52.3	42.7
23	160°24.6	148°05.3	11.5	36°48.3	18.9	174°49.7	11.7	337°55.0	42.8
Mer.pass.:12:20		v-0.4 d1.3 m-3.8		v2.3 d-0.1 m-0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	175°27.1	163°04.9	N04°12.8	51°50.5	N23°18.8	189°51.7	S07°11.4	352°57.6	N01°42.9
1	190°29.5	178°04.5	14.1	66°52.8	18.6	204°53.6	11.2	8°00.2	43.0
2	205°32.0	193°04.1	15.4	81°55.0	18.5	219°55.5	11.0	23°02.9	43.1
3	220°34.5	208°03.8	·· 16.6	96°57.3	·· 18.4	234°57.4	·· 10.8	38°05.5	·· 43.1
4	235°36.9	223°03.4	17.9	111°59.5	18.2	249°59.3	10.5	53°08.2	43.2
5	250°39.4	238°03.0	19.2	127°01.8	18.1	265°01.2	10.3	68°10.8	43.3
6	265°41.8	253°02.7	N04°20.5	142°04.0	N23°18.0	280°03.1	S07°10.1	83°13.5	N01°43.4
7	280°44.3	268°02.3	21.7	157°06.3	17.8	295°05.0	09.8	98°16.1	43.5
8	295°46.8	283°01.9	23.0	172°08.5	17.7	310°06.9	09.6	113°18.7	43.5
9	310°49.2	298°01.5	·· 24.3	187°10.8	·· 17.6	325°08.8	·· 09.4	128°21.4	·· 43.6
10	325°51.7	313°01.2	25.5	202°13.0	17.4	340°10.7	09.2	143°24.0	43.7
11	340°54.2	328°00.8	26.8	217°15.3	17.3	355°12.6	08.9	158°26.7	43.8
12	355°56.6	343°00.4	N04°28.1	232°17.5	N23°17.2	10°14.6	S07°08.7	173°29.3	N01°43.9
13	10°59.1	358°00.0	29.4	247°19.8	17.0	25°16.5	08.5	188°32.0	43.9
14	26°01.6	12°59.7	30.6	262°22.0	16.9	40°18.4	08.3	203°34.6	44.0
15	41°04.0	27°59.3	·· 31.9	277°24.3	·· 16.8	55°20.3	·· 08.0	218°37.3	·· 44.1
16	56°06.5	42°58.9	33.2	292°26.5	16.6	70°22.2	07.8	233°39.9	44.2
17	71°08.9	57°58.6	34.4	307°28.7	16.5	85°24.1	07.6	248°42.5	44.3
18	86°11.4	72°58.2	N04°35.7	322°31.0	N23°16.3	100°26.0	S07°07.4	263°45.2	N01°44.4
19	101°13.9	87°57.8	37.0	337°33.2	16.2	115°27.9	07.1	278°47.8	44.4
20	116°16.3	102°57.4	38.3	352°35.4	16.1	130°29.8	06.9	293°50.5	44.5
21	131°18.8	117°57.1	·· 39.5	7°37.7	·· 15.9	145°31.7	·· 06.7	308°53.1	·· 44.6
22	146°21.3	132°56.7	40.8	22°39.9	15.8	160°33.6	06.5	323°55.8	44.7
23	161°23.7	147°56.3	42.1	37°42.1	15.7	175°35.6	06.2	338°58.4	44.8
Mer.pass.:12:16		v-0.4 d1.3 m-3.8		v2.3 d-0.1 m-0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	176°26.2	162°55.9	N04°43.3	52°44.4	N23°15.5	190°37.5	S07°06.0	354°01.0	N01°44.8
1	191°28.7	177°55.6	44.6	67°46.6	15.4	205°39.4	05.8	9°03.7	44.9
2	206°31.1	192°55.2	45.9	82°48.8	15.2	220°41.3	05.5	24°06.3	45.0
3	221°33.6	207°54.8	·· 47.1	97°51.0	·· 15.1	235°43.2	·· 05.3	39°09.0	·· 45.1
4	236°36.1	222°54.5	48.4	112°53.3	15.0	250°45.1	05.1	54°11.6	45.2
5	251°38.5	237°54.1	49.7	127°55.5	14.8	265°47.0	04.9	69°14.3	45.2
6	266°41.0	252°53.7	N04°50.9	142°57.7	N23°14.7	280°48.9	S07°04.6	84°16.9	N01°45.3
7	281°43.4	267°53.3	52.2	157°59.9	14.5	295°50.8	04.4	99°19.5	45.4
8	296°45.9	282°53.0	53.5	173°02.2	14.4	310°52.7	04.2	114°22.2	45.5
9	311°48.4	297°52.6	·· 54.8	188°04.4	·· 14.3	325°54.7	·· 04.0	129°24.8	·· 45.6
10	326°50.8	312°52.2	56.0	203°06.6	14.1	340°56.6	03.7	144°27.5	45.6
11	341°53.3	327°51.8	57.3	218°08.8	14.0	355°58.5	03.5	159°30.1	45.7
12	356°55.8	342°51.5	N04°58.6	233°11.0	N23°13.8	11°00.4	S07°03.3	174°32.8	N01°45.8
13	11°58.2	357°51.1	04°59.8	248°13.2	13.7	26°02.3	03.1	189°35.4	45.9
14	27°00.7	12°50.7	05°01.1	263°15.5	13.6	41°04.2	02.8	204°38.0	46.0
15	42°03.2	27°50.3	·· 02.4	278°17.7	·· 13.4	56°06.1	·· 02.6	219°40.7	·· 46.0
16	57°05.6	42°50.0	03.6	293°19.9	13.3	71°08.0	02.4	234°43.3	46.1
17	72°08.1	57°49.6	04.9	308°22.1	13.1	86°09.9	02.2	249°46.0	46.2
18	87°10.6	72°49.2	N05°06.2	323°24.3	N23°13.0	101°11.8	S07°01.9	264°48.6	N01°46.3
19	102°13.0	87°48.8	07.4	338°26.5	12.8	116°13.8	01.7	279°51.3	46.4
20	117°15.5	102°48.4	08.7	353°28.7	12.7	131°15.7	01.5	294°53.9	46.4
21	132°17.9	117°48.1	·· 10.0	8°30.9	·· 12.6	146°17.6	·· 01.3	309°56.6	·· 46.5
22	147°20.4	132°47.7	11.2	23°33.1	12.4	161°19.5	01.0	324°59.2	46.6
23	162°22.9	147°47.3	12.5	38°35.3	12.3	176°21.4	00.8	340°01.8	46.7
Mer.pass.:12:12		v-0.4 d1.3 m-3.8		v2.2 d-0.1 m-0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.1
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.9	-57°11.2
Hamal	328°03.8	23°30.7
Polaris	319°16.6	89°18.8
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.0	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.1	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.3	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.4	28°00.1
Avior	234°18.7	-59°32.8
Suhail	222°53.9	-43°28.7
Miaplacidus	221°39.7	-69°45.8
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.6
Denebola	182°35.7	14°30.7
Gienah	175°54.5	-17°36.1
Acrux	173°11.6	-63°09.5
Gacrux	172°03.2	-57°10.4
Alioth	166°22.0	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.2	49°15.4
Hadar	148°50.9	-60°25.3
Menkent	148°10.1	-36°25.3
Arcturus	145°57.6	19°07.5
Rigil Kent.	139°54.6	-60°52.6
Kochab	137°18.8	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°29.1	-26°27.3
Atria	107°33.0	-69°02.6
Sabik	102°15.2	-15°44.3
Shaula	96°25.1	-37°06.6
Rasalhague	96°08.6	12°32.9
Eltanin	90°47.3	51°28.9
Kaus Aust.	83°47.0	-34°22.7
Vega	80°40.7	38°47.3
Nunki	76°01.3	-26°17.0
Altair	62°10.7	8°53.6
Peacock	53°23.2	-56°41.9
Deneb	49°33.5	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°47.0	-46°54.6
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.2
Markab	13°41.0	15°15.6

Mar 17 Wed	**SHA**	**Mer.pass**
Venus	348°45.8	13:07
Mars	236°28.0	20:33
Jupiter	14°37.9	11:22
Saturn	177°26.3	00:32

Mar 18 Thu	**SHA**	**Mer.pass**
Venus	347°37.8	13:08
Mars	236°23.5	20:30
Jupiter	14°24.6	11:19
Saturn	177°30.5	00:28

Mar 19 Fri	**SHA**	**Mer.pass**
Venus	346°29.7	13:09
Mars	236°18.2	20:26
Jupiter	14°11.3	11:16
Saturn	177°34.8	00:24

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°52.3	S01°28.5	168°13.5	15.2'	N08°06.1	12.6'	55.0'
1	192°52.5	27.5	182°47.7	15.1'	08°18.7	12.6'	55.0'
2	207°52.6	26.5	197°21.8	15.1'	08°31.3	12.6'	55.0'
3	222°52.8	· · 25.6	211°55.8	15.0'	08°43.8	12.5'	55.0'
4	237°53.0	24.6	226°29.8	15.0'	08°56.4	12.5'	55.1'
5	252°53.2	23.6	241°03.7	14.9'	09°08.8	12.5'	55.1'
6	267°53.4	S01°22.6	255°37.6	14.9'	N09°21.3	12.4'	55.1'
7	282°53.5	21.6	270°11.5	14.8'	09°33.7	12.4'	55.1'
8	297°53.7	20.6	284°45.2	14.8'	09°46.1	12.4'	55.1'
9	312°53.9	· · 19.6	299°19.0	14.7'	09°58.5	12.3'	55.1'
10	327°54.1	18.6	313°52.7	14.7'	10°10.8	12.3'	55.2'
11	342°54.3	17.6	328°26.3	14.6'	10°23.1	12.3'	55.2'
12	357°54.4	S01°16.7	342°59.9	14.5'	N10°35.3	12.2'	55.2'
13	12°54.6	15.7	357°33.4	14.5'	10°47.5	12.2'	55.2'
14	27°54.8	14.7	12°06.9	14.4'	10°59.7	12.2'	55.2'
15	42°55.0	· · 13.7	26°40.3	14.4'	11°11.9	12.1'	55.2'
16	57°55.2	12.7	41°13.6	14.3'	11°23.9	12.1'	55.3'
17	72°55.3	11.7	55°46.9	14.3'	11°36.0	12.0'	55.3'
18	87°55.5	S01°10.7	70°20.2	14.2'	N11°48.0	12.0'	55.3'
19	102°55.7	09.7	84°53.3	14.1'	12°00.0	11.9'	55.3'
20	117°55.9	08.8	99°26.4	14.1'	12°11.9	11.9'	55.3'
21	132°56.0	· · 07.8	113°59.5	14.0'	12°23.8	11.9'	55.3'
22	147°56.2	06.8	128°32.5	14.0'	12°35.6	11.8'	55.4'
23	162°56.4	05.8	143°05.4	13.9'	12°47.4	11.8'	55.4'
	SD.=16.1	d=1.0	S.D.=15.0				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°56.6	S01°04.8	157°38.3	13.8'	N12°59.1	11.7'	55.4'
1	192°56.8	03.8	172°11.1	13.8'	13°10.8	11.7'	55.4'
2	207°56.9	02.8	186°43.8	13.7'	13°22.5	11.6'	55.4'
3	222°57.1	· · 01.8	201°16.5	13.6'	13°34.1	11.6'	55.5'
4	237°57.3	01°00.8	215°49.1	13.6'	13°45.6	11.5'	55.5'
5	252°57.5	00°59.8	230°21.6	13.5'	13°57.1	11.5'	55.5'
6	267°57.7	S00°58.9	244°54.1	13.4'	N14°08.5	11.4'	55.5'
7	282°57.9	57.9	259°26.5	13.4'	14°19.9	11.3'	55.5'
8	297°58.0	56.9	273°58.8	13.3'	14°31.2	11.3'	55.5'
9	312°58.2	· · 55.9	288°31.1	13.2'	14°42.4	11.2'	55.6'
10	327°58.4	54.9	303°03.3	13.2'	14°53.6	11.2'	55.6'
11	342°58.6	53.9	317°35.4	13.1'	15°04.8	11.1'	55.6'
12	357°58.8	S00°52.9	332°07.5	13.0'	N15°15.8	11.0'	55.6'
13	12°58.9	51.9	346°39.4	12.9'	15°26.8	11.0'	55.6'
14	27°59.1	50.9	1°11.3	12.9'	15°37.8	10.9'	55.7'
15	42°59.3	· · 50.0	15°43.2	12.8'	15°48.7	10.9'	55.7'
16	57°59.5	49.0	30°14.9	12.7'	15°59.5	10.8'	55.7'
17	72°59.7	48.0	44°46.6	12.6'	16°10.3	10.7'	55.7'
18	87°59.8	S00°47.0	59°18.2	12.6'	N16°20.9	10.7'	55.7'
19	103°00.0	46.0	73°49.7	12.5'	16°31.6	10.6'	55.8'
20	118°00.2	45.0	88°21.2	12.4'	16°42.1	10.5'	55.8'
21	133°00.4	· · 44.0	102°52.6	12.3'	16°52.6	10.4'	55.8'
22	148°00.6	43.0	117°23.9	12.3'	17°03.0	10.4'	55.8'
23	163°00.8	42.0	131°55.1	12.2'	17°13.3	10.3'	55.8'
	SD.=16.1	d=1.0	S.D.=15.2				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°00.9	S00°41.1	146°26.2	12.1'	N17°23.6	10.2'	55.9'
1	193°01.1	40.1	160°57.3	12.0'	17°33.8	10.1'	55.9'
2	208°01.3	39.1	175°28.3	11.9'	17°43.9	10.1'	55.9'
3	223°01.5	· · 38.1	189°59.2	11.9'	17°53.9	10.0'	55.9'
4	238°01.7	37.1	204°30.0	11.8'	18°03.9	9.9'	55.9'
5	253°01.8	36.1	219°00.7	11.7'	18°13.7	9.8'	56.0'
6	268°02.0	S00°35.1	233°31.4	11.6'	N18°23.5	9.7'	56.0'
7	283°02.2	34.1	248°02.0	11.5'	18°33.2	9.7'	56.0'
8	298°02.4	33.1	262°32.5	11.5'	18°42.9	9.6'	56.0'
9	313°02.6	· · 32.2	277°02.9	11.4'	18°52.4	9.5'	56.0'
10	328°02.8	31.2	291°33.2	11.3'	19°01.9	9.4'	56.1'
11	343°02.9	30.2	306°03.5	11.2'	19°11.2	9.3'	56.1'
12	358°03.1	S00°29.2	320°33.6	11.1'	N19°20.5	9.2'	56.1'
13	13°03.3	28.2	335°03.7	11.0'	19°29.7	9.1'	56.1'
14	28°03.5	27.2	349°33.7	11.0'	19°38.8	9.1'	56.2'
15	43°03.7	· · 26.2	4°03.6	10.9'	19°47.8	9.0'	56.2'
16	58°03.9	25.2	18°33.5	10.8'	19°56.7	8.9'	56.2'
17	73°04.0	24.3	33°03.2	10.7'	20°05.5	8.8'	56.2'
18	88°04.2	S00°23.3	47°32.9	10.6'	N20°14.3	8.7'	56.2'
19	103°04.4	22.3	62°02.5	10.5'	20°22.9	8.6'	56.3'
20	118°04.6	21.3	76°32.0	10.5'	20°31.4	8.5'	56.3'
21	133°04.8	· · 20.3	91°01.4	10.4'	20°39.9	8.4'	56.3'
22	148°05.0	19.3	105°30.7	10.3'	20°48.2	8.3'	56.3'
23	163°05.1	18.3	120°00.0	10.2'	20°56.4	8.2'	56.4'
	SD.=16.1	d=1.0	S.D.=15.3				

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

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

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 2-4 3-13%
17	08:31	08:22	12:08	13:10	00:48	
18	08:14	08:05	12:08	13:55	01:32	
19	07:56	07:48	12:08	14:43	02:19	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	177°25.3	162°46.9	N05°13.7	53°37.5	N23°12.1	191°23.3	S07°00.6	355°04.5	N01°46.8
1	192°27.8	177°46.6	15.0	68°39.7	12.0	206°25.2	00.3	10°07.1	46.8
2	207°30.3	192°46.2	16.3	83°41.9	11.8	221°27.1	07°00.1	25°09.8	46.9
3	222°32.7	207°45.8	·· 17.5	98°44.1	·· 11.7	236°29.0	06°59.9	40°12.4	·· 47.0
4	237°35.2	222°45.4	18.8	113°46.3	11.6	251°31.0	59.7	55°15.1	47.1
5	252°37.7	237°45.1	20.1	128°48.5	11.4	266°32.9	59.4	70°17.7	47.2
6	267°40.1	252°44.7	N05°21.3	143°50.7	N23°11.3	281°34.8	S06°59.2	85°20.3	N01°47.2
7	282°42.6	267°44.3	22.6	158°52.9	11.1	296°36.7	59.0	100°23.0	47.3
8	297°45.0	282°43.9	23.9	173°55.1	11.0	311°38.6	58.8	115°25.6	47.4
9	312°47.5	297°43.5	·· 25.1	188°57.3	·· 10.8	326°40.5	·· 58.5	130°28.3	·· 47.5
10	327°50.0	312°43.2	26.4	203°59.5	10.7	341°42.4	58.3	145°30.9	47.6
11	342°52.4	327°42.8	27.7	219°01.7	10.5	356°44.3	58.1	160°33.6	47.6
12	357°54.9	342°42.4	N05°28.9	234°03.8	N23°10.4	11°46.2	S06°57.9	175°36.2	N01°47.7
13	12°57.4	357°42.0	30.2	249°06.0	10.2	26°48.2	57.6	190°38.9	47.8
14	27°59.8	12°41.7	31.4	264°08.2	10.1	41°50.1	57.4	205°41.5	47.9
15	43°02.3	27°41.3	·· 32.7	279°10.4	·· 09.9	56°52.0	·· 57.2	220°44.1	·· 48.0
16	58°04.8	42°40.9	34.0	294°12.6	09.8	71°53.9	57.0	235°46.8	48.0
17	73°07.2	57°40.5	35.2	309°14.8	09.6	86°55.8	56.7	250°49.4	48.1
18	88°09.7	72°40.1	N05°36.5	324°16.9	N23°09.5	101°57.7	S06°56.5	265°52.1	N01°48.2
19	103°12.2	87°39.8	37.8	339°19.1	09.3	116°59.6	56.3	280°54.7	48.3
20	118°14.6	102°39.4	39.0	354°21.3	09.2	132°01.5	56.1	295°57.4	48.4
21	133°17.1	117°39.0	·· 40.3	9°23.5	·· 09.1	147°03.4	·· 55.8	311°00.0	·· 48.4
22	148°19.5	132°38.6	41.5	24°25.6	08.9	162°05.4	55.6	326°02.6	48.5
23	163°22.0	147°38.2	42.8	39°27.8	08.8	177°07.3	55.4	341°05.3	48.6
Mer.pass.:12:08		v-0.4 d1.3 m-3.8		v2.2 d-0.1 m-0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.5	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	178°24.5	162°37.9	N05°44.1	54°30.0	N23°08.6	192°09.2	S06°55.2	356°07.9	N01°48.7
1	193°26.9	177°37.5	45.3	69°32.2	08.5	207°11.1	54.9	11°10.6	48.8
2	208°29.4	192°37.1	46.6	84°34.3	08.3	222°13.0	54.7	26°13.2	48.8
3	223°31.9	207°36.7	·· 47.8	99°36.5	·· 08.2	237°14.9	·· 54.5	41°15.9	·· 48.9
4	238°34.3	222°36.3	49.1	114°38.7	08.0	252°16.8	54.2	56°18.5	49.0
5	253°36.8	237°36.0	50.4	129°40.8	07.8	267°18.7	54.0	71°21.2	49.1
6	268°39.3	252°35.6	N05°51.6	144°43.0	N23°07.7	282°20.6	S06°53.8	86°23.8	N01°49.2
7	283°41.7	267°35.2	52.9	159°45.2	07.5	297°22.6	53.6	101°26.4	49.2
8	298°44.2	282°34.8	54.1	174°47.3	07.4	312°24.5	53.3	116°29.1	49.3
9	313°46.7	297°34.4	·· 55.4	189°49.5	·· 07.2	327°26.4	·· 53.1	131°31.7	·· 49.4
10	328°49.1	312°34.1	56.6	204°51.7	07.1	342°28.3	52.9	146°34.4	49.5
11	343°51.6	327°33.7	57.9	219°53.8	06.9	357°30.2	52.7	161°37.0	49.6
12	358°54.0	342°33.3	N05°59.2	234°56.0	N23°06.8	12°32.1	S06°52.4	176°39.7	N01°49.6
13	13°56.5	357°32.9	06°00.4	249°58.1	06.6	27°34.0	52.2	191°42.3	49.7
14	28°59.0	12°32.5	01.7	265°00.3	06.5	42°35.9	52.0	206°45.0	49.8
15	44°01.4	27°32.2	·· 02.9	280°02.5	·· 06.3	57°37.9	·· 51.8	221°47.6	·· 49.9
16	59°03.9	42°31.8	04.2	295°04.6	06.2	72°39.8	51.5	236°50.2	50.0
17	74°06.4	57°31.4	05.4	310°06.8	06.0	87°41.7	51.3	251°52.9	50.0
18	89°08.8	72°31.0	N06°06.7	325°08.9	N23°05.9	102°43.6	S06°51.1	266°55.5	N01°50.1
19	104°11.3	87°30.6	08.0	340°11.1	05.7	117°45.5	50.9	281°58.2	50.2
20	119°13.8	102°30.2	09.2	355°13.2	05.6	132°47.4	50.6	297°00.8	50.3
21	134°16.2	117°29.9	·· 10.5	10°15.4	·· 05.4	147°49.3	·· 50.4	312°03.5	·· 50.4
22	149°18.7	132°29.5	11.7	25°17.5	05.2	162°51.2	50.2	327°06.1	50.4
23	164°21.1	147°29.1	13.0	40°19.7	05.1	177°53.2	50.0	342°08.7	50.5
Mer.pass.:12:04		v-0.4 d1.3 m-3.8		v2.2 d-0.1 m-0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.5	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	179°23.6	162°28.7	N06°14.2	55°21.8	N23°04.9	192°55.1	S06°49.7	357°11.4	N01°50.6
1	194°26.1	177°28.3	15.5	70°23.9	04.8	207°57.0	49.5	12°14.0	50.7
2	209°28.5	192°27.9	16.7	85°26.1	04.6	222°58.9	49.3	27°16.7	50.8
3	224°31.0	207°27.6	·· 18.0	100°28.2	·· 04.5	238°00.8	·· 49.1	42°19.3	·· 50.8
4	239°33.5	222°27.2	19.2	115°30.4	04.3	253°02.7	48.8	57°22.0	50.9
5	254°35.9	237°26.8	20.5	130°32.5	04.2	268°04.6	48.6	72°24.6	51.0
6	269°38.4	252°26.4	N06°21.8	145°34.7	N23°04.0	283°06.6	S06°48.4	87°27.3	N01°51.1
7	284°40.9	267°26.0	23.0	160°36.8	03.8	298°08.5	48.2	102°29.9	51.2
8	299°43.3	282°25.6	24.3	175°38.9	03.7	313°10.4	47.9	117°32.5	51.2
9	314°45.8	297°25.2	·· 25.5	190°41.1	·· 03.5	328°12.3	·· 47.7	132°35.2	·· 51.3
10	329°48.3	312°24.9	26.8	205°43.2	03.4	343°14.2	47.5	147°37.8	51.4
11	344°50.7	327°24.5	28.0	220°45.3	03.2	358°16.1	47.3	162°40.5	51.5
12	359°53.2	342°24.1	N06°29.3	235°47.5	N23°03.1	13°18.0	S06°47.0	177°43.1	N01°51.6
13	14°55.6	357°23.7	30.5	250°49.6	02.9	28°20.0	46.8	192°45.8	51.6
14	29°58.1	12°23.3	31.8	265°51.7	02.7	43°21.9	46.6	207°48.4	51.7
15	45°00.6	27°22.9	·· 33.0	280°53.9	·· 02.6	58°23.8	·· 46.4	222°51.1	·· 51.8
16	60°03.0	42°22.5	34.3	295°56.0	02.4	73°25.7	46.1	237°53.7	51.9
17	75°05.5	57°22.2	35.5	310°58.1	02.3	88°27.6	45.9	252°56.3	52.0
18	90°08.0	72°21.8	N06°36.8	326°00.2	N23°02.1	103°29.5	S06°45.7	267°59.0	N01°52.0
19	105°10.4	87°21.4	38.0	341°02.4	01.9	118°31.4	45.5	283°01.6	52.1
20	120°12.9	102°21.0	39.3	356°04.5	01.8	133°33.3	45.2	298°04.3	52.2
21	135°15.4	117°20.6	·· 40.5	11°06.6	·· 01.6	148°35.3	·· 45.0	313°06.9	·· 52.3
22	150°17.8	132°20.2	41.8	26°08.7	01.5	163°37.2	44.8	328°09.6	52.4
23	165°20.3	147°19.8	43.0	41°10.8	01.3	178°39.1	44.6	343°12.2	52.4
Mer.pass.:12:00		v-0.4 d1.3 m-3.8		v2.1 d-0.2 m-0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.5	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.9	-57°11.2
Hamal	328°03.8	23°30.7
Polaris	319°17.3	89°18.8
Acamar	315°20.3	-40°16.0
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.2	-52°42.4
Sirius	258°35.7	-16°44.0
Adhara	255°14.3	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.4	28°00.1
Avior	234°18.7	-59°32.9
Suhail	222°54.0	-43°28.7
Miaplacidus	221°39.8	-69°45.8
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.5
Gacrux	172°03.2	-57°10.4
Alioth	166°22.0	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.2	49°15.4
Hadar	148°50.9	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.6	19°07.5
Rigil Kent.	139°54.6	-60°52.6
Kochab	137°18.7	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°29.0	-26°27.3
Atria	107°32.9	-69°02.6
Sabik	102°15.2	-15°44.3
Shaula	96°25.1	-37°06.6
Rasalhague	96°08.6	12°32.9
Eltanin	90°47.2	51°28.9
Kaus Aust.	83°47.0	-34°22.7
Vega	80°40.6	38°47.3
Nunki	76°01.3	-26°17.0
Altair	62°10.7	8°53.6
Peacock	53°23.2	-56°41.9
Deneb	49°33.5	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°47.0	-46°54.6
Fomalhaut	15°26.9	-29°34.1
Scheat	13°56.1	28°08.2
Markab	13°41.0	15°15.6

Mar 20 Sat	**SHA**	**Mer.pass**
Venus	345°21.6	13:09
Mars	236°12.2	20:23
Jupiter	13°58.0	11:13
Saturn	177°39.2	00:20

Mar 21 Sun	**SHA**	**Mer.pass**
Venus	344°13.4	13:10
Mars	236°05.5	20:19
Jupiter	13°44.7	11:10
Saturn	177°43.5	00:15

Mar 22 Mon	**SHA**	**Mer.pass**
Venus	343°05.1	13:10
Mars	235°58.2	20:16
Jupiter	13°31.5	11:07
Saturn	177°47.8	00:11

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h

Sat	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	178°05.3	S00°17.3	134°29.1	10.1'	N21°04.6	8.1'	56.4'
1	193°05.5	16.3	148°58.2	10.0'	21°12.6	8.0'	56.4'
2	208°05.7	15.4	163°27.2	9.9'	21°20.5	7.9'	56.4'
3	223°05.9	· · 14.4	177°56.1	9.9'	21°28.4	7.8'	56.4'
4	238°06.1	13.4	192°24.9	9.8'	21°36.1	7.7'	56.5'
5	253°06.2	12.4	206°53.6	9.7'	21°43.7	7.6'	56.5'
6	268°06.4	S00°11.4	221°22.3	9.6'	N21°51.2	7.4'	56.5'
7	283°06.6	10.4	235°50.9	9.5'	21°58.6	7.3'	56.5'
8	298°06.8	09.4	250°19.4	9.4'	22°05.8	7.2'	56.6'
9	313°07.0	· · 08.4	264°47.8	9.4'	22°13.0	7.1'	56.6'
10	328°07.2	07.4	279°16.1	9.3'	22°20.1	7.0'	56.6'
11	343°07.3	06.5	293°44.3	9.2'	22°27.0	6.9'	56.6'
12	358°07.5	S00°05.5	308°12.5	9.1'	N22°33.8	6.8'	56.7'
13	13°07.7	04.5	322°40.5	9.0'	22°40.5	6.6'	56.7'
14	28°07.9	03.5	337°08.5	8.9'	22°47.1	6.5'	56.7'
15	43°08.1	· · 02.5	351°36.4	8.9'	22°53.6	6.4'	56.7'
16	58°08.3	01.5	6°04.3	8.8'	22°59.9	6.3'	56.7'
17	73°08.4	S00°00.5	20°32.0	8.7'	23°06.2	6.2'	56.8'
18	88°08.6	N00°00.5	34°59.7	8.6'	N23°12.3	6.0'	56.8'
19	103°08.8	01.4	49°27.3	8.5'	23°18.2	5.9'	56.8'
20	118°09.0	02.4	63°54.8	8.5'	23°24.1	5.8'	56.8'
21	133°09.2	· · 03.4	78°22.2	8.4'	23°29.8	5.7'	56.9'
22	148°09.4	04.4	92°49.6	8.3'	23°35.4	5.5'	56.9'
23	163°09.6	05.4	107°16.8	8.2'	23°40.9	5.4'	56.9'
	SD.=16.0	d=1.0	S.D.=15.4				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°09.7	N00°06.4	121°44.0	8.2'	N23°46.3	5.3'	56.9'
1	193°09.9	07.4	136°11.2	8.1'	23°51.5	5.2'	57.0'
2	208°10.1	08.4	150°38.2	8.0'	23°56.6	5.0'	57.0'
3	223°10.3	· · 09.4	165°05.2	7.9'	24°01.5	4.9'	57.0'
4	238°10.5	10.3	179°32.1	7.9'	24°06.3	4.8'	57.0'
5	253°10.7	11.3	193°58.9	7.8'	24°11.0	4.6'	57.1'
6	268°10.9	N00°12.3	208°25.7	7.7'	N24°15.6	4.5'	57.1'
7	283°11.0	13.3	222°52.3	7.6'	24°20.0	4.4'	57.1'
8	298°11.2	14.3	237°18.9	7.6'	24°24.3	4.2'	57.1'
9	313°11.4	· · 15.3	251°45.5	7.5'	24°28.4	4.1'	57.2'
10	328°11.6	16.3	266°12.0	7.4'	24°32.4	3.9'	57.2'
11	343°11.8	17.3	280°38.4	7.4'	24°36.3	3.8'	57.2'
12	358°12.0	N00°18.2	295°04.7	7.3'	N24°40.0	3.7'	57.2'
13	13°12.2	19.2	309°31.0	7.2'	24°43.6	3.5'	57.3'
14	28°12.3	20.2	323°57.2	7.2'	24°47.1	3.4'	57.3'
15	43°12.5	· · 21.2	338°23.3	7.1'	24°50.4	3.2'	57.3'
16	58°12.7	22.2	352°49.4	7.1'	24°53.5	3.1'	57.3'
17	73°12.9	23.2	7°15.4	7.0'	24°56.5	2.9'	57.4'
18	88°13.1	N00°24.2	21°41.4	6.9'	N24°59.4	2.8'	57.4'
19	103°13.3	25.2	36°07.3	6.9'	25°02.1	2.6'	57.4'
20	118°13.5	26.1	50°33.2	6.8'	25°04.7	2.5'	57.5'
21	133°13.6	· · 27.1	64°59.0	6.8'	25°07.1	2.3'	57.5'
22	148°13.8	28.1	79°24.7	6.7'	25°09.4	2.2'	57.5'
23	163°14.0	29.1	93°50.4	6.7'	25°11.5	2.0'	57.5'
	SD.=16.0	d=1.0	S.D.=15.6				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°14.2	N00°30.1	108°16.0	6.6'	N25°13.5	1.9'	57.6'
1	193°14.4	31.1	122°41.6	6.6'	25°15.3	1.7'	57.6'
2	208°14.6	32.1	137°07.1	6.5'	25°17.0	1.6'	57.6'
3	223°14.8	· · 33.1	151°32.6	6.5'	25°18.5	1.4'	57.6'
4	238°14.9	34.0	165°58.0	6.4'	25°19.9	1.3'	57.7'
5	253°15.1	35.0	180°23.4	6.4'	25°21.1	1.1'	57.7'
6	268°15.3	N00°36.0	194°48.7	6.3'	N25°22.1	1.0'	57.7'
7	283°15.5	37.0	209°14.0	6.3'	25°23.0	0.8'	57.7'
8	298°15.7	38.0	223°39.3	6.2'	25°23.8	0.7'	57.8'
9	313°15.9	· · 39.0	238°04.5	6.2'	25°24.4	0.5'	57.8'
10	328°16.1	40.0	252°29.7	6.2'	25°24.8	0.4'	57.8'
11	343°16.3	40.9	266°54.8	6.1'	25°25.1	0.2'	57.9'
12	358°16.4	N00°41.9	281°19.9	6.1'	N25°25.2	0.0'	57.9'
13	13°16.6	42.9	295°45.0	6.1'	25°25.2	-0.1'	57.9'
14	28°16.8	43.9	310°10.0	6.0'	25°25.0	-0.3'	57.9'
15	43°17.0	· · 44.9	324°35.0	6.0'	25°24.6	-0.4'	58.0'
16	58°17.2	45.9	339°00.0	6.0'	25°24.1	-0.6'	58.0'
17	73°17.4	46.9	353°25.0	5.9'	25°23.5	-0.7'	58.0'
18	88°17.6	N00°47.9	7°49.9	5.9'	N25°22.6	-0.9'	58.0'
19	103°17.7	48.8	22°14.8	5.9'	25°21.7	-1.1'	58.1'
20	118°17.9	49.8	36°39.7	5.9'	25°20.5	-1.2'	58.1'
21	133°18.1	· · 50.8	51°04.5	5.8'	25°19.2	-1.4'	58.1'
22	148°18.3	51.8	65°29.3	5.8'	25°17.7	-1.5'	58.1'
23	163°18.5	52.8	79°54.2	5.8'	25°16.1	-1.7'	58.2'
	SD.=16.0	d=1.0	S.D.=15.8				

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

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

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	Moon Age 5-7 20-40%
20	07:39	07:30	12:07	15:35	03:09	
21	07:21	07:12	12:07	16:30	04:02	
22	07:03	06:54	12:07	17:27	04:58	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	180°22.8	162°19.5	N06°44.3	56°13.0	N23°01.1	193°41.0	S06°44.3	358°14.8	N01°52.5
1	195°25.2	177°19.1	45.5	71°15.1	01.0	208°42.9	44.1	13°17.5	52.6
2	210°27.7	192°18.7	46.8	86°17.2	00.8	223°44.8	43.9	28°20.1	52.7
3	225°30.1	207°18.3	·· 48.0	101°19.3	·· 00.7	238°46.7	·· 43.7	43°22.8	·· 52.8
4	240°32.6	222°17.9	49.3	116°21.4	00.5	253°48.7	43.4	58°25.4	52.8
5	255°35.1	237°17.5	50.5	131°23.5	00.3	268°50.6	43.2	73°28.1	52.9
6	270°37.5	252°17.1	N06°51.8	146°25.6	N23°00.2	283°52.5	S06°43.0	88°30.7	N01°53.0
7	285°40.0	267°16.7	53.0	161°27.8	23°00.0	298°54.4	42.8	103°33.4	53.1
8	300°42.5	282°16.3	54.3	176°29.9	22°59.8	313°56.3	42.5	118°36.0	53.2
9	315°44.9	297°16.0	·· 55.5	191°32.0	·· 59.7	328°58.2	·· 42.3	133°38.6	·· 53.2
10	330°47.4	312°15.6	56.7	206°34.1	59.5	344°00.2	42.1	148°41.3	53.3
11	345°49.9	327°15.2	58.0	221°36.2	59.4	359°02.1	41.9	163°43.9	53.4
12	0°52.3	342°14.8	N06°59.2	236°38.3	N22°59.2	14°04.0	S06°41.6	178°46.6	N01°53.5
13	15°54.8	357°14.4	07°00.5	251°40.4	59.0	29°05.9	41.4	193°49.2	53.6
14	30°57.3	12°14.0	01.7	266°42.5	58.9	44°07.8	41.2	208°51.9	53.6
15	45°59.7	27°13.6	·· 03.0	281°44.6	·· 58.7	59°09.7	·· 41.0	223°54.5	·· 53.7
16	61°02.2	42°13.2	04.2	296°46.7	58.5	74°11.6	40.7	238°57.2	53.8
17	76°04.6	57°12.8	05.5	311°48.8	58.4	89°13.6	40.5	253°59.8	53.9
18	91°07.1	72°12.4	N07°06.7	326°50.9	N22°58.2	104°15.5	S06°40.3	269°02.4	N01°53.9
19	106°09.6	87°12.1	07.9	341°53.0	58.0	119°17.4	40.1	284°05.1	54.0
20	121°12.0	102°11.7	09.2	356°55.1	57.9	134°19.3	39.8	299°07.7	54.1
21	136°14.5	117°11.3	·· 10.4	11°57.2	·· 57.7	149°21.2	·· 39.6	314°10.4	·· 54.2
22	151°17.0	132°10.9	11.7	26°59.3	57.5	164°23.1	39.4	329°13.0	54.3
23	166°19.4	147°10.5	12.9	42°01.4	57.4	179°25.0	39.2	344°15.7	54.3
Mer.pass.:11:57		v-0.4 d1.2 m-3.8		v2.1 d-0.2 m-0.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	181°21.9	162°10.1	N07°14.2	57°03.5	N22°57.2	194°27.0	S06°38.9	359°18.3	N01°54.4
1	196°24.4	177°09.7	15.4	72°05.6	57.1	209°28.9	38.7	14°20.9	54.5
2	211°26.8	192°09.3	16.6	87°07.7	56.9	224°30.8	38.5	29°23.6	54.6
3	226°29.3	207°08.9	·· 17.9	102°09.7	·· 56.7	239°32.7	·· 38.3	44°26.2	·· 54.7
4	241°31.7	222°08.5	19.1	117°11.8	56.6	254°34.6	38.0	59°28.9	54.7
5	256°34.2	237°08.1	20.4	132°13.9	56.4	269°36.5	37.8	74°31.5	54.8
6	271°36.7	252°07.7	N07°21.6	147°16.0	N22°56.2	284°38.5	S06°37.6	89°34.2	N01°54.9
7	286°39.1	267°07.3	22.8	162°18.1	56.0	299°40.4	37.4	104°36.8	55.0
8	301°41.6	282°07.0	24.1	177°20.2	55.9	314°42.3	37.1	119°39.5	55.1
9	316°44.1	297°06.6	·· 25.3	192°22.3	·· 55.7	329°44.2	·· 36.9	134°42.1	·· 55.1
10	331°46.5	312°06.2	26.6	207°24.3	55.5	344°46.1	36.7	149°44.7	55.2
11	346°49.0	327°05.8	27.8	222°26.4	55.4	359°48.0	36.5	164°47.4	55.3
12	1°51.5	342°05.4	N07°29.0	237°28.5	N22°55.2	14°50.0	S06°36.2	179°50.0	N01°55.4
13	16°53.9	357°05.0	30.3	252°30.6	55.0	29°51.9	36.0	194°52.7	55.5
14	31°56.4	12°04.6	31.5	267°32.7	54.9	44°53.8	35.8	209°55.3	55.5
15	46°58.9	27°04.2	·· 32.8	282°34.7	·· 54.7	59°55.7	·· 35.6	224°58.0	·· 55.6
16	62°01.3	42°03.8	34.0	297°36.8	54.5	74°57.6	35.3	240°00.6	55.7
17	77°03.8	57°03.4	35.2	312°38.9	54.4	89°59.5	35.1	255°03.3	55.8
18	92°06.2	72°03.0	N07°36.5	327°41.0	N22°54.2	105°01.5	S06°34.9	270°05.9	N01°55.9
19	107°08.7	87°02.6	37.7	342°43.0	54.0	120°03.4	34.7	285°08.5	55.9
20	122°11.2	102°02.2	38.9	357°45.1	53.9	135°05.3	34.4	300°11.2	56.0
21	137°13.6	117°01.8	·· 40.2	12°47.2	·· 53.7	150°07.2	·· 34.2	315°13.8	·· 56.1
22	152°16.1	132°01.4	41.4	27°49.2	53.5	165°09.1	34.0	330°16.5	56.2
23	167°18.6	147°01.0	42.7	42°51.3	53.3	180°11.0	33.8	345°19.1	56.2
Mer.pass.:11:53		v-0.4 d1.2 m-3.8		v2.1 d-0.2 m-0.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	182°21.0	162°00.6	N07°43.9	57°53.4	N22°53.2	195°13.0	S06°33.5	0°21.8	N01°56.3
1	197°23.5	177°00.2	45.1	72°55.4	53.0	210°14.9	33.3	15°24.4	56.4
2	212°26.0	191°59.8	46.4	87°57.5	52.8	225°16.8	33.1	30°27.0	56.5
3	227°28.4	206°59.4	·· 47.6	102°59.6	·· 52.7	240°18.7	·· 32.9	45°29.7	·· 56.6
4	242°30.9	221°59.0	48.8	118°01.6	52.5	255°20.6	32.6	60°32.3	56.6
5	257°33.4	236°58.6	50.1	133°03.7	52.3	270°22.5	32.4	75°35.0	56.7
6	272°35.8	251°58.2	N07°51.3	148°05.8	N22°52.1	285°24.5	S06°32.2	90°37.6	N01°56.8
7	287°38.3	266°57.8	52.5	163°07.8	52.0	300°26.4	32.0	105°40.3	56.9
8	302°40.7	281°57.4	53.8	178°09.9	51.8	315°28.3	31.7	120°42.9	57.0
9	317°43.2	296°57.1	·· 55.0	193°11.9	·· 51.6	330°30.2	·· 31.5	135°45.6	·· 57.0
10	332°45.7	311°56.7	56.2	208°14.0	51.4	345°32.1	31.3	150°48.2	57.1
11	347°48.1	326°56.3	57.5	223°16.0	51.3	0°34.0	31.1	165°50.8	57.2
12	2°50.6	341°55.9	N07°58.7	238°18.1	N22°51.1	15°36.0	S06°30.9	180°53.5	N01°57.3
13	17°53.1	356°55.5	07°59.9	253°20.1	50.9	30°37.9	30.6	195°56.1	57.4
14	32°55.5	11°55.1	08°01.1	268°22.2	50.7	45°39.8	30.4	210°58.8	57.4
15	47°58.0	26°54.7	·· 02.4	283°24.2	·· 50.6	60°41.7	·· 30.2	226°01.4	·· 57.5
16	63°00.5	41°54.3	03.6	298°26.3	50.4	75°43.6	30.0	241°04.1	57.6
17	78°02.9	56°53.9	04.8	313°28.3	50.2	90°45.6	29.7	256°06.7	57.7
18	93°05.4	71°53.5	N08°06.1	328°30.4	N22°50.0	105°47.5	S06°29.5	271°09.3	N01°57.7
19	108°07.9	86°53.1	07.3	343°32.4	49.9	120°49.4	29.3	286°12.0	57.8
20	123°10.3	101°52.6	08.5	358°34.5	49.7	135°51.3	29.1	301°14.6	57.9
21	138°12.8	116°52.2	·· 09.8	13°36.5	·· 49.5	150°53.2	·· 28.8	316°17.3	·· 58.0
22	153°15.2	131°51.8	11.0	28°38.6	49.3	165°55.1	28.6	331°19.9	58.1
23	168°17.7	146°51.4	12.2	43°40.6	49.2	180°57.1	28.4	346°22.6	58.1
Mer.pass.:11:49		v-0.4 d1.2 m-3.8		v2.1 d-0.2 m0.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.9	-57°11.2
Hamal	328°03.8	23°30.7
Polaris	319°17.9	89°18.8
Acamar	315°20.4	-40°16.0
Menkar	314°17.8	4°07.8
Mirfak	308°44.1	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.2	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.3	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.4	28°00.1
Avior	234°18.8	-59°32.9
Suhail	222°54.0	-43°28.7
Miaplacidus	221°39.8	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.5
Gacrux	172°03.1	-57°10.4
Alioth	166°22.0	55°54.0
Spica	158°33.5	-11°13.1
Alkaid	153°00.2	49°15.4
Hadar	148°50.9	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.5	-60°52.6
Kochab	137°18.7	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.5
Antares	112°29.0	-26°27.3
Atria	107°32.9	-69°02.6
Sabik	102°15.2	-15°44.3
Shaula	96°25.1	-37°06.6
Rasalhague	96°08.6	12°32.9
Eltanin	90°47.2	51°28.9
Kaus Aust.	83°46.9	-34°22.7
Vega	80°40.6	38°47.3
Nunki	76°01.3	-26°17.0
Altair	62°10.7	8°53.6
Peacock	53°23.1	-56°41.9
Deneb	49°33.4	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°46.9	-46°54.6
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.1	28°08.2
Markab	13°41.0	15°15.6

Mar 23 Tue	**SHA**	**Mer.pass**
Venus	341°56.7	13:11
Mars	235°50.2	20:12
Jupiter	13°18.3	11:04
Saturn	177°52.1	00:07

Mar 24 Wed	**SHA**	**Mer.pass**
Venus	340°48.2	13:12
Mars	235°41.6	20:09
Jupiter	13°05.1	11:01
Saturn	177°56.4	00:03

Mar 25 Thu	**SHA**	**Mer.pass**
Venus	339°39.6	13:12
Mars	235°32.3	20:06
Jupiter	12°51.9	10:58
Saturn	178°00.7	23:54

Horizontal parallax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°18.7	N00°53.8	94°18.9	5.8'	N25°14.3	-1.9'	58.2'
1	193°18.9	54.8	108°43.7	5.8'	25°12.4	-2.0'	58.2'
2	208°19.1	55.7	123°08.5	5.8'	25°10.3	-2.2'	58.3'
3	223°19.2	·· 56.7	137°33.2	5.7'	25°08.0	-2.4'	58.3'
4	238°19.4	57.7	151°58.0	5.7'	25°05.5	-2.5'	58.3'
5	253°19.6	58.7	166°22.7	5.7'	25°03.0	-2.7'	58.3'
6	268°19.8	N00°59.7	180°47.5	5.7'	N25°00.2	-2.8'	58.4'
7	283°20.0	01°00.7	195°12.2	5.7'	24°57.3	-3.0'	58.4'
8	298°20.2	01.7	209°36.9	5.7'	24°54.2	-3.2'	58.4'
9	313°20.4	·· 02.6	224°01.6	5.7'	24°51.0	-3.3'	58.5'
10	328°20.6	03.6	238°26.3	5.7'	24°47.6	-3.5'	58.5'
11	343°20.7	04.6	252°51.0	5.7'	24°44.0	-3.6'	58.5'
12	358°20.9	N01°05.6	267°15.7	5.7'	N24°40.3	-3.8'	58.5'
13	13°21.1	06.6	281°40.4	5.7'	24°36.4	-4.0'	58.6'
14	28°21.3	07.6	296°05.2	5.7'	24°32.3	-4.1'	58.6'
15	43°21.5	·· 08.6	310°29.9	5.7'	24°28.1	-4.3'	58.6'
16	58°21.7	09.5	324°54.6	5.7'	24°23.8	-4.4'	58.6'
17	73°21.9	10.5	339°19.4	5.7'	24°19.2	-4.6'	58.7'
18	88°22.1	N01°11.5	353°44.1	5.8'	N24°14.5	-4.8'	58.7'
19	103°22.3	12.5	8°08.9	5.8'	24°09.7	-4.9'	58.7'
20	118°22.4	13.5	22°33.7	5.8'	24°04.7	-5.1'	58.8'
21	133°22.6	·· 14.5	36°58.4	5.8'	23°59.5	-5.2'	58.8'
22	148°22.8	15.5	51°23.3	5.8'	23°54.2	-5.4'	58.8'
23	163°23.0	16.4	65°48.1	5.8'	23°48.7	-5.6'	58.8'
	SD.=16.0	d=1.0	S.D.=16.0				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°23.2	N01°17.4	80°12.9	5.9'	N23°43.1	-5.7'	58.9'
1	193°23.4	18.4	94°37.8	5.9'	23°37.3	-5.9'	58.9'
2	208°23.6	19.4	109°02.7	5.9'	23°31.4	-6.0'	58.9'
3	223°23.8	·· 20.4	123°27.6	5.9'	23°25.3	-6.2'	58.9'
4	238°23.9	21.4	137°52.5	5.9'	23°19.0	-6.3'	59.0'
5	253°24.1	22.3	152°17.5	6.0'	23°12.6	-6.5'	59.0'
6	268°24.3	N01°23.3	166°42.4	6.0'	N23°06.0	-6.6'	59.0'
7	283°24.5	24.3	181°07.4	6.0'	22°59.3	-6.8'	59.0'
8	298°24.7	25.3	195°32.5	6.0'	22°52.4	-7.0'	59.1'
9	313°24.9	·· 26.3	209°57.5	6.1'	22°45.4	-7.1'	59.1'
10	328°25.1	27.3	224°22.6	6.1'	22°38.2	-7.3'	59.1'
11	343°25.3	28.3	238°47.8	6.1'	22°30.9	-7.4'	59.2'
12	358°25.5	N01°29.2	253°12.9	6.2'	N22°23.4	-7.6'	59.2'
13	13°25.6	30.2	267°38.1	6.2'	22°15.8	-7.7'	59.2'
14	28°25.8	31.2	282°03.3	6.2'	22°08.0	-7.9'	59.2'
15	43°26.0	·· 32.2	296°28.6	6.3'	22°00.1	-8.0'	59.3'
16	58°26.2	33.2	310°53.9	6.3'	21°52.0	-8.1'	59.3'
17	73°26.4	34.2	325°19.2	6.4'	21°43.8	-8.3'	59.3'
18	88°26.6	N01°35.1	339°44.6	6.4'	N21°35.4	-8.4'	59.3'
19	103°26.8	36.1	354°10.0	6.4'	21°26.9	-8.6'	59.4'
20	118°27.0	37.1	8°35.5	6.5'	21°18.3	-8.7'	59.4'
21	133°27.2	·· 38.1	23°01.0	6.5'	21°09.5	-8.9'	59.4'
22	148°27.3	39.1	37°26.5	6.6'	21°00.5	-9.0'	59.4'
23	163°27.5	40.1	51°52.1	6.6'	20°51.5	-9.1'	59.5'
	SD.=16.0	d=1.0	S.D.=16.1				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°27.7	N01°41.0	66°17.7	6.6'	N20°42.2	-9.3'	59.5'
1	193°27.9	42.0	80°43.4	6.7'	20°32.9	-9.4'	59.5'
2	208°28.1	43.0	95°09.1	6.7'	20°23.4	-9.6'	59.5'
3	223°28.3	·· 44.0	109°34.8	6.8'	20°13.8	-9.7'	59.6'
4	238°28.5	45.0	124°00.6	6.8'	20°04.0	-9.8'	59.6'
5	253°28.7	46.0	138°26.4	6.9'	19°54.1	-10.0'	59.6'
6	268°28.9	N01°46.9	152°52.3	6.9'	N19°44.1	-10.1'	59.6'
7	283°29.0	47.9	167°18.3	7.0'	19°33.9	-10.2'	59.6'
8	298°29.2	48.9	181°44.2	7.0'	19°23.6	-10.4'	59.7'
9	313°29.4	·· 49.9	196°10.3	7.0'	19°13.2	-10.5'	59.7'
10	328°29.6	50.9	210°36.3	7.1'	19°02.7	-10.6'	59.7'
11	343°29.8	51.8	225°02.4	7.1'	18°52.0	-10.7'	59.7'
12	358°30.0	N01°52.8	239°28.6	7.2'	N18°41.2	-10.9'	59.8'
13	13°30.2	53.8	253°54.8	7.2'	18°30.3	-11.0'	59.8'
14	28°30.4	54.8	268°21.1	7.3'	18°19.2	-11.1'	59.8'
15	43°30.6	·· 55.8	282°47.4	7.3'	18°08.0	-11.2'	59.8'
16	58°30.7	56.8	297°13.8	7.4'	17°56.8	-11.4'	59.9'
17	73°30.9	57.7	311°40.2	7.4'	17°45.3	-11.5'	59.9'
18	88°31.1	N01°58.7	326°06.6	7.5'	N17°33.8	-11.6'	59.9'
19	103°31.3	01°59.7	340°33.1	7.5'	17°22.2	-11.7'	59.9'
20	118°31.5	02°00.7	354°59.7	7.6'	17°10.4	-11.8'	59.9'
21	133°31.7	·· 01.7	9°26.3	7.6'	16°58.5	-11.9'	60.0'
22	148°31.9	02.7	23°52.9	7.7'	16°46.5	-12.0'	60.0'
23	163°32.1	03.6	38°19.7	7.7'	16°34.4	-12.2'	60.0'
	SD.=16.0	d=1.0	S.D.=16.3				

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

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

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 8-10 51-73%
23	06:45	06:36	12:07	18:26	05:57	
24	06:27	06:18	12:06	19:24	06:55	
25	06:09	06:00	12:06	20:21	07:53	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	183°20.2	161°51.0	N08°13.4	58°42.7	N22°49.0	195°59.0	S06°28.2	1°25.2	N01°58.2
1	198°22.6	176°50.6	14.7	73°44.7	48.8	211°00.9	27.9	16°27.9	58.3
2	213°25.1	191°50.2	15.9	88°46.7	48.6	226°02.8	27.7	31°30.5	58.4
3	228°27.6	206°49.8	·· 17.1	103°48.8	·· 48.5	241°04.7	·· 27.5	46°33.1	·· 58.5
4	243°30.0	221°49.4	18.3	118°50.8	48.3	256°06.7	27.3	61°35.8	58.5
5	258°32.5	236°49.0	19.6	133°52.9	48.1	271°08.6	27.0	76°38.4	58.6
6	273°35.0	251°48.6	N08°20.8	148°54.9	N22°47.9	286°10.5	S06°26.8	91°41.1	N01°58.7
7	288°37.4	266°48.2	22.0	163°56.9	47.7	301°12.4	26.6	106°43.7	58.8
8	303°39.9	281°47.8	23.2	178°59.0	47.6	316°14.3	26.4	121°46.4	58.8
9	318°42.3	296°47.4	·· 24.5	194°01.0	·· 47.4	331°16.2	·· 26.1	136°49.0	·· 58.9
10	333°44.8	311°47.0	25.7	209°03.0	47.2	346°18.2	25.9	151°51.6	59.0
11	348°47.3	326°46.6	26.9	224°05.1	47.0	1°20.1	25.7	166°54.3	59.1
12	3°49.7	341°46.2	N08°28.1	239°07.1	N22°46.9	16°22.0	S06°25.5	181°56.9	N01°59.2
13	18°52.2	356°45.8	29.4	254°09.1	46.7	31°23.9	25.3	196°59.6	59.2
14	33°54.7	11°45.4	30.6	269°11.1	46.5	46°25.8	25.0	212°02.2	59.3
15	48°57.1	26°45.0	·· 31.8	284°13.2	·· 46.3	61°27.8	·· 24.8	227°04.9	·· 59.4
16	63°59.6	41°44.6	33.0	299°15.2	46.1	76°29.7	24.6	242°07.5	59.5
17	79°02.1	56°44.2	34.3	314°17.2	46.0	91°31.6	24.4	257°10.1	59.6
18	94°04.5	71°43.8	N08°35.5	329°19.2	N22°45.8	106°33.5	S06°24.1	272°12.8	N01°59.6
19	109°07.0	86°43.4	36.7	344°21.3	45.6	121°35.4	23.9	287°15.4	59.7
20	124°09.5	101°43.0	37.9	359°23.3	45.4	136°37.4	23.7	302°18.1	59.8
21	139°11.9	116°42.5	·· 39.1	14°25.3	·· 45.2	151°39.3	·· 23.5	317°20.7	·· 59.9
22	154°14.4	131°42.1	40.4	29°27.3	45.1	166°41.2	23.2	332°23.4	01°59.9
23	169°16.8	146°41.7	41.6	44°29.3	44.9	181°43.1	23.0	347°26.0	02°00.0
Mer.pass.:11:45		v-0.4 d1.2 m-3.8		v2.0 d-0.2 m0.0		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	184°19.3	161°41.3	N08°42.8	59°31.4	N22°44.7	196°45.0	S06°22.8	2°28.6	N02°00.1
1	199°21.8	176°40.9	44.0	74°33.4	44.5	211°47.0	22.6	17°31.3	00.2
2	214°24.2	191°40.5	45.2	89°35.4	44.3	226°48.9	22.3	32°33.9	00.3
3	229°26.7	206°40.1	·· 46.5	104°37.4	·· 44.1	241°50.8	·· 22.1	47°36.6	·· 00.3
4	244°29.2	221°39.7	47.7	119°39.4	44.0	256°52.7	21.9	62°39.2	00.4
5	259°31.6	236°39.3	48.9	134°41.4	43.8	271°54.6	21.7	77°41.9	00.5
6	274°34.1	251°38.9	N08°50.1	149°43.4	N22°43.6	286°56.6	S06°21.5	92°44.5	N02°00.6
7	289°36.6	266°38.5	51.3	164°45.4	43.4	301°58.5	21.2	107°47.1	00.6
8	304°39.0	281°38.1	52.5	179°47.5	43.2	317°00.4	21.0	122°49.8	00.7
9	319°41.5	296°37.6	·· 53.8	194°49.5	·· 43.0	332°02.3	·· 20.8	137°52.4	·· 00.8
10	334°44.0	311°37.2	55.0	209°51.5	42.9	347°04.2	20.6	152°55.1	00.9
11	349°46.4	326°36.8	56.2	224°53.5	42.7	2°06.2	20.3	167°57.7	01.0
12	4°48.9	341°36.4	N08°57.4	239°55.5	N22°42.5	17°08.1	S06°20.1	183°00.4	N02°01.0
13	19°51.3	356°36.0	58.6	254°57.5	42.3	32°10.0	19.9	198°03.0	01.1
14	34°53.8	11°35.6	08°59.8	269°59.5	42.1	47°11.9	19.7	213°05.7	01.2
15	49°56.3	26°35.2	09°01.1	285°01.5	·· 41.9	62°13.8	·· 19.4	228°08.3	·· 01.3
16	64°58.7	41°34.8	02.3	300°03.5	41.8	77°15.8	19.2	243°10.9	01.4
17	80°01.2	56°34.4	03.5	315°05.5	41.6	92°17.7	19.0	258°13.6	01.4
18	95°03.7	71°33.9	N09°04.7	330°07.5	N22°41.4	107°19.6	S06°18.8	273°16.2	N02°01.5
19	110°06.1	86°33.5	05.9	345°09.5	41.2	122°21.5	18.5	288°18.9	01.6
20	125°08.6	101°33.1	07.1	0°11.5	41.0	137°23.5	18.3	303°21.5	01.7
21	140°11.1	116°32.7	·· 08.3	15°13.5	·· 40.8	152°25.4	·· 18.1	318°24.2	·· 01.7
22	155°13.5	131°32.3	09.5	30°15.5	40.6	167°27.3	17.9	333°26.8	01.8
23	170°16.0	146°31.9	10.8	45°17.5	40.5	182°29.2	17.7	348°29.4	01.9
Mer.pass.:11:41		v-0.4 d1.2 m-3.8		v2.0 d-0.2 m0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	185°18.4	161°31.5	N09°12.0	60°19.5	N22°40.3	197°31.1	S06°17.4	3°32.1	N02°02.0
1	200°20.9	176°31.1	13.2	75°21.5	40.1	212°33.1	17.2	18°34.7	02.1
2	215°23.4	191°30.6	14.4	90°23.5	39.9	227°35.0	17.0	33°37.4	02.1
3	230°25.8	206°30.2	·· 15.6	105°25.4	·· 39.7	242°36.9	·· 16.8	48°40.0	·· 02.2
4	245°28.3	221°29.8	16.8	120°27.4	39.5	257°38.8	16.5	63°42.6	02.3
5	260°30.8	236°29.4	18.0	135°29.4	39.3	272°40.7	16.3	78°45.3	02.4
6	275°33.2	251°29.0	N09°19.2	150°31.4	N22°39.1	287°42.7	S06°16.1	93°47.9	N02°02.4
7	290°35.7	266°28.6	20.4	165°33.4	39.0	302°44.6	15.9	108°50.6	02.5
8	305°38.2	281°28.1	21.6	180°35.4	38.8	317°46.5	15.7	123°53.2	02.6
9	320°40.6	296°27.7	·· 22.8	195°37.4	·· 38.6	332°48.4	·· 15.4	138°55.9	·· 02.7
10	335°43.1	311°27.3	24.1	210°39.4	38.4	347°50.4	15.2	153°58.5	02.8
11	350°45.6	326°26.9	25.3	225°41.3	38.2	2°52.3	15.0	169°01.1	02.8
12	5°48.0	341°26.5	N09°26.5	240°43.3	N22°38.0	17°54.2	S06°14.8	184°03.8	N02°02.9
13	20°50.5	356°26.1	27.7	255°45.3	37.8	32°56.1	14.5	199°06.4	03.0
14	35°52.9	11°25.6	28.9	270°47.3	37.6	47°58.0	14.3	214°09.1	03.1
15	50°55.4	26°25.2	·· 30.1	285°49.3	·· 37.4	63°00.0	·· 14.1	229°11.7	·· 03.1
16	65°57.9	41°24.8	31.3	300°51.2	37.3	78°01.9	13.9	244°14.4	03.2
17	81°00.3	56°24.4	32.5	315°53.2	37.1	93°03.8	13.6	259°17.0	03.3
18	96°02.8	71°24.0	N09°33.7	330°55.2	N22°36.9	108°05.7	S06°13.4	274°19.6	N02°03.4
19	111°05.3	86°23.6	34.9	345°57.2	36.7	123°07.7	13.2	289°22.3	03.5
20	126°07.7	101°23.1	36.1	0°59.1	36.5	138°09.6	13.0	304°24.9	03.5
21	141°10.2	116°22.7	·· 37.3	16°01.1	·· 36.3	153°11.5	·· 12.8	319°27.6	·· 03.6
22	156°12.7	131°22.3	38.5	31°03.1	36.1	168°13.4	12.5	334°30.2	03.7
23	171°15.1	146°21.9	39.7	46°05.1	35.9	183°15.3	12.3	349°32.9	03.8
Mer.pass.:11:37		v-0.4 d1.2 m-3.8		v2.0 d-0.2 m0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°44.0	56°35.7
Diphda	348°58.5	-17°55.9
Achernar	335°28.9	-57°11.1
Hamal	328°03.8	23°30.7
Polaris	319°18.8	89°18.8
Acamar	315°20.4	-40°16.0
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°54.0
Aldebaran	290°52.2	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.2	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.3	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.4	28°00.1
Avior	234°18.8	-59°32.9
Suhail	222°54.0	-43°28.8
Miaplacidus	221°39.8	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.5
Gacrux	172°03.1	-57°10.4
Alioth	166°22.0	55°54.0
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.5
Hadar	148°50.8	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.5	-60°52.6
Kochab	137°18.7	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.5
Antares	112°29.0	-26°27.3
Atria	107°32.8	-69°02.6
Sabik	102°15.1	-15°44.3
Shaula	96°25.0	-37°06.6
Rasalhague	96°08.6	12°32.9
Eltanin	90°47.2	51°28.9
Kaus Aust.	83°46.9	-34°22.7
Vega	80°40.6	38°47.3
Nunki	76°01.2	-26°17.0
Altair	62°10.6	8°53.6
Peacock	53°23.1	-56°41.9
Deneb	49°33.4	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°46.9	-46°54.6
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.1	28°08.2
Markab	13°41.0	15°15.6

Mar 26 Fri	**SHA**	**Mer.pass**
Venus	338°30.9	13:13
Mars	235°22.5	20:02
Jupiter	12°38.8	10:55
Saturn	178°05.0	23:50

Mar 27 Sat	**SHA**	**Mer.pass**
Venus	337°22.0	13:14
Mars	235°12.0	19:59
Jupiter	12°25.7	10:52
Saturn	178°09.3	23:46

Mar 28 Sun	**SHA**	**Mer.pass**
Venus	336°13.0	13:14
Mars	235°01.0	19:56
Jupiter	12°12.7	10:49
Saturn	178°13.6	23:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°32.3	N02°04.6	52°46.4	7.8'	N16°22.2	-12.3'	60.0'
1	193°32.5	05.6	67°13.2	7.8'	16°09.9	-12.4'	60.0'
2	208°32.6	06.6	81°40.1	7.9'	15°57.5	-12.5'	60.1'
3	223°32.8	·· 07.6	96°07.0	7.9'	15°44.9	-12.6'	60.1'
4	238°33.0	08.5	110°33.9	8.0'	15°32.3	-12.7'	60.1'
5	253°33.2	09.5	125°00.9	8.0'	15°19.5	-12.8'	60.1'
6	268°33.4	N02°10.5	139°28.0	8.1'	N15°06.7	-12.9'	60.1'
7	283°33.6	11.5	153°55.0	8.1'	14°53.8	-13.0'	60.1'
8	298°33.8	12.5	168°22.2	8.2'	14°40.7	-13.1'	60.2'
9	313°34.0	·· 13.4	182°49.4	8.2'	14°27.6	-13.2'	60.2'
10	328°34.2	14.4	197°16.6	8.3'	14°14.3	-13.3'	60.2'
11	343°34.3	15.4	211°43.9	8.3'	14°01.0	-13.4'	60.2'
12	358°34.5	N02°16.4	226°11.2	8.4'	N13°47.6	-13.5'	60.2'
13	13°34.7	17.4	240°38.6	8.4'	13°34.1	-13.6'	60.2'
14	28°34.9	18.3	255°06.0	8.4'	13°20.5	-13.6'	60.3'
15	43°35.1	·· 19.3	269°33.5	8.5'	13°06.8	-13.7'	60.3'
16	58°35.3	20.3	284°01.0	8.5'	12°53.0	-13.8'	60.3'
17	73°35.5	21.3	298°28.6	8.6'	12°39.1	-13.9'	60.3'
18	88°35.7	N02°22.3	312°56.2	8.6'	N12°25.2	-14.0'	60.3'
19	103°35.9	23.2	327°23.8	8.7'	12°11.2	-14.1'	60.3'
20	118°36.1	24.2	341°51.5	8.7'	11°57.1	-14.1'	60.3'
21	133°36.2	·· 25.2	356°19.2	8.8'	11°42.9	-14.2'	60.4'
22	148°36.4	26.2	10°47.0	8.8'	11°28.6	-14.3'	60.4'
23	163°36.6	27.2	25°14.8	8.8'	11°14.3	-14.4'	60.4'
	SD.=16.0	d=1.0	S.D.=16.4				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°36.8	N02°28.1	39°42.7	8.9'	N10°59.9	-14.4'	60.4'
1	193°37.0	29.1	54°10.6	8.9'	10°45.4	-14.5'	60.4'
2	208°37.2	30.1	68°38.5	9.0'	10°30.9	-14.6'	60.4'
3	223°37.4	·· 31.1	83°06.5	9.0'	10°16.2	-14.7'	60.4'
4	238°37.6	32.1	97°34.5	9.0'	10°01.6	-14.7'	60.4'
5	253°37.8	33.0	112°02.5	9.1'	09°46.8	-14.8'	60.5'
6	268°37.9	N02°34.0	126°30.6	9.1'	N09°32.0	-14.8'	60.5'
7	283°38.1	35.0	140°58.7	9.1'	09°17.1	-14.9'	60.5'
8	298°38.3	36.0	155°26.9	9.2'	09°02.2	-15.0'	60.5'
9	313°38.5	·· 37.0	169°55.1	9.2'	08°47.2	-15.0'	60.5'
10	328°38.7	37.9	184°23.3	9.2'	08°32.2	-15.1'	60.5'
11	343°38.9	38.9	198°51.6	9.3'	08°17.1	-15.1'	60.5'
12	358°39.1	N02°39.9	213°19.9	9.3'	N08°01.9	-15.2'	60.5'
13	13°39.3	40.9	227°48.2	9.3'	07°46.7	-15.2'	60.5'
14	28°39.5	41.8	242°16.6	9.4'	07°31.4	-15.3'	60.5'
15	43°39.7	·· 42.8	256°44.9	9.4'	07°16.1	-15.3'	60.5'
16	58°39.8	43.8	271°13.4	9.4'	07°00.8	-15.4'	60.5'
17	73°40.0	44.8	285°41.8	9.5'	06°45.4	-15.4'	60.5'
18	88°40.2	N02°45.8	300°10.3	9.5'	N06°29.9	-15.5'	60.6'
19	103°40.4	46.7	314°38.8	9.5'	06°14.5	-15.5'	60.6'
20	118°40.6	47.7	329°07.3	9.5'	05°59.0	-15.5'	60.6'
21	133°40.8	·· 48.7	343°35.8	9.6'	05°43.4	-15.6'	60.6'
22	148°41.0	49.7	358°04.4	9.6'	05°27.8	-15.6'	60.6'
23	163°41.2	50.6	12°33.0	9.6'	05°12.2	-15.6'	60.6'
	SD.=16.0	d=1.0	S.D.=16.5				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°41.4	N02°51.6	27°01.6	9.6'	N04°56.5	-15.7'	60.6'
1	193°41.6	52.6	41°30.3	9.7'	04°40.8	-15.7'	60.6'
2	208°41.7	53.6	55°58.9	9.7'	04°25.1	-15.7'	60.6'
3	223°41.9	·· 54.5	70°27.6	9.7'	04°09.4	-15.8'	60.6'
4	238°42.1	55.5	84°56.3	9.7'	03°53.6	-15.8'	60.6'
5	253°42.3	56.5	99°25.1	9.7'	03°37.8	-15.8'	60.6'
6	268°42.5	N02°57.5	113°53.8	9.7'	N03°22.0	-15.8'	60.6'
7	283°42.7	58.5	128°22.6	9.8'	03°06.2	-15.8'	60.6'
8	298°42.9	02°59.4	142°51.3	9.8'	02°50.3	-15.9'	60.6'
9	313°43.1	03°00.4	157°20.1	9.8'	02°34.5	-15.9'	60.6'
10	328°43.3	01.4	171°48.9	9.8'	02°18.6	-15.9'	60.6'
11	343°43.4	02.4	186°17.7	9.8'	02°02.7	-15.9'	60.6'
12	358°43.6	N03°03.3	200°46.6	9.8'	N01°46.8	-15.9'	60.6'
13	13°43.8	04.3	215°15.4	9.8'	01°30.9	-15.9'	60.6'
14	28°44.0	05.3	229°44.3	9.9'	01°15.0	-15.9'	60.6'
15	43°44.2	·· 06.3	244°13.1	9.9'	00°59.0	-15.9'	60.6'
16	58°44.4	07.2	258°42.0	9.9'	00°43.1	-15.9'	60.6'
17	73°44.6	08.2	273°10.9	9.9'	00°27.2	-15.9'	60.5'
18	88°44.8	N03°09.2	287°39.7	9.9'	N00°11.3	-15.9'	60.5'
19	103°45.0	10.2	302°08.6	9.9'	S00°04.7	-15.9'	60.5'
20	118°45.2	11.1	316°37.5	9.9'	00°20.6	-15.9'	60.5'
21	133°45.3	·· 12.1	331°06.4	9.9'	00°36.5	-15.9'	60.5'
22	148°45.5	13.1	345°35.3	9.9'	00°52.4	-15.9'	60.5'
23	163°45.7	14.1	0°04.2	9.9'	01°08.3	-15.9'	60.5'
	SD.=16.0	d=1.0	S.D.=16.5				

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

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

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 82-96%
26	05:51	05:42	12:06	21:15	08:48	
27	05:33	05:24	12:05	22:08	09:42	
28	05:15	05:05	12:05	23:00	10:34	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	186°17.6	161°21.5	N09°40.9	61°07.0	N22°35.7	198°17.3	S06°12.1	4°35.5	N02°03.8
1	201°20.0	176°21.0	42.1	76°09.0	35.5	213°19.2	11.9	19°38.1	03.9
2	216°22.5	191°20.6	43.3	91°11.0	35.3	228°21.1	11.6	34°40.8	04.0
3	231°25.0	206°20.2	·· 44.5	106°12.9	·· 35.1	243°23.0	·· 11.4	49°43.4	·· 04.1
4	246°27.4	221°19.8	45.7	121°14.9	35.0	258°25.0	11.2	64°46.1	04.1
5	261°29.9	236°19.4	46.9	136°16.9	34.8	273°26.9	11.0	79°48.7	04.2
6	276°32.4	251°18.9	N09°48.1	151°18.8	N22°34.6	288°28.8	S06°10.8	94°51.3	N02°04.3
7	291°34.8	266°18.5	49.3	166°20.8	34.4	303°30.7	10.5	109°54.0	04.4
8	306°37.3	281°18.1	50.5	181°22.8	34.2	318°32.7	10.3	124°56.6	04.5
9	321°39.8	296°17.7	·· 51.7	196°24.7	·· 34.0	333°34.6	·· 10.1	139°59.3	·· 04.5
10	336°42.2	311°17.2	52.9	211°26.7	33.8	348°36.5	09.9	155°01.9	04.6
11	351°44.7	326°16.8	54.1	226°28.6	33.6	3°38.4	09.6	170°04.6	04.7
12	6°47.2	341°16.4	N09°55.3	241°30.6	N22°33.4	18°40.3	S06°09.4	185°07.2	N02°04.8
13	21°49.6	356°16.0	56.5	256°32.6	33.2	33°42.3	09.2	200°09.8	04.8
14	36°52.1	11°15.5	57.7	271°34.5	33.0	48°44.2	09.0	215°12.5	04.9
15	51°54.5	26°15.1	09°58.9	286°36.5	·· 32.8	63°46.1	·· 08.7	230°15.1	·· 05.0
16	66°57.0	41°14.7	10°00.1	301°38.4	32.6	78°48.0	08.5	245°17.8	05.1
17	81°59.5	56°14.3	01.3	316°40.4	32.4	93°50.0	08.3	260°20.4	05.1
18	97°01.9	71°13.8	N10°02.5	331°42.3	N22°32.2	108°51.9	S06°08.1	275°23.1	N02°05.2
19	112°04.4	86°13.4	03.7	346°44.3	32.0	123°53.8	07.9	290°25.7	05.3
20	127°06.9	101°13.0	04.9	1°46.2	31.8	138°55.7	07.6	305°28.3	05.4
21	142°09.3	116°12.6	·· 06.1	16°48.2	·· 31.7	153°57.7	·· 07.4	320°31.0	·· 05.5
22	157°11.8	131°12.1	07.3	31°50.1	31.5	168°59.6	07.2	335°33.6	05.5
23	172°14.3	146°11.7	08.4	46°52.1	31.3	184°01.5	07.0	350°36.3	05.6
Mer.pass.:11:33		v-0.4 d1.2 m-3.8		v2.0 d-0.2 m0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	187°16.7	161°11.3	N10°09.6	61°54.0	N22°31.1	199°03.4	S06°06.7	5°38.9	N02°05.7
1	202°19.2	176°10.9	10.8	76°56.0	30.9	214°05.4	06.5	20°41.5	05.8
2	217°21.6	191°10.4	12.0	91°57.9	30.7	229°07.3	06.3	35°44.2	05.8
3	232°24.1	206°10.0	·· 13.2	106°59.9	·· 30.5	244°09.2	·· 06.1	50°46.8	·· 05.9
4	247°26.6	221°09.6	14.4	122°01.8	30.3	259°11.1	05.9	65°49.5	06.0
5	262°29.0	236°09.1	15.6	137°03.8	30.1	274°13.1	05.6	80°52.1	06.1
6	277°31.5	251°08.7	N10°16.8	152°05.7	N22°29.9	289°15.0	S06°05.4	95°54.8	N02°06.1
7	292°34.0	266°08.3	18.0	167°07.6	29.7	304°16.9	05.2	110°57.4	06.2
8	307°36.4	281°07.9	19.2	182°09.6	29.5	319°18.8	05.0	126°00.0	06.3
9	322°38.9	296°07.4	·· 20.4	197°11.5	·· 29.3	334°20.8	·· 04.8	141°02.7	·· 06.4
10	337°41.4	311°07.0	21.5	212°13.5	29.1	349°22.7	04.5	156°05.3	06.5
11	352°43.8	326°06.6	22.7	227°15.4	28.9	4°24.6	04.3	171°08.0	06.5
12	7°46.3	341°06.1	N10°23.9	242°17.3	N22°28.7	19°26.5	S06°04.1	186°10.6	N02°06.6
13	22°48.8	356°05.7	25.1	257°19.3	28.5	34°28.5	03.9	201°13.2	06.7
14	37°51.2	11°05.3	26.3	272°21.2	28.3	49°30.4	03.6	216°15.9	06.8
15	52°53.7	26°04.8	·· 27.5	287°23.1	·· 28.1	64°32.3	·· 03.4	231°18.5	·· 06.8
16	67°56.1	41°04.4	28.7	302°25.1	27.9	79°34.2	03.2	246°21.2	06.9
17	82°58.6	56°04.0	29.8	317°27.0	27.7	94°36.2	03.0	261°23.8	07.0
18	98°01.1	71°03.6	N10°31.0	332°28.9	N22°27.5	109°38.1	S06°02.8	276°26.4	N02°07.1
19	113°03.5	86°03.1	32.2	347°30.9	27.3	124°40.0	02.5	291°29.1	07.1
20	128°06.0	101°02.7	33.4	2°32.8	27.1	139°41.9	02.3	306°31.7	07.2
21	143°08.5	116°02.3	·· 34.6	17°34.7	·· 26.9	154°43.9	·· 02.1	321°34.4	·· 07.3
22	158°10.9	131°01.8	35.8	32°36.6	26.7	169°45.8	01.9	336°37.0	07.4
23	173°13.4	146°01.4	36.9	47°38.6	26.5	184°47.7	01.6	351°39.6	07.4
Mer.pass.:11:29		v-0.4 d1.2 m-3.8		v1.9 d-0.2 m0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	188°15.9	161°01.0	N10°38.1	62°40.5	N22°26.3	199°49.6	S06°01.4	6°42.3	N02°07.5
1	203°18.3	176°00.5	39.3	77°42.4	26.1	214°51.6	01.2	21°44.9	07.6
2	218°20.8	191°00.1	40.5	92°44.3	25.9	229°53.5	01.0	36°47.6	07.7
3	233°23.2	205°59.6	·· 41.7	107°46.3	·· 25.7	244°55.4	·· 00.8	51°50.2	·· 07.8
4	248°25.7	220°59.2	42.9	122°48.2	25.5	259°57.3	00.5	66°52.9	07.8
5	263°28.2	235°58.8	44.0	137°50.1	25.3	274°59.3	00.3	81°55.5	07.9
6	278°30.6	250°58.3	N10°45.2	152°52.0	N22°25.1	290°01.2	S06°00.1	96°58.1	N02°08.0
7	293°33.1	265°57.9	46.4	167°53.9	24.9	305°03.1	05°59.9	112°00.8	08.1
8	308°35.6	280°57.5	47.6	182°55.9	24.7	320°05.0	59.7	127°03.4	08.1
9	323°38.0	295°57.0	·· 48.7	197°57.8	·· 24.5	335°07.0	·· 59.4	142°06.1	·· 08.2
10	338°40.5	310°56.6	49.9	212°59.7	24.3	350°08.9	59.2	157°08.7	08.3
11	353°43.0	325°56.2	51.1	228°01.6	24.1	5°10.8	59.0	172°11.3	08.4
12	8°45.4	340°55.7	N10°52.3	243°03.5	N22°23.9	20°12.8	S05°58.8	187°14.0	N02°08.4
13	23°47.9	355°55.3	53.5	258°05.4	23.6	35°14.7	58.5	202°16.6	08.5
14	38°50.4	10°54.8	54.6	273°07.4	23.4	50°16.6	58.3	217°19.3	08.6
15	53°52.8	25°54.4	·· 55.8	288°09.3	·· 23.2	65°18.5	·· 58.1	232°21.9	·· 08.7
16	68°55.3	40°54.0	57.0	303°11.2	23.0	80°20.5	57.9	247°24.5	08.7
17	83°57.7	55°53.5	58.2	318°13.1	22.8	95°22.4	57.7	262°27.2	08.8
18	99°00.2	70°53.1	N10°59.3	333°15.0	N22°22.6	110°24.3	S05°57.4	277°29.8	N02°08.9
19	114°02.7	85°52.6	11°00.5	348°16.9	22.4	125°26.2	57.2	292°32.5	09.0
20	129°05.1	100°52.2	01.7	3°18.8	22.2	140°28.2	57.0	307°35.1	09.0
21	144°07.6	115°51.8	·· 02.9	18°20.7	·· 22.0	155°30.1	·· 56.8	322°37.7	·· 09.1
22	159°10.1	130°51.3	04.0	33°22.6	21.8	170°32.0	56.6	337°40.4	09.2
23	174°12.5	145°50.9	05.2	48°24.5	21.6	185°34.0	56.3	352°43.0	09.3
Mer.pass.:11:25		v-0.4 d1.2 m-3.8		v1.9 d-0.2 m0.1		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.4	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°44.0	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.1
Hamal	328°03.8	23°30.7
Polaris	319°19.5	89°18.8
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°54.0
Aldebaran	290°52.3	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.2	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.4	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.5	28°00.1
Avior	234°18.8	-59°32.9
Suhail	222°54.0	-43°28.8
Miaplacidus	221°39.9	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.5
Gacrux	172°03.1	-57°10.4
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.8	-60°25.4
Menkent	148°10.1	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.5	-60°52.6
Kochab	137°18.6	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.5
Antares	112°29.0	-26°27.3
Atria	107°32.8	-69°02.6
Sabik	102°15.1	-15°44.3
Shaula	96°25.0	-37°06.6
Rasalhague	96°08.5	12°32.9
Eltanin	90°47.1	51°28.9
Kaus Aust.	83°46.9	-34°22.7
Vega	80°40.6	38°47.3
Nunki	76°01.2	-26°17.0
Altair	62°10.6	8°53.6
Peacock	53°23.1	-56°41.9
Deneb	49°33.4	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°46.9	-46°54.5
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°41.0	15°15.6

Mar 29 Mon	**SHA**	**Mer.pass**
Venus	335°03.9	13:15
Mars	234°49.4	19:53
Jupiter	11°59.7	10:45
Saturn	178°17.9	23:37

Mar 30 Tue	**SHA**	**Mer.pass**
Venus	333°54.6	13:16
Mars	234°37.3	19:50
Jupiter	11°46.7	10:42
Saturn	178°22.2	23:33

Mar 31 Wed	**SHA**	**Mer.pass**
Venus	332°45.1	13:16
Mars	234°24.6	19:47
Jupiter	11°33.8	10:39
Saturn	178°26.4	23:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.0193 sec ΔT = TT-UT1 = +66.1647 sec

2010 March 29 to Mar. 31 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°45.9	N03°15.0	14°33.1	9.9'	S01°24.2	-15.9'	60.5'
1	193°46.1	16.0	29°02.0	9.9'	01°40.1	-15.9'	60.5'
2	208°46.3	17.0	43°30.9	9.9'	01°56.0	-15.9'	60.5'
3	223°46.5	· · 18.0	57°59.8	9.9'	02°11.8	-15.8'	60.5'
4	238°46.7	18.9	72°28.7	9.9'	02°27.7	-15.8'	60.5'
5	253°46.9	19.9	86°57.6	9.9'	02°43.5	-15.8'	60.5'
6	268°47.0	N03°20.9	101°26.5	9.9'	S02°59.3	-15.8'	60.4'
7	283°47.2	21.9	115°55.4	9.9'	03°15.0	-15.8'	60.4'
8	298°47.4	22.8	130°24.3	9.9'	03°30.8	-15.7'	60.4'
9	313°47.6	· · 23.8	144°53.2	9.9'	03°46.5	-15.7'	60.4'
10	328°47.8	24.8	159°22.1	9.9'	04°02.2	-15.7'	60.4'
11	343°48.0	25.7	173°50.9	9.9'	04°17.8	-15.6'	60.4'
12	358°48.2	N03°26.7	188°19.8	9.9'	S04°33.5	-15.6'	60.4'
13	13°48.4	27.7	202°48.6	9.8'	04°49.1	-15.6'	60.3'
14	28°48.6	28.7	217°17.5	9.8'	05°04.6	-15.5'	60.3'
15	43°48.8	· · 29.6	231°46.3	9.8'	05°20.1	-15.5'	60.3'
16	58°48.9	30.6	246°15.1	9.8'	05°35.6	-15.5'	60.3'
17	73°49.1	31.6	260°43.9	9.8'	05°51.1	-15.4'	60.3'
18	88°49.3	N03°32.6	275°12.7	9.8'	S06°06.5	-15.4'	60.3'
19	103°49.5	33.5	289°41.5	9.8'	06°21.8	-15.3'	60.3'
20	118°49.7	34.5	304°10.2	9.8'	06°37.1	-15.3'	60.2'
21	133°49.9	· · 35.5	318°39.0	9.7'	06°52.4	-15.2'	60.2'
22	148°50.1	36.4	333°07.7	9.7'	07°07.6	-15.2'	60.2'
23	163°50.3	37.4	347°36.4	9.7'	07°22.8	-15.1'	60.2'
	SD.=16.0	d=1.0			S.D.=16.5		

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°50.5	N03°38.4	2°05.1	9.7'	S07°37.9	-15.1'	60.2'
1	193°50.6	39.4	16°33.8	9.7'	07°53.0	-15.0'	60.1'
2	208°50.8	40.3	31°02.4	9.6'	08°08.0	-15.0'	60.1'
3	223°51.0	· · 41.3	45°31.1	9.6'	08°22.9	-14.9'	60.1'
4	238°51.2	42.3	59°59.7	9.6'	08°37.8	-14.9'	60.1'
5	253°51.4	43.2	74°28.3	9.6'	08°52.6	-14.8'	60.1'
6	268°51.6	N03°44.2	88°56.8	9.6'	S09°07.4	-14.7'	60.0'
7	283°51.8	45.2	103°25.4	9.5'	09°22.1	-14.7'	60.0'
8	298°52.0	46.2	117°53.9	9.5'	09°36.7	-14.6'	60.0'
9	313°52.2	· · 47.1	132°22.4	9.5'	09°51.3	-14.5'	60.0'
10	328°52.3	48.1	146°50.9	9.5'	10°05.8	-14.5'	60.0'
11	343°52.5	49.1	161°19.3	9.4'	10°20.3	-14.4'	59.9'
12	358°52.7	N03°50.0	175°47.8	9.4'	S10°34.6	-14.3'	59.9'
13	13°52.9	51.0	190°16.2	9.4'	10°48.9	-14.3'	59.9'
14	28°53.1	52.0	204°44.5	9.4'	11°03.1	-14.2'	59.9'
15	43°53.3	· · 53.0	219°12.9	9.3'	11°17.3	-14.1'	59.8'
16	58°53.5	53.9	233°41.2	9.3'	11°31.3	-14.0'	59.8'
17	73°53.7	54.9	248°09.5	9.3'	11°45.3	-13.9'	59.8'
18	88°53.8	N03°55.9	262°37.8	9.3'	S11°59.2	-13.9'	59.8'
19	103°54.0	56.8	277°06.0	9.2'	12°13.0	-13.8'	59.7'
20	118°54.2	57.8	291°34.2	9.2'	12°26.8	-13.7'	59.7'
21	133°54.4	· · 58.8	306°02.4	9.2'	12°40.4	-13.6'	59.7'
22	148°54.6	03°59.7	320°30.6	9.1'	12°54.0	-13.5'	59.6'
23	163°54.8	04°00.7	334°58.7	9.1'	13°07.5	-13.4'	59.6'
	SD.=16.0	d=1.0			S.D.=16.3		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°55.0	N04°01.7	349°26.8	9.1'	S13°20.8	-13.3'	59.6'
1	193°55.2	02.6	3°54.9	9.0'	13°34.1	-13.3'	59.6'
2	208°55.4	03.6	18°22.9	9.0'	13°47.4	-13.2'	59.5'
3	223°55.5	· · 04.6	32°50.9	9.0'	14°00.5	-13.1'	59.5'
4	238°55.7	05.6	47°18.9	9.0'	14°13.5	-13.0'	59.5'
5	253°55.9	06.5	61°46.8	8.9'	14°26.4	-12.9'	59.4'
6	268°56.1	N04°07.5	76°14.7	8.9'	S14°39.2	-12.8'	59.4'
7	283°56.3	08.5	90°42.6	8.9'	14°52.0	-12.7'	59.4'
8	298°56.5	09.4	105°10.5	8.8'	15°04.6	-12.6'	59.4'
9	313°56.7	· · 10.4	119°38.3	8.8'	15°17.1	-12.5'	59.3'
10	328°56.9	11.4	134°06.1	8.8'	15°29.5	-12.4'	59.3'
11	343°57.0	12.3	148°33.8	8.7'	15°41.8	-12.3'	59.3'
12	358°57.2	N04°13.3	163°01.5	8.7'	S15°54.1	-12.2'	59.2'
13	13°57.4	14.3	177°29.2	8.7'	16°06.2	-12.1'	59.2'
14	28°57.6	15.2	191°56.9	8.6'	16°18.2	-11.9'	59.2'
15	43°57.8	· · 16.2	206°24.5	8.6'	16°30.0	-11.8'	59.1'
16	58°58.0	17.2	220°52.1	8.6'	16°41.8	-11.7'	59.1'
17	73°58.2	18.1	235°19.7	8.5'	16°53.5	-11.6'	59.1'
18	88°58.4	N04°19.1	249°47.2	8.5'	S17°05.0	-11.5'	59.0'
19	103°58.5	20.1	264°14.7	8.5'	17°16.5	-11.4'	59.0'
20	118°58.7	21.0	278°42.2	8.5'	17°27.8	-11.3'	59.0'
21	133°58.9	· · 22.0	293°09.6	8.4'	17°39.0	-11.2'	58.9'
22	148°59.1	23.0	307°37.0	8.4'	17°50.1	-11.0'	58.9'
23	163°59.3	23.9	322°04.4	8.4'	18°01.1	-10.9'	58.9'
	SD.=16.0	d=1.0			S.D.=16.1		

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 14-16 99-97%
29	04:56	04:47	12:05	23:51	11:25	
30	04:38	04:29	12:04	–:–	12:17	
31	04:20	04:11	12:04	00:44	13:10	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	189°15.0	160°50.4	N11°06.4	63°26.4	N22°21.4	200°35.9	S05°56.1	7°45.7	N02°09.3
1	204°17.5	175°50.0	07.5	78°28.3	21.2	215°37.8	55.9	22°48.3	09.4
2	219°19.9	190°49.6	08.7	93°30.2	21.0	230°39.7	55.7	37°50.9	09.5
3	234°22.4	205°49.1	·· 09.9	108°32.1	·· 20.8	245°41.7	·· 55.4	52°53.6	·· 09.6
4	249°24.9	220°48.7	11.1	123°34.0	20.6	260°43.6	55.2	67°56.2	09.6
5	264°27.3	235°48.2	12.2	138°35.9	20.4	275°45.5	55.0	82°58.9	09.7
6	279°29.8	250°47.8	N11°13.4	153°37.8	N22°20.1	290°47.4	S05°54.8	98°01.5	N02°09.8
7	294°32.2	265°47.3	14.6	168°39.7	19.9	305°49.4	54.6	113°04.1	09.9
8	309°34.7	280°46.9	15.7	183°41.6	19.7	320°51.3	54.3	128°06.8	10.0
9	324°37.2	295°46.4	·· 16.9	198°43.5	·· 19.5	335°53.2	·· 54.1	143°09.4	·· 10.0
10	339°39.6	310°46.0	18.1	213°45.4	19.3	350°55.2	53.9	158°12.1	10.1
11	354°42.1	325°45.6	19.2	228°47.3	19.1	5°57.1	53.7	173°14.7	10.2
12	9°44.6	340°45.1	N11°20.4	243°49.2	N22°18.9	20°59.0	S05°53.5	188°17.3	N02°10.3
13	24°47.0	355°44.7	21.6	258°51.1	18.7	36°00.9	53.2	203°20.0	10.3
14	39°49.5	10°44.2	22.7	273°53.0	18.5	51°02.9	53.0	218°22.6	10.4
15	54°52.0	25°43.8	·· 23.9	288°54.9	·· 18.3	66°04.8	·· 52.8	233°25.3	·· 10.5
16	69°54.4	40°43.3	25.1	303°56.8	18.1	81°06.7	52.6	248°27.9	10.6
17	84°56.9	55°42.9	26.2	318°58.7	17.9	96°08.7	52.4	263°30.5	10.6
18	99°59.3	70°42.4	N11°27.4	334°00.6	N22°17.6	111°10.6	S05°52.1	278°33.2	N02°10.7
19	115°01.8	85°42.0	28.5	349°02.4	17.4	126°12.5	51.9	293°35.8	10.8
20	130°04.3	100°41.5	29.7	4°04.3	17.2	141°14.4	51.7	308°38.5	10.9
21	145°06.7	115°41.1	·· 30.9	19°06.2	·· 17.0	156°16.4	·· 51.5	323°41.1	·· 10.9
22	160°09.2	130°40.6	32.0	34°08.1	16.8	171°18.3	51.3	338°43.7	11.0
23	175°11.7	145°40.2	33.2	49°10.0	16.6	186°20.2	51.0	353°46.4	11.1
Mer.pass.:11:21		v-0.4 d1.2 m-3.8		v1.9 d-0.2 m0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	190°14.1	160°39.7	N11°34.3	64°11.9	N22°16.4	201°22.2	S05°50.8	8°49.0	N02°11.2
1	205°16.6	175°39.3	35.5	79°13.7	16.2	216°24.1	50.6	23°51.6	11.2
2	220°19.1	190°38.8	36.7	94°15.6	16.0	231°26.0	50.4	38°54.3	11.3
3	235°21.5	205°38.4	·· 37.8	109°17.5	·· 15.7	246°28.0	·· 50.2	53°56.9	·· 11.4
4	250°24.0	220°37.9	39.0	124°19.4	15.5	261°29.9	49.9	68°59.6	11.5
5	265°26.5	235°37.5	40.1	139°21.3	15.3	276°31.8	49.7	84°02.2	11.5
6	280°28.9	250°37.0	N11°41.3	154°23.1	N22°15.1	291°33.7	S05°49.5	99°04.8	N02°11.6
7	295°31.4	265°36.6	42.5	169°25.0	14.9	306°35.7	49.3	114°07.5	11.7
8	310°33.8	280°36.1	43.6	184°26.9	14.7	321°37.6	49.0	129°10.1	11.8
9	325°36.3	295°35.7	·· 44.8	199°28.8	·· 14.5	336°39.5	·· 48.8	144°12.8	·· 11.8
10	340°38.8	310°35.2	45.9	214°30.6	14.3	351°41.5	48.6	159°15.4	11.9
11	355°41.2	325°34.8	47.1	229°32.5	14.0	6°43.4	48.4	174°18.0	12.0
12	10°43.7	340°34.3	N11°48.2	244°34.4	N22°13.8	21°45.3	S05°48.2	189°20.7	N02°12.1
13	25°46.2	355°33.9	49.4	259°36.3	13.6	36°47.3	47.9	204°23.3	12.1
14	40°48.6	10°33.4	50.5	274°38.1	13.4	51°49.2	47.7	219°26.0	12.2
15	55°51.1	25°33.0	·· 51.7	289°40.0	·· 13.2	66°51.1	·· 47.5	234°28.6	·· 12.3
16	70°53.6	40°32.5	52.9	304°41.9	13.0	81°53.0	47.3	249°31.2	12.4
17	85°56.0	55°32.0	54.0	319°43.7	12.8	96°55.0	47.1	264°33.9	12.4
18	100°58.5	70°31.6	N11°55.2	334°45.6	N22°12.5	111°56.9	S05°46.8	279°36.5	N02°12.5
19	116°01.0	85°31.1	56.3	349°47.5	12.3	126°58.8	46.6	294°39.1	12.6
20	131°03.4	100°30.7	57.5	4°49.3	12.1	142°00.8	46.4	309°41.8	12.6
21	146°05.9	115°30.2	·· 58.6	19°51.2	·· 11.9	157°02.7	·· 46.2	324°44.4	·· 12.7
22	161°08.3	130°29.8	11°59.8	34°53.1	11.7	172°04.6	46.0	339°47.1	12.8
23	176°10.8	145°29.3	12°00.9	49°54.9	11.5	187°06.6	45.7	354°49.7	12.9
Mer.pass.:11:17		v-0.4 d1.2 m-3.8		v1.9 d-0.2 m0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	191°13.3	160°28.8	N12°02.1	64°56.8	N22°11.2	202°08.5	S05°45.5	9°52.3	N02°12.9
1	206°15.7	175°28.4	03.2	79°58.7	11.0	217°10.4	45.3	24°55.0	13.0
2	221°18.2	190°27.9	04.4	95°00.5	10.8	232°12.3	45.1	39°57.6	13.1
3	236°20.7	205°27.5	·· 05.5	110°02.4	·· 10.6	247°14.3	·· 44.9	55°00.2	·· 13.2
4	251°23.1	220°27.0	06.6	125°04.2	10.4	262°16.2	44.6	70°02.9	13.2
5	266°25.6	235°26.6	07.8	140°06.1	10.2	277°18.1	44.4	85°05.5	13.3
6	281°28.1	250°26.1	N12°08.9	155°08.0	N22°10.0	292°20.1	S05°44.2	100°08.2	N02°13.4
7	296°30.5	265°25.6	10.1	170°09.8	09.7	307°22.0	44.0	115°10.8	13.5
8	311°33.0	280°25.2	11.2	185°11.7	09.5	322°23.9	43.8	130°13.4	13.5
9	326°35.5	295°24.7	·· 12.4	200°13.5	·· 09.3	337°25.9	·· 43.5	145°16.1	·· 13.6
10	341°37.9	310°24.2	13.5	215°15.4	09.1	352°27.8	43.3	160°18.7	13.7
11	356°40.4	325°23.8	14.7	230°17.2	08.9	7°29.7	43.1	175°21.4	13.8
12	11°42.8	340°23.3	N12°15.8	245°19.1	N22°08.6	22°31.7	S05°42.9	190°24.0	N02°13.8
13	26°45.3	355°22.9	16.9	260°20.9	08.4	37°33.6	42.7	205°26.6	13.9
14	41°47.8	10°22.4	18.1	275°22.8	08.2	52°35.5	42.4	220°29.3	14.0
15	56°50.2	25°21.9	·· 19.2	290°24.6	·· 08.0	67°37.5	·· 42.2	235°31.9	·· 14.1
16	71°52.7	40°21.5	20.4	305°26.5	07.8	82°39.4	42.0	250°34.5	14.1
17	86°55.2	55°21.0	21.5	320°28.3	07.5	97°41.3	41.8	265°37.2	14.2
18	101°57.6	70°20.5	N12°22.7	335°30.2	N22°07.3	112°43.3	S05°41.6	280°39.8	N02°14.3
19	117°00.1	85°20.1	23.8	350°32.0	07.1	127°45.2	41.3	295°42.5	14.4
20	132°02.6	100°19.6	24.9	5°33.9	06.9	142°47.1	41.1	310°45.1	14.4
21	147°05.0	115°19.1	·· 26.1	20°35.7	·· 06.7	157°49.1	·· 40.9	325°47.7	·· 14.5
22	162°07.5	130°18.7	27.2	35°37.6	06.4	172°51.0	40.7	340°50.4	14.6
23	177°09.9	145°18.2	28.3	50°39.4	06.2	187°52.9	40.5	355°53.0	14.6
Mer.pass.:11:13		v-0.5 d1.1 m-3.8		v1.9 d-0.2 m0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°44.0	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.1
Hamal	328°03.8	23°30.7
Polaris	319°20.0	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°54.0
Aldebaran	290°52.3	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.8	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.3	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.4	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.5	28°00.1
Avior	234°18.9	-59°32.9
Suhail	222°54.0	-43°28.8
Miaplacidus	221°39.9	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.8
Dubhe	193°53.7	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.5
Gacrux	172°03.1	-57°10.4
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.8	-60°25.4
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.5	-60°52.6
Kochab	137°18.6	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.5
Antares	112°29.0	-26°27.3
Atria	107°32.7	-69°02.6
Sabik	102°15.1	-15°44.3
Shaula	96°25.0	-37°06.6
Rasalhague	96°08.5	12°32.9
Eltanin	90°47.1	51°28.9
Kaus Aust.	83°46.9	-34°22.7
Vega	80°40.5	38°47.3
Nunki	76°01.2	-26°17.0
Altair	62°10.6	8°53.6
Peacock	53°23.0	-56°41.9
Deneb	49°33.4	45°18.8
Enif	33°49.7	9°55.2
Al Na'ir	27°46.9	-46°54.5
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°41.0	15°15.6

Apr 01 Thu	**SHA**	**Mer.pass**
Venus	331°35.4	13:17
Mars	234°11.4	19:44
Jupiter	11°20.9	10:36
Saturn	178°30.7	23:25

Apr 02 Fri	**SHA**	**Mer.pass**
Venus	330°25.6	13:18
Mars	233°57.7	19:41
Jupiter	11°08.0	10:33
Saturn	178°34.9	23:21

Apr 03 Sat	**SHA**	**Mer.pass**
Venus	329°15.6	13:18
Mars	233°43.5	19:38
Jupiter	10°55.2	10:30
Saturn	178°39.1	23:16

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°59.5	N04°24.9	336°31.7	8.3'	S18°12.0	-10.8'	58.8'
1	193°59.7	25.9	350°59.1	8.3'	18°22.7	-10.7'	58.8'
2	208°59.9	26.8	5°26.3	8.3'	18°33.3	-10.6'	58.8'
3	224°00.0	·· 27.8	19°53.6	8.2'	18°43.8	-10.4'	58.7'
4	239°00.2	28.8	34°20.8	8.2'	18°54.2	-10.3'	58.7'
5	254°00.4	29.7	48°48.0	8.2'	19°04.4	-10.2'	58.7'
6	269°00.6	N04°30.7	63°15.2	8.2'	S19°14.5	-10.1'	58.6'
7	284°00.8	31.6	77°42.3	8.1'	19°24.5	-9.9'	58.6'
8	299°01.0	32.6	92°09.5	8.1'	19°34.4	-9.8'	58.6'
9	314°01.2	·· 33.6	106°36.6	8.1'	19°44.2	-9.7'	58.5'
10	329°01.3	34.5	121°03.6	8.1'	19°53.8	-9.5'	58.5'
11	344°01.5	35.5	135°30.7	8.0'	20°03.2	-9.4'	58.5'
12	359°01.7	N04°36.5	149°57.7	8.0'	S20°12.6	-9.3'	58.4'
13	14°01.9	37.4	164°24.6	8.0'	20°21.8	-9.2'	58.4'
14	29°02.1	38.4	178°51.6	8.0'	20°30.9	-9.0'	58.4'
15	44°02.3	·· 39.4	193°18.6	7.9'	20°39.9	-8.9'	58.3'
16	59°02.5	40.3	207°45.5	7.9'	20°48.7	-8.8'	58.3'
17	74°02.7	41.3	222°12.4	7.9'	20°57.4	-8.6'	58.2'
18	89°02.8	N04°42.3	236°39.2	7.9'	S21°05.9	-8.5'	58.2'
19	104°03.0	43.2	251°06.1	7.8'	21°14.4	-8.4'	58.2'
20	119°03.2	44.2	265°32.9	7.8'	21°22.7	-8.2'	58.1'
21	134°03.4	·· 45.1	279°59.7	7.8'	21°30.8	-8.1'	58.1'
22	149°03.6	46.1	294°26.5	7.8'	21°38.8	-7.9'	58.1'
23	164°03.8	47.1	308°53.3	7.8'	21°46.7	-7.8'	58.0'
	SD.=16.0	d=1.0	S.D.=15.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°04.0	N04°48.0	323°20.1	7.7'	S21°54.4	-7.7'	58.0'
1	194°04.1	49.0	337°46.8	7.7'	22°02.0	-7.5'	58.0'
2	209°04.3	50.0	352°13.5	7.7'	22°09.5	-7.4'	57.9'
3	224°04.5	·· 50.9	6°40.2	7.7'	22°16.8	-7.2'	57.9'
4	239°04.7	51.9	21°06.9	7.7'	22°24.0	-7.1'	57.8'
5	254°04.9	52.8	35°33.6	7.7'	22°31.0	-7.0'	57.8'
6	269°05.1	N04°53.8	50°00.3	7.7'	S22°37.9	-6.8'	57.8'
7	284°05.3	54.8	64°27.0	7.7'	22°44.6	-6.7'	57.7'
8	299°05.4	55.7	78°53.6	7.6'	22°51.3	-6.5'	57.7'
9	314°05.6	·· 56.7	93°20.3	7.6'	22°57.7	-6.4'	57.7'
10	329°05.8	57.6	107°46.9	7.6'	23°04.0	-6.3'	57.6'
11	344°06.0	58.6	122°13.5	7.6'	23°10.2	-6.1'	57.6'
12	359°06.2	N04°59.6	136°40.1	7.6'	S23°16.3	-6.0'	57.5'
13	14°06.4	05°00.5	151°06.8	7.6'	23°22.1	-5.8'	57.5'
14	29°06.5	01.5	165°33.4	7.6'	23°27.9	-5.7'	57.5'
15	44°06.7	·· 02.4	180°00.0	7.6'	23°33.5	-5.5'	57.4'
16	59°06.9	03.4	194°26.6	7.6'	23°39.0	-5.4'	57.4'
17	74°07.1	04.4	208°53.2	7.6'	23°44.3	-5.2'	57.4'
18	89°07.3	N05°05.3	223°19.8	7.6'	S23°49.4	-5.1'	57.3'
19	104°07.5	06.3	237°46.4	7.6'	23°54.5	-4.9'	57.3'
20	119°07.7	07.2	252°13.0	7.6'	23°59.3	-4.8'	57.3'
21	134°07.8	·· 08.2	266°39.7	7.6'	24°04.1	-4.7'	57.2'
22	149°08.0	09.2	281°06.3	7.6'	24°08.6	-4.5'	57.2'
23	164°08.2	10.1	295°32.9	7.6'	24°13.1	-4.4'	57.1'
	SD.=16.0	d=1.0	S.D.=15.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°08.4	N05°11.1	309°59.6	7.6'	S24°17.4	-4.2'	57.1'
1	194°08.6	12.0	324°26.2	7.7'	24°21.5	-4.1'	57.1'
2	209°08.8	13.0	338°52.9	7.7'	24°25.5	-3.9'	57.0'
3	224°08.9	·· 14.0	353°19.5	7.7'	24°29.4	-3.8'	57.0'
4	239°09.1	14.9	7°46.2	7.7'	24°33.1	-3.6'	57.0'
5	254°09.3	15.9	22°12.9	7.7'	24°36.7	-3.5'	56.9'
6	269°09.5	N05°16.8	36°39.6	7.7'	S24°40.1	-3.3'	56.9'
7	284°09.7	17.8	51°06.3	7.7'	24°43.3	-3.2'	56.9'
8	299°09.9	18.7	65°33.1	7.7'	24°46.5	-3.1'	56.8'
9	314°10.1	·· 19.7	79°59.8	7.8'	24°49.5	-2.9'	56.8'
10	329°10.2	20.7	94°26.6	7.8'	24°52.3	-2.8'	56.8'
11	344°10.4	21.6	108°53.4	7.8'	24°55.0	-2.6'	56.7'
12	359°10.6	N05°22.6	123°20.2	7.8'	S24°57.5	-2.5'	56.7'
13	14°10.8	23.5	137°47.0	7.9'	24°59.9	-2.3'	56.6'
14	29°11.0	24.5	152°13.9	7.9'	25°02.2	-2.2'	56.6'
15	44°11.2	·· 25.4	166°40.8	7.9'	25°04.3	-2.0'	56.6'
16	59°11.3	26.4	181°07.7	7.9'	25°06.3	-1.9'	56.5'
17	74°11.5	27.4	195°34.7	8.0'	25°08.1	-1.8'	56.5'
18	89°11.7	N05°28.3	210°01.6	8.0'	S25°09.8	-1.6'	56.5'
19	104°11.9	29.3	224°28.6	8.0'	25°11.3	-1.5'	56.4'
20	119°12.1	30.2	238°55.7	8.0'	25°12.7	-1.3'	56.4'
21	134°12.3	·· 31.2	253°22.7	8.1'	25°13.9	-1.2'	56.4'
22	149°12.4	32.1	267°49.8	8.1'	25°15.1	-1.0'	56.3'
23	164°12.6	33.1	282°17.0	8.1'	25°16.0	-0.9'	56.3'
	SD.=16.0	d=1.0	S.D.=15.4				

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

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

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 92-77%
01	04:02	03:53	12:04	01:37	14:05	
02	03:44	03:35	12:04	02:32	15:00	
03	03:26	03:18	12:03	03:28	15:55	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	192°12.4	160°17.8	N12°29.5	65°41.2	N22°06.0	202°54.9	S05°40.3	10°55.6	N02°14.7
1	207°14.9	175°17.3	30.6	80°43.1	05.8	217°56.8	40.0	25°58.3	14.8
2	222°17.3	190°16.8	31.8	95°44.9	05.6	232°58.7	39.8	41°00.9	14.9
3	237°19.8	205°16.3	·· 32.9	110°46.8	·· 05.3	248°00.7	·· 39.6	56°03.5	·· 14.9
4	252°22.3	220°15.9	34.0	125°48.6	05.1	263°02.6	39.4	71°06.2	15.0
5	267°24.7	235°15.4	35.2	140°50.4	04.9	278°04.5	39.2	86°08.8	15.1
6	282°27.2	250°14.9	N12°36.3	155°52.3	N22°04.7	293°06.5	S05°38.9	101°11.5	N02°15.2
7	297°29.7	265°14.5	37.4	170°54.1	04.5	308°08.4	38.7	116°14.1	15.2
8	312°32.1	280°14.0	38.6	185°56.0	04.2	323°10.3	38.5	131°16.7	15.3
9	327°34.6	295°13.5	·· 39.7	200°57.8	·· 04.0	338°12.2	·· 38.3	146°19.4	·· 15.4
10	342°37.1	310°13.1	40.8	215°59.6	03.8	353°14.2	38.1	161°22.0	15.5
11	357°39.5	325°12.6	42.0	231°01.5	03.6	8°16.1	37.8	176°24.6	15.5
12	12°42.0	340°12.1	N12°43.1	246°03.3	N22°03.3	23°18.1	S05°37.6	191°27.3	N02°15.6
13	27°44.4	355°11.7	44.2	261°05.1	03.1	38°20.0	37.4	206°29.9	15.7
14	42°46.9	10°11.2	45.3	276°07.0	02.9	53°21.9	37.2	221°32.5	15.7
15	57°49.4	25°10.7	·· 46.5	291°08.8	·· 02.7	68°23.9	·· 37.0	236°35.2	·· 15.8
16	72°51.8	40°10.2	47.6	306°10.6	02.4	83°25.8	36.7	251°37.8	15.9
17	87°54.3	55°09.8	48.7	321°12.4	02.2	98°27.7	36.5	266°40.5	16.0
18	102°56.8	70°09.3	N12°49.9	336°14.3	N22°02.0	113°29.7	S05°36.3	281°43.1	N02°16.0
19	117°59.2	85°08.8	51.0	351°16.1	01.8	128°31.6	36.1	296°45.7	16.1
20	133°01.7	100°08.3	52.1	6°17.9	01.6	143°33.5	35.9	311°48.4	16.2
21	148°04.2	115°07.9	·· 53.2	21°19.7	·· 01.3	158°35.5	·· 35.7	326°51.0	·· 16.3
22	163°06.6	130°07.4	54.4	36°21.6	01.1	173°37.4	35.4	341°53.6	16.3
23	178°09.1	145°06.9	55.5	51°23.4	00.9	188°39.3	35.2	356°56.3	16.4
Mer.pass.:11:09		v-0.5 d1.1 m-3.8		v1.8 d-0.2 m0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	193°11.6	160°06.4	N12°56.6	66°25.2	N22°00.7	203°41.3	S05°35.0	11°58.9	N02°16.5
1	208°14.0	175°06.0	57.7	81°27.0	00.4	218°43.2	34.8	27°01.5	16.6
2	223°16.5	190°05.5	12°58.9	96°28.9	00.2	233°45.1	34.6	42°04.2	16.6
3	238°18.9	205°05.0	13°00.0	111°30.7	22°00.0	248°47.1	·· 34.3	57°06.8	·· 16.7
4	253°21.4	220°04.5	01.1	126°32.5	21°59.7	263°49.0	34.1	72°09.5	16.8
5	268°23.9	235°04.1	02.2	141°34.3	59.5	278°50.9	33.9	87°12.1	16.8
6	283°26.3	250°03.6	N13°03.3	156°36.1	N21°59.3	293°52.9	S05°33.7	102°14.7	N02°16.9
7	298°28.8	265°03.1	04.5	171°37.9	59.1	308°54.8	33.5	117°17.4	17.0
8	313°31.3	280°02.6	05.6	186°39.8	58.8	323°56.7	33.2	132°20.0	17.1
9	328°33.7	295°02.2	·· 06.7	201°41.6	·· 58.6	338°58.7	·· 33.0	147°22.6	·· 17.1
10	343°36.2	310°01.7	07.8	216°43.4	58.4	354°00.6	32.8	162°25.3	17.2
11	358°38.7	325°01.2	08.9	231°45.2	58.2	9°02.5	32.6	177°27.9	17.3
12	13°41.1	340°00.7	N13°10.1	246°47.0	N21°57.9	24°04.5	S05°32.4	192°30.5	N02°17.3
13	28°43.6	355°00.2	11.2	261°48.8	57.7	39°06.4	32.2	207°33.2	17.4
14	43°46.1	9°59.8	12.3	276°50.6	57.5	54°08.4	31.9	222°35.8	17.5
15	58°48.5	24°59.3	·· 13.4	291°52.5	·· 57.2	69°10.3	·· 31.7	237°38.4	·· 17.6
16	73°51.0	39°58.8	14.5	306°54.3	57.0	84°12.2	31.5	252°41.1	17.6
17	88°53.4	54°58.3	15.6	321°56.1	56.8	99°14.2	31.3	267°43.7	17.7
18	103°55.9	69°57.8	N13°16.7	336°57.9	N21°56.6	114°16.1	S05°31.1	282°46.3	N02°17.8
19	118°58.4	84°57.3	17.9	351°59.7	56.3	129°18.0	30.8	297°49.0	17.9
20	134°00.8	99°56.9	19.0	7°01.5	56.1	144°20.0	30.6	312°51.6	17.9
21	149°03.3	114°56.4	·· 20.1	22°03.3	·· 55.9	159°21.9	·· 30.4	327°54.3	·· 18.0
22	164°05.8	129°55.9	21.2	37°05.1	55.6	174°23.8	30.2	342°56.9	18.1
23	179°08.2	144°55.4	22.3	52°06.9	55.4	189°25.8	30.0	357°59.5	18.1
Mer.pass.:11:05		v-0.5 d1.1 m-3.8		v1.8 d-0.2 m0.2		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	194°10.7	159°54.9	N13°23.4	67°08.7	N21°55.2	204°27.7	S05°29.8	13°02.2	N02°18.2
1	209°13.2	174°54.4	24.5	82°10.5	55.0	219°29.6	29.5	28°04.8	18.3
2	224°15.6	189°54.0	25.6	97°12.3	54.7	234°31.6	29.3	43°07.4	18.4
3	239°18.1	204°53.5	·· 26.8	112°14.1	·· 54.5	249°33.5	·· 29.1	58°10.1	·· 18.4
4	254°20.5	219°53.0	27.9	127°15.9	54.3	264°35.5	28.9	73°12.7	18.5
5	269°23.0	234°52.5	29.0	142°17.7	54.0	279°37.4	28.7	88°15.3	18.6
6	284°25.5	249°52.0	N13°30.1	157°19.5	N21°53.8	294°39.3	S05°28.4	103°18.0	N02°18.6
7	299°27.9	264°51.5	31.2	172°21.3	53.6	309°41.3	28.2	118°20.6	18.7
8	314°30.4	279°51.0	32.3	187°23.1	53.3	324°43.2	28.0	133°23.2	18.8
9	329°32.9	294°50.5	·· 33.4	202°24.9	·· 53.1	339°45.1	·· 27.8	148°25.9	·· 18.9
10	344°35.3	309°50.1	34.5	217°26.7	52.9	354°47.1	27.6	163°28.5	18.9
11	359°37.8	324°49.6	35.6	232°28.5	52.6	9°49.0	27.4	178°31.1	19.0
12	14°40.3	339°49.1	N13°36.7	247°30.3	N21°52.4	24°51.0	S05°27.1	193°33.8	N02°19.1
13	29°42.7	354°48.6	37.8	262°32.1	52.2	39°52.9	26.9	208°36.4	19.1
14	44°45.2	9°48.1	38.9	277°33.9	51.9	54°54.8	26.7	223°39.0	19.2
15	59°47.7	24°47.6	·· 40.0	292°35.7	·· 51.7	69°56.8	·· 26.5	238°41.7	·· 19.3
16	74°50.1	39°47.1	41.1	307°37.5	51.5	84°58.7	26.3	253°44.3	19.4
17	89°52.6	54°46.6	42.2	322°39.3	51.2	100°00.6	26.0	268°46.9	19.4
18	104°55.0	69°46.1	N13°43.3	337°41.0	N21°51.0	115°02.6	S05°25.8	283°49.6	N02°19.5
19	119°57.5	84°45.6	44.4	352°42.8	50.8	130°04.5	25.6	298°52.2	19.6
20	135°00.0	99°45.2	45.5	7°44.6	50.5	145°06.5	25.4	313°54.8	19.6
21	150°02.4	114°44.7	·· 46.6	22°46.4	·· 50.3	160°08.4	·· 25.2	328°57.5	·· 19.7
22	165°04.9	129°44.2	47.7	37°48.2	50.1	175°10.3	25.0	344°00.1	19.8
23	180°07.4	144°43.7	48.8	52°50.0	49.8	190°12.3	24.7	359°02.7	19.9
Mer.pass.:11:01		v-0.5 d1.1 m-3.8		v1.8 d-0.2 m0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.1
Hamal	328°03.8	23°30.7
Polaris	319°20.3	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°54.0
Aldebaran	290°52.3	16°31.8
Rigel	281°14.4	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.6	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.3	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.4	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.5	28°00.1
Avior	234°18.9	-59°32.9
Suhail	222°54.0	-43°28.8
Miaplacidus	221°39.9	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.9
Dubhe	193°53.7	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.6
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.8	-60°25.4
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.4	-60°52.7
Kochab	137°18.6	74°06.5
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.7	26°40.5
Antares	112°28.9	-26°27.3
Atria	107°32.7	-69°02.6
Sabik	102°15.1	-15°44.3
Shaula	96°24.9	-37°06.6
Rasalhague	96°08.5	12°32.9
Eltanin	90°47.1	51°28.9
Kaus Aust.	83°46.8	-34°22.7
Vega	80°40.5	38°47.3
Nunki	76°01.2	-26°17.0
Altair	62°10.6	8°53.6
Peacock	53°23.0	-56°41.9
Deneb	49°33.3	45°18.8
Enif	33°49.6	9°55.2
Al Na'ir	27°46.9	-46°54.5
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°41.0	15°15.6

Apr 04 Sun	**SHA**	**Mer.pass**
Venus	328°05.3	13:19
Mars	233°28.8	19:35
Jupiter	10°42.4	10:27
Saturn	178°43.2	23:12

Apr 05 Mon	**SHA**	**Mer.pass**
Venus	326°54.9	13:20
Mars	233°13.7	19:32
Jupiter	10°29.7	10:24
Saturn	178°47.4	23:08

Apr 06 Tue	**SHA**	**Mer.pass**
Venus	325°44.2	13:21
Mars	232°58.0	19:29
Jupiter	10°17.0	10:21
Saturn	178°51.5	23:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°12.8	N05°34.0	296°44.1	8.2'	S25°16.8	-0.8'	56.3'
1	194°13.0	35.0	311°11.3	8.2'	25°17.5	-0.6'	56.2'
2	209°13.2	36.0	325°38.6	8.3'	25°18.1	-0.5'	56.2'
3	224°13.3	·· 36.9	340°05.8	8.3'	25°18.5	-0.3'	56.2'
4	239°13.5	37.9	354°33.2	8.3'	25°18.7	-0.2'	56.1'
5	254°13.7	38.8	9°00.5	8.4'	25°18.9	-0.1'	56.1'
6	269°13.9	N05°39.8	23°27.9	8.4'	S25°18.9	0.1'	56.1'
7	284°14.1	40.7	37°55.4	8.5'	25°18.7	0.2'	56.0'
8	299°14.3	41.7	52°22.9	8.5'	25°18.4	0.4'	56.0'
9	314°14.4	·· 42.6	66°50.4	8.6'	25°18.0	0.5'	56.0'
10	329°14.6	43.6	81°18.0	8.6'	25°17.4	0.6'	56.0'
11	344°14.8	44.5	95°45.6	8.7'	25°16.7	0.8'	55.9'
12	359°15.0	N05°45.5	110°13.3	8.7'	S25°15.9	0.9'	55.9'
13	14°15.2	46.4	124°41.0	8.7'	25°14.9	1.0'	55.9'
14	29°15.3	47.4	139°08.8	8.8'	25°13.8	1.2'	55.8'
15	44°15.5	·· 48.3	153°36.6	8.8'	25°12.6	1.3'	55.8'
16	59°15.7	49.3	168°04.5	8.9'	25°11.2	1.4'	55.8'
17	74°15.9	50.2	182°32.4	9.0'	25°09.7	1.6'	55.7'
18	89°16.1	N05°51.2	197°00.4	9.0'	S25°08.1	1.7'	55.7'
19	104°16.3	52.2	211°28.4	9.1'	25°06.3	1.8'	55.7'
20	119°16.4	53.1	225°56.5	9.1'	25°04.4	2.0'	55.7'
21	134°16.6	·· 54.1	240°24.7	9.2'	25°02.4	2.1'	55.6'
22	149°16.8	55.0	254°52.9	9.2'	25°00.3	2.2'	55.6'
23	164°17.0	56.0	269°21.1	9.3'	24°58.0	2.3'	55.6'
	SD.=16.0	d=1.0	S.D.=15.2				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°17.2	N05°56.9	283°49.4	9.3'	S24°55.6	2.5'	55.5'
1	194°17.3	57.9	298°17.8	9.4'	24°53.0	2.6'	55.5'
2	209°17.5	58.8	312°46.3	9.5'	24°50.4	2.7'	55.5'
3	224°17.7	05°59.8	327°14.8	9.5'	24°47.6	2.9'	55.5'
4	239°17.9	06°00.7	341°43.3	9.6'	24°44.7	3.0'	55.4'
5	254°18.1	01.7	356°11.9	9.6'	24°41.6	3.1'	55.4'
6	269°18.2	N06°02.6	10°40.6	9.7'	S24°38.5	3.2'	55.4'
7	284°18.4	03.6	25°09.3	9.8'	24°35.2	3.3'	55.3'
8	299°18.6	04.5	39°38.2	9.8'	24°31.8	3.5'	55.3'
9	314°18.8	·· 05.5	54°07.0	9.9'	24°28.3	3.6'	55.3'
10	329°19.0	06.4	68°36.0	10.0'	24°24.6	3.7'	55.3'
11	344°19.1	07.4	83°05.0	10.0'	24°20.9	3.8'	55.2'
12	359°19.3	N06°08.3	97°34.0	10.1'	S24°17.0	3.9'	55.2'
13	14°19.5	09.3	112°03.2	10.2'	24°13.0	4.1'	55.2'
14	29°19.7	10.2	126°32.4	10.2'	24°08.8	4.2'	55.2'
15	44°19.9	·· 11.1	141°01.6	10.3'	24°04.6	4.3'	55.1'
16	59°20.0	12.1	155°30.9	10.4'	24°00.3	4.4'	55.1'
17	74°20.2	13.0	170°00.3	10.4'	23°55.8	4.5'	55.1'
18	89°20.4	N06°14.0	184°29.8	10.5'	S23°51.2	4.6'	55.1'
19	104°20.6	14.9	198°59.3	10.6'	23°46.5	4.7'	55.1'
20	119°20.8	15.9	213°28.9	10.6'	23°41.7	4.9'	55.0'
21	134°20.9	·· 16.8	227°58.6	10.7'	23°36.8	5.0'	55.0'
22	149°21.1	17.8	242°28.3	10.8'	23°31.8	5.1'	55.0'
23	164°21.3	18.7	256°58.1	10.8'	23°26.7	5.2'	55.0'
	SD.=16.0	d=1.0	S.D.=15.0				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°21.5	N06°19.7	271°28.0	10.9'	S23°21.4	5.3'	54.9'
1	194°21.6	20.6	285°58.0	11.0'	23°16.1	5.4'	54.9'
2	209°21.8	21.6	300°28.0	11.0'	23°10.6	5.5'	54.9'
3	224°22.0	·· 22.5	314°58.1	11.1'	23°05.0	5.6'	54.9'
4	239°22.2	23.5	329°28.2	11.2'	22°59.4	5.7'	54.9'
5	254°22.4	24.4	343°58.5	11.3'	22°53.6	5.8'	54.8'
6	269°22.5	N06°25.3	358°28.7	11.3'	S22°47.7	5.9'	54.8'
7	284°22.7	26.3	12°59.1	11.4'	22°41.7	6.0'	54.8'
8	299°22.9	27.2	27°29.5	11.5'	22°35.7	6.1'	54.8'
9	314°23.1	·· 28.2	42°00.1	11.5'	22°29.5	6.2'	54.8'
10	329°23.3	29.1	56°30.6	11.6'	22°23.2	6.3'	54.7'
11	344°23.4	30.1	71°01.3	11.7'	22°16.8	6.4'	54.7'
12	359°23.6	N06°31.0	85°32.0	11.8'	S22°10.3	6.5'	54.7'
13	14°23.8	32.0	100°02.8	11.8'	22°03.7	6.6'	54.7'
14	29°24.0	32.9	114°33.6	11.9'	21°57.1	6.7'	54.7'
15	44°24.1	·· 33.8	129°04.6	12.0'	21°50.3	6.8'	54.6'
16	59°24.3	34.8	143°35.6	12.0'	21°43.4	6.9'	54.6'
17	74°24.5	35.7	158°06.6	12.1'	21°36.4	7.0'	54.6'
18	89°24.7	N06°36.7	172°37.8	12.2'	S21°29.4	7.1'	54.6'
19	104°24.8	37.6	187°09.0	12.2'	21°22.2	7.2'	54.6'
20	119°25.0	38.6	201°40.2	12.3'	21°15.0	7.3'	54.6'
21	134°25.2	·· 39.5	216°11.6	12.4'	21°07.7	7.4'	54.5'
22	149°25.4	40.4	230°43.0	12.4'	21°00.2	7.5'	54.5'
23	164°25.6	41.4	245°14.5	12.5'	20°52.7	7.6'	54.5'
	SD.=16.0	d=0.9	S.D.=14.9				

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

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

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 68-49%
04	03:09	03:00	12:03	04:23	16:49	
05	02:51	02:43	12:03	05:16	17:41	
06	02:34	02:26	12:02	06:06	18:30	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	195°09.8	159°43.2	N13°49.9	67°51.8	N21°49.6	205°14.2	S05°24.5	14°05.4	N02°19.9
1	210°12.3	174°42.7	51.0	82°53.5	49.4	220°16.1	24.3	29°08.0	20.0
2	225°14.8	189°42.2	52.1	97°55.3	49.1	235°18.1	24.1	44°10.6	20.1
3	240°17.2	204°41.7	·· 53.2	112°57.1	·· 48.9	250°20.0	·· 23.9	59°13.3	·· 20.1
4	255°19.7	219°41.2	54.3	127°58.9	48.7	265°22.0	23.7	74°15.9	20.2
5	270°22.2	234°40.7	55.4	143°00.7	48.4	280°23.9	23.4	89°18.5	20.3
6	285°24.6	249°40.2	N13°56.5	158°02.5	N21°48.2	295°25.8	S05°23.2	104°21.2	N02°20.4
7	300°27.1	264°39.7	57.6	173°04.2	47.9	310°27.8	23.0	119°23.8	20.4
8	315°29.5	279°39.2	58.7	188°06.0	47.7	325°29.7	22.8	134°26.4	20.5
9	330°32.0	294°38.7	13°59.8	203°07.8	·· 47.5	340°31.7	·· 22.6	149°29.1	·· 20.6
10	345°34.5	309°38.2	14°00.9	218°09.6	47.2	355°33.6	22.4	164°31.7	20.6
11	0°36.9	324°37.7	01.9	233°11.3	47.0	10°35.5	22.1	179°34.3	20.7
12	15°39.4	339°37.2	N14°03.0	248°13.1	N21°46.8	25°37.5	S05°21.9	194°37.0	N02°20.8
13	30°41.9	354°36.7	04.1	263°14.9	46.5	40°39.4	21.7	209°39.6	20.9
14	45°44.3	9°36.2	05.2	278°16.7	46.3	55°41.3	21.5	224°42.2	20.9
15	60°46.8	24°35.7	·· 06.3	293°18.4	·· 46.1	70°43.3	·· 21.3	239°44.9	·· 21.0
16	75°49.3	39°35.2	07.4	308°20.2	45.8	85°45.2	21.1	254°47.5	21.1
17	90°51.7	54°34.7	08.5	323°22.0	45.6	100°47.2	20.8	269°50.1	21.1
18	105°54.2	69°34.2	N14°09.6	338°23.8	N21°45.3	115°49.1	S05°20.6	284°52.8	N02°21.2
19	120°56.6	84°33.7	10.7	353°25.5	45.1	130°51.0	20.4	299°55.4	21.3
20	135°59.1	99°33.2	11.7	8°27.3	44.9	145°53.0	20.2	314°58.0	21.4
21	151°01.6	114°32.7	·· 12.8	23°29.1	·· 44.6	160°54.9	·· 20.0	330°00.7	·· 21.4
22	166°04.0	129°32.2	13.9	38°30.8	44.4	175°56.9	19.7	345°03.3	21.5
23	181°06.5	144°31.7	15.0	53°32.6	44.1	190°58.8	19.5	0°05.9	21.6
Mer.pass.:10:58		v-0.5 d1.1 m-3.8		v1.8 d-0.2 m0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	196°09.0	159°31.2	N14°16.1	68°34.4	N21°43.9	206°00.7	S05°19.3	15°08.5	N02°21.6
1	211°11.4	174°30.7	17.2	83°36.1	43.7	221°02.7	19.1	30°11.2	21.7
2	226°13.9	189°30.2	18.2	98°37.9	43.4	236°04.6	18.9	45°13.8	21.8
3	241°16.4	204°29.7	·· 19.3	113°39.7	·· 43.2	251°06.6	·· 18.7	60°16.4	·· 21.8
4	256°18.8	219°29.2	20.4	128°41.4	42.9	266°08.5	18.4	75°19.1	21.9
5	271°21.3	234°28.7	21.5	143°43.2	42.7	281°10.4	18.2	90°21.7	22.0
6	286°23.8	249°28.2	N14°22.6	158°45.0	N21°42.5	296°12.4	S05°18.0	105°24.3	N02°22.1
7	301°26.2	264°27.7	23.6	173°46.7	42.2	311°14.3	17.8	120°27.0	22.1
8	316°28.7	279°27.2	24.7	188°48.5	42.0	326°16.3	17.6	135°29.6	22.2
9	331°31.1	294°26.6	·· 25.8	203°50.2	·· 41.7	341°18.2	·· 17.4	150°32.2	·· 22.3
10	346°33.6	309°26.1	26.9	218°52.0	41.5	356°20.2	17.2	165°34.9	22.3
11	1°36.1	324°25.6	27.9	233°53.7	41.3	11°22.1	16.9	180°37.5	22.4
12	16°38.5	339°25.1	N14°29.0	248°55.5	N21°41.0	26°24.0	S05°16.7	195°40.1	N02°22.5
13	31°41.0	354°24.6	30.1	263°57.3	40.8	41°26.0	16.5	210°42.8	22.5
14	46°43.5	9°24.1	31.2	278°59.0	40.5	56°27.9	16.3	225°45.4	22.6
15	61°45.9	24°23.6	·· 32.2	294°00.8	·· 40.3	71°29.9	·· 16.1	240°48.0	·· 22.7
16	76°48.4	39°23.1	33.3	309°02.5	40.0	86°31.8	15.9	255°50.6	22.8
17	91°50.9	54°22.6	34.4	324°04.3	39.8	101°33.7	15.6	270°53.3	22.8
18	106°53.3	69°22.1	N14°35.5	339°06.0	N21°39.6	116°35.7	S05°15.4	285°55.9	N02°22.9
19	121°55.8	84°21.6	36.5	354°07.8	39.3	131°37.6	15.2	300°58.5	23.0
20	136°58.3	99°21.0	37.6	9°09.5	39.1	146°39.6	15.0	316°01.2	23.0
21	152°00.7	114°20.5	·· 38.7	24°11.3	·· 38.8	161°41.5	·· 14.8	331°03.8	·· 23.1
22	167°03.2	129°20.0	39.7	39°13.0	38.6	176°43.5	14.6	346°06.4	23.2
23	182°05.6	144°19.5	40.8	54°14.8	38.3	191°45.4	14.3	1°09.1	23.2
Mer.pass.:10:54		v-0.5 d1.1 m-3.8		v1.8 d-0.2 m0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	197°08.1	159°19.0	N14°41.9	69°16.5	N21°38.1	206°47.3	S05°14.1	16°11.7	N02°23.3
1	212°10.6	174°18.5	43.0	84°18.3	37.8	221°49.3	13.9	31°14.3	23.4
2	227°13.0	189°18.0	44.0	99°20.0	37.6	236°51.2	13.7	46°17.0	23.5
3	242°15.5	204°17.4	·· 45.1	114°21.8	·· 37.4	251°53.2	·· 13.5	61°19.6	·· 23.5
4	257°18.0	219°16.9	46.2	129°23.5	37.1	266°55.1	13.3	76°22.2	23.6
5	272°20.4	234°16.4	47.2	144°25.3	36.9	281°57.0	13.0	91°24.8	23.7
6	287°22.9	249°15.9	N14°48.3	159°27.0	N21°36.6	296°59.0	S05°12.8	106°27.5	N02°23.7
7	302°25.4	264°15.4	49.3	174°28.8	36.4	312°00.9	12.6	121°30.1	23.8
8	317°27.8	279°14.9	50.4	189°30.5	36.1	327°02.9	12.4	136°32.7	23.9
9	332°30.3	294°14.3	·· 51.5	204°32.2	·· 35.9	342°04.8	·· 12.2	151°35.4	·· 23.9
10	347°32.7	309°13.8	52.5	219°34.0	35.6	357°06.8	12.0	166°38.0	24.0
11	2°35.2	324°13.3	53.6	234°35.7	35.4	12°08.7	11.8	181°40.6	24.1
12	17°37.7	339°12.8	N14°54.7	249°37.5	N21°35.1	27°10.6	S05°11.5	196°43.2	N02°24.1
13	32°40.1	354°12.3	55.7	264°39.2	34.9	42°12.6	11.3	211°45.9	24.2
14	47°42.6	9°11.8	56.8	279°40.9	34.6	57°14.5	11.1	226°48.5	24.3
15	62°45.1	24°11.2	·· 57.8	294°42.7	·· 34.4	72°16.5	·· 10.9	241°51.1	·· 24.3
16	77°47.5	39°10.7	58.9	309°44.4	34.2	87°18.4	10.7	256°53.8	24.4
17	92°50.0	54°10.2	14°59.9	324°46.2	33.9	102°20.4	10.5	271°56.4	24.5
18	107°52.5	69°09.7	N15°01.0	339°47.9	N21°33.7	117°22.3	S05°10.2	286°59.0	N02°24.6
19	122°54.9	84°09.1	02.1	354°49.6	33.4	132°24.3	10.0	302°01.7	24.6
20	137°57.4	99°08.6	03.1	9°51.4	33.2	147°26.2	09.8	317°04.3	24.7
21	152°59.9	114°08.1	·· 04.2	24°53.1	·· 32.9	162°28.1	·· 09.6	332°06.9	·· 24.8
22	168°02.3	129°07.6	05.2	39°54.8	32.7	177°30.1	09.4	347°09.5	24.8
23	183°04.8	144°07.1	06.3	54°56.6	32.4	192°32.0	09.2	2°12.2	24.9
Mer.pass.:10:50		v-0.5 d1.1 m-3.8		v1.7 d-0.2 m0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.3	-42°15.0
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.1
Hamal	328°03.8	23°30.7
Polaris	319°20.8	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°54.0
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.1	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.7	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.3	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.4	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.5	28°00.1
Avior	234°18.9	-59°32.9
Suhail	222°54.0	-43°28.8
Miaplacidus	221°40.0	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.7	11°54.9
Dubhe	193°53.8	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.6
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.8	-60°25.4
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.4	-60°52.7
Kochab	137°18.5	74°06.5
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.5
Antares	112°28.9	-26°27.3
Atria	107°32.6	-69°02.6
Sabik	102°15.0	-15°44.3
Shaula	96°24.9	-37°06.6
Rasalhague	96°08.5	12°32.9
Eltanin	90°47.0	51°28.9
Kaus Aust.	83°46.8	-34°22.7
Vega	80°40.5	38°47.3
Nunki	76°01.1	-26°17.0
Altair	62°10.6	8°53.6
Peacock	53°22.9	-56°41.9
Deneb	49°33.3	45°18.8
Enif	33°49.6	9°55.2
Al Na'ir	27°46.8	-46°54.5
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°41.0	15°15.6

Apr 07 Wed	**SHA**	**Mer.pass**
Venus	324°33.3	13:22
Mars	232°41.9	19:26
Jupiter	10°04.4	10:18
Saturn	178°55.5	23:00

Apr 08 Thu	**SHA**	**Mer.pass**
Venus	323°22.2	13:22
Mars	232°25.4	19:23
Jupiter	9°51.8	10:15
Saturn	178°59.6	22:55

Apr 09 Fri	**SHA**	**Mer.pass**
Venus	322°10.9	13:23
Mars	232°08.4	19:21
Jupiter	9°39.2	10:12
Saturn	179°03.6	22:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°25.7	N06°42.3	259°46.0	12.6'	S20°45.1	7.6'	54.5'
1	194°25.9	43.3	274°17.6	12.7'	20°37.4	7.7'	54.5'
2	209°26.1	44.2	288°49.3	12.7'	20°29.6	7.8'	54.5'
3	224°26.3	·· 45.2	303°21.1	12.8'	20°21.8	7.9'	54.5'
4	239°26.4	46.1	317°52.9	12.9'	20°13.8	8.0'	54.4'
5	254°26.6	47.0	332°24.8	12.9'	20°05.8	8.1'	54.4'
6	269°26.8	N06°48.0	346°56.7	13.0'	S19°57.7	8.2'	54.4'
7	284°27.0	48.9	1°28.7	13.1'	19°49.5	8.2'	54.4'
8	299°27.1	49.9	16°00.8	13.1'	19°41.2	8.3'	54.4'
9	314°27.3	·· 50.8	30°33.0	13.2'	19°32.8	8.4'	54.4'
10	329°27.5	51.7	45°05.2	13.2'	19°24.4	8.5'	54.4'
11	344°27.7	52.7	59°37.5	13.3'	19°15.8	8.6'	54.4'
12	359°27.8	N06°53.6	74°09.8	13.4'	S19°07.2	8.6'	54.3'
13	14°28.0	54.6	88°42.2	13.4'	18°58.6	8.7'	54.3'
14	29°28.2	55.5	103°14.7	13.5'	18°49.8	8.8'	54.3'
15	44°28.4	·· 56.4	117°47.2	13.6'	18°41.0	8.9'	54.3'
16	59°28.5	57.4	132°19.8	13.6'	18°32.1	9.0'	54.3'
17	74°28.7	58.3	146°52.5	13.7'	18°23.1	9.0'	54.3'
18	89°28.9	N06°59.3	161°25.2	13.7'	S18°14.0	9.1'	54.3'
19	104°29.1	07°00.2	175°58.0	13.8'	18°04.9	9.2'	54.3'
20	119°29.2	01.1	190°30.8	13.9'	17°55.7	9.2'	54.3'
21	134°29.4	·· 02.1	205°03.7	13.9'	17°46.4	9.3'	54.3'
22	149°29.6	03.0	219°36.7	14.0'	17°37.0	9.4'	54.3'
23	164°29.8	03.9	234°09.7	14.0'	17°27.6	9.5'	54.2'
	SD.=16.0	d=0.9	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°29.9	N07°04.9	248°42.7	14.1'	S17°18.1	9.5'	54.2'
1	194°30.1	05.8	263°15.9	14.2'	17°08.6	9.6'	54.2'
2	209°30.3	06.8	277°49.1	14.2'	16°58.9	9.7'	54.2'
3	224°30.5	·· 07.7	292°22.3	14.3'	16°49.2	9.7'	54.2'
4	239°30.6	08.6	306°55.6	14.3'	16°39.5	9.8'	54.2'
5	254°30.8	09.6	321°29.0	14.4'	16°29.6	9.9'	54.2'
6	269°31.0	N07°10.5	336°02.4	14.4'	S16°19.7	9.9'	54.2'
7	284°31.1	11.4	350°35.8	14.5'	16°09.8	10.0'	54.2'
8	299°31.3	12.4	5°09.3	14.5'	15°59.8	10.1'	54.2'
9	314°31.5	·· 13.3	19°42.9	14.6'	15°49.7	10.1'	54.2'
10	329°31.7	14.2	34°16.5	14.6'	15°39.5	10.2'	54.2'
11	344°31.8	15.2	48°50.2	14.7'	15°29.3	10.2'	54.2'
12	359°32.0	N07°16.1	63°23.9	14.7'	S15°19.1	10.3'	54.2'
13	14°32.2	17.0	77°57.7	14.8'	15°08.7	10.4'	54.2'
14	29°32.4	18.0	92°31.5	14.8'	14°58.3	10.4'	54.2'
15	44°32.5	·· 18.9	107°05.4	14.9'	14°47.9	10.5'	54.2'
16	59°32.7	19.8	121°39.3	14.9'	14°37.4	10.5'	54.2'
17	74°32.9	20.8	136°13.2	15.0'	14°26.8	10.6'	54.2'
18	89°33.0	N07°21.7	150°47.2	15.0'	S14°16.2	10.6'	54.1'
19	104°33.2	22.6	165°21.3	15.1'	14°05.5	10.7'	54.1'
20	119°33.4	23.6	179°55.4	15.1'	13°54.8	10.8'	54.1'
21	134°33.6	·· 24.5	194°29.5	15.2'	13°44.0	10.8'	54.1'
22	149°33.7	25.4	209°03.7	15.2'	13°33.2	10.9'	54.1'
23	164°33.9	26.4	223°37.9	15.2'	13°22.3	10.9'	54.1'
	SD.=16.0	d=0.9	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°34.1	N07°27.3	238°12.2	15.3'	S13°11.3	11.0'	54.1'
1	194°34.2	28.2	252°46.5	15.3'	13°00.3	11.0'	54.1'
2	209°34.4	29.2	267°20.9	15.4'	12°49.3	11.1'	54.1'
3	224°34.6	·· 30.1	281°55.3	15.4'	12°38.2	11.1'	54.1'
4	239°34.8	31.0	296°29.7	15.4'	12°27.1	11.2'	54.1'
5	254°34.9	32.0	311°04.1	15.5'	12°15.9	11.2'	54.1'
6	269°35.1	N07°32.9	325°38.6	15.5'	S12°04.6	11.3'	54.1'
7	284°35.3	33.8	340°13.2	15.6'	11°53.3	11.3'	54.1'
8	299°35.4	34.8	354°47.7	15.6'	11°42.0	11.4'	54.1'
9	314°35.6	·· 35.7	9°22.4	15.6'	11°30.6	11.4'	54.1'
10	329°35.8	36.6	23°57.0	15.7'	11°19.2	11.5'	54.1'
11	344°35.9	37.5	38°31.7	15.7'	11°07.7	11.5'	54.1'
12	359°36.1	N07°38.5	53°06.4	15.7'	S10°56.2	11.5'	54.1'
13	14°36.3	39.4	67°41.1	15.7'	10°44.6	11.6'	54.2'
14	29°36.5	40.3	82°15.9	15.8'	10°33.0	11.6'	54.2'
15	44°36.6	·· 41.3	96°50.7	15.8'	10°21.4	11.7'	54.2'
16	59°36.8	42.2	111°25.5	15.8'	10°09.7	11.7'	54.2'
17	74°37.0	43.1	126°00.3	15.9'	09°58.0	11.7'	54.2'
18	89°37.1	N07°44.0	140°35.2	15.9'	S09°46.2	11.8'	54.2'
19	104°37.3	45.0	155°10.1	15.9'	09°34.4	11.8'	54.2'
20	119°37.5	45.9	169°45.0	15.9'	09°22.5	11.9'	54.2'
21	134°37.6	·· 46.8	184°20.0	16.0'	09°10.7	11.9'	54.2'
22	149°37.8	47.8	198°55.0	16.0'	08°58.7	11.9'	54.2'
23	164°38.0	48.7	213°30.0	16.0'	08°46.8	12.0'	54.2'
	SD.=16.0	d=0.9	S.D.=14.8				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 23-25 40-22%
07	02:17	02:09	12:02	06:54	19:17	
08	02:00	01:52	12:02	07:39	20:00	
09	01:44	01:36	12:02	08:21	20:42	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	198°07.2	159°06.5	N15°07.3	69°58.3	N21°32.2	207°34.0	S05°09.0	17°14.8	N02°25.0
1	213°09.7	174°06.0	08.4	85°00.0	31.9	222°35.9	08.7	32°17.4	25.0
2	228°12.2	189°05.5	09.4	100°01.7	31.7	237°37.9	08.5	47°20.1	25.1
3	243°14.6	204°05.0	·· 10.5	115°03.5	·· 31.4	252°39.8	·· 08.3	62°22.7	·· 25.2
4	258°17.1	219°04.4	11.5	130°05.2	31.2	267°41.8	08.1	77°25.3	25.2
5	273°19.6	234°03.9	12.6	145°06.9	30.9	282°43.7	07.9	92°27.9	25.3
6	288°22.0	249°03.4	N15°13.6	160°08.7	N21°30.7	297°45.6	S05°07.7	107°30.6	N02°25.4
7	303°24.5	264°02.9	14.7	175°10.4	30.4	312°47.6	07.4	122°33.2	25.4
8	318°27.0	279°02.3	15.7	190°12.1	30.2	327°49.5	07.2	137°35.8	25.5
9	333°29.4	294°01.8	·· 16.8	205°13.8	·· 29.9	342°51.5	·· 07.0	152°38.5	·· 25.6
10	348°31.9	309°01.3	17.8	220°15.6	29.7	357°53.4	06.8	167°41.1	25.7
11	3°34.4	324°00.7	18.9	235°17.3	29.4	12°55.4	06.6	182°43.7	25.7
12	18°36.8	339°00.2	N15°19.9	250°19.0	N21°29.2	27°57.3	S05°06.4	197°46.3	N02°25.8
13	33°39.3	353°59.7	21.0	265°20.7	28.9	42°59.3	06.2	212°49.0	25.9
14	48°41.7	8°59.2	22.0	280°22.4	28.7	58°01.2	05.9	227°51.6	25.9
15	63°44.2	23°58.6	·· 23.1	295°24.2	·· 28.4	73°03.1	·· 05.7	242°54.2	·· 26.0
16	78°46.7	38°58.1	24.1	310°25.9	28.2	88°05.1	05.5	257°56.8	26.1
17	93°49.1	53°57.6	25.1	325°27.6	27.9	103°07.0	05.3	272°59.5	26.1
18	108°51.6	68°57.0	N15°26.2	340°29.3	N21°27.6	118°09.0	S05°05.1	288°02.1	N02°26.2
19	123°54.1	83°56.5	27.2	355°31.0	27.4	133°10.9	04.9	303°04.7	26.3
20	138°56.5	98°56.0	28.3	10°32.8	27.1	148°12.9	04.7	318°07.4	26.3
21	153°59.0	113°55.4	·· 29.3	25°34.5	·· 26.9	163°14.8	·· 04.4	333°10.0	·· 26.4
22	169°01.5	128°54.9	30.3	40°36.2	26.6	178°16.8	04.2	348°12.6	26.5
23	184°03.9	143°54.4	31.4	55°37.9	26.4	193°18.7	04.0	3°15.2	26.5
Mer.pass.:10:46		v-0.5 d1.1 m-3.8		v1.7 d-0.2 m0.3		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	199°06.4	158°53.8	N15°32.4	70°39.6	N21°26.1	208°20.7	S05°03.8	18°17.9	N02°26.6
1	214°08.8	173°53.3	33.4	85°41.3	25.9	223°22.6	03.6	33°20.5	26.7
2	229°11.3	188°52.8	34.5	100°43.0	25.6	238°24.6	03.4	48°23.1	26.7
3	244°13.8	203°52.2	·· 35.5	115°44.8	·· 25.4	253°26.5	·· 03.2	63°25.7	·· 26.8
4	259°16.2	218°51.7	36.6	130°46.5	25.1	268°28.4	02.9	78°28.4	26.9
5	274°18.7	233°51.2	37.6	145°48.2	24.9	283°30.4	02.7	93°31.0	26.9
6	289°21.2	248°50.6	N15°38.6	160°49.9	N21°24.6	298°32.3	S05°02.5	108°33.6	N02°27.0
7	304°23.6	263°50.1	39.7	175°51.6	24.3	313°34.3	02.3	123°36.2	27.1
8	319°26.1	278°49.5	40.7	190°53.3	24.1	328°36.2	02.1	138°38.9	27.1
9	334°28.6	293°49.0	·· 41.7	205°55.0	·· 23.8	343°38.2	·· 01.9	153°41.5	·· 27.2
10	349°31.0	308°48.5	42.7	220°56.7	23.6	358°40.1	01.7	168°44.1	27.3
11	4°33.5	323°47.9	43.8	235°58.4	23.3	13°42.1	01.4	183°46.8	27.3
12	19°36.0	338°47.4	N15°44.8	251°00.1	N21°23.1	28°44.0	S05°01.2	198°49.4	N02°27.4
13	34°38.4	353°46.8	45.8	266°01.8	22.8	43°46.0	01.0	213°52.0	27.5
14	49°40.9	8°46.3	46.9	281°03.5	22.6	58°47.9	00.8	228°54.6	27.5
15	64°43.3	23°45.8	·· 47.9	296°05.2	·· 22.3	73°49.9	·· 00.6	243°57.3	·· 27.6
16	79°45.8	38°45.2	48.9	311°06.9	22.0	88°51.8	00.4	258°59.9	27.7
17	94°48.3	53°44.7	49.9	326°08.7	21.8	103°53.8	05°00.2	274°02.5	27.7
18	109°50.7	68°44.1	N15°51.0	341°10.4	N21°21.5	118°55.7	S04°59.9	289°05.1	N02°27.8
19	124°53.2	83°43.6	52.0	356°12.1	21.3	133°57.7	59.7	304°07.8	27.9
20	139°55.7	98°43.1	53.0	11°13.8	21.0	148°59.6	59.5	319°10.4	27.9
21	154°58.1	113°42.5	·· 54.0	26°15.5	·· 20.8	164°01.6	·· 59.3	334°13.0	·· 28.0
22	170°00.6	128°42.0	55.1	41°17.2	20.5	179°03.5	59.1	349°15.6	28.1
23	185°03.1	143°41.4	56.1	56°18.8	20.2	194°05.4	58.9	4°18.3	28.1
Mer.pass.:10:42		v-0.5 d1.0 m-3.8		v1.7 d-0.3 m0.4		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	200°05.5	158°40.9	N15°57.1	71°20.5	N21°20.0	209°07.4	S04°58.7	19°20.9	N02°28.2
1	215°08.0	173°40.3	58.1	86°22.2	19.7	224°09.3	58.5	34°23.5	28.3
2	230°10.4	188°39.8	15°59.1	101°23.9	19.5	239°11.3	58.2	49°26.1	28.3
3	245°12.9	203°39.2	16°00.2	116°25.6	·· 19.2	254°13.2	·· 58.0	64°28.8	·· 28.4
4	260°15.4	218°38.7	01.2	131°27.3	18.9	269°15.2	57.8	79°31.4	28.5
5	275°17.8	233°38.2	02.2	146°29.0	18.7	284°17.1	57.6	94°34.0	28.5
6	290°20.3	248°37.6	N16°03.2	161°30.7	N21°18.4	299°19.1	S04°57.4	109°36.6	N02°28.6
7	305°22.8	263°37.1	04.2	176°32.4	18.2	314°21.0	57.2	124°39.3	28.7
8	320°25.2	278°36.5	05.2	191°34.1	17.9	329°23.0	57.0	139°41.9	28.7
9	335°27.7	293°36.0	·· 06.3	206°35.8	·· 17.6	344°24.9	·· 56.7	154°44.5	·· 28.8
10	350°30.2	308°35.4	07.3	221°37.5	17.4	359°26.9	56.5	169°47.1	28.9
11	5°32.6	323°34.9	08.3	236°39.2	17.1	14°28.8	56.3	184°49.8	28.9
12	20°35.1	338°34.3	N16°09.3	251°40.9	N21°16.9	29°30.8	S04°56.1	199°52.4	N02°29.0
13	35°37.6	353°33.8	10.3	266°42.6	16.6	44°32.7	55.9	214°55.0	29.1
14	50°40.0	8°33.2	11.3	281°44.2	16.3	59°34.7	55.7	229°57.6	29.1
15	65°42.5	23°32.7	·· 12.3	296°45.9	·· 16.1	74°36.6	·· 55.5	245°00.3	·· 29.2
16	80°44.9	38°32.1	13.3	311°47.6	15.8	89°38.6	55.3	260°02.9	29.3
17	95°47.4	53°31.6	14.4	326°49.3	15.6	104°40.5	55.0	275°05.5	29.3
18	110°49.9	68°31.0	N16°15.4	341°51.0	N21°15.3	119°42.5	S04°54.8	290°08.1	N02°29.4
19	125°52.3	83°30.4	16.4	356°52.7	15.0	134°44.4	54.6	305°10.7	29.5
20	140°54.8	98°29.9	17.4	11°54.4	14.8	149°46.4	54.4	320°13.4	29.5
21	155°57.3	113°29.3	·· 18.4	26°56.0	·· 14.5	164°48.3	·· 54.2	335°16.0	·· 29.6
22	170°59.7	128°28.8	19.4	41°57.7	14.2	179°50.3	54.0	350°18.6	29.7
23	186°02.2	143°28.2	20.4	56°59.4	14.0	194°52.2	53.8	5°21.2	29.7
Mer.pass.:10:38		v-0.5 d1.0 m-3.8		v1.7 d-0.3 m0.4		v1.9 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.3	-42°14.9
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.1
Hamal	328°03.8	23°30.7
Polaris	319°21.4	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°54.0
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.3	-52°42.4
Sirius	258°35.8	-16°44.0
Adhara	255°14.4	-28°59.4
Procyon	245°02.1	5°11.8
Pollux	243°30.5	28°00.1
Avior	234°19.0	-59°32.9
Suhail	222°54.1	-43°28.8
Miaplacidus	221°40.0	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.8	61°41.7
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.6
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.8	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.4	-60°52.7
Kochab	137°18.5	74°06.6
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.5
Antares	112°28.9	-26°27.3
Atria	107°32.6	-69°02.6
Sabik	102°15.0	-15°44.3
Shaula	96°24.9	-37°06.6
Rasalhague	96°08.5	12°32.9
Eltanin	90°47.0	51°28.9
Kaus Aust.	83°46.8	-34°22.7
Vega	80°40.5	38°47.3
Nunki	76°01.1	-26°17.0
Altair	62°10.5	8°53.6
Peacock	53°22.9	-56°41.9
Deneb	49°33.3	45°18.8
Enif	33°49.6	9°55.2
Al Na'ir	27°46.8	-46°54.5
Fomalhaut	15°26.8	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°40.9	15°15.6

Apr 10 Sat	**SHA**	**Mer.pass**
Venus	320°59.3	13:24
Mars	231°51.0	19:18
Jupiter	9°26.7	10:08
Saturn	179°07.6	22:47

Apr 11 Sun	**SHA**	**Mer.pass**
Venus	319°47.4	13:25
Mars	231°33.2	19:15
Jupiter	9°14.3	10:05
Saturn	179°11.5	22:43

Apr 12 Mon	**SHA**	**Mer.pass**
Venus	318°35.4	13:26
Mars	231°15.0	19:12
Jupiter	9°01.9	10:02
Saturn	179°15.4	22:39

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°38.1	N07°49.6	228°05.0	16.0'	S08°34.8	12.0'	54.2'
1	194°38.3	50.5	242°40.0	16.1'	08°22.8	12.0'	54.2'
2	209°38.5	51.5	257°15.1	16.1'	08°10.7	12.1'	54.2'
3	224°38.6	· · 52.4	271°50.2	16.1'	07°58.6	12.1'	54.2'
4	239°38.8	53.3	286°25.3	16.1'	07°46.5	12.1'	54.2'
5	254°39.0	54.2	301°00.4	16.1'	07°34.3	12.2'	54.2'
6	269°39.2	N07°55.2	315°35.5	16.1'	S07°22.1	12.2'	54.2'
7	284°39.3	56.1	330°10.7	16.2'	07°09.9	12.2'	54.2'
8	299°39.5	57.0	344°45.8	16.2'	06°57.6	12.3'	54.2'
9	314°39.7	· · 57.9	359°21.0	16.2'	06°45.3	12.3'	54.3'
10	329°39.8	58.9	13°56.2	16.2'	06°33.0	12.3'	54.3'
11	344°40.0	07°59.8	28°31.4	16.2'	06°20.6	12.4'	54.3'
12	359°40.2	N08°00.7	43°06.6	16.2'	S06°08.3	12.4'	54.3'
13	14°40.3	01.6	57°41.9	16.2'	05°55.9	12.4'	54.3'
14	29°40.5	02.6	72°17.1	16.2'	05°43.4	12.4'	54.3'
15	44°40.7	· · 03.5	86°52.3	16.2'	05°31.0	12.5'	54.3'
16	59°40.8	04.4	101°27.6	16.3'	05°18.5	12.5'	54.3'
17	74°41.0	05.3	116°02.8	16.3'	05°06.0	12.5'	54.3'
18	89°41.2	N08°06.2	130°38.1	16.3'	S04°53.5	12.5'	54.3'
19	104°41.3	07.2	145°13.4	16.3'	04°40.9	12.6'	54.3'
20	119°41.5	08.1	159°48.6	16.3'	04°28.3	12.6'	54.4'
21	134°41.7	· · 09.0	174°23.9	16.3'	04°15.7	12.6'	54.4'
22	149°41.8	09.9	188°59.2	16.3'	04°03.1	12.6'	54.4'
23	164°42.0	10.9	203°34.5	16.3'	03°50.5	12.7'	54.4'
	SD.=16.0	d=0.9	S.D.=14.8				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°42.1	N08°11.8	218°09.8	16.3'	S03°37.8	12.7'	54.4'
1	194°42.3	12.7	232°45.0	16.3'	03°25.1	12.7'	54.4'
2	209°42.5	13.6	247°20.3	16.3'	03°12.4	12.7'	54.4'
3	224°42.6	· · 14.5	261°55.6	16.3'	02°59.7	12.7'	54.4'
4	239°42.8	15.5	276°30.9	16.3'	02°47.0	12.7'	54.4'
5	254°43.0	16.4	291°06.1	16.3'	02°34.2	12.8'	54.4'
6	269°43.1	N08°17.3	305°41.4	16.3'	S02°21.4	12.8'	54.5'
7	284°43.3	18.2	320°16.6	16.3'	02°08.7	12.8'	54.5'
8	299°43.5	19.1	334°51.9	16.2'	01°55.9	12.8'	54.5'
9	314°43.6	· · 20.1	349°27.1	16.2'	01°43.0	12.8'	54.5'
10	329°43.8	21.0	4°02.4	16.2'	01°30.2	12.8'	54.5'
11	344°44.0	21.9	18°37.6	16.2'	01°17.4	12.8'	54.5'
12	359°44.1	N08°22.8	33°12.8	16.2'	S01°04.5	12.9'	54.5'
13	14°44.3	23.7	47°48.0	16.2'	00°51.7	12.9'	54.5'
14	29°44.4	24.6	62°23.2	16.2'	00°38.8	12.9'	54.6'
15	44°44.6	· · 25.6	76°58.4	16.2'	00°25.9	12.9'	54.6'
16	59°44.8	26.5	91°33.5	16.2'	00°13.0	12.9'	54.6'
17	74°44.9	27.4	106°08.7	16.1'	S00°00.2	12.9'	54.6'
18	89°45.1	N08°28.3	120°43.8	16.1'	N00°12.8	12.9'	54.6'
19	104°45.3	29.2	135°18.9	16.1'	00°25.7	12.9'	54.6'
20	119°45.4	30.1	149°54.0	16.1'	00°38.6	12.9'	54.6'
21	134°45.6	· · 31.1	164°29.1	16.1'	00°51.5	12.9'	54.7'
22	149°45.8	32.0	179°04.2	16.0'	01°04.4	12.9'	54.7'
23	164°45.9	32.9	193°39.2	16.0'	01°17.3	12.9'	54.7'
	SD.=15.9	d=0.9	S.D.=14.9				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°46.1	N08°33.8	208°14.2	16.0'	N01°30.3	12.9'	54.7'
1	194°46.2	34.7	222°49.2	16.0'	01°43.2	12.9'	54.7'
2	209°46.4	35.6	237°24.2	16.0'	01°56.1	12.9'	54.7'
3	224°46.6	· · 36.6	251°59.1	15.9'	02°09.1	12.9'	54.7'
4	239°46.7	37.5	266°34.0	15.9'	02°22.0	12.9'	54.8'
5	254°46.9	38.4	281°08.9	15.9'	02°34.9	12.9'	54.8'
6	269°47.0	N08°39.3	295°43.8	15.9'	N02°47.9	12.9'	54.8'
7	284°47.2	40.2	310°18.6	15.8'	03°00.8	12.9'	54.8'
8	299°47.4	41.1	324°53.4	15.8'	03°13.7	12.9'	54.8'
9	314°47.5	· · 42.0	339°28.2	15.8'	03°26.6	12.9'	54.8'
10	329°47.7	42.9	354°02.9	15.7'	03°39.5	12.9'	54.9'
11	344°47.9	43.9	8°37.7	15.7'	03°52.5	12.9'	54.9'
12	359°48.0	N08°44.8	23°12.3	15.7'	N04°05.4	12.9'	54.9'
13	14°48.2	45.7	37°47.0	15.6'	04°18.2	12.9'	54.9'
14	29°48.3	46.6	52°21.6	15.6'	04°31.1	12.9'	54.9'
15	44°48.5	· · 47.5	66°56.2	15.6'	04°44.0	12.9'	54.9'
16	59°48.7	48.4	81°30.7	15.5'	04°56.9	12.9'	55.0'
17	74°48.8	49.3	96°05.2	15.5'	05°09.7	12.8'	55.0'
18	89°49.0	N08°50.2	110°39.7	15.4'	N05°22.6	12.8'	55.0'
19	104°49.1	51.2	125°14.1	15.4'	05°35.4	12.8'	55.0'
20	119°49.3	52.1	139°48.5	15.4'	05°48.2	12.8'	55.0'
21	134°49.5	· · 53.0	154°22.9	15.3'	06°01.0	12.8'	55.0'
22	149°49.6	53.9	168°57.2	15.3'	06°13.8	12.8'	55.1'
23	164°49.8	54.8	183°31.4	15.2'	06°26.6	12.8'	55.1'
	SD.=15.9	d=0.9	S.D.=15.0				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 26-28 15-4%
10	01:27	01:19	12:01	09:03	21:23	
11	01:11	01:04	12:01	09:43	22:04	
12	00:56	00:48	12:01	10:24	22:45	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	201°04.7	158°27.7	N16°21.4	72°01.1	N21°13.7	209°54.2	S04°53.5	20°23.9	N02°29.8
1	216°07.1	173°27.1	22.4	87°02.8	13.5	224°56.1	53.3	35°26.5	29.9
2	231°09.6	188°26.6	23.4	102°04.4	13.2	239°58.1	53.1	50°29.1	29.9
3	246°12.0	203°26.0	·· 24.4	117°06.1	·· 12.9	255°00.0	·· 52.9	65°31.7	·· 30.0
4	261°14.5	218°25.4	25.4	132°07.8	12.7	270°02.0	52.7	80°34.4	30.1
5	276°17.0	233°24.9	26.4	147°09.5	12.4	285°03.9	52.5	95°37.0	30.1
6	291°19.4	248°24.3	N16°27.4	162°11.2	N21°12.1	300°05.9	S04°52.3	110°39.6	N02°30.2
7	306°21.9	263°23.8	28.4	177°12.8	11.9	315°07.8	52.1	125°42.2	30.3
8	321°24.4	278°23.2	29.4	192°14.5	11.6	330°09.8	51.8	140°44.8	30.3
9	336°26.8	293°22.7	·· 30.4	207°16.2	·· 11.3	345°11.7	·· 51.6	155°47.5	·· 30.4
10	351°29.3	308°22.1	31.4	222°17.9	11.1	0°13.7	51.4	170°50.1	30.4
11	6°31.8	323°21.5	32.4	237°19.5	10.8	15°15.7	51.2	185°52.7	30.5
12	21°34.2	338°21.0	N16°33.4	252°21.2	N21°10.5	30°17.6	S04°51.0	200°55.3	N02°30.6
13	36°36.7	353°20.4	34.4	267°22.9	10.3	45°19.6	50.8	215°58.0	30.6
14	51°39.2	8°19.9	35.4	282°24.6	10.0	60°21.5	50.6	231°00.6	30.7
15	66°41.6	23°19.3	·· 36.4	297°26.2	·· 09.7	75°23.5	·· 50.4	246°03.2	·· 30.8
16	81°44.1	38°18.7	37.4	312°27.9	09.5	90°25.4	50.2	261°05.8	30.8
17	96°46.5	53°18.2	38.4	327°29.6	09.2	105°27.4	49.9	276°08.4	30.9
18	111°49.0	68°17.6	N16°39.3	342°31.2	N21°08.9	120°29.3	S04°49.7	291°11.1	N02°31.0
19	126°51.5	83°17.0	40.3	357°32.9	08.7	135°31.3	49.5	306°13.7	31.0
20	141°53.9	98°16.5	41.3	12°34.6	08.4	150°33.2	49.3	321°16.3	31.1
21	156°56.4	113°15.9	·· 42.3	27°36.2	·· 08.1	165°35.2	·· 49.1	336°18.9	·· 31.2
22	171°58.9	128°15.3	43.3	42°37.9	07.9	180°37.1	48.9	351°21.6	31.2
23	187°01.3	143°14.8	44.3	57°39.6	07.6	195°39.1	48.7	6°24.2	31.3
Mer.pass.:10:34		v-0.6 d1.0 m-3.8		v1.7 d-0.3 m0.4		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	202°03.8	158°14.2	N16°45.3	72°41.2	N21°07.3	210°41.0	S04°48.5	21°26.8	N02°31.4
1	217°06.3	173°13.6	46.3	87°42.9	07.1	225°43.0	48.2	36°29.4	31.4
2	232°08.7	188°13.1	47.2	102°44.6	06.8	240°44.9	48.0	51°32.0	31.5
3	247°11.2	203°12.5	·· 48.2	117°46.2	·· 06.5	255°46.9	·· 47.8	66°34.7	·· 31.5
4	262°13.6	218°11.9	49.2	132°47.9	06.3	270°48.8	47.6	81°37.3	31.6
5	277°16.1	233°11.4	50.2	147°49.6	06.0	285°50.8	47.4	96°39.9	31.7
6	292°18.6	248°10.8	N16°51.2	162°51.2	N21°05.7	300°52.8	S04°47.2	111°42.5	N02°31.7
7	307°21.0	263°10.2	52.2	177°52.9	05.5	315°54.7	47.0	126°45.1	31.8
8	322°23.5	278°09.7	53.1	192°54.5	05.2	330°56.7	46.8	141°47.8	31.9
9	337°26.0	293°09.1	·· 54.1	207°56.2	·· 04.9	345°58.6	·· 46.6	156°50.4	·· 31.9
10	352°28.4	308°08.5	55.1	222°57.9	04.6	1°00.6	46.3	171°53.0	32.0
11	7°30.9	323°08.0	56.1	237°59.5	04.4	16°02.5	46.1	186°55.6	32.1
12	22°33.4	338°07.4	N16°57.1	253°01.2	N21°04.1	31°04.5	S04°45.9	201°58.2	N02°32.1
13	37°35.8	353°06.8	58.0	268°02.8	03.8	46°06.4	45.7	217°00.9	32.2
14	52°38.3	8°06.2	16°59.0	283°04.5	03.6	61°08.4	45.5	232°03.5	32.2
15	67°40.8	23°05.7	17°00.0	298°06.1	·· 03.3	76°10.3	·· 45.3	247°06.1	·· 32.3
16	82°43.2	38°05.1	01.0	313°07.8	03.0	91°12.3	45.1	262°08.7	32.4
17	97°45.7	53°04.5	01.9	328°09.4	02.8	106°14.2	44.9	277°11.3	32.4
18	112°48.1	68°03.9	N17°02.9	343°11.1	N21°02.5	121°16.2	S04°44.7	292°14.0	N02°32.5
19	127°50.6	83°03.4	03.9	358°12.8	02.2	136°18.2	44.4	307°16.6	32.6
20	142°53.1	98°02.8	04.9	13°14.4	01.9	151°20.1	44.2	322°19.2	32.6
21	157°55.5	113°02.2	·· 05.8	28°16.1	·· 01.7	166°22.1	·· 44.0	337°21.8	·· 32.7
22	172°58.0	128°01.6	06.8	43°17.7	01.4	181°24.0	43.8	352°24.4	32.8
23	188°00.5	143°01.1	07.8	58°19.4	01.1	196°26.0	43.6	7°27.1	32.8
Mer.pass.:10:30		v-0.6 d1.0 m-3.8		v1.7 d-0.3 m0.4		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	203°02.9	158°00.5	N17°08.7	73°21.0	N21°00.8	211°27.9	S04°43.4	22°29.7	N02°32.9
1	218°05.4	172°59.9	09.7	88°22.7	00.6	226°29.9	43.2	37°32.3	32.9
2	233°07.9	187°59.3	10.7	103°24.3	00.3	241°31.8	43.0	52°34.9	33.0
3	248°10.3	202°58.7	·· 11.6	118°26.0	21°00.0	256°33.8	·· 42.8	67°37.5	·· 33.1
4	263°12.8	217°58.2	12.6	133°27.6	20°59.8	271°35.8	42.5	82°40.2	33.1
5	278°15.3	232°57.6	13.6	148°29.3	59.5	286°37.7	42.3	97°42.8	33.2
6	293°17.7	247°57.0	N17°14.5	163°30.9	N20°59.2	301°39.7	S04°42.1	112°45.4	N02°33.3
7	308°20.2	262°56.4	15.5	178°32.5	58.9	316°41.6	41.9	127°48.0	33.3
8	323°22.6	277°55.9	16.5	193°34.2	58.7	331°43.6	41.7	142°50.6	33.4
9	338°25.1	292°55.3	·· 17.4	208°35.8	·· 58.4	346°45.5	·· 41.5	157°53.2	·· 33.5
10	353°27.6	307°54.7	18.4	223°37.5	58.1	1°47.5	41.3	172°55.9	33.5
11	8°30.0	322°54.1	19.3	238°39.1	57.8	16°49.4	41.1	187°58.5	33.6
12	23°32.5	337°53.5	N17°20.3	253°40.8	N20°57.6	31°51.4	S04°40.9	203°01.1	N02°33.6
13	38°35.0	352°52.9	21.3	268°42.4	57.3	46°53.4	40.6	218°03.7	33.7
14	53°37.4	7°52.4	22.2	283°44.0	57.0	61°55.3	40.4	233°06.3	33.8
15	68°39.9	22°51.8	·· 23.2	298°45.7	·· 56.7	76°57.3	·· 40.2	248°09.0	·· 33.8
16	83°42.4	37°51.2	24.1	313°47.3	56.5	91°59.2	40.0	263°11.6	33.9
17	98°44.8	52°50.6	25.1	328°49.0	56.2	107°01.2	39.8	278°14.2	34.0
18	113°47.3	67°50.0	N17°26.0	343°50.6	N20°55.9	122°03.1	S04°39.6	293°16.8	N02°34.0
19	128°49.7	82°49.4	27.0	358°52.2	55.6	137°05.1	39.4	308°19.4	34.1
20	143°52.2	97°48.8	28.0	13°53.9	55.4	152°07.1	39.2	323°22.0	34.1
21	158°54.7	112°48.3	·· 28.9	28°55.5	·· 55.1	167°09.0	·· 39.0	338°24.7	·· 34.2
22	173°57.1	127°47.7	29.9	43°57.2	54.8	182°11.0	38.8	353°27.3	34.3
23	188°59.6	142°47.1	30.8	58°58.8	54.5	197°12.9	38.5	8°29.9	34.3
Mer.pass.:10:26		v-0.6 d1.0 m-3.8		v1.6 d-0.3 m0.5		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.3	-42°14.9
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.0
Hamal	328°03.8	23°30.7
Polaris	319°21.7	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.4	-52°42.4
Sirius	258°35.9	-16°44.0
Adhara	255°14.4	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.5	28°00.1
Avior	234°19.0	-59°32.9
Suhail	222°54.1	-43°28.8
Miaplacidus	221°40.1	-69°45.9
Alphard	217°58.2	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.8	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.6
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.7	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.4	-60°52.7
Kochab	137°18.5	74°06.6
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.6
Antares	112°28.9	-26°27.3
Atria	107°32.5	-69°02.6
Sabik	102°15.0	-15°44.3
Shaula	96°24.9	-37°06.6
Rasalhague	96°08.4	12°33.0
Eltanin	90°47.0	51°28.9
Kaus Aust.	83°46.8	-34°22.7
Vega	80°40.4	38°47.3
Nunki	76°01.1	-26°17.0
Altair	62°10.5	8°53.6
Peacock	53°22.9	-56°41.9
Deneb	49°33.3	45°18.8
Enif	33°49.6	9°55.2
Al Na'ir	27°46.8	-46°54.5
Fomalhaut	15°26.7	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°40.9	15°15.6

Apr 13 Tue	**SHA**	**Mer.pass**
Venus	317°23.0	13:27
Mars	230°56.4	19:10
Jupiter	8°49.5	09:59
Saturn	179°19.2	22:34

Apr 14 Wed	**SHA**	**Mer.pass**
Venus	316°10.4	13:28
Mars	230°37.4	19:07
Jupiter	8°37.2	09:56
Saturn	179°23.0	22:30

Apr 15 Thu	**SHA**	**Mer.pass**
Venus	314°57.6	13:28
Mars	230°18.1	19:05
Jupiter	8°25.0	09:53
Saturn	179°26.7	22:26

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°49.9	N08°55.7	198°05.6	15.2'	N06°39.3	12.7'	55.1'
1	194°50.1	56.6	212°39.8	15.2'	06°52.0	12.7'	55.1'
2	209°50.2	57.5	227°13.9	15.1'	07°04.8	12.7'	55.1'
3	224°50.4	·· 58.4	241°48.0	15.1'	07°17.4	12.7'	55.2'
4	239°50.6	08°59.3	256°22.1	15.0'	07°30.1	12.7'	55.2'
5	254°50.7	09°00.2	270°56.0	15.0'	07°42.8	12.6'	55.2'
6	269°50.9	N09°01.1	285°30.0	14.9'	N07°55.4	12.6'	55.2'
7	284°51.0	02.1	300°03.9	14.9'	08°08.0	12.6'	55.2'
8	299°51.2	03.0	314°37.7	14.8'	08°20.6	12.6'	55.2'
9	314°51.4	·· 03.9	329°11.5	14.8'	08°33.1	12.5'	55.3'
10	329°51.5	04.8	343°45.2	14.7'	08°45.7	12.5'	55.3'
11	344°51.7	05.7	358°18.9	14.7'	08°58.2	12.5'	55.3'
12	359°51.8	N09°06.6	12°52.5	14.6'	N09°10.6	12.5'	55.3'
13	14°52.0	07.5	27°26.1	14.5'	09°23.1	12.4'	55.3'
14	29°52.1	08.4	41°59.6	14.5'	09°35.5	12.4'	55.4'
15	44°52.3	·· 09.3	56°33.1	14.4'	09°47.9	12.4'	55.4'
16	59°52.5	10.2	71°06.5	14.4'	10°00.2	12.3'	55.4'
17	74°52.6	11.1	85°39.8	14.3'	10°12.5	12.3'	55.4'
18	89°52.8	N09°12.0	100°13.1	14.3'	N10°24.8	12.3'	55.4'
19	104°52.9	12.9	114°46.3	14.2'	10°37.0	12.2'	55.5'
20	119°53.1	13.8	129°19.5	14.1'	10°49.3	12.2'	55.5'
21	134°53.2	·· 14.7	143°52.6	14.1'	11°01.4	12.1'	55.5'
22	149°53.4	15.6	158°25.6	14.0'	11°13.6	12.1'	55.5'
23	164°53.5	16.5	172°58.6	13.9'	11°25.6	12.1'	55.5'
	SD.=15.9	d=0.9	S.D.=15.1				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°53.7	N09°17.4	187°31.5	13.9'	N11°37.7	12.0'	55.6'
1	194°53.9	18.3	202°04.4	13.8'	11°49.7	12.0'	55.6'
2	209°54.0	19.2	216°37.2	13.8'	12°01.7	11.9'	55.6'
3	224°54.2	·· 20.1	231°09.9	13.7'	12°13.6	11.9'	55.6'
4	239°54.3	21.0	245°42.5	13.6'	12°25.5	11.9'	55.6'
5	254°54.5	22.0	260°15.1	13.5'	12°37.3	11.8'	55.7'
6	269°54.6	N09°22.9	274°47.6	13.5'	N12°49.1	11.8'	55.7'
7	284°54.8	23.8	289°20.1	13.4'	13°00.8	11.7'	55.7'
8	299°54.9	24.7	303°52.4	13.3'	13°12.5	11.7'	55.7'
9	314°55.1	·· 25.6	318°24.7	13.3'	13°24.1	11.6'	55.7'
10	329°55.2	26.5	332°57.0	13.2'	13°35.7	11.6'	55.8'
11	344°55.4	27.4	347°29.1	13.1'	13°47.2	11.5'	55.8'
12	359°55.6	N09°28.3	2°01.2	13.1'	N13°58.7	11.4'	55.8'
13	14°55.7	29.2	16°33.2	13.0'	14°10.1	11.4'	55.8'
14	29°55.9	30.1	31°05.2	12.9'	14°21.5	11.3'	55.8'
15	44°56.0	·· 31.0	45°37.1	12.8'	14°32.8	11.3'	55.9'
16	59°56.2	31.8	60°08.9	12.8'	14°44.1	11.2'	55.9'
17	74°56.3	32.7	74°40.6	12.7'	14°55.2	11.2'	55.9'
18	89°56.5	N09°33.6	89°12.2	12.6'	N15°06.4	11.1'	55.9'
19	104°56.6	34.5	103°43.8	12.5'	15°17.4	11.0'	55.9'
20	119°56.8	35.4	118°15.3	12.5'	15°28.4	11.0'	56.0'
21	134°56.9	·· 36.3	132°46.7	12.4'	15°39.4	10.9'	56.0'
22	149°57.1	37.2	147°18.0	12.3'	15°50.3	10.8'	56.0'
23	164°57.2	38.1	161°49.3	12.2'	16°01.1	10.8'	56.0'
	SD.=15.9	d=0.9	S.D.=15.2				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°57.4	N09°39.0	176°20.4	12.1'	N16°11.8	10.7'	56.0'
1	194°57.5	39.9	190°51.5	12.1'	16°22.5	10.6'	56.1'
2	209°57.7	40.8	205°22.6	12.0'	16°33.1	10.6'	56.1'
3	224°57.8	·· 41.7	219°53.5	11.9'	16°43.6	10.5'	56.1'
4	239°58.0	42.6	234°24.3	11.8'	16°54.1	10.4'	56.1'
5	254°58.1	43.5	248°55.1	11.7'	17°04.4	10.3'	56.1'
6	269°58.3	N09°44.4	263°25.8	11.6'	N17°14.7	10.3'	56.2'
7	284°58.4	45.3	277°56.4	11.6'	17°25.0	10.2'	56.2'
8	299°58.6	46.2	292°26.9	11.5'	17°35.1	10.1'	56.2'
9	314°58.8	·· 47.1	306°57.4	11.4'	17°45.2	10.0'	56.2'
10	329°58.9	48.0	321°27.7	11.3'	17°55.2	10.0'	56.3'
11	344°59.1	48.9	335°58.0	11.2'	18°05.1	9.9'	56.3'
12	359°59.2	N09°49.8	350°28.2	11.2'	N18°14.9	9.8'	56.3'
13	14°59.4	50.7	4°58.3	11.1'	18°24.7	9.7'	56.3'
14	29°59.5	51.5	19°28.3	11.0'	18°34.3	9.6'	56.3'
15	44°59.7	·· 52.4	33°58.3	10.9'	18°43.9	9.5'	56.4'
16	59°59.8	53.3	48°28.1	10.8'	18°53.4	9.4'	56.4'
17	75°00.0	54.2	62°57.9	10.7'	19°02.8	9.4'	56.4'
18	90°00.1	N09°55.1	77°27.6	10.6'	N19°12.1	9.3'	56.4'
19	105°00.2	56.0	91°57.2	10.6'	19°21.3	9.2'	56.4'
20	120°00.4	56.9	106°26.7	10.5'	19°30.5	9.1'	56.5'
21	135°00.5	·· 57.8	120°56.2	10.4'	19°39.5	9.0'	56.5'
22	150°00.7	58.7	135°25.5	10.3'	19°48.4	8.9'	56.5'
23	165°00.8	59.6	149°54.8	10.2'	19°57.3	8.8'	56.5'
	SD.=15.9	d=0.9	S.D.=15.3				

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

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

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 29-1 1-1%
13	00:40	00:33	12:01	11:07	23:29	●
14	00:25	00:18	12:00	11:52	–:–	
15	00:10	00:03	12:00	12:39	00:15	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	204°02.1	157°46.5	N17°31.8	74°00.4	N20°54.2	212°14.9	S04°38.3	23°32.5	N02°34.4
1	219°04.5	172°45.9	32.7	89°02.1	54.0	227°16.8	38.1	38°35.1	34.5
2	234°07.0	187°45.3	33.7	104°03.7	53.7	242°18.8	37.9	53°37.7	34.5
3	249°09.5	202°44.7	·· 34.6	119°05.3	·· 53.4	257°20.8	·· 37.7	68°40.4	·· 34.6
4	264°11.9	217°44.1	35.6	134°07.0	53.1	272°22.7	37.5	83°43.0	34.6
5	279°14.4	232°43.5	36.5	149°08.6	52.9	287°24.7	37.3	98°45.6	34.7
6	294°16.9	247°43.0	N17°37.4	164°10.2	N20°52.6	302°26.6	S04°37.1	113°48.2	N02°34.8
7	309°19.3	262°42.4	38.4	179°11.9	52.3	317°28.6	36.9	128°50.8	34.8
8	324°21.8	277°41.8	39.3	194°13.5	52.0	332°30.5	36.7	143°53.4	34.9
9	339°24.2	292°41.2	·· 40.3	209°15.1	·· 51.7	347°32.5	·· 36.4	158°56.1	·· 34.9
10	354°26.7	307°40.6	41.2	224°16.7	51.5	2°34.5	36.2	173°58.7	35.0
11	9°29.2	322°40.0	42.2	239°18.4	51.2	17°36.4	36.0	189°01.3	35.1
12	24°31.6	337°39.4	N17°43.1	254°20.0	N20°50.9	32°38.4	S04°35.8	204°03.9	N02°35.1
13	39°34.1	352°38.8	44.0	269°21.6	50.6	47°40.3	35.6	219°06.5	35.2
14	54°36.6	7°38.2	45.0	284°23.3	50.3	62°42.3	35.4	234°09.1	35.3
15	69°39.0	22°37.6	·· 45.9	299°24.9	·· 50.1	77°44.3	·· 35.2	249°11.8	·· 35.3
16	84°41.5	37°37.0	46.9	314°26.5	49.8	92°46.2	35.0	264°14.4	35.4
17	99°44.0	52°36.4	47.8	329°28.1	49.5	107°48.2	34.8	279°17.0	35.4
18	114°46.4	67°35.8	N17°48.7	344°29.8	N20°49.2	122°50.1	S04°34.6	294°19.6	N02°35.5
19	129°48.9	82°35.2	49.7	359°31.4	48.9	137°52.1	34.4	309°22.2	35.6
20	144°51.4	97°34.6	50.6	14°33.0	48.7	152°54.1	34.1	324°24.8	35.6
21	159°53.8	112°34.0	·· 51.5	29°34.6	·· 48.4	167°56.0	·· 33.9	339°27.4	·· 35.7
22	174°56.3	127°33.4	52.5	44°36.2	48.1	182°58.0	33.7	354°30.1	35.7
23	189°58.7	142°32.8	53.4	59°37.9	47.8	197°59.9	33.5	9°32.7	35.8
Mer.pass.:10:22		v-0.6 d0.9 m-3.8		v1.6 d-0.3 m0.5		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	205°01.2	157°32.2	N17°54.3	74°39.5	N20°47.5	213°01.9	S04°33.3	24°35.3	N02°35.9
1	220°03.7	172°31.6	55.3	89°41.1	47.2	228°03.9	33.1	39°37.9	35.9
2	235°06.1	187°31.0	56.2	104°42.7	47.0	243°05.8	32.9	54°40.5	36.0
3	250°08.6	202°30.4	·· 57.1	119°44.3	·· 46.7	258°07.8	·· 32.7	69°43.1	·· 36.0
4	265°11.1	217°29.8	58.1	134°46.0	46.4	273°09.7	32.5	84°45.7	36.1
5	280°13.5	232°29.2	59.0	149°47.6	46.1	288°11.7	32.3	99°48.4	36.2
6	295°16.0	247°28.6	N17°59.9	164°49.2	N20°45.8	303°13.7	S04°32.1	114°51.0	N02°36.2
7	310°18.5	262°28.0	18°00.8	179°50.8	45.5	318°15.6	31.8	129°53.6	36.3
8	325°20.9	277°27.4	01.8	194°52.4	45.3	333°17.6	31.6	144°56.2	36.3
9	340°23.4	292°26.8	·· 02.7	209°54.0	·· 45.0	348°19.5	·· 31.4	159°58.8	·· 36.4
10	355°25.8	307°26.2	03.6	224°55.7	44.7	3°21.5	31.2	175°01.4	36.5
11	10°28.3	322°25.6	04.5	239°57.3	44.4	18°23.5	31.0	190°04.0	36.5
12	25°30.8	337°25.0	N18°05.5	254°58.9	N20°44.1	33°25.4	S04°30.8	205°06.7	N02°36.6
13	40°33.2	352°24.4	06.4	270°00.5	43.8	48°27.4	30.6	220°09.3	36.7
14	55°35.7	7°23.8	07.3	285°02.1	43.6	63°29.3	30.4	235°11.9	36.7
15	70°38.2	22°23.2	·· 08.2	300°03.7	·· 43.3	78°31.3	·· 30.2	250°14.5	·· 36.8
16	85°40.6	37°22.6	09.1	315°05.3	43.0	93°33.3	30.0	265°17.1	36.8
17	100°43.1	52°22.0	10.1	330°06.9	42.7	108°35.2	29.8	280°19.7	36.9
18	115°45.6	67°21.4	N18°11.0	345°08.6	N20°42.4	123°37.2	S04°29.6	295°22.3	N02°37.0
19	130°48.0	82°20.8	11.9	0°10.2	42.1	138°39.2	29.3	310°25.0	37.0
20	145°50.5	97°20.2	12.8	15°11.8	41.8	153°41.1	29.1	325°27.6	37.1
21	160°53.0	112°19.6	·· 13.7	30°13.4	·· 41.6	168°43.1	·· 28.9	340°30.2	·· 37.1
22	175°55.4	127°18.9	14.6	45°15.0	41.3	183°45.0	28.7	355°32.8	37.2
23	190°57.9	142°18.3	15.5	60°16.6	41.0	198°47.0	28.5	10°35.4	37.3
Mer.pass.:10:18		v-0.6 d0.9 m-3.8		v1.6 d-0.3 m0.5		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	206°00.3	157°17.7	N18°16.5	75°18.2	N20°40.7	213°49.0	S04°28.3	25°38.0	N02°37.3
1	221°02.8	172°17.1	17.4	90°19.8	40.4	228°50.9	28.1	40°40.6	37.4
2	236°05.3	187°16.5	18.3	105°21.4	40.1	243°52.9	27.9	55°43.2	37.4
3	251°07.7	202°15.9	·· 19.2	120°23.0	·· 39.8	258°54.9	·· 27.7	70°45.9	·· 37.5
4	266°10.2	217°15.3	20.1	135°24.6	39.6	273°56.8	27.5	85°48.5	37.5
5	281°12.7	232°14.7	21.0	150°26.2	39.3	288°58.8	27.3	100°51.1	37.6
6	296°15.1	247°14.1	N18°21.9	165°27.8	N20°39.0	304°00.7	S04°27.1	115°53.7	N02°37.7
7	311°17.6	262°13.4	22.8	180°29.4	38.7	319°02.7	26.8	130°56.3	37.7
8	326°20.1	277°12.8	23.7	195°31.0	38.4	334°04.7	26.6	145°58.9	37.8
9	341°22.5	292°12.2	·· 24.6	210°32.6	·· 38.1	349°06.6	·· 26.4	161°01.5	·· 37.8
10	356°25.0	307°11.6	25.5	225°34.2	37.8	4°08.6	26.2	176°04.1	37.9
11	11°27.5	322°11.0	26.4	240°35.8	37.5	19°10.6	26.0	191°06.7	38.0
12	26°29.9	337°10.4	N18°27.3	255°37.4	N20°37.2	34°12.5	S04°25.8	206°09.4	N02°38.0
13	41°32.4	352°09.7	28.2	270°39.0	37.0	49°14.5	25.6	221°12.0	38.1
14	56°34.8	7°09.1	29.1	285°40.6	36.7	64°16.5	25.4	236°14.6	38.1
15	71°37.3	22°08.5	·· 30.0	300°42.2	·· 36.4	79°18.4	·· 25.2	251°17.2	·· 38.2
16	86°39.8	37°07.9	30.9	315°43.8	36.1	94°20.4	25.0	266°19.8	38.3
17	101°42.2	52°07.3	31.8	330°45.4	35.8	109°22.3	24.8	281°22.4	38.3
18	116°44.7	67°06.7	N18°32.7	345°47.0	N20°35.5	124°24.3	S04°24.6	296°25.0	N02°38.4
19	131°47.2	82°06.0	33.6	0°48.6	35.2	139°26.3	24.4	311°27.6	38.4
20	146°49.6	97°05.4	34.5	15°50.2	34.9	154°28.2	24.2	326°30.2	38.5
21	161°52.1	112°04.8	·· 35.4	30°51.8	·· 34.6	169°30.2	·· 23.9	341°32.9	·· 38.6
22	176°54.6	127°04.2	36.3	45°53.4	34.3	184°32.2	23.7	356°35.5	38.6
23	191°57.0	142°03.6	37.2	60°55.0	34.1	199°34.1	23.5	11°38.1	38.7
Mer.pass.:10:14		v-0.6 d0.9 m-3.8		v1.6 d-0.3 m0.5		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.3	-42°14.9
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.0
Hamal	328°03.8	23°30.6
Polaris	319°21.8	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.4	-52°42.4
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.0	-59°32.9
Suhail	222°54.1	-43°28.8
Miaplacidus	221°40.1	-69°45.9
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.8	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.6
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.5
Hadar	148°50.7	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.4	-60°52.7
Kochab	137°18.5	74°06.6
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.6
Antares	112°28.8	-26°27.3
Atria	107°32.5	-69°02.6
Sabik	102°15.0	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.4	12°33.0
Eltanin	90°47.0	51°28.9
Kaus Aust.	83°46.7	-34°22.7
Vega	80°40.4	38°47.3
Nunki	76°01.1	-26°17.0
Altair	62°10.5	8°53.6
Peacock	53°22.8	-56°41.9
Deneb	49°33.2	45°18.8
Enif	33°49.6	9°55.2
Al Na'ir	27°46.8	-46°54.5
Fomalhaut	15°26.7	-29°34.0
Scheat	13°56.0	28°08.2
Markab	13°40.9	15°15.6

Apr 16 Fri	**SHA**	**Mer.pass**
Venus	313°44.4	13:29
Mars	229°58.4	19:02
Jupiter	8°12.8	09:50
Saturn	179°30.4	22:22

Apr 17 Sat	**SHA**	**Mer.pass**
Venus	312°31.0	13:30
Mars	229°38.3	18:59
Jupiter	8°00.7	09:47
Saturn	179°34.1	22:18

Apr 18 Sun	**SHA**	**Mer.pass**
Venus	311°17.4	13:31
Mars	229°17.8	18:57
Jupiter	7°48.6	09:43
Saturn	179°37.7	22:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°01.0	**N**10°00.5	164°23.9	10.1'	**N**20°06.0	8.7'	56.5'
1	195°01.1	01.3	178°53.0	10.0'	20°14.7	8.6'	56.6'
2	210°01.3	02.2	193°22.0	10.0'	20°23.2	8.5'	56.6'
3	225°01.4	· · 03.1	207°51.0	9.9'	20°31.6	8.4'	56.6'
4	240°01.6	04.0	222°19.8	9.8'	20°40.0	8.3'	56.6'
5	255°01.7	04.9	236°48.5	9.7'	20°48.2	8.2'	56.7'
6	270°01.9	**N**10°05.8	251°17.2	9.6'	**N**20°56.4	8.1'	56.7'
7	285°02.0	06.7	265°45.8	9.5'	21°04.4	8.0'	56.7'
8	300°02.2	07.6	280°14.3	9.5'	21°12.3	7.9'	56.7'
9	315°02.3	· · 08.4	294°42.7	9.4'	21°20.1	7.8'	56.7'
10	330°02.5	09.3	309°11.0	9.3'	21°27.8	7.6'	56.8'
11	345°02.6	10.2	323°39.3	9.2'	21°35.4	7.5'	56.8'
12	0°02.8	**N**10°11.1	338°07.5	9.1'	**N**21°42.9	7.4'	56.8'
13	15°02.9	12.0	352°35.5	9.0'	21°50.2	7.3'	56.8'
14	30°03.1	12.9	7°03.5	9.0'	21°57.5	7.2'	56.8'
15	45°03.2	· · 13.8	21°31.5	8.9'	22°04.6	7.1'	56.9'
16	60°03.3	14.6	35°59.3	8.8'	22°11.7	7.0'	56.9'
17	75°03.5	15.5	50°27.1	8.7'	22°18.6	6.8'	56.9'
18	90°03.6	**N**10°16.4	64°54.7	8.6'	**N**22°25.3	6.7'	56.9'
19	105°03.8	17.3	79°22.3	8.6'	22°32.0	6.6'	56.9'
20	120°03.9	18.2	93°49.9	8.5'	22°38.5	6.5'	57.0'
21	135°04.1	· · 19.1	108°17.3	8.4'	22°44.9	6.4'	57.0'
22	150°04.2	19.9	122°44.7	8.3'	22°51.2	6.2'	57.0'
23	165°04.4	20.8	137°11.9	8.2'	22°57.4	6.1'	57.0'
	SD.=15.9	d=0.9			S.D.=15.5		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°04.5	**N**10°21.7	151°39.2	8.2'	**N**23°03.5	6.0'	57.0'
1	195°04.6	22.6	166°06.3	8.1'	23°09.4	5.9'	57.1'
2	210°04.8	23.5	180°33.4	8.0'	23°15.2	5.7'	57.1'
3	225°04.9	· · 24.4	195°00.3	8.0'	23°20.8	5.6'	57.1'
4	240°05.1	25.2	209°27.3	7.9'	23°26.3	5.5'	57.1'
5	255°05.2	26.1	223°54.1	7.8'	23°31.7	5.3'	57.1'
6	270°05.4	**N**10°27.0	238°20.9	7.7'	**N**23°37.0	5.2'	57.2'
7	285°05.5	27.9	252°47.6	7.7'	23°42.1	5.1'	57.2'
8	300°05.7	28.8	267°14.2	7.6'	23°47.1	4.9'	57.2'
9	315°05.8	· · 29.6	281°40.8	7.5'	23°52.0	4.8'	57.2'
10	330°05.9	30.5	296°07.3	7.5'	23°56.7	4.7'	57.3'
11	345°06.1	31.4	310°33.7	7.4'	24°01.3	4.5'	57.3'
12	0°06.2	**N**10°32.3	325°00.1	7.3'	**N**24°05.7	4.4'	57.3'
13	15°06.4	33.2	339°26.4	7.3'	24°10.1	4.2'	57.3'
14	30°06.5	34.0	353°52.6	7.2'	24°14.2	4.1'	57.3'
15	45°06.7	· · 34.9	8°18.8	7.1'	24°18.3	4.0'	57.4'
16	60°06.8	35.8	22°44.9	7.1'	24°22.1	3.8'	57.4'
17	75°06.9	36.7	37°11.0	7.0'	24°25.9	3.7'	57.4'
18	90°07.1	**N**10°37.5	51°37.0	7.0'	**N**24°29.5	3.5'	57.4'
19	105°07.2	38.4	66°02.9	6.9'	24°32.9	3.4'	57.4'
20	120°07.4	39.3	80°28.8	6.9'	24°36.3	3.2'	57.5'
21	135°07.5	· · 40.2	94°54.6	6.8'	24°39.4	3.1'	57.5'
22	150°07.6	41.1	109°20.4	6.8'	24°42.4	2.9'	57.5'
23	165°07.8	41.9	123°46.1	6.7'	24°45.3	2.8'	57.5'
	SD.=15.9	d=0.9			S.D.=15.6		

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°07.9	**N**10°42.8	138°11.8	6.7'	**N**24°48.0	2.6'	57.5'
1	195°08.1	43.7	152°37.4	6.6'	24°50.6	2.5'	57.6'
2	210°08.2	44.6	167°03.0	6.6'	24°53.0	2.4'	57.6'
3	225°08.3	· · 45.4	181°28.5	6.5'	24°55.3	2.2'	57.6'
4	240°08.5	46.3	195°54.0	6.5'	24°57.4	2.0'	57.6'
5	255°08.6	47.2	210°19.5	6.4'	24°59.4	1.9'	57.6'
6	270°08.8	**N**10°48.0	224°44.9	6.4'	**N**25°01.2	1.7'	57.6'
7	285°08.9	48.9	239°10.3	6.3'	25°02.9	1.6'	57.7'
8	300°09.0	49.8	253°35.6	6.3'	25°04.4	1.4'	57.7'
9	315°09.2	· · 50.7	268°00.9	6.3'	25°05.8	1.3'	57.7'
10	330°09.3	51.5	282°26.1	6.2'	25°07.0	1.1'	57.7'
11	345°09.5	52.4	296°51.4	6.2'	25°08.0	1.0'	57.7'
12	0°09.6	**N**10°53.3	311°16.6	6.2'	**N**25°08.9	0.8'	57.8'
13	15°09.7	54.1	325°41.7	6.1'	25°09.7	0.7'	57.8'
14	30°09.9	55.0	340°06.9	6.1'	25°10.3	0.5'	57.8'
15	45°10.0	· · 55.9	354°32.0	6.1'	25°10.7	0.4'	57.8'
16	60°10.2	56.8	8°57.0	6.1'	25°11.0	0.2'	57.8'
17	75°10.3	57.6	23°22.1	6.0'	25°11.1	0.0'	57.9'
18	90°10.4	**N**10°58.5	37°47.1	6.0'	**N**25°11.1	-0.1'	57.9'
19	105°10.6	10°59.4	52°12.1	6.0'	25°10.9	-0.3'	57.9'
20	120°10.7	11°00.2	66°37.1	6.0'	25°10.5	-0.4'	57.9'
21	135°10.8	· · 01.1	81°02.1	6.0'	25°10.0	-0.6'	57.9'
22	150°11.0	02.0	95°27.1	6.0'	25°09.3	-0.7'	58.0'
23	165°11.1	02.8	109°52.0	5.9'	25°08.5	-0.9'	58.0'
	SD.=15.9	d=0.9			S.D.=15.7		

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

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

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 2-4 4-17%
16	00:04	00:11	12:00	13:31	01:05	●
17	00:18	00:25	12:00	14:25	01:58	
18	00:32	00:38	11:59	15:23	02:54	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	206°59.5	157°02.9	N18°38.1	75°56.6	N20°33.8	214°36.1	S04°23.3	26°40.7	N02°38.7
1	222°02.0	172°02.3	39.0	90°58.2	33.5	229°38.1	23.1	41°43.3	38.8
2	237°04.4	187°01.7	39.9	105°59.8	33.2	244°40.0	22.9	56°45.9	38.8
3	252°06.9	202°01.1	·· 40.8	121°01.3	·· 32.9	259°42.0	·· 22.7	71°48.5	·· 38.9
4	267°09.3	217°00.4	41.7	136°02.9	32.6	274°44.0	22.5	86°51.1	39.0
5	282°11.8	231°59.8	42.6	151°04.5	32.3	289°45.9	22.3	101°53.7	39.0
6	297°14.3	246°59.2	N18°43.4	166°06.1	N20°32.0	304°47.9	S04°22.1	116°56.3	N02°39.1
7	312°16.7	261°58.6	44.3	181°07.7	31.7	319°49.9	21.9	131°59.0	39.1
8	327°19.2	276°58.0	45.2	196°09.3	31.4	334°51.8	21.7	147°01.6	39.2
9	342°21.7	291°57.3	·· 46.1	211°10.9	·· 31.1	349°53.8	·· 21.5	162°04.2	·· 39.3
10	357°24.1	306°56.7	47.0	226°12.5	30.8	4°55.8	21.3	177°06.8	39.3
11	12°26.6	321°56.1	47.9	241°14.1	30.5	19°57.7	21.1	192°09.4	39.4
12	27°29.1	336°55.4	N18°48.7	256°15.6	N20°30.3	34°59.7	S04°20.8	207°12.0	N02°39.4
13	42°31.5	351°54.8	49.6	271°17.2	30.0	50°01.7	20.6	222°14.6	39.5
14	57°34.0	6°54.2	50.5	286°18.8	29.7	65°03.6	20.4	237°17.2	39.5
15	72°36.5	21°53.6	·· 51.4	301°20.4	·· 29.4	80°05.6	·· 20.2	252°19.8	·· 39.6
16	87°38.9	36°52.9	52.3	316°22.0	29.1	95°07.6	20.0	267°22.4	39.7
17	102°41.4	51°52.3	53.1	331°23.6	28.8	110°09.5	19.8	282°25.0	39.7
18	117°43.8	66°51.7	N18°54.0	346°25.1	N20°28.5	125°11.5	S04°19.6	297°27.6	N02°39.8
19	132°46.3	81°51.0	54.9	1°26.7	28.2	140°13.5	19.4	312°30.3	39.8
20	147°48.8	96°50.4	55.8	16°28.3	27.9	155°15.4	19.2	327°32.9	39.9
21	162°51.2	111°49.8	·· 56.6	31°29.9	·· 27.6	170°17.4	·· 19.0	342°35.5	·· 39.9
22	177°53.7	126°49.2	57.5	46°31.5	27.3	185°19.4	18.8	357°38.1	40.0
23	192°56.2	141°48.5	58.4	61°33.0	27.0	200°21.3	18.6	12°40.7	40.1
Mer.pass.:10:10		v-0.6 d0.9 m-3.8		v1.6 d-0.3 m0.5		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	207°58.6	156°47.9	N18°59.3	76°34.6	N20°26.7	215°23.3	S04°18.4	27°43.3	N02°40.1
1	223°01.1	171°47.3	19°00.1	91°36.2	26.4	230°25.3	18.2	42°45.9	40.2
2	238°03.6	186°46.6	01.0	106°37.8	26.1	245°27.2	18.0	57°48.5	40.2
3	253°06.0	201°46.0	·· 01.9	121°39.4	·· 25.8	260°29.2	·· 17.8	72°51.1	·· 40.3
4	268°08.5	216°45.4	02.7	136°40.9	25.5	275°31.2	17.5	87°53.7	40.3
5	283°10.9	231°44.7	03.6	151°42.5	25.2	290°33.1	17.3	102°56.3	40.4
6	298°13.4	246°44.1	N19°04.5	166°44.1	N20°24.9	305°35.1	S04°17.1	117°58.9	N02°40.5
7	313°15.9	261°43.4	05.3	181°45.7	24.6	320°37.1	16.9	133°01.5	40.5
8	328°18.3	276°42.8	06.2	196°47.2	24.3	335°39.0	16.7	148°04.2	40.6
9	343°20.8	291°42.2	·· 07.1	211°48.8	·· 24.0	350°41.0	·· 16.5	163°06.8	·· 40.6
10	358°23.3	306°41.5	07.9	226°50.4	23.7	5°43.0	16.3	178°09.4	40.7
11	13°25.7	321°40.9	08.8	241°52.0	23.4	20°44.9	16.1	193°12.0	40.7
12	28°28.2	336°40.3	N19°09.7	256°53.5	N20°23.1	35°46.9	S04°15.9	208°14.6	N02°40.8
13	43°30.7	351°39.6	10.5	271°55.1	22.8	50°48.9	15.7	223°17.2	40.9
14	58°33.1	6°39.0	11.4	286°56.7	22.5	65°50.8	15.5	238°19.8	40.9
15	73°35.6	21°38.3	·· 12.2	301°58.2	·· 22.2	80°52.8	·· 15.3	253°22.4	·· 41.0
16	88°38.1	36°37.7	13.1	316°59.8	22.0	95°54.8	15.1	268°25.0	41.0
17	103°40.5	51°37.1	14.0	332°01.4	21.7	110°56.8	14.9	283°27.6	41.1
18	118°43.0	66°36.4	N19°14.8	347°03.0	N20°21.4	125°58.7	S04°14.7	298°30.2	N02°41.1
19	133°45.4	81°35.8	15.7	2°04.5	21.1	141°00.7	14.5	313°32.8	41.2
20	148°47.9	96°35.1	16.5	17°06.1	20.8	156°02.7	14.3	328°35.4	41.2
21	163°50.4	111°34.5	·· 17.4	32°07.7	·· 20.5	171°04.6	·· 14.1	343°38.0	·· 41.3
22	178°52.8	126°33.9	18.2	47°09.2	20.2	186°06.6	13.9	358°40.6	41.4
23	193°55.3	141°33.2	19.1	62°10.8	19.9	201°08.6	13.6	13°43.2	41.4
Mer.pass.:10:06		v-0.6 d0.9 m-3.8		v1.6 d-0.3 m0.5		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	208°57.8	156°32.6	N19°19.9	77°12.4	N20°19.6	216°10.5	S04°13.4	28°45.8	N02°41.5
1	224°00.2	171°31.9	20.8	92°13.9	19.3	231°12.5	13.2	43°48.5	41.5
2	239°02.7	186°31.3	21.6	107°15.5	19.0	246°14.5	13.0	58°51.1	41.6
3	254°05.2	201°30.6	·· 22.5	122°17.1	·· 18.6	261°16.5	·· 12.8	73°53.7	·· 41.6
4	269°07.6	216°30.0	23.3	137°18.6	18.3	276°18.4	12.6	88°56.3	41.7
5	284°10.1	231°29.4	24.2	152°20.2	18.0	291°20.4	12.4	103°58.9	41.7
6	299°12.6	246°28.7	N19°25.0	167°21.7	N20°17.7	306°22.4	S04°12.2	119°01.5	N02°41.8
7	314°15.0	261°28.1	25.9	182°23.3	17.4	321°24.3	12.0	134°04.1	41.9
8	329°17.5	276°27.4	26.7	197°24.9	17.1	336°26.3	11.8	149°06.7	41.9
9	344°19.9	291°26.8	·· 27.6	212°26.4	·· 16.8	351°28.3	·· 11.6	164°09.3	·· 42.0
10	359°22.4	306°26.1	28.4	227°28.0	16.5	6°30.2	11.4	179°11.9	42.0
11	14°24.9	321°25.5	29.2	242°29.5	16.2	21°32.2	11.2	194°14.5	42.1
12	29°27.3	336°24.8	N19°30.1	257°31.1	N20°15.9	36°34.2	S04°11.0	209°17.1	N02°42.1
13	44°29.8	351°24.2	30.9	272°32.7	15.6	51°36.2	10.8	224°19.7	42.2
14	59°32.3	6°23.5	31.8	287°34.2	15.3	66°38.1	10.6	239°22.3	42.2
15	74°34.7	21°22.9	·· 32.6	302°35.8	·· 15.0	81°40.1	·· 10.4	254°24.9	·· 42.3
16	89°37.2	36°22.2	33.4	317°37.3	14.7	96°42.1	10.2	269°27.5	42.4
17	104°39.7	51°21.6	34.3	332°38.9	14.4	111°44.1	10.0	284°30.1	42.4
18	119°42.1	66°20.9	N19°35.1	347°40.5	N20°14.1	126°46.0	S04°09.8	299°32.7	N02°42.5
19	134°44.6	81°20.3	35.9	2°42.0	13.8	141°48.0	09.6	314°35.3	42.5
20	149°47.1	96°19.6	36.8	17°43.6	13.5	156°50.0	09.4	329°37.9	42.6
21	164°49.5	111°19.0	·· 37.6	32°45.1	·· 13.2	171°51.9	·· 09.2	344°40.5	·· 42.6
22	179°52.0	126°18.3	38.4	47°46.7	12.9	186°53.9	08.9	359°43.1	42.7
23	194°54.4	141°17.7	39.3	62°48.2	12.6	201°55.9	08.7	14°45.7	42.7
Mer.pass.:10:02		v-0.6 d0.9 m-3.8		v1.6 d-0.3 m0.6		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.2	-42°14.9
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.0
Hamal	328°03.8	23°30.6
Polaris	319°21.8	89°18.7
Acamar	315°20.4	-40°15.9
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.4	-52°42.4
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.0	-59°32.9
Suhail	222°54.1	-43°28.8
Miaplacidus	221°40.1	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.8	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.6
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.1
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.3	-60°52.7
Kochab	137°18.5	74°06.6
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.6
Antares	112°28.8	-26°27.3
Atria	107°32.4	-69°02.6
Sabik	102°15.0	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.4	12°33.0
Eltanin	90°46.9	51°28.9
Kaus Aust.	83°46.7	-34°22.7
Vega	80°40.4	38°47.3
Nunki	76°01.0	-26°17.0
Altair	62°10.5	8°53.6
Peacock	53°22.8	-56°41.8
Deneb	49°33.2	45°18.8
Enif	33°49.5	9°55.3
Al Na'ir	27°46.7	-46°54.5
Fomalhaut	15°26.7	-29°33.9
Scheat	13°55.9	28°08.2
Markab	13°40.9	15°15.6

Apr 19 Mon	**SHA**	**Mer.pass**
Venus	310°03.5	13:32
Mars	228°57.1	18:54
Jupiter	7°36.6	09:40
Saturn	179°41.2	22:09

Apr 20 Tue	**SHA**	**Mer.pass**
Venus	308°49.3	13:33
Mars	228°36.0	18:52
Jupiter	7°24.7	09:37
Saturn	179°44.7	22:05

Apr 21 Wed	**SHA**	**Mer.pass**
Venus	307°34.8	13:34
Mars	228°14.6	18:49
Jupiter	7°12.8	09:34
Saturn	179°48.1	22:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°11.2	**N**11°03.7	124°17.0	5.9'	**N**25°07.5	-1.1'	58.0'
1	195°11.4	04.6	138°41.9	5.9'	25°06.4	-1.2'	58.0'
2	210°11.5	05.4	153°06.8	5.9'	25°05.1	-1.4'	58.0'
3	225°11.7	· · 06.3	167°31.7	5.9'	25°03.6	-1.5'	58.0'
4	240°11.8	07.2	181°56.6	5.9'	25°02.0	-1.7'	58.1'
5	255°11.9	08.0	196°21.5	5.9'	25°00.2	-1.9'	58.1'
6	270°12.1	**N**11°08.9	210°46.4	5.9'	**N**24°58.3	-2.0'	58.1'
7	285°12.2	09.8	225°11.3	5.9'	24°56.2	-2.2'	58.1'
8	300°12.3	10.6	239°36.2	5.9'	24°53.9	-2.3'	58.1'
9	315°12.5	· · 11.5	254°01.1	5.9'	24°51.5	-2.5'	58.2'
10	330°12.6	12.4	268°26.0	5.9'	24°48.9	-2.7'	58.2'
11	345°12.7	13.2	282°50.9	5.9'	24°46.2	-2.8'	58.2'
12	0°12.9	**N**11°14.1	297°15.8	5.9'	**N**24°43.3	-3.0'	58.2'
13	15°13.0	15.0	311°40.7	5.9'	24°40.3	-3.1'	58.2'
14	30°13.1	15.8	326°05.7	5.9'	24°37.1	-3.3'	58.3'
15	45°13.3	· · 16.7	340°30.6	6.0'	24°33.7	-3.4'	58.3'
16	60°13.4	17.5	354°55.6	6.0'	24°30.2	-3.6'	58.3'
17	75°13.5	18.4	9°20.5	6.0'	24°26.5	-3.8'	58.3'
18	90°13.7	**N**11°19.3	23°45.5	6.0'	**N**24°22.7	-3.9'	58.3'
19	105°13.8	20.1	38°10.5	6.0'	24°18.7	-4.1'	58.3'
20	120°13.9	21.0	52°35.6	6.0'	24°14.6	-4.2'	58.4'
21	135°14.1	· · 21.9	67°00.6	6.1'	24°10.3	-4.4'	58.4'
22	150°14.2	22.7	81°25.7	6.1'	24°05.8	-4.5'	58.4'
23	165°14.3	23.6	95°50.8	6.1'	24°01.2	-4.7'	58.4'
	SD.=15.9	d=0.9			S.D.=15.9		

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°14.5	**N**11°24.4	110°15.9	6.1'	**N**23°56.4	-4.8'	58.4'
1	195°14.6	25.3	124°41.1	6.2'	23°51.5	-5.0'	58.4'
2	210°14.7	26.2	139°06.2	6.2'	23°46.5	-5.1'	58.5'
3	225°14.9	· · 27.0	153°31.4	6.2'	23°41.3	-5.3'	58.5'
4	240°15.0	27.9	167°56.7	6.2'	23°35.9	-5.4'	58.5'
5	255°15.1	28.7	182°21.9	6.3'	23°30.4	-5.6'	58.5'
6	270°15.3	**N**11°29.6	196°47.2	6.3'	**N**23°24.7	-5.7'	58.5'
7	285°15.4	30.4	211°12.5	6.3'	23°18.9	-5.9'	58.5'
8	300°15.5	31.3	225°37.9	6.4'	23°12.9	-6.0'	58.6'
9	315°15.7	· · 32.2	240°03.3	6.4'	23°06.8	-6.2'	58.6'
10	330°15.8	33.0	254°28.8	6.5'	23°00.5	-6.3'	58.6'
11	345°15.9	33.9	268°54.2	6.5'	22°54.1	-6.5'	58.6'
12	0°16.1	**N**11°34.7	283°19.7	6.5'	**N**22°47.6	-6.6'	58.6'
13	15°16.2	35.6	297°45.3	6.6'	22°40.9	-6.8'	58.7'
14	30°16.3	36.4	312°10.9	6.6'	22°34.0	-6.9'	58.7'
15	45°16.4	· · 37.3	326°36.5	6.7'	22°27.0	-7.1'	58.7'
16	60°16.6	38.1	341°02.2	6.7'	22°19.9	-7.2'	58.7'
17	75°16.7	39.0	355°27.9	6.7'	22°12.6	-7.3'	58.7'
18	90°16.8	**N**11°39.9	9°53.7	6.8'	**N**22°05.2	-7.5'	58.7'
19	105°17.0	40.7	24°19.5	6.8'	21°57.7	-7.6'	58.7'
20	120°17.1	41.6	38°45.4	6.9'	21°50.0	-7.8'	58.8'
21	135°17.2	· · 42.4	53°11.3	6.9'	21°42.1	-7.9'	58.8'
22	150°17.3	43.3	67°37.3	7.0'	21°34.2	-8.0'	58.8'
23	165°17.5	44.1	82°03.3	7.0'	21°26.0	-8.2'	58.8'
	SD.=15.9	d=0.9			S.D.=16.0		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°17.6	**N**11°45.0	96°29.3	7.1'	**N**21°17.8	-8.3'	58.8'
1	195°17.7	45.8	110°55.4	7.1'	21°09.4	-8.4'	58.8'
2	210°17.9	46.7	125°21.6	7.2'	21°00.9	-8.6'	58.9'
3	225°18.0	· · 47.5	139°47.8	7.2'	20°52.3	-8.7'	58.9'
4	240°18.1	48.4	154°14.1	7.3'	20°43.5	-8.8'	58.9'
5	255°18.2	49.2	168°40.4	7.3'	20°34.6	-9.0'	58.9'
6	270°18.4	**N**11°50.1	183°06.7	7.4'	**N**20°25.6	-9.1'	58.9'
7	285°18.5	50.9	197°33.1	7.4'	20°16.4	-9.2'	58.9'
8	300°18.6	51.8	211°59.6	7.5'	20°07.1	-9.4'	59.0'
9	315°18.7	· · 52.6	226°26.1	7.6'	19°57.7	-9.5'	59.0'
10	330°18.9	53.5	240°52.7	7.6'	19°48.1	-9.6'	59.0'
11	345°19.0	54.3	255°19.4	7.7'	19°38.5	-9.7'	59.0'
12	0°19.1	**N**11°55.2	269°46.0	7.7'	**N**19°28.7	-9.9'	59.0'
13	15°19.3	56.0	284°12.8	7.8'	19°18.8	-10.0'	59.0'
14	30°19.4	56.9	298°39.6	7.8'	19°08.7	-10.1'	59.0'
15	45°19.5	· · 57.7	313°06.4	7.9'	18°58.6	-10.2'	59.1'
16	60°19.6	58.6	327°33.3	7.9'	18°48.3	-10.3'	59.1'
17	75°19.8	11°59.4	342°00.3	8.0'	18°37.9	-10.4'	59.1'
18	90°19.9	**N**12°00.2	356°27.3	8.0'	**N**18°27.4	-10.6'	59.1'
19	105°20.0	01.1	10°54.4	8.1'	18°16.8	-10.7'	59.1'
20	120°20.1	01.9	25°21.5	8.2'	18°06.1	-10.8'	59.1'
21	135°20.3	· · 02.8	39°48.7	8.2'	17°55.2	-10.9'	59.1'
22	150°20.4	03.6	54°16.0	8.3'	17°44.3	-11.0'	59.2'
23	165°20.5	04.5	68°43.3	8.3'	17°33.2	-11.1'	59.2'
	SD.=15.9	d=0.9			S.D.=16.1		

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 5-7 26-47%
19	00:45	00:51	11:59	16:21	03:52	
20	00:58	01:04	11:59	17:19	04:50	
21	01:10	01:17	11:59	18:15	05:47	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	209°56.9	156°17.0	N19°40.1	77°49.8	N20°12.3	216°57.9	S04°08.5	29°48.3	N02°42.8
1	224°59.4	171°16.3	40.9	92°51.3	12.0	231°59.8	08.3	44°50.9	42.8
2	240°01.8	186°15.7	41.8	107°52.9	11.7	247°01.8	08.1	59°53.5	42.9
3	255°04.3	201°15.0	·· 42.6	122°54.4	·· 11.4	262°03.8	·· 07.9	74°56.1	·· 43.0
4	270°06.8	216°14.4	43.4	137°56.0	11.1	277°05.8	07.7	89°58.7	43.0
5	285°09.2	231°13.7	44.2	152°57.5	10.8	292°07.7	07.5	105°01.3	43.1
6	300°11.7	246°13.1	N19°45.1	167°59.1	N20°10.4	307°09.7	S04°07.3	120°03.9	N02°43.1
7	315°14.2	261°12.4	45.9	183°00.6	10.1	322°11.7	07.1	135°06.5	43.2
8	330°16.6	276°11.7	46.7	198°02.2	09.8	337°13.6	06.9	150°09.2	43.2
9	345°19.1	291°11.1	·· 47.5	213°03.7	·· 09.5	352°15.6	·· 06.7	165°11.8	·· 43.3
10	0°21.5	306°10.4	48.3	228°05.3	09.2	7°17.6	06.5	180°14.4	43.3
11	15°24.0	321°09.8	49.2	243°06.8	08.9	22°19.6	06.3	195°17.0	43.4
12	30°26.5	336°09.1	N19°50.0	258°08.4	N20°08.6	37°21.5	S04°06.1	210°19.6	N02°43.4
13	45°28.9	351°08.4	50.8	273°09.9	08.3	52°23.5	05.9	225°22.2	43.5
14	60°31.4	6°07.8	51.6	288°11.5	08.0	67°25.5	05.7	240°24.8	43.6
15	75°33.9	21°07.1	·· 52.4	303°13.0	·· 07.7	82°27.5	·· 05.5	255°27.4	·· 43.6
16	90°36.3	36°06.5	53.3	318°14.6	07.4	97°29.4	05.3	270°30.0	43.7
17	105°38.8	51°05.8	54.1	333°16.1	07.1	112°31.4	05.1	285°32.6	43.7
18	120°41.3	66°05.1	N19°54.9	348°17.7	N20°06.8	127°33.4	S04°04.9	300°35.2	N02°43.8
19	135°43.7	81°04.5	55.7	3°19.2	06.4	142°35.4	04.7	315°37.8	43.8
20	150°46.2	96°03.8	56.5	18°20.7	06.1	157°37.3	04.5	330°40.4	43.9
21	165°48.7	111°03.2	·· 57.3	33°22.3	·· 05.8	172°39.3	·· 04.3	345°43.0	·· 43.9
22	180°51.1	126°02.5	58.1	48°23.8	05.5	187°41.3	04.1	0°45.6	44.0
23	195°53.6	141°01.8	58.9	63°25.4	05.2	202°43.3	03.9	15°48.2	44.0
Mer.pass.:09:59		v-0.7 d0.8 m-3.8		v1.6 d-0.3 m0.6		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.7	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	210°56.0	156°01.2	N19°59.7	78°26.9	N20°04.9	217°45.2	S04°03.7	30°50.8	N02°44.1
1	225°58.5	171°00.5	20°00.5	93°28.5	04.6	232°47.2	03.5	45°53.4	44.1
2	241°01.0	185°59.8	01.4	108°30.0	04.3	247°49.2	03.3	60°56.0	44.2
3	256°03.4	200°59.2	·· 02.2	123°31.5	·· 04.0	262°51.2	·· 03.1	75°58.6	·· 44.2
4	271°05.9	215°58.5	03.0	138°33.1	03.7	277°53.1	02.9	91°01.2	44.3
5	286°08.4	230°57.8	03.8	153°34.6	03.4	292°55.1	02.7	106°03.8	44.4
6	301°10.8	245°57.2	N20°04.6	168°36.2	N20°03.0	307°57.1	S04°02.5	121°06.4	N02°44.4
7	316°13.3	260°56.5	05.4	183°37.7	02.7	322°59.1	02.2	136°09.0	44.5
8	331°15.8	275°55.8	06.2	198°39.2	02.4	338°01.0	02.0	151°11.6	44.5
9	346°18.2	290°55.2	·· 07.0	213°40.8	·· 02.1	353°03.0	·· 01.8	166°14.2	·· 44.6
10	1°20.7	305°54.5	07.8	228°42.3	01.8	8°05.0	01.6	181°16.8	44.6
11	16°23.2	320°53.8	08.6	243°43.8	01.5	23°07.0	01.4	196°19.3	44.7
12	31°25.6	335°53.1	N20°09.4	258°45.4	N20°01.2	38°09.0	S04°01.2	211°21.9	N02°44.7
13	46°28.1	350°52.5	10.2	273°46.9	00.9	53°10.9	01.0	226°24.5	44.8
14	61°30.5	5°51.8	11.0	288°48.4	00.5	68°12.9	00.8	241°27.1	44.8
15	76°33.0	20°51.1	·· 11.7	303°50.0	20°00.2	83°14.9	·· 00.6	256°29.7	·· 44.9
16	91°35.5	35°50.5	12.5	318°51.5	19°59.9	98°16.9	00.4	271°32.3	44.9
17	106°37.9	50°49.8	13.3	333°53.0	59.6	113°18.8	00.2	286°34.9	45.0
18	121°40.4	65°49.1	N20°14.1	348°54.6	N19°59.3	128°20.8	S04°00.0	301°37.5	N02°45.0
19	136°42.9	80°48.4	14.9	3°56.1	59.0	143°22.8	03°59.8	316°40.1	45.1
20	151°45.3	95°47.8	15.7	18°57.6	58.7	158°24.8	59.6	331°42.7	45.1
21	166°47.8	110°47.1	·· 16.5	33°59.2	·· 58.4	173°26.8	·· 59.4	346°45.3	·· 45.2
22	181°50.3	125°46.4	17.3	49°00.7	58.0	188°28.7	59.2	1°47.9	45.2
23	196°52.7	140°45.7	18.1	64°02.2	57.7	203°30.7	59.0	16°50.5	45.3
Mer.pass.:09:55		v-0.7 d0.8 m-3.8		v1.5 d-0.3 m0.6		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.8	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	211°55.2	155°45.1	N20°18.9	79°03.8	N19°57.4	218°32.7	S03°58.8	31°53.1	N02°45.3
1	226°57.6	170°44.4	19.6	94°05.3	57.1	233°34.7	58.6	46°55.7	45.4
2	242°00.1	185°43.7	20.4	109°06.8	56.8	248°36.6	58.4	61°58.3	45.5
3	257°02.6	200°43.0	·· 21.2	124°08.3	·· 56.5	263°38.6	·· 58.2	77°00.9	·· 45.5
4	272°05.0	215°42.4	22.0	139°09.9	56.2	278°40.6	58.0	92°03.5	45.6
5	287°07.5	230°41.7	22.8	154°11.4	55.8	293°42.6	57.8	107°06.1	45.6
6	302°10.0	245°41.0	N20°23.5	169°12.9	N19°55.5	308°44.6	S03°57.6	122°08.7	N02°45.7
7	317°12.4	260°40.3	24.3	184°14.4	55.2	323°46.5	57.4	137°11.3	45.7
8	332°14.9	275°39.6	25.1	199°16.0	54.9	338°48.5	57.2	152°13.9	45.8
9	347°17.4	290°39.0	·· 25.9	214°17.5	·· 54.6	353°50.5	·· 57.0	167°16.5	·· 45.8
10	2°19.8	305°38.3	26.7	229°19.0	54.3	8°52.5	56.8	182°19.1	45.9
11	17°22.3	320°37.6	27.4	244°20.5	53.9	23°54.5	56.6	197°21.7	45.9
12	32°24.8	335°36.9	N20°28.2	259°22.1	N19°53.6	38°56.4	S03°56.4	212°24.3	N02°46.0
13	47°27.2	350°36.2	29.0	274°23.6	53.3	53°58.4	56.2	227°26.9	46.0
14	62°29.7	5°35.6	29.8	289°25.1	53.0	69°00.4	56.0	242°29.5	46.1
15	77°32.1	20°34.9	·· 30.5	304°26.6	·· 52.7	84°02.4	·· 55.8	257°32.1	·· 46.1
16	92°34.6	35°34.2	31.3	319°28.2	52.4	99°04.4	55.6	272°34.7	46.2
17	107°37.1	50°33.5	32.1	334°29.7	52.0	114°06.3	55.4	287°37.3	46.2
18	122°39.5	65°32.8	N20°32.8	349°31.2	N19°51.7	129°08.3	S03°55.2	302°39.8	N02°46.3
19	137°42.0	80°32.1	33.6	4°32.7	51.4	144°10.3	55.0	317°42.4	46.3
20	152°44.5	95°31.5	34.4	19°34.2	51.1	159°12.3	54.8	332°45.0	46.4
21	167°46.9	110°30.8	·· 35.1	34°35.8	·· 50.8	174°14.3	·· 54.6	347°47.6	·· 46.4
22	182°49.4	125°30.1	35.9	49°37.3	50.5	189°16.2	54.4	2°50.2	46.5
23	197°51.9	140°29.4	36.7	64°38.8	50.1	204°18.2	54.2	17°52.8	46.5
Mer.pass.:09:51		v-0.7 d0.8 m-3.8		v1.5 d-0.3 m0.6		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.3	29°08.8
Ankaa	353°18.2	-42°14.9
Schedar	349°43.9	56°35.6
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.0
Hamal	328°03.8	23°30.6
Polaris	319°21.9	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.4	-52°42.4
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.1	-59°32.9
Suhail	222°54.1	-43°28.8
Miaplacidus	221°40.2	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.8	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.7
Gacrux	172°03.1	-57°10.5
Alioth	166°22.0	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.3	-60°52.7
Kochab	137°18.5	74°06.6
Zuben'ubi	137°07.7	-16°05.3
Alphecca	126°12.6	26°40.6
Antares	112°28.8	-26°27.4
Atria	107°32.4	-69°02.6
Sabik	102°14.9	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.4	12°33.0
Eltanin	90°46.9	51°29.0
Kaus Aust.	83°46.7	-34°22.7
Vega	80°40.3	38°47.3
Nunki	76°01.0	-26°17.0
Altair	62°10.4	8°53.6
Peacock	53°22.8	-56°41.8
Deneb	49°33.2	45°18.8
Enif	33°49.5	9°55.3
Al Na'ir	27°46.7	-46°54.4
Fomalhaut	15°26.7	-29°33.9
Scheat	13°55.9	28°08.2
Markab	13°40.9	15°15.6

Apr 22 Thu	**SHA**	**Mer.pass**
Venus	306°20.1	13:35
Mars	227°52.9	18:47
Jupiter	7°00.9	09:31
Saturn	179°51.4	21:57

Apr 23 Fri	**SHA**	**Mer.pass**
Venus	305°05.1	13:37
Mars	227°30.9	18:44
Jupiter	6°49.2	09:28
Saturn	179°54.7	21:53

Apr 24 Sat	**SHA**	**Mer.pass**
Venus	303°49.9	13:38
Mars	227°08.6	18:42
Jupiter	6°37.5	09:25
Saturn	179°57.9	21:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°20.6	N12°05.3	83°10.6	8.4'	N17°22.0	-11.2'	59.2'
1	195°20.7	06.2	97°38.0	8.4'	17°10.8	-11.3'	59.2'
2	210°20.9	07.0	112°05.5	8.5'	16°59.4	-11.4'	59.2'
3	225°21.0	· · 07.8	126°33.0	8.5'	16°47.9	-11.5'	59.2'
4	240°21.1	08.7	141°00.6	8.6'	16°36.3	-11.6'	59.2'
5	255°21.2	09.5	155°28.2	8.7'	16°24.6	-11.7'	59.2'
6	270°21.4	N12°10.4	169°55.9	8.7'	N16°12.8	-11.8'	59.3'
7	285°21.5	11.2	184°23.6	8.8'	16°00.9	-11.9'	59.3'
8	300°21.6	12.1	198°51.4	8.8'	15°48.9	-12.0'	59.3'
9	315°21.7	· · 12.9	213°19.3	8.9'	15°36.8	-12.1'	59.3'
10	330°21.9	13.7	227°47.1	8.9'	15°24.6	-12.2'	59.3'
11	345°22.0	14.6	242°15.1	9.0'	15°12.4	-12.3'	59.3'
12	0°22.1	N12°15.4	256°43.1	9.0'	N15°00.0	-12.4'	59.3'
13	15°22.2	16.2	271°11.2	9.1'	14°47.5	-12.5'	59.3'
14	30°22.3	17.1	285°39.3	9.1'	14°35.0	-12.6'	59.4'
15	45°22.5	· · 17.9	300°07.4	9.2'	14°22.3	-12.7'	59.4'
16	60°22.6	18.8	314°35.6	9.2'	14°09.6	-12.8'	59.4'
17	75°22.7	19.6	329°03.9	9.3'	13°56.8	-12.9'	59.4'
18	90°22.8	N12°20.4	343°32.2	9.3'	N13°43.9	-12.9'	59.4'
19	105°22.9	21.3	358°00.5	9.4'	13°30.9	-13.0'	59.4'
20	120°23.1	22.1	12°29.0	9.4'	13°17.8	-13.1'	59.4'
21	135°23.2	· · 22.9	26°57.4	9.5'	13°04.7	-13.2'	59.4'
22	150°23.3	23.8	41°25.9	9.5'	12°51.5	-13.3'	59.4'
23	165°23.4	24.6	55°54.5	9.6'	12°38.1	-13.3'	59.5'
	SD.=15.9	d=0.8	S.D.=16.2				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°23.5	N12°25.5	70°23.0	9.6'	N12°24.8	-13.4'	59.5'
1	195°23.7	26.3	84°51.7	9.7'	12°11.3	-13.5'	59.5'
2	210°23.8	27.1	99°20.4	9.7'	11°57.8	-13.6'	59.5'
3	225°23.9	· · 28.0	113°49.1	9.7'	11°44.2	-13.6'	59.5'
4	240°24.0	28.8	128°17.9	9.8'	11°30.5	-13.7'	59.5'
5	255°24.1	29.6	142°46.7	9.8'	11°16.8	-13.8'	59.5'
6	270°24.3	N12°30.5	157°15.5	9.9'	N11°03.0	-13.8'	59.5'
7	285°24.4	31.3	171°44.4	9.9'	10°49.1	-13.9'	59.5'
8	300°24.5	32.1	186°13.4	10.0'	10°35.2	-14.0'	59.5'
9	315°24.6	· · 33.0	200°42.3	10.0'	10°21.2	-14.0'	59.6'
10	330°24.7	33.8	215°11.4	10.0'	10°07.1	-14.1'	59.6'
11	345°24.8	34.6	229°40.4	10.1'	09°53.0	-14.2'	59.6'
12	0°25.0	N12°35.4	244°09.5	10.1'	N09°38.8	-14.2'	59.6'
13	15°25.1	36.3	258°38.6	10.1'	09°24.5	-14.3'	59.6'
14	30°25.2	37.1	273°07.8	10.2'	09°10.2	-14.3'	59.6'
15	45°25.3	· · 37.9	287°37.0	10.2'	08°55.9	-14.4'	59.6'
16	60°25.4	38.8	302°06.2	10.2'	08°41.5	-14.4'	59.6'
17	75°25.5	39.6	316°35.5	10.3'	08°27.0	-14.5'	59.6'
18	90°25.7	N12°40.4	331°04.8	10.3'	N08°12.5	-14.5'	59.6'
19	105°25.8	41.3	345°34.1	10.3'	07°58.0	-14.6'	59.6'
20	120°25.9	42.1	0°03.5	10.4'	07°43.3	-14.6'	59.6'
21	135°26.0	· · 42.9	14°32.8	10.4'	07°28.7	-14.7'	59.6'
22	150°26.1	43.7	29°02.3	10.4'	07°14.0	-14.7'	59.6'
23	165°26.2	44.6	43°31.7	10.5'	06°59.3	-14.8'	59.6'
	SD.=15.9	d=0.8	S.D.=16.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°26.4	N12°45.4	58°01.2	10.5'	N06°44.5	-14.8'	59.7'
1	195°26.5	46.2	72°30.7	10.5'	06°29.7	-14.8'	59.7'
2	210°26.6	47.0	87°00.2	10.5'	06°14.8	-14.9'	59.7'
3	225°26.7	· · 47.9	101°29.7	10.6'	05°59.9	-14.9'	59.7'
4	240°26.8	48.7	115°59.3	10.6'	05°45.0	-15.0'	59.7'
5	255°26.9	49.5	130°28.9	10.6'	05°30.0	-15.0'	59.7'
6	270°27.0	N12°50.3	144°58.5	10.6'	N05°15.0	-15.0'	59.7'
7	285°27.2	51.2	159°28.1	10.6'	05°00.0	-15.0'	59.7'
8	300°27.3	52.0	173°57.8	10.7'	04°44.9	-15.1'	59.7'
9	315°27.4	· · 52.8	188°27.4	10.7'	04°29.8	-15.1'	59.7'
10	330°27.5	53.6	202°57.1	10.7'	04°14.7	-15.1'	59.7'
11	345°27.6	54.5	217°26.8	10.7'	03°59.6	-15.2'	59.7'
12	0°27.7	N12°55.3	231°56.5	10.7'	N03°44.4	-15.2'	59.7'
13	15°27.8	56.1	246°26.3	10.7'	03°29.2	-15.2'	59.7'
14	30°27.9	56.9	260°56.0	10.7'	03°14.0	-15.2'	59.7'
15	45°28.1	· · 57.7	275°25.8	10.8'	02°58.8	-15.2'	59.7'
16	60°28.2	58.6	289°55.5	10.8'	02°43.5	-15.3'	59.7'
17	75°28.3	12°59.4	304°25.3	10.8'	02°28.3	-15.3'	59.7'
18	90°28.4	N13°00.2	318°55.1	10.8'	N02°13.0	-15.3'	59.7'
19	105°28.5	01.0	333°24.9	10.8'	01°57.7	-15.3'	59.7'
20	120°28.6	01.8	347°54.7	10.8'	01°42.4	-15.3'	59.7'
21	135°28.7	· · 02.7	2°24.5	10.8'	01°27.1	-15.3'	59.7'
22	150°28.8	03.5	16°54.3	10.8'	01°11.8	-15.3'	59.7'
23	165°28.9	04.3	31°24.1	10.8'	00°56.4	-15.3'	59.7'
	SD.=15.9	d=0.8	S.D.=16.3				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 8-10 59-80%
22	01:23	01:28	11:59	19:08	06:42	
23	01:34	01:40	11:58	20:00	07:34	
24	01:45	01:51	11:58	20:50	08:25	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	212°54.3	155°28.7	N20°37.4	79°40.3	N19°49.8	219°20.2	S03°54.0	32°55.4	N02°46.6
1	227°56.8	170°28.0	38.2	94°41.8	49.5	234°22.2	53.8	47°58.0	46.6
2	242°59.3	185°27.3	38.9	109°43.4	49.2	249°24.2	53.6	63°00.6	46.7
3	258°01.7	200°26.6	·· 39.7	124°44.9	·· 48.9	264°26.1	·· 53.4	78°03.2	·· 46.7
4	273°04.2	215°26.0	40.5	139°46.4	48.5	279°28.1	53.2	93°05.8	46.8
5	288°06.6	230°25.3	41.2	154°47.9	48.2	294°30.1	53.0	108°08.4	46.8
6	303°09.1	245°24.6	N20°42.0	169°49.4	N19°47.9	309°32.1	S03°52.8	123°11.0	N02°46.9
7	318°11.6	260°23.9	42.7	184°50.9	47.6	324°34.1	52.6	138°13.6	46.9
8	333°14.0	275°23.2	43.5	199°52.4	47.3	339°36.1	52.4	153°16.2	47.0
9	348°16.5	290°22.5	·· 44.2	214°54.0	·· 46.9	354°38.0	·· 52.2	168°18.8	·· 47.0
10	3°19.0	305°21.8	45.0	229°55.5	46.6	9°40.0	52.0	183°21.4	47.1
11	18°21.4	320°21.1	45.8	244°57.0	46.3	24°42.0	51.8	198°23.9	47.1
12	33°23.9	335°20.4	N20°46.5	259°58.5	N19°46.0	39°44.0	S03°51.6	213°26.5	N02°47.2
13	48°26.4	350°19.7	47.3	275°00.0	45.7	54°46.0	51.4	228°29.1	47.2
14	63°28.8	5°19.1	48.0	290°01.5	45.3	69°47.9	51.2	243°31.7	47.3
15	78°31.3	20°18.4	·· 48.8	305°03.0	·· 45.0	84°49.9	·· 51.0	258°34.3	·· 47.3
16	93°33.7	35°17.7	49.5	320°04.5	44.7	99°51.9	50.8	273°36.9	47.4
17	108°36.2	50°17.0	50.2	335°06.1	44.4	114°53.9	50.6	288°39.5	47.4
18	123°38.7	65°16.3	N20°51.0	350°07.6	N19°44.1	129°55.9	S03°50.4	303°42.1	N02°47.5
19	138°41.1	80°15.6	51.7	5°09.1	43.7	144°57.9	50.2	318°44.7	47.5
20	153°43.6	95°14.9	52.5	20°10.6	43.4	159°59.8	50.0	333°47.3	47.6
21	168°46.1	110°14.2	·· 53.2	35°12.1	·· 43.1	175°01.8	·· 49.8	348°49.9	·· 47.6
22	183°48.5	125°13.5	54.0	50°13.6	42.8	190°03.8	49.6	3°52.5	47.7
23	198°51.0	140°12.8	54.7	65°15.1	42.4	205°05.8	49.4	18°55.1	47.7
Mer.pass.:09:47		v-0.7 d0.8 m-3.8		v1.5 d-0.3 m0.6		v2.0 d0.2 m-1.9		v2.6 d0.1 m0.8	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	213°53.5	155°12.1	N20°55.4	80°16.6	N19°42.1	220°07.8	S03°49.2	33°57.6	N02°47.8
1	228°55.9	170°11.4	56.2	95°18.1	41.8	235°09.8	49.0	49°00.2	47.8
2	243°58.4	185°10.7	56.9	110°19.6	41.5	250°11.7	48.8	64°02.8	47.9
3	259°00.9	200°10.0	·· 57.7	125°21.1	·· 41.1	265°13.7	·· 48.6	79°05.4	·· 47.9
4	274°03.3	215°09.3	58.4	140°22.6	40.8	280°15.7	48.4	94°08.0	48.0
5	289°05.8	230°08.6	59.1	155°24.1	40.5	295°17.7	48.2	109°10.6	48.0
6	304°08.2	245°07.9	N20°59.9	170°25.6	N19°40.2	310°19.7	S03°48.0	124°13.2	N02°48.1
7	319°10.7	260°07.2	21°00.6	185°27.1	39.8	325°21.7	47.8	139°15.8	48.1
8	334°13.2	275°06.5	01.3	200°28.6	39.5	340°23.7	47.6	154°18.4	48.2
9	349°15.6	290°05.8	·· 02.1	215°30.2	·· 39.2	355°25.6	·· 47.4	169°21.0	·· 48.2
10	4°18.1	305°05.1	02.8	230°31.7	38.9	10°27.6	47.2	184°23.5	48.3
11	19°20.6	320°04.4	03.5	245°33.2	38.5	25°29.6	47.0	199°26.1	48.3
12	34°23.0	335°03.7	N21°04.2	260°34.7	N19°38.2	40°31.6	S03°46.8	214°28.7	N02°48.4
13	49°25.5	350°03.0	05.0	275°36.2	37.9	55°33.6	46.6	229°31.3	48.4
14	64°28.0	5°02.3	05.7	290°37.7	37.6	70°35.6	46.4	244°33.9	48.5
15	79°30.4	20°01.6	·· 06.4	305°39.2	·· 37.2	85°37.6	·· 46.2	259°36.5	·· 48.5
16	94°32.9	35°00.9	07.1	320°40.7	36.9	100°39.5	46.0	274°39.1	48.5
17	109°35.3	50°00.2	07.9	335°42.2	36.6	115°41.5	45.8	289°41.7	48.6
18	124°37.8	64°59.5	N21°08.6	350°43.7	N19°36.3	130°43.5	S03°45.6	304°44.3	N02°48.6
19	139°40.3	79°58.8	09.3	5°45.2	35.9	145°45.5	45.4	319°46.9	48.7
20	154°42.7	94°58.1	10.0	20°46.7	35.6	160°47.5	45.2	334°49.4	48.7
21	169°45.2	109°57.4	·· 10.8	35°48.2	·· 35.3	175°49.5	·· 45.0	349°52.0	·· 48.8
22	184°47.7	124°56.7	11.5	50°49.6	35.0	190°51.5	44.8	4°54.6	48.8
23	199°50.1	139°56.0	12.2	65°51.1	34.6	205°53.4	44.6	19°57.2	48.9
Mer.pass.:09:43		v-0.7 d0.7 m-3.8		v1.5 d-0.3 m0.6		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	214°52.6	154°55.2	N21°12.9	80°52.6	N19°34.3	220°55.4	S03°44.4	34°59.8	N02°48.9
1	229°55.1	169°54.5	13.6	95°54.1	34.0	235°57.4	44.3	50°02.4	49.0
2	244°57.5	184°53.8	14.3	110°55.6	33.6	250°59.4	44.1	65°05.0	49.0
3	260°00.0	199°53.1	·· 15.0	125°57.1	·· 33.3	266°01.4	·· 43.9	80°07.6	·· 49.1
4	275°02.5	214°52.4	15.8	140°58.6	33.0	281°03.4	43.7	95°10.2	49.1
5	290°04.9	229°51.7	16.5	156°00.1	32.7	296°05.4	43.5	110°12.7	49.2
6	305°07.4	244°51.0	N21°17.2	171°01.6	N19°32.3	311°07.4	S03°43.3	125°15.3	N02°49.2
7	320°09.8	259°50.3	17.9	186°03.1	32.0	326°09.3	43.1	140°17.9	49.3
8	335°12.3	274°49.6	18.6	201°04.6	31.7	341°11.3	42.9	155°20.5	49.3
9	350°14.8	289°48.9	·· 19.3	216°06.1	·· 31.3	356°13.3	·· 42.7	170°23.1	·· 49.4
10	5°17.2	304°48.1	20.0	231°07.6	31.0	11°15.3	42.5	185°25.7	49.4
11	20°19.7	319°47.4	20.7	246°09.1	30.7	26°17.3	42.3	200°28.3	49.5
12	35°22.2	334°46.7	N21°21.4	261°10.6	N19°30.4	41°19.3	S03°42.1	215°30.9	N02°49.5
13	50°24.6	349°46.0	22.1	276°12.1	30.0	56°21.3	41.9	230°33.4	49.5
14	65°27.1	4°45.3	22.8	291°13.5	29.7	71°23.3	41.7	245°36.0	49.6
15	80°29.6	19°44.6	·· 23.5	306°15.0	·· 29.4	86°25.2	·· 41.5	260°38.6	·· 49.6
16	95°32.0	34°43.9	24.2	321°16.5	29.0	101°27.2	41.3	275°41.2	49.7
17	110°34.5	49°43.2	24.9	336°18.0	28.7	116°29.2	41.1	290°43.8	49.7
18	125°36.9	64°42.4	N21°25.6	351°19.5	N19°28.4	131°31.2	S03°40.9	305°46.4	N02°49.8
19	140°39.4	79°41.7	26.3	6°21.0	28.0	146°33.2	40.7	320°49.0	49.8
20	155°41.9	94°41.0	27.0	21°22.5	27.7	161°35.2	40.5	335°51.5	49.9
21	170°44.3	109°40.3	·· 27.7	36°24.0	·· 27.4	176°37.2	·· 40.3	350°54.1	·· 49.9
22	185°46.8	124°39.6	28.4	51°25.4	27.0	191°39.2	40.1	5°56.7	50.0
23	200°49.3	139°38.9	29.1	66°26.9	26.7	206°41.2	39.9	20°59.3	50.0
Mer.pass.:09:39		v-0.7 d0.7 m-3.8		v1.5 d-0.3 m0.7		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.2	29°08.8
Ankaa	353°18.2	-42°14.9
Schedar	349°43.8	56°35.5
Diphda	348°58.5	-17°55.8
Achernar	335°28.9	-57°11.0
Hamal	328°03.7	23°30.6
Polaris	319°22.1	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.5	-52°42.3
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.1	-59°32.9
Suhail	222°54.2	-43°28.8
Miaplacidus	221°40.2	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.7
Gacrux	172°03.1	-57°10.6
Alioth	166°22.0	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.4	74°06.6
Zuben'ubi	137°07.7	-16°05.3
Alphecca	126°12.6	26°40.6
Antares	112°28.8	-26°27.4
Atria	107°32.3	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.4	12°33.0
Eltanin	90°46.9	51°29.0
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.3	38°47.3
Nunki	76°01.0	-26°17.0
Altair	62°10.4	8°53.6
Peacock	53°22.7	-56°41.8
Deneb	49°33.1	45°18.8
Enif	33°49.5	9°55.3
Al Na'ir	27°46.7	-46°54.4
Fomalhaut	15°26.7	-29°33.9
Scheat	13°55.9	28°08.2
Markab	13°40.9	15°15.6

Apr 25 Sun	**SHA**	**Mer.pass**
Venus	302°34.4	13:39
Mars	226°46.0	18:39
Jupiter	6°25.9	09:21
Saturn	180°01.1	21:45

Apr 26 Mon	**SHA**	**Mer.pass**
Venus	301°18.6	13:40
Mars	226°23.2	18:37
Jupiter	6°14.3	09:18
Saturn	180°04.2	21:40

Apr 27 Tue	**SHA**	**Mer.pass**
Venus	300°02.6	13:41
Mars	226°00.0	18:35
Jupiter	6°02.8	09:15
Saturn	180°07.2	21:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°29.0	N13°05.1	45°53.9	10.8'	N00°41.1	-15.3'	59.7'
1	195°29.2	05.9	60°23.7	10.8'	00°25.8	-15.3'	59.7'
2	210°29.3	06.7	74°53.5	10.8'	N00°10.4	-15.3'	59.7'
3	225°29.4	· · 07.6	89°23.3	10.8'	S00°04.9	-15.3'	59.7'
4	240°29.5	08.4	103°53.2	10.8'	00°20.3	-15.3'	59.7'
5	255°29.6	09.2	118°23.0	10.8'	00°35.6	-15.3'	59.7'
6	270°29.7	N13°10.0	132°52.8	10.8'	S00°50.9	-15.3'	59.7'
7	285°29.8	10.8	147°22.6	10.8'	01°06.3	-15.3'	59.7'
8	300°29.9	11.6	161°52.4	10.8'	01°21.6	-15.3'	59.7'
9	315°30.0	· · 12.5	176°22.2	10.8'	01°36.9	-15.3'	59.7'
10	330°30.1	13.3	190°52.0	10.8'	01°52.2	-15.3'	59.7'
11	345°30.2	14.1	205°21.8	10.8'	02°07.5	-15.3'	59.7'
12	0°30.4	N13°14.9	219°51.5	10.8'	S02°22.8	-15.3'	59.7'
13	15°30.5	15.7	234°21.3	10.8'	02°38.1	-15.3'	59.7'
14	30°30.6	16.5	248°51.0	10.7'	02°53.3	-15.2'	59.7'
15	45°30.7	· · 17.3	263°20.8	10.7'	03°08.6	-15.2'	59.7'
16	60°30.8	18.1	277°50.5	10.7'	03°23.8	-15.2'	59.7'
17	75°30.9	19.0	292°20.2	10.7'	03°39.0	-15.2'	59.7'
18	90°31.0	N13°19.8	306°49.9	10.7'	S03°54.1	-15.2'	59.6'
19	105°31.1	20.6	321°19.6	10.7'	04°09.3	-15.1'	59.6'
20	120°31.2	21.4	335°49.3	10.7'	04°24.4	-15.1'	59.6'
21	135°31.3	· · 22.2	350°18.9	10.6'	04°39.5	-15.1'	59.6'
22	150°31.4	23.0	4°48.6	10.6'	04°54.6	-15.1'	59.6'
23	165°31.5	23.8	19°18.2	10.6'	05°09.6	-15.0'	59.6'
	SD.=15.9	d=0.8	S.D.=16.3				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°31.6	N13°24.6	33°47.8	10.6'	S05°24.6	-15.0'	59.6'
1	195°31.7	25.4	48°17.3	10.6'	05°39.6	-15.0'	59.6'
2	210°31.8	26.2	62°46.9	10.5'	05°54.5	-14.9'	59.6'
3	225°31.9	· · 27.0	77°16.4	10.5'	06°09.4	-14.9'	59.6'
4	240°32.0	27.8	91°45.9	10.5'	06°24.3	-14.8'	59.6'
5	255°32.2	28.7	106°15.4	10.5'	06°39.1	-14.8'	59.6'
6	270°32.3	N13°29.5	120°44.8	10.4'	S06°53.9	-14.8'	59.6'
7	285°32.4	30.3	135°14.3	10.4'	07°08.7	-14.7'	59.5'
8	300°32.5	31.1	149°43.7	10.4'	07°23.4	-14.7'	59.5'
9	315°32.6	· · 31.9	164°13.1	10.4'	07°38.0	-14.6'	59.5'
10	330°32.7	32.7	178°42.4	10.3'	07°52.7	-14.6'	59.5'
11	345°32.8	33.5	193°11.7	10.3'	08°07.2	-14.5'	59.5'
12	0°32.9	N13°34.3	207°41.0	10.3'	S08°21.7	-14.5'	59.5'
13	15°33.0	35.1	222°10.3	10.2'	08°36.2	-14.4'	59.5'
14	30°33.1	35.9	236°39.5	10.2'	08°50.6	-14.4'	59.5'
15	45°33.2	· · 36.7	251°08.7	10.2'	09°05.0	-14.3'	59.5'
16	60°33.3	37.5	265°37.8	10.1'	09°19.3	-14.3'	59.4'
17	75°33.4	38.3	280°07.0	10.1'	09°33.5	-14.2'	59.4'
18	90°33.5	N13°39.1	294°36.1	10.1'	S09°47.7	-14.2'	59.4'
19	105°33.6	39.9	309°05.1	10.0'	10°01.8	-14.1'	59.4'
20	120°33.7	40.7	323°34.2	10.0'	10°15.9	-14.0'	59.4'
21	135°33.8	· · 41.5	338°03.1	10.0'	10°29.9	-14.0'	59.4'
22	150°33.9	42.3	352°32.1	9.9'	10°43.8	-13.9'	59.4'
23	165°34.0	43.1	7°01.0	9.9'	10°57.7	-13.8'	59.3'
	SD.=15.9	d=0.8	S.D.=16.2				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°34.1	N13°43.9	21°29.9	9.9'	S11°11.5	-13.8'	59.3'
1	195°34.2	44.7	35°58.7	9.8'	11°25.2	-13.7'	59.3'
2	210°34.3	45.5	50°27.5	9.8'	11°38.9	-13.6'	59.3'
3	225°34.4	· · 46.3	64°56.3	9.7'	11°52.4	-13.6'	59.3'
4	240°34.5	47.1	79°25.0	9.7'	12°06.0	-13.5'	59.3'
5	255°34.6	47.9	93°53.7	9.7'	12°19.4	-13.4'	59.3'
6	270°34.7	N13°48.7	108°22.4	9.6'	S12°32.8	-13.3'	59.2'
7	285°34.8	49.5	122°51.0	9.6'	12°46.0	-13.2'	59.2'
8	300°34.9	50.3	137°19.5	9.5'	12°59.3	-13.2'	59.2'
9	315°35.0	· · 51.1	151°48.1	9.5'	13°12.4	-13.1'	59.2'
10	330°35.1	51.9	166°16.5	9.5'	13°25.4	-13.0'	59.2'
11	345°35.2	52.7	180°45.0	9.4'	13°38.4	-12.9'	59.2'
12	0°35.3	N13°53.5	195°13.4	9.4'	S13°51.2	-12.8'	59.1'
13	15°35.4	54.3	209°41.7	9.3'	14°04.0	-12.7'	59.1'
14	30°35.5	55.0	224°10.0	9.3'	14°16.7	-12.7'	59.1'
15	45°35.6	· · 55.8	238°38.3	9.2'	14°29.3	-12.6'	59.1'
16	60°35.7	56.6	253°06.5	9.2'	14°41.9	-12.5'	59.1'
17	75°35.8	57.4	267°34.7	9.2'	14°54.3	-12.4'	59.0'
18	90°35.9	N13°58.2	282°02.8	9.1'	S15°06.6	-12.3'	59.0'
19	105°35.9	59.0	296°30.9	9.1'	15°18.8	-12.2'	59.0'
20	120°36.0	13°59.8	310°59.0	9.0'	15°31.0	-12.1'	59.0'
21	135°36.1	14°00.6	325°27.0	9.0'	15°43.0	-12.0'	59.0'
22	150°36.2	01.4	339°55.0	8.9'	15°55.0	-11.9'	58.9'
23	165°36.3	02.2	354°22.9	8.9'	16°06.8	-11.8'	58.9'
	SD.=15.9	d=0.8	S.D.=16.1				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 11-13 88-98%
25	01:56	02:01	11:58	21:40	09:15	
26	02:07	02:11	11:58	22:31	10:05	
27	02:16	02:21	11:58	23:23	10:57	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	215°51.7	154°38.1	N21°29.8	81°28.4	N19°26.4	221°43.1	S03°39.7	36°01.9	N02°50.1
1	230°54.2	169°37.4	30.5	96°29.9	26.1	236°45.1	39.5	51°04.5	50.1
2	245°56.7	184°36.7	31.2	111°31.4	25.7	251°47.1	39.3	66°07.1	50.1
3	260°59.1	199°36.0	·· 31.9	126°32.9	·· 25.4	266°49.1	·· 39.1	81°09.6	·· 50.2
4	276°01.6	214°35.3	32.5	141°34.4	25.1	281°51.1	38.9	96°12.2	50.2
5	291°04.1	229°34.5	33.2	156°35.8	24.7	296°53.1	38.7	111°14.8	50.3
6	306°06.5	244°33.8	N21°33.9	171°37.3	N19°24.4	311°55.1	S03°38.5	126°17.4	N02°50.3
7	321°09.0	259°33.1	34.6	186°38.8	24.1	326°57.1	38.3	141°20.0	50.4
8	336°11.4	274°32.4	35.3	201°40.3	23.7	341°59.1	38.1	156°22.6	50.4
9	351°13.9	289°31.7	·· 36.0	216°41.8	·· 23.4	357°01.1	·· 37.9	171°25.2	·· 50.5
10	6°16.4	304°30.9	36.7	231°43.3	23.1	12°03.1	37.8	186°27.7	50.5
11	21°18.8	319°30.2	37.3	246°44.7	22.7	27°05.0	37.6	201°30.3	50.6
12	36°21.3	334°29.5	N21°38.0	261°46.2	N19°22.4	42°07.0	S03°37.4	216°32.9	N02°50.6
13	51°23.8	349°28.8	38.7	276°47.7	22.0	57°09.0	37.2	231°35.5	50.7
14	66°26.2	4°28.1	39.4	291°49.2	21.7	72°11.0	37.0	246°38.1	50.7
15	81°28.7	19°27.3	·· 40.0	306°50.7	·· 21.4	87°13.0	·· 36.8	261°40.7	·· 50.7
16	96°31.2	34°26.6	40.7	321°52.1	21.0	102°15.0	36.6	276°43.2	50.8
17	111°33.6	49°25.9	41.4	336°53.6	20.7	117°17.0	36.4	291°45.8	50.8
18	126°36.1	64°25.2	N21°42.1	351°55.1	N19°20.4	132°19.0	S03°36.2	306°48.4	N02°50.9
19	141°38.6	79°24.4	42.7	6°56.6	20.0	147°21.0	36.0	321°51.0	50.9
20	156°41.0	94°23.7	43.4	21°58.0	19.7	162°23.0	35.8	336°53.6	51.0
21	171°43.5	109°23.0	·· 44.1	36°59.5	·· 19.4	177°25.0	·· 35.6	351°56.2	·· 51.0
22	186°45.9	124°22.3	44.8	52°01.0	19.0	192°27.0	35.4	6°58.7	51.1
23	201°48.4	139°21.5	45.4	67°02.5	18.7	207°28.9	35.2	22°01.3	51.1
Mer.pass.:09:35		v-0.7 d0.7 m-3.8		v1.5 d-0.3 m0.7		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	216°50.9	154°20.8	N21°46.1	82°03.9	N19°18.4	222°30.9	S03°35.0	37°03.9	N02°51.1
1	231°53.3	169°20.1	46.8	97°05.4	18.0	237°32.9	34.8	52°06.5	51.2
2	246°55.8	184°19.3	47.4	112°06.9	17.7	252°34.9	34.6	67°09.1	51.2
3	261°58.3	199°18.6	·· 48.1	127°08.4	·· 17.3	267°36.9	·· 34.4	82°11.7	·· 51.3
4	277°00.7	214°17.9	48.8	142°09.8	17.0	282°38.9	34.2	97°14.2	51.3
5	292°03.2	229°17.2	49.4	157°11.3	16.7	297°40.9	34.0	112°16.8	51.4
6	307°05.7	244°16.4	N21°50.1	172°12.8	N19°16.3	312°42.9	S03°33.8	127°19.4	N02°51.4
7	322°08.1	259°15.7	50.7	187°14.3	16.0	327°44.9	33.6	142°22.0	51.5
8	337°10.6	274°15.0	51.4	202°15.7	15.7	342°46.9	33.5	157°24.6	51.5
9	352°13.0	289°14.2	·· 52.1	217°17.2	·· 15.3	357°48.9	·· 33.3	172°27.1	·· 51.5
10	7°15.5	304°13.5	52.7	232°18.7	15.0	12°50.9	33.1	187°29.7	51.6
11	22°18.0	319°12.8	53.4	247°20.1	14.6	27°52.9	32.9	202°32.3	51.6
12	37°20.4	334°12.0	N21°54.0	262°21.6	N19°14.3	42°54.9	S03°32.7	217°34.9	N02°51.7
13	52°22.9	349°11.3	54.7	277°23.1	14.0	57°56.9	32.5	232°37.5	51.7
14	67°25.4	4°10.6	55.3	292°24.6	13.6	72°58.8	32.3	247°40.0	51.8
15	82°27.8	19°09.8	·· 56.0	307°26.0	·· 13.3	88°00.8	·· 32.1	262°42.6	·· 51.8
16	97°30.3	34°09.1	56.6	322°27.5	12.9	103°02.8	31.9	277°45.2	51.9
17	112°32.8	49°08.4	57.3	337°29.0	12.6	118°04.8	31.7	292°47.8	51.9
18	127°35.2	64°07.6	N21°57.9	352°30.4	N19°12.3	133°06.8	S03°31.5	307°50.4	N02°51.9
19	142°37.7	79°06.9	58.6	7°31.9	11.9	148°08.8	31.3	322°52.9	52.0
20	157°40.2	94°06.2	59.2	22°33.4	11.6	163°10.8	31.1	337°55.5	52.0
21	172°42.6	109°05.4	21°59.9	37°34.8	·· 11.2	178°12.8	·· 30.9	352°58.1	·· 52.1
22	187°45.1	124°04.7	22°00.5	52°36.3	10.9	193°14.8	30.7	8°00.7	52.1
23	202°47.5	139°04.0	01.2	67°37.8	10.6	208°16.8	30.5	23°03.3	52.2
Mer.pass.:09:31		v-0.7 d0.7 m-3.8		v1.5 d-0.3 m0.7		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	217°50.0	154°03.2	N22°01.8	82°39.2	N19°10.2	223°18.8	S03°30.3	38°05.8	N02°52.2
1	232°52.5	169°02.5	02.4	97°40.7	09.9	238°20.8	30.1	53°08.4	52.2
2	247°54.9	184°01.7	03.1	112°42.2	09.5	253°22.8	30.0	68°11.0	52.3
3	262°57.4	199°01.0	·· 03.7	127°43.6	·· 09.2	268°24.8	·· 29.8	83°13.6	·· 52.3
4	277°59.9	214°00.3	04.4	142°45.1	08.9	283°26.8	29.6	98°16.2	52.4
5	293°02.3	228°59.5	05.0	157°46.6	08.5	298°28.8	29.4	113°18.7	52.4
6	308°04.8	243°58.8	N22°05.6	172°48.0	N19°08.2	313°30.8	S03°29.2	128°21.3	N02°52.5
7	323°07.3	258°58.1	06.3	187°49.5	07.8	328°32.8	29.0	143°23.9	52.5
8	338°09.7	273°57.3	06.9	202°50.9	07.5	343°34.8	28.8	158°26.5	52.5
9	353°12.2	288°56.6	·· 07.5	217°52.4	·· 07.1	358°36.8	·· 28.6	173°29.1	·· 52.6
10	8°14.7	303°55.8	08.2	232°53.9	06.8	13°38.8	28.4	188°31.6	52.6
11	23°17.1	318°55.1	08.8	247°55.3	06.5	28°40.8	28.2	203°34.2	52.7
12	38°19.6	333°54.3	N22°09.4	262°56.8	N19°06.1	43°42.8	S03°28.0	218°36.8	N02°52.7
13	53°22.0	348°53.6	10.1	277°58.3	05.8	58°44.8	27.8	233°39.4	52.8
14	68°24.5	3°52.9	10.7	292°59.7	05.4	73°46.7	27.6	248°41.9	52.8
15	83°27.0	18°52.1	·· 11.3	308°01.2	·· 05.1	88°48.7	·· 27.4	263°44.5	·· 52.8
16	98°29.4	33°51.4	11.9	323°02.6	04.7	103°50.7	27.2	278°47.1	52.9
17	113°31.9	48°50.6	12.6	338°04.1	04.4	118°52.7	27.0	293°49.7	52.9
18	128°34.4	63°49.9	N22°13.2	353°05.5	N19°04.1	133°54.7	S03°26.9	308°52.3	N02°53.0
19	143°36.8	78°49.1	13.8	8°07.0	03.7	148°56.7	26.7	323°54.8	53.0
20	158°39.3	93°48.4	14.4	23°08.5	03.4	163°58.7	26.5	338°57.4	53.1
21	173°41.8	108°47.7	·· 15.1	38°09.9	·· 03.0	179°00.7	·· 26.3	354°00.0	·· 53.1
22	188°44.2	123°46.9	15.7	53°11.4	02.7	194°02.7	26.1	9°02.6	53.1
23	203°46.7	138°46.2	16.3	68°12.8	02.3	209°04.7	25.9	24°05.1	53.2
Mer.pass.:09:27		v-0.7 d0.6 m-3.8		v1.5 d-0.3 m0.7		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.2	29°08.8
Ankaa	353°18.2	-42°14.8
Schedar	349°43.8	56°35.5
Diphda	348°58.4	-17°55.8
Achernar	335°28.9	-57°10.9
Hamal	328°03.7	23°30.6
Polaris	319°21.8	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.5	-52°42.3
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.1	-59°32.9
Suhail	222°54.2	-43°28.8
Miaplacidus	221°40.3	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.7
Gacrux	172°03.1	-57°10.6
Alioth	166°22.0	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.5
Menkent	148°10.0	-36°25.4
Arcturus	145°57.5	19°07.5
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.4	74°06.7
Zuben'ubi	137°07.7	-16°05.3
Alphecca	126°12.6	26°40.6
Antares	112°28.8	-26°27.4
Atria	107°32.3	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.3	12°33.0
Eltanin	90°46.9	51°29.0
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.3	38°47.3
Nunki	76°01.0	-26°17.0
Altair	62°10.4	8°53.6
Peacock	53°22.7	-56°41.8
Deneb	49°33.1	45°18.8
Enif	33°49.5	9°55.3
Al Na'ir	27°46.7	-46°54.4
Fomalhaut	15°26.6	-29°33.9
Scheat	13°55.9	28°08.2
Markab	13°40.8	15°15.6

Apr 28 Wed	**SHA**	**Mer.pass**
Venus	298°46.4	13:42
Mars	225°36.7	18:32
Jupiter	5°51.4	09:12
Saturn	180°10.2	21:32

Apr 29 Thu	**SHA**	**Mer.pass**
Venus	297°29.9	13:43
Mars	225°13.1	18:30
Jupiter	5°40.1	09:09
Saturn	180°13.0	21:28

Apr 30 Fri	**SHA**	**Mer.pass**
Venus	296°13.2	13:44
Mars	224°49.2	18:28
Jupiter	5°28.8	09:06
Saturn	180°15.8	21:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°36.4	N14°03.0	8°50.7	8.9'	S16°18.6	-11.7'	58.9'
1	195°36.5	03.8	23°18.6	8.8'	16°30.2	-11.6'	58.9'
2	210°36.6	04.5	37°46.4	8.8'	16°41.7	-11.5'	58.8'
3	225°36.7	·· 05.3	52°14.1	8.7'	16°53.2	-11.4'	58.8'
4	240°36.8	06.1	66°41.8	8.7'	17°04.5	-11.3'	58.8'
5	255°36.9	06.9	81°09.4	8.6'	17°15.7	-11.2'	58.8'
6	270°37.0	N14°07.7	95°37.1	8.6'	S17°26.8	-11.1'	58.8'
7	285°37.1	08.5	110°04.6	8.5'	17°37.8	-10.9'	58.7'
8	300°37.2	09.3	124°32.1	8.5'	17°48.7	-10.8'	58.7'
9	315°37.3	·· 10.1	138°59.6	8.5'	17°59.5	-10.7'	58.7'
10	330°37.4	10.8	153°27.1	8.4'	18°10.1	-10.6'	58.7'
11	345°37.5	11.6	167°54.5	8.4'	18°20.7	-10.5'	58.6'
12	0°37.5	N14°12.4	182°21.8	8.3'	S18°31.1	-10.4'	58.6'
13	15°37.6	13.2	196°49.1	8.3'	18°41.4	-10.3'	58.6'
14	30°37.7	14.0	211°16.4	8.2'	18°51.6	-10.1'	58.6'
15	45°37.8	·· 14.8	225°43.6	8.2'	19°01.7	-10.0'	58.5'
16	60°37.9	15.5	240°10.8	8.2'	19°11.6	-9.9'	58.5'
17	75°38.0	16.3	254°38.0	8.1'	19°21.5	-9.8'	58.5'
18	90°38.1	N14°17.1	269°05.1	8.1'	S19°31.2	-9.6'	58.5'
19	105°38.2	17.9	283°32.1	8.1'	19°40.8	-9.5'	58.4'
20	120°38.3	18.7	297°59.2	8.0'	19°50.2	-9.4'	58.4'
21	135°38.4	·· 19.5	312°26.2	8.0'	19°59.6	-9.3'	58.4'
22	150°38.5	20.2	326°53.1	7.9'	20°08.8	-9.1'	58.4'
23	165°38.5	21.0	341°20.0	7.9'	20°17.8	-9.0'	58.3'
	SD.=15.9	d=0.8			S.D.=16.0		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°38.6	N14°21.8	355°46.9	7.9'	S20°26.8	-8.9'	58.3'
1	195°38.7	22.6	10°13.8	7.8'	20°35.6	-8.8'	58.3'
2	210°38.8	23.3	24°40.6	7.8'	20°44.3	-8.6'	58.3'
3	225°38.9	·· 24.1	39°07.4	7.8'	20°52.9	-8.5'	58.2'
4	240°39.0	24.9	53°34.1	7.7'	21°01.3	-8.4'	58.2'
5	255°39.1	25.7	68°00.8	7.7'	21°09.6	-8.2'	58.2'
6	270°39.2	N14°26.5	82°27.5	7.7'	S21°17.8	-8.1'	58.1'
7	285°39.3	27.2	96°54.2	7.6'	21°25.8	-8.0'	58.1'
8	300°39.3	28.0	111°20.8	7.6'	21°33.7	-7.8'	58.1'
9	315°39.4	·· 28.8	125°47.4	7.6'	21°41.4	-7.7'	58.1'
10	330°39.5	29.6	140°14.0	7.6'	21°49.1	-7.6'	58.0'
11	345°39.6	30.3	154°40.5	7.5'	21°56.5	-7.4'	58.0'
12	0°39.7	N14°31.1	169°07.0	7.5'	S22°03.9	-7.3'	58.0'
13	15°39.8	31.9	183°33.5	7.5'	22°11.1	-7.1'	57.9'
14	30°39.9	32.7	198°00.0	7.5'	22°18.2	-7.0'	57.9'
15	45°40.0	·· 33.4	212°26.4	7.4'	22°25.1	-6.9'	57.9'
16	60°40.0	34.2	226°52.8	7.4'	22°31.9	-6.7'	57.9'
17	75°40.1	35.0	241°19.2	7.4'	22°38.5	-6.6'	57.8'
18	90°40.2	N14°35.8	255°45.6	7.4'	S22°45.0	-6.4'	57.8'
19	105°40.3	36.5	270°12.0	7.4'	22°51.4	-6.3'	57.8'
20	120°40.4	37.3	284°38.3	7.3'	22°57.6	-6.1'	57.7'
21	135°40.5	·· 38.1	299°04.6	7.3'	23°03.7	-6.0'	57.7'
22	150°40.5	38.8	313°30.9	7.3'	23°09.6	-5.9'	57.7'
23	165°40.6	39.6	327°57.2	7.3'	23°15.4	-5.7'	57.6'
	SD.=15.9	d=0.8			S.D.=15.8		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°40.7	N14°40.4	342°23.5	7.3'	S23°21.0	-5.6'	57.6'
1	195°40.8	41.2	356°49.8	7.3'	23°26.5	-5.4'	57.6'
2	210°40.9	41.9	11°16.1	7.3'	23°31.9	-5.3'	57.6'
3	225°41.0	·· 42.7	25°42.3	7.3'	23°37.1	-5.1'	57.5'
4	240°41.1	43.5	40°08.6	7.2'	23°42.1	-5.0'	57.5'
5	255°41.1	44.2	54°34.8	7.2'	23°47.0	-4.8'	57.5'
6	270°41.2	N14°45.0	69°01.1	7.2'	S23°51.8	-4.7'	57.4'
7	285°41.3	45.8	83°27.3	7.2'	23°56.4	-4.5'	57.4'
8	300°41.4	46.5	97°53.5	7.2'	24°00.9	-4.4'	57.4'
9	315°41.5	·· 47.3	112°19.8	7.2'	24°05.2	-4.3'	57.3'
10	330°41.5	48.1	126°46.0	7.2'	24°09.4	-4.1'	57.3'
11	345°41.6	48.8	141°12.2	7.2'	24°13.4	-4.0'	57.3'
12	0°41.7	N14°49.6	155°38.5	7.2'	S24°17.3	-3.8'	57.3'
13	15°41.8	50.4	170°04.7	7.2'	24°21.1	-3.7'	57.2'
14	30°41.9	51.1	184°31.0	7.3'	24°24.6	-3.5'	57.2'
15	45°42.0	·· 51.9	198°57.2	7.3'	24°28.1	-3.4'	57.2'
16	60°42.0	52.6	213°23.5	7.3'	24°31.4	-3.2'	57.1'
17	75°42.1	53.4	227°49.7	7.3'	24°34.5	-3.1'	57.1'
18	90°42.2	N14°54.2	242°16.0	7.3'	S24°37.5	-2.9'	57.1'
19	105°42.3	54.9	256°42.3	7.3'	24°40.4	-2.8'	57.0'
20	120°42.4	55.7	271°08.6	7.3'	24°43.1	-2.6'	57.0'
21	135°42.4	·· 56.5	285°35.0	7.3'	24°45.6	-2.5'	57.0'
22	150°42.5	57.2	300°01.3	7.4'	24°48.0	-2.3'	56.9'
23	165°42.6	58.0	314°27.7	7.4'	24°50.3	-2.2'	56.9'
	SD.=15.9	d=0.8			S.D.=15.6		

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 14-16 100-95%
28	02:26	02:30	11:57	–:–	11:50	○
29	02:35	02:39	11:57	00:18	12:45	
30	02:43	02:47	11:57	01:13	13:41	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	218°49.2	153°45.4	N22°16.9	83°14.3	N19°02.0	224°06.7	S03°25.7	39°07.7	N02°53.2
1	233°51.6	168°44.7	17.5	98°15.7	01.6	239°08.7	25.5	54°10.3	53.3
2	248°54.1	183°43.9	18.2	113°17.2	01.3	254°10.7	25.3	69°12.9	53.3
3	263°56.5	198°43.2	·· 18.8	128°18.7	·· 00.9	269°12.7	·· 25.1	84°15.4	·· 53.3
4	278°59.0	213°42.4	19.4	143°20.1	00.6	284°14.7	24.9	99°18.0	53.4
5	294°01.5	228°41.7	20.0	158°21.6	19°00.3	299°16.7	24.7	114°20.6	53.4
6	309°03.9	243°40.9	N22°20.6	173°23.0	N18°59.9	314°18.7	S03°24.5	129°23.2	N02°53.5
7	324°06.4	258°40.2	21.2	188°24.5	59.6	329°20.7	24.4	144°25.8	53.5
8	339°08.9	273°39.4	21.8	203°25.9	59.2	344°22.7	24.2	159°28.3	53.5
9	354°11.3	288°38.7	·· 22.4	218°27.4	·· 58.9	359°24.7	·· 24.0	174°30.9	·· 53.6
10	9°13.8	303°37.9	23.0	233°28.8	58.5	14°26.7	23.8	189°33.5	53.6
11	24°16.3	318°37.2	23.6	248°30.3	58.2	29°28.7	23.6	204°36.1	53.7
12	39°18.7	333°36.4	N22°24.2	263°31.7	N18°57.8	44°30.7	S03°23.4	219°38.6	N02°53.7
13	54°21.2	348°35.7	24.8	278°33.2	57.5	59°32.7	23.2	234°41.2	53.8
14	69°23.7	3°34.9	25.5	293°34.6	57.1	74°34.7	23.0	249°43.8	53.8
15	84°26.1	18°34.2	·· 26.1	308°36.1	·· 56.8	89°36.7	·· 22.8	264°46.4	·· 53.8
16	99°28.6	33°33.4	26.7	323°37.5	56.4	104°38.7	22.6	279°48.9	53.9
17	114°31.0	48°32.7	27.3	338°39.0	56.1	119°40.7	22.4	294°51.5	53.9
18	129°33.5	63°31.9	N22°27.9	353°40.4	N18°55.7	134°42.7	S03°22.2	309°54.1	N02°54.0
19	144°36.0	78°31.2	28.4	8°41.9	55.4	149°44.7	22.0	324°56.6	54.0
20	159°38.4	93°30.4	29.0	23°43.3	55.0	164°46.7	21.9	339°59.2	54.0
21	174°40.9	108°29.7	·· 29.6	38°44.8	·· 54.7	179°48.7	·· 21.7	355°01.8	·· 54.1
22	189°43.4	123°28.9	30.2	53°46.2	54.3	194°50.7	21.5	10°04.4	54.1
23	204°45.8	138°28.1	30.8	68°47.7	54.0	209°52.7	21.3	25°06.9	54.2
Mer.pass.:09:23		v-0.7 d0.6 m-3.8		v1.5 d-0.3 m0.7		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	219°48.3	153°27.4	N22°31.4	83°49.1	N18°53.6	224°54.7	S03°21.1	40°09.5	N02°54.2
1	234°50.8	168°26.6	32.0	98°50.6	53.3	239°56.7	20.9	55°12.1	54.2
2	249°53.2	183°25.9	32.6	113°52.0	52.9	254°58.7	20.7	70°14.7	54.3
3	264°55.7	198°25.1	·· 33.2	128°53.5	·· 52.6	270°00.7	·· 20.5	85°17.2	·· 54.3
4	279°58.1	213°24.4	33.8	143°54.9	52.2	285°02.7	20.3	100°19.8	54.4
5	295°00.6	228°23.6	34.4	158°56.3	51.9	300°04.7	20.1	115°22.4	54.4
6	310°03.1	243°22.8	N22°34.9	173°57.8	N18°51.5	315°06.8	S03°19.9	130°25.0	N02°54.4
7	325°05.5	258°22.1	35.5	188°59.2	51.2	330°08.8	19.8	145°27.5	54.5
8	340°08.0	273°21.3	36.1	204°00.7	50.8	345°10.8	19.6	160°30.1	54.5
9	355°10.5	288°20.6	·· 36.7	219°02.1	·· 50.5	0°12.8	·· 19.4	175°32.7	·· 54.6
10	10°12.9	303°19.8	37.3	234°03.6	50.1	15°14.8	19.2	190°35.2	54.6
11	25°15.4	318°19.1	37.9	249°05.0	49.8	30°16.8	19.0	205°37.8	54.6
12	40°17.9	333°18.3	N22°38.4	264°06.4	N18°49.4	45°18.8	S03°18.8	220°40.4	N02°54.7
13	55°20.3	348°17.5	39.0	279°07.9	49.1	60°20.8	18.6	235°43.0	54.7
14	70°22.8	3°16.8	39.6	294°09.3	48.7	75°22.8	18.4	250°45.5	54.8
15	85°25.3	18°16.0	·· 40.2	309°10.8	·· 48.4	90°24.8	·· 18.2	265°48.1	·· 54.8
16	100°27.7	33°15.2	40.7	324°12.2	48.0	105°26.8	18.0	280°50.7	54.8
17	115°30.2	48°14.5	41.3	339°13.6	47.7	120°28.8	17.8	295°53.2	54.9
18	130°32.6	63°13.7	N22°41.9	354°15.1	N18°47.3	135°30.8	S03°17.7	310°55.8	N02°54.9
19	145°35.1	78°13.0	42.5	9°16.5	46.9	150°32.8	17.5	325°58.4	55.0
20	160°37.6	93°12.2	43.0	24°18.0	46.6	165°34.8	17.3	341°01.0	55.0
21	175°40.0	108°11.4	·· 43.6	39°19.4	·· 46.2	180°36.8	·· 17.1	356°03.5	·· 55.0
22	190°42.5	123°10.7	44.2	54°20.8	45.9	195°38.8	16.9	11°06.1	55.1
23	205°45.0	138°09.9	44.7	69°22.3	45.5	210°40.8	16.7	26°08.7	55.1
Mer.pass.:09:19		v-0.8 d0.6 m-3.8		v1.4 d-0.4 m0.7		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	220°47.4	153°09.1	N22°45.3	84°23.7	N18°45.2	225°42.8	S03°16.5	41°11.2	N02°55.1
1	235°49.9	168°08.4	45.9	99°25.2	44.8	240°44.8	16.3	56°13.8	55.2
2	250°52.4	183°07.6	46.4	114°26.6	44.5	255°46.8	16.1	71°16.4	55.2
3	265°54.8	198°06.8	·· 47.0	129°28.0	·· 44.1	270°48.8	·· 15.9	86°18.9	·· 55.3
4	280°57.3	213°06.1	47.6	144°29.5	43.8	285°50.8	15.8	101°21.5	55.3
5	295°59.8	228°05.3	48.1	159°30.9	43.4	300°52.8	15.6	116°24.1	55.3
6	311°02.2	243°04.5	N22°48.7	174°32.3	N18°43.0	315°54.9	S03°15.4	131°26.7	N02°55.4
7	326°04.7	258°03.8	49.2	189°33.8	42.7	330°56.9	15.2	146°29.2	55.4
8	341°07.1	273°03.0	49.8	204°35.2	42.3	345°58.9	15.0	161°31.8	55.5
9	356°09.6	288°02.2	·· 50.3	219°36.6	·· 42.0	1°00.9	·· 14.8	176°34.4	·· 55.5
10	11°12.1	303°01.5	50.9	234°38.1	41.6	16°02.9	14.6	191°36.9	55.5
11	26°14.5	318°00.7	51.5	249°39.5	41.3	31°04.9	14.4	206°39.5	55.6
12	41°17.0	332°59.9	N22°52.0	264°40.9	N18°40.9	46°06.9	S03°14.2	221°42.1	N02°55.6
13	56°19.5	347°59.2	52.6	279°42.4	40.6	61°08.9	14.0	236°44.6	55.6
14	71°21.9	2°58.4	53.1	294°43.8	40.2	76°10.9	13.9	251°47.2	55.7
15	86°24.4	17°57.6	·· 53.7	309°45.2	·· 39.8	91°12.9	·· 13.7	266°49.8	·· 55.7
16	101°26.9	32°56.9	54.2	324°46.7	39.5	106°14.9	13.5	281°52.3	55.8
17	116°29.3	47°56.1	54.8	339°48.1	39.1	121°16.9	13.3	296°54.9	55.8
18	131°31.8	62°55.3	N22°55.3	354°49.5	N18°38.8	136°18.9	S03°13.1	311°57.5	N02°55.8
19	146°34.3	77°54.5	55.8	9°51.0	38.4	151°20.9	12.9	327°00.0	55.9
20	161°36.7	92°53.8	56.4	24°52.4	38.1	166°22.9	12.7	342°02.6	55.9
21	176°39.2	107°53.0	·· 56.9	39°53.8	·· 37.7	181°25.0	·· 12.5	357°05.2	·· 55.9
22	191°41.6	122°52.2	57.5	54°55.3	37.3	196°27.0	12.3	12°07.7	56.0
23	206°44.1	137°51.5	58.0	69°56.7	37.0	211°29.0	12.2	27°10.3	56.0
Mer.pass.:09:15		v-0.8 d0.6 m-3.8		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.2	29°08.8
Ankaa	353°18.2	-42°14.8
Schedar	349°43.8	56°35.5
Diphda	348°58.4	-17°55.7
Achernar	335°28.9	-57°10.9
Hamal	328°03.7	23°30.6
Polaris	319°21.5	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.5	-52°42.3
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.2	-59°32.9
Suhail	222°54.2	-43°28.8
Miaplacidus	221°40.3	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.5	-63°09.7
Gacrux	172°03.1	-57°10.6
Alioth	166°22.0	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.4	74°06.7
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.6	26°40.6
Antares	112°28.8	-26°27.4
Atria	107°32.2	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.3	12°33.0
Eltanin	90°46.8	51°29.0
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.3	38°47.4
Nunki	76°00.9	-26°17.0
Altair	62°10.4	8°53.6
Peacock	53°22.6	-56°41.8
Deneb	49°33.1	45°18.8
Enif	33°49.4	9°55.3
Al Na'ir	27°46.6	-46°54.4
Fomalhaut	15°26.6	-29°33.9
Scheat	13°55.8	28°08.2
Markab	13°40.8	15°15.6

May 01 Sat	**SHA**	**Mer.pass**
Venus	294°56.3	13:46
Mars	224°25.1	18:25
Jupiter	5°17.6	09:02
Saturn	180°18.6	21:20

May 02 Sun	**SHA**	**Mer.pass**
Venus	293°39.1	13:47
Mars	224°00.8	18:23
Jupiter	5°06.4	08:59
Saturn	180°21.2	21:16

May 03 Mon	**SHA**	**Mer.pass**
Venus	292°21.7	13:48
Mars	223°36.3	18:21
Jupiter	4°55.4	08:56
Saturn	180°23.8	21:12

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°42.7	N14°58.7	328°54.1	7.4'	S24°52.4	-2.0'	56.9'
1	195°42.7	14°59.5	343°20.5	7.4'	24°54.3	-1.9'	56.9'
2	210°42.8	15°00.3	357°46.9	7.4'	24°56.2	-1.7'	56.8'
3	225°42.9	·· 01.0	12°13.4	7.5'	24°57.8	-1.6'	56.8'
4	240°43.0	01.8	26°39.9	7.5'	24°59.3	-1.4'	56.8'
5	255°43.1	02.5	41°06.4	7.5'	25°00.7	-1.3'	56.7'
6	270°43.1	N15°03.3	55°32.9	7.6'	S25°02.0	-1.2'	56.7'
7	285°43.2	04.0	69°59.5	7.6'	25°03.0	-1.0'	56.7'
8	300°43.3	04.8	84°26.1	7.6'	25°04.0	-0.9'	56.6'
9	315°43.4	·· 05.6	98°52.7	7.6'	25°04.8	-0.7'	56.6'
10	330°43.4	06.3	113°19.4	7.7'	25°05.4	-0.6'	56.6'
11	345°43.5	07.1	127°46.1	7.7'	25°05.9	-0.4'	56.6'
12	0°43.6	N15°07.8	142°12.8	7.8'	S25°06.3	-0.3'	56.5'
13	15°43.7	08.6	156°39.6	7.8'	25°06.5	-0.1'	56.5'
14	30°43.7	09.3	171°06.4	7.8'	25°06.6	-0.0'	56.5'
15	45°43.8	·· 10.1	185°33.2	7.9'	25°06.5	0.1'	56.4'
16	60°43.9	10.8	200°00.1	7.9'	25°06.3	0.3'	56.4'
17	75°44.0	11.6	214°27.1	8.0'	25°06.0	0.4'	56.4'
18	90°44.0	N15°12.3	228°54.1	8.0'	S25°05.5	0.6'	56.3'
19	105°44.1	13.1	243°21.1	8.1'	25°04.9	0.7'	56.3'
20	120°44.2	13.8	257°48.2	8.1'	25°04.1	0.8'	56.3'
21	135°44.3	·· 14.6	272°15.3	8.1'	25°03.2	1.0'	56.3'
22	150°44.3	15.3	286°42.5	8.2'	25°02.1	1.1'	56.2'
23	165°44.4	16.1	301°09.7	8.2'	25°01.0	1.3'	56.2'
	SD.=15.9	d=0.8	S.D.=15.4				

Sun	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°44.5	N15°16.8	315°37.0	8.3'	S24°59.6	1.4'	56.2'
1	195°44.6	17.6	330°04.3	8.4'	24°58.2	1.5'	56.1'
2	210°44.6	18.3	344°31.7	8.4'	24°56.6	1.7'	56.1'
3	225°44.7	·· 19.1	358°59.1	8.5'	24°54.9	1.8'	56.1'
4	240°44.8	19.8	13°26.6	8.5'	24°53.0	1.9'	56.1'
5	255°44.8	20.6	27°54.2	8.6'	24°51.0	2.1'	56.0'
6	270°44.9	N15°21.3	42°21.8	8.6'	S24°48.9	2.2'	56.0'
7	285°45.0	22.1	56°49.4	8.7'	24°46.6	2.3'	56.0'
8	300°45.1	22.8	71°17.2	8.8'	24°44.2	2.5'	55.9'
9	315°45.1	·· 23.6	85°44.9	8.8'	24°41.7	2.6'	55.9'
10	330°45.2	24.3	100°12.8	8.9'	24°39.0	2.7'	55.9'
11	345°45.3	25.1	114°40.7	8.9'	24°36.2	2.8'	55.9'
12	0°45.3	N15°25.8	129°08.7	9.0'	S24°33.3	3.0'	55.8'
13	15°45.4	26.5	143°36.7	9.1'	24°30.3	3.1'	55.8'
14	30°45.5	27.3	158°04.8	9.1'	24°27.1	3.2'	55.8'
15	45°45.5	·· 28.0	172°33.0	9.2'	24°23.8	3.4'	55.7'
16	60°45.6	28.8	187°01.2	9.3'	24°20.4	3.5'	55.7'
17	75°45.7	29.5	201°29.5	9.3'	24°16.9	3.6'	55.7'
18	90°45.7	N15°30.3	215°57.9	9.4'	S24°13.2	3.7'	55.7'
19	105°45.8	31.0	230°26.3	9.5'	24°09.4	3.8'	55.6'
20	120°45.9	31.7	244°54.8	9.5'	24°05.5	4.0'	55.6'
21	135°46.0	·· 32.5	259°23.4	9.6'	24°01.5	4.1'	55.6'
22	150°46.0	33.2	273°52.0	9.7'	23°57.3	4.2'	55.6'
23	165°46.1	34.0	288°20.7	9.8'	23°53.1	4.3'	55.5'
	SD.=15.9	d=0.7	S.D.=15.2				

Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°46.2	N15°34.7	302°49.5	9.8'	S23°48.7	4.4'	55.5'
1	195°46.2	35.4	317°18.4	9.9'	23°44.2	4.6'	55.5'
2	210°46.3	36.2	331°47.3	10.0'	23°39.5	4.7'	55.5'
3	225°46.4	·· 36.9	346°16.3	10.0'	23°34.8	4.8'	55.4'
4	240°46.4	37.6	0°45.4	10.1'	23°30.0	4.9'	55.4'
5	255°46.5	38.4	15°14.5	10.2'	23°25.0	5.0'	55.4'
6	270°46.5	N15°39.1	29°43.8	10.3'	S23°19.9	5.1'	55.4'
7	285°46.6	39.9	44°13.1	10.3'	23°14.7	5.2'	55.3'
8	300°46.7	40.6	58°42.4	10.4'	23°09.4	5.4'	55.3'
9	315°46.7	·· 41.3	73°11.9	10.5'	23°04.0	5.5'	55.3'
10	330°46.8	42.1	87°41.4	10.6'	22°58.5	5.6'	55.3'
11	345°46.9	42.8	102°11.0	10.6'	22°52.9	5.7'	55.2'
12	0°46.9	N15°43.5	116°40.7	10.7'	S22°47.1	5.8'	55.2'
13	15°47.0	44.3	131°10.4	10.8'	22°41.3	5.9'	55.2'
14	30°47.1	45.0	145°40.2	10.9'	22°35.3	6.0'	55.2'
15	45°47.1	·· 45.7	160°10.1	10.9'	22°29.3	6.1'	55.2'
16	60°47.2	46.5	174°40.1	11.0'	22°23.1	6.2'	55.1'
17	75°47.3	47.2	189°10.2	11.1'	22°16.9	6.3'	55.1'
18	90°47.3	N15°47.9	203°40.3	11.2'	S22°10.5	6.4'	55.1'
19	105°47.4	48.6	218°10.5	11.2'	22°04.0	6.5'	55.1'
20	120°47.4	49.4	232°40.8	11.3'	21°57.5	6.6'	55.0'
21	135°47.5	·· 50.1	247°11.2	11.4'	21°50.8	6.7'	55.0'
22	150°47.6	50.8	261°41.6	11.5'	21°44.0	6.8'	55.0'
23	165°47.6	51.6	276°12.1	11.6'	21°37.2	6.9'	55.0'
	SD.=15.9	d=0.7	S.D.=15.0				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 17-19 90-75%
01	02:51	02:54	11:57	02:09	14:37	
02	02:58	03:01	11:57	03:04	15:31	
03	03:05	03:08	11:57	03:57	16:22	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	221°46.6	152°50.7	N22°58.6	84°58.1	N18°36.6	226°31.0	S03°12.0	42°12.9	N02°56.1
1	236°49.0	167°49.9	59.1	99°59.5	36.3	241°33.0	11.8	57°15.4	56.1
2	251°51.5	182°49.1	22°59.6	115°01.0	35.9	256°35.0	11.6	72°18.0	56.1
3	266°54.0	197°48.4	23°00.2	130°02.4	·· 35.5	271°37.0	·· 11.4	87°20.6	·· 56.2
4	281°56.4	212°47.6	00.7	145°03.8	35.2	286°39.0	11.2	102°23.1	56.2
5	296°58.9	227°46.8	01.2	160°05.2	34.8	301°41.0	11.0	117°25.7	56.2
6	312°01.4	242°46.0	N23°01.8	175°06.7	N18°34.5	316°43.0	S03°10.8	132°28.3	N02°56.3
7	327°03.8	257°45.3	02.3	190°08.1	34.1	331°45.0	10.7	147°30.8	56.3
8	342°06.3	272°44.5	02.8	205°09.5	33.7	346°47.0	10.5	162°33.4	56.3
9	357°08.8	287°43.7	·· 03.4	220°10.9	·· 33.4	1°49.1	·· 10.3	177°36.0	·· 56.4
10	12°11.2	302°42.9	03.9	235°12.4	33.0	16°51.1	10.1	192°38.5	56.4
11	27°13.7	317°42.2	04.4	250°13.8	32.7	31°53.1	09.9	207°41.1	56.5
12	42°16.1	332°41.4	N23°04.9	265°15.2	N18°32.3	46°55.1	S03°09.7	222°43.7	N02°56.5
13	57°18.6	347°40.6	05.5	280°16.6	31.9	61°57.1	09.5	237°46.2	56.5
14	72°21.1	2°39.8	06.0	295°18.1	31.6	76°59.1	09.3	252°48.8	56.6
15	87°23.5	17°39.1	·· 06.5	310°19.5	·· 31.2	92°01.1	·· 09.1	267°51.4	·· 56.6
16	102°26.0	32°38.3	07.0	325°20.9	30.8	107°03.1	09.0	282°53.9	56.6
17	117°28.5	47°37.5	07.6	340°22.3	30.5	122°05.1	08.8	297°56.5	56.7
18	132°30.9	62°36.7	N23°08.1	355°23.8	N18°30.1	137°07.1	S03°08.6	312°59.1	N02°56.7
19	147°33.4	77°35.9	08.6	10°25.2	29.8	152°09.2	08.4	328°01.6	56.7
20	162°35.9	92°35.2	09.1	25°26.6	29.4	167°11.2	08.2	343°04.2	56.8
21	177°38.3	107°34.4	·· 09.6	40°28.0	·· 29.0	182°13.2	·· 08.0	358°06.7	·· 56.8
22	192°40.8	122°33.6	10.1	55°29.4	28.7	197°15.2	07.8	13°09.3	56.9
23	207°43.2	137°32.8	10.7	70°30.9	28.3	212°17.2	07.6	28°11.9	56.9
Mer.pass.:09:11		v-0.8 d0.5 m-3.8		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	222°45.7	152°32.0	N23°11.2	85°32.3	N18°27.9	227°19.2	S03°07.5	43°14.4	N02°56.9
1	237°48.2	167°31.3	11.7	100°33.7	27.6	242°21.2	07.3	58°17.0	57.0
2	252°50.6	182°30.5	12.2	115°35.1	27.2	257°23.2	07.1	73°19.6	57.0
3	267°53.1	197°29.7	·· 12.7	130°36.5	·· 26.9	272°25.2	·· 06.9	88°22.1	·· 57.0
4	282°55.6	212°28.9	13.2	145°38.0	26.5	287°27.3	06.7	103°24.7	57.1
5	297°58.0	227°28.1	13.7	160°39.4	26.1	302°29.3	06.5	118°27.3	57.1
6	313°00.5	242°27.3	N23°14.2	175°40.8	N18°25.8	317°31.3	S03°06.3	133°29.8	N02°57.1
7	328°03.0	257°26.6	14.7	190°42.2	25.4	332°33.3	06.2	148°32.4	57.2
8	343°05.4	272°25.8	15.2	205°43.6	25.0	347°35.3	06.0	163°34.9	57.2
9	358°07.9	287°25.0	·· 15.7	220°45.0	·· 24.7	2°37.3	·· 05.8	178°37.5	·· 57.2
10	13°10.4	302°24.2	16.2	235°46.5	24.3	17°39.3	05.6	193°40.1	57.3
11	28°12.8	317°23.4	16.7	250°47.9	23.9	32°41.3	05.4	208°42.6	57.3
12	43°15.3	332°22.6	N23°17.2	265°49.3	N18°23.6	47°43.4	S03°05.2	223°45.2	N02°57.3
13	58°17.7	347°21.9	17.7	280°50.7	23.2	62°45.4	05.0	238°47.8	57.4
14	73°20.2	2°21.1	18.2	295°52.1	22.8	77°47.4	04.8	253°50.3	57.4
15	88°22.7	17°20.3	·· 18.7	310°53.5	·· 22.5	92°49.4	·· 04.7	268°52.9	·· 57.4
16	103°25.1	32°19.5	19.2	325°55.0	22.1	107°51.4	04.5	283°55.4	57.5
17	118°27.6	47°18.7	19.7	340°56.4	21.7	122°53.4	04.3	298°58.0	57.5
18	133°30.1	62°17.9	N23°20.2	355°57.8	N18°21.4	137°55.4	S03°04.1	314°00.6	N02°57.6
19	148°32.5	77°17.1	20.7	10°59.2	21.0	152°57.5	03.9	329°03.1	57.6
20	163°35.0	92°16.3	21.2	26°00.6	20.6	167°59.5	03.7	344°05.7	57.6
21	178°37.5	107°15.6	·· 21.7	41°02.0	·· 20.3	183°01.5	·· 03.5	359°08.2	·· 57.7
22	193°39.9	122°14.8	22.2	56°03.4	19.9	198°03.5	03.4	14°10.8	57.7
23	208°42.4	137°14.0	22.6	71°04.8	19.5	213°05.5	03.2	29°13.4	57.7
Mer.pass.:09:07		v-0.8 d0.5 m-3.8		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	223°44.9	152°13.2	N23°23.1	86°06.3	N18°19.2	228°07.5	S03°03.0	44°15.9	N02°57.8
1	238°47.3	167°12.4	23.6	101°07.7	18.8	243°09.5	02.8	59°18.5	57.8
2	253°49.8	182°11.6	24.1	116°09.1	18.4	258°11.6	02.6	74°21.0	57.8
3	268°52.2	197°10.8	·· 24.6	131°10.5	·· 18.1	273°13.6	·· 02.4	89°23.6	·· 57.9
4	283°54.7	212°10.0	25.1	146°11.9	17.7	288°15.6	02.2	104°26.2	57.9
5	298°57.2	227°09.2	25.5	161°13.3	17.3	303°17.6	02.1	119°28.7	57.9
6	313°59.6	242°08.5	N23°26.0	176°14.7	N18°17.0	318°19.6	S03°01.9	134°31.3	N02°58.0
7	329°02.1	257°07.7	26.5	191°16.1	16.6	333°21.6	01.7	149°33.8	58.0
8	344°04.6	272°06.9	27.0	206°17.5	16.2	348°23.7	01.5	164°36.4	58.0
9	359°07.0	287°06.1	·· 27.5	221°18.9	·· 15.9	3°25.7	·· 01.3	179°39.0	·· 58.1
10	14°09.5	302°05.3	27.9	236°20.4	15.5	18°27.7	01.1	194°41.5	58.1
11	29°12.0	317°04.5	28.4	251°21.8	15.1	33°29.7	00.9	209°44.1	58.1
12	44°14.4	332°03.7	N23°28.9	266°23.2	N18°14.7	48°31.7	S03°00.8	224°46.6	N02°58.2
13	59°16.9	347°02.9	29.3	281°24.6	14.4	63°33.7	00.6	239°49.2	58.2
14	74°19.3	2°02.1	29.8	296°26.0	14.0	78°35.7	00.4	254°51.7	58.2
15	89°21.8	17°01.3	·· 30.3	311°27.4	·· 13.6	93°37.8	·· 00.2	269°54.3	·· 58.3
16	104°24.3	32°00.5	30.8	326°28.8	13.3	108°39.8	03°00.0	284°56.9	58.3
17	119°26.7	46°59.7	31.2	341°30.2	12.9	123°41.8	02°59.8	299°59.4	58.3
18	134°29.2	61°58.9	N23°31.7	356°31.6	N18°12.5	138°43.8	S02°59.7	315°02.0	N02°58.4
19	149°31.7	76°58.2	32.1	11°33.0	12.2	153°45.8	59.5	330°04.5	58.4
20	164°34.1	91°57.4	32.6	26°34.4	11.8	168°47.9	59.3	345°07.1	58.4
21	179°36.6	106°56.6	·· 33.1	41°35.8	·· 11.4	183°49.9	·· 59.1	0°09.7	·· 58.5
22	194°39.1	121°55.8	33.5	56°37.2	11.0	198°51.9	58.9	15°12.2	58.5
23	209°41.5	136°55.0	34.0	71°38.6	10.7	213°53.9	58.7	30°14.8	58.5
Mer.pass.:09:04		v-0.8 d0.5 m-3.8		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°46.2	29°08.8
Ankaa	353°18.2	-42°14.8
Schedar	349°43.8	56°35.5
Diphda	348°58.4	-17°55.7
Achernar	335°28.9	-57°10.9
Hamal	328°03.7	23°30.6
Polaris	319°21.3	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.5	-52°42.3
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.2	-59°32.9
Suhail	222°54.2	-43°28.8
Miaplacidus	221°40.4	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°53.9	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.6	-63°09.7
Gacrux	172°03.2	-57°10.6
Alioth	166°22.0	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.4	74°06.7
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.6
Antares	112°28.7	-26°27.4
Atria	107°32.2	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.3	12°33.0
Eltanin	90°46.8	51°29.0
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.3	38°47.4
Nunki	76°00.9	-26°17.0
Altair	62°10.4	8°53.6
Peacock	53°22.6	-56°41.8
Deneb	49°33.0	45°18.8
Enif	33°49.4	9°55.3
Al Na'ir	27°46.6	-46°54.4
Fomalhaut	15°26.6	-29°33.9
Scheat	13°55.8	28°08.2
Markab	13°40.8	15°15.6

May 04 Tue	**SHA**	**Mer.pass**
Venus	291°04.1	13:49
Mars	223°11.5	18:18
Jupiter	4°44.4	08:53
Saturn	180°26.3	21:08

May 05 Wed	**SHA**	**Mer.pass**
Venus	289°46.3	13:51
Mars	222°46.6	18:16
Jupiter	4°33.5	08:50
Saturn	180°28.7	21:03

May 06 Thu	**SHA**	**Mer.pass**
Venus	288°28.3	13:52
Mars	222°21.4	18:14
Jupiter	4°22.7	08:46
Saturn	180°31.1	20:59

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°47.7	N15°52.3	290°42.7	11.6'	S21°30.2	7.0'	55.0'
1	195°47.7	53.0	305°13.4	11.7'	21°23.2	7.1'	54.9'
2	210°47.8	53.7	319°44.1	11.8'	21°16.1	7.2'	54.9'
3	225°47.9	·· 54.5	334°14.9	11.9'	21°08.8	7.3'	54.9'
4	240°47.9	55.2	348°45.8	11.9'	21°01.5	7.4'	54.9'
5	255°48.0	55.9	3°16.8	12.0'	20°54.1	7.5'	54.9'
6	270°48.0	N15°56.7	17°47.8	12.1'	S20°46.6	7.6'	54.8'
7	285°48.1	57.4	32°19.0	12.2'	20°39.0	7.6'	54.8'
8	300°48.2	58.1	46°50.2	12.2'	20°31.3	7.7'	54.8'
9	315°48.2	·· 58.8	61°21.4	12.3'	20°23.5	7.8'	54.8'
10	330°48.3	15°59.5	75°52.8	12.4'	20°15.6	7.9'	54.8'
11	345°48.3	16°00.3	90°24.2	12.5'	20°07.7	8.0'	54.8'
12	0°48.4	N16°01.0	104°55.7	12.5'	S19°59.7	8.1'	54.7'
13	15°48.5	01.7	119°27.3	12.6'	19°51.5	8.2'	54.7'
14	30°48.5	02.4	133°58.9	12.7'	19°43.3	8.2'	54.7'
15	45°48.6	·· 03.2	148°30.6	12.8'	19°35.1	8.3'	54.7'
16	60°48.6	03.9	163°02.4	12.8'	19°26.7	8.4'	54.7'
17	75°48.7	04.6	177°34.3	12.9'	19°18.2	8.5'	54.7'
18	90°48.7	N16°05.3	192°06.2	13.0'	S19°09.7	8.6'	54.6'
19	105°48.8	06.0	206°38.2	13.0'	19°01.1	8.6'	54.6'
20	120°48.9	06.8	221°10.3	13.1'	18°52.4	8.7'	54.6'
21	135°48.9	·· 07.5	235°42.4	13.2'	18°43.7	8.8'	54.6'
22	150°49.0	08.2	250°14.6	13.2'	18°34.8	8.9'	54.6'
23	165°49.0	08.9	264°46.9	13.3'	18°25.9	8.9'	54.6'
	SD.=15.9	d=0.7	S.D.=14.9				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°49.1	N16°09.6	279°19.3	13.4'	S18°16.9	9.0'	54.6'
1	195°49.1	10.3	293°51.7	13.5'	18°07.9	9.1'	54.5'
2	210°49.2	11.1	308°24.2	13.5'	17°58.8	9.2'	54.5'
3	225°49.2	·· 11.8	322°56.7	13.6'	17°49.6	9.2'	54.5'
4	240°49.3	12.5	337°29.3	13.7'	17°40.3	9.3'	54.5'
5	255°49.3	13.2	352°02.0	13.7'	17°30.9	9.4'	54.5'
6	270°49.4	N16°13.9	6°34.8	13.8'	S17°21.5	9.4'	54.5'
7	285°49.5	14.6	21°07.6	13.8'	17°12.0	9.5'	54.5'
8	300°49.5	15.3	35°40.5	13.9'	17°02.5	9.6'	54.5'
9	315°49.6	·· 16.1	50°13.4	14.0'	16°52.9	9.7'	54.4'
10	330°49.6	16.8	64°46.4	14.0'	16°43.2	9.7'	54.4'
11	345°49.7	17.5	79°19.5	14.1'	16°33.4	9.8'	54.4'
12	0°49.7	N16°18.2	93°52.6	14.2'	S16°23.6	9.8'	54.4'
13	15°49.8	18.9	108°25.8	14.2'	16°13.8	9.9'	54.4'
14	30°49.8	19.6	122°59.1	14.3'	16°03.8	10.0'	54.4'
15	45°49.9	·· 20.3	137°32.4	14.3'	15°53.8	10.0'	54.4'
16	60°49.9	21.0	152°05.8	14.4'	15°43.8	10.1'	54.4'
17	75°50.0	21.7	166°39.2	14.5'	15°33.6	10.2'	54.4'
18	90°50.0	N16°22.5	181°12.7	14.5'	S15°23.4	10.2'	54.4'
19	105°50.1	23.2	195°46.2	14.6'	15°13.2	10.3'	54.4'
20	120°50.1	23.9	210°19.8	14.6'	15°02.9	10.3'	54.3'
21	135°50.2	·· 24.6	224°53.5	14.7'	14°52.5	10.4'	54.3'
22	150°50.2	25.3	239°27.2	14.7'	14°42.1	10.4'	54.3'
23	165°50.3	26.0	254°01.0	14.8'	14°31.7	10.5'	54.3'
	SD.=15.8	d=0.7	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°50.3	N16°26.7	268°34.8	14.8'	S14°21.1	10.6'	54.3'
1	195°50.4	27.4	283°08.6	14.9'	14°10.5	10.6'	54.3'
2	210°50.4	28.1	297°42.6	14.9'	13°59.9	10.7'	54.3'
3	225°50.5	·· 28.8	312°16.5	15.0'	13°49.2	10.7'	54.3'
4	240°50.5	29.5	326°50.6	15.0'	13°38.5	10.8'	54.3'
5	255°50.6	30.2	341°24.6	15.1'	13°27.7	10.8'	54.3'
6	270°50.6	N16°30.9	355°58.7	15.1'	S13°16.8	10.9'	54.3'
7	285°50.7	31.6	10°32.9	15.2'	13°05.9	10.9'	54.3'
8	300°50.7	32.3	25°07.1	15.2'	12°55.0	11.0'	54.3'
9	315°50.8	·· 33.0	39°41.4	15.3'	12°44.0	11.0'	54.3'
10	330°50.8	33.7	54°15.7	15.3'	12°33.0	11.1'	54.3'
11	345°50.8	34.4	68°50.0	15.4'	12°21.9	11.1'	54.3'
12	0°50.9	N16°35.1	83°24.4	15.4'	S12°10.7	11.2'	54.3'
13	15°50.9	35.8	97°58.8	15.5'	11°59.6	11.2'	54.3'
14	30°51.0	36.5	112°33.3	15.5'	11°48.3	11.2'	54.3'
15	45°51.0	·· 37.2	127°07.8	15.5'	11°37.1	11.3'	54.2'
16	60°51.1	37.9	141°42.4	15.6'	11°25.7	11.3'	54.2'
17	75°51.1	38.6	156°17.0	15.6'	11°14.4	11.4'	54.2'
18	90°51.2	N16°39.3	170°51.6	15.6'	S11°03.0	11.4'	54.2'
19	105°51.2	40.0	185°26.3	15.7'	10°51.5	11.5'	54.2'
20	120°51.3	40.7	200°01.0	15.7'	10°40.1	11.5'	54.2'
21	135°51.3	·· 41.4	214°35.7	15.8'	10°28.5	11.5'	54.2'
22	150°51.3	42.1	229°10.5	15.8'	10°17.0	11.6'	54.2'
23	165°51.4	42.8	243°45.3	15.8'	10°05.4	11.6'	54.2'
	SD.=15.8	d=0.7	S.D.=14.8				

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

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

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 20-22 66-47%
04	03:11	03:14	11:57	04:46	17:10	◑
05	03:16	03:19	11:57	05:33	17:55	
06	03:21	03:24	11:57	06:17	18:38	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	224°44.0	151°54.2	**N**23°34.5	86°40.0	**N**18°10.3	228°55.9	**S**02°58.5	45°17.3	**N**02°58.6
1	239°46.5	166°53.4	34.9	101°41.4	09.9	243°57.9	58.4	60°19.9	58.6
2	254°48.9	181°52.6	35.4	116°42.8	09.5	259°00.0	58.2	75°22.4	58.6
3	269°51.4	196°51.8	·· 35.8	131°44.2	·· 09.2	274°02.0	·· 58.0	90°25.0	·· 58.6
4	284°53.8	211°51.0	36.3	146°45.6	08.8	289°04.0	57.8	105°27.5	58.7
5	299°56.3	226°50.2	36.7	161°47.0	08.4	304°06.0	57.6	120°30.1	58.7
6	314°58.8	241°49.4	**N**23°37.2	176°48.4	**N**18°08.1	319°08.0	**S**02°57.4	135°32.7	**N**02°58.7
7	330°01.2	256°48.6	37.6	191°49.8	07.7	334°10.1	57.3	150°35.2	58.8
8	345°03.7	271°47.8	38.1	206°51.2	07.3	349°12.1	57.1	165°37.8	58.8
9	0°06.2	286°47.0	·· 38.5	221°52.6	·· 06.9	4°14.1	·· 56.9	180°40.3	·· 58.8
10	15°08.6	301°46.2	39.0	236°54.0	06.6	19°16.1	56.7	195°42.9	58.9
11	30°11.1	316°45.4	39.4	251°55.4	06.2	34°18.1	56.5	210°45.4	58.9
12	45°13.6	331°44.6	**N**23°39.9	266°56.8	**N**18°05.8	49°20.2	**S**02°56.3	225°48.0	**N**02°58.9
13	60°16.0	346°43.8	40.3	281°58.2	05.4	64°22.2	56.2	240°50.5	59.0
14	75°18.5	1°43.0	40.7	296°59.6	05.1	79°24.2	56.0	255°53.1	59.0
15	90°21.0	16°42.2	·· 41.2	312°01.0	·· 04.7	94°26.2	·· 55.8	270°55.7	·· 59.0
16	105°23.4	31°41.4	41.6	327°02.4	04.3	109°28.2	55.6	285°58.2	59.1
17	120°25.9	46°40.6	42.1	342°03.8	03.9	124°30.3	55.4	301°00.8	59.1
18	135°28.3	61°39.8	**N**23°42.5	357°05.2	**N**18°03.6	139°32.3	**S**02°55.2	316°03.3	**N**02°59.1
19	150°30.8	76°39.0	42.9	12°06.6	03.2	154°34.3	55.1	331°05.9	59.2
20	165°33.3	91°38.2	43.4	27°08.0	02.8	169°36.3	54.9	346°08.4	59.2
21	180°35.7	106°37.4	·· 43.8	42°09.4	·· 02.4	184°38.3	·· 54.7	1°11.0	·· 59.2
22	195°38.2	121°36.6	44.2	57°10.8	02.1	199°40.4	54.5	16°13.5	59.2
23	210°40.7	136°35.8	44.7	72°12.2	01.7	214°42.4	54.3	31°16.1	59.3
Mer.pass.:09:00		v-0.8 d0.5 m-3.8		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.8	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	225°43.1	151°35.0	**N**23°45.1	87°13.6	**N**18°01.3	229°44.4	**S**02°54.1	46°18.6	**N**02°59.3
1	240°45.6	166°34.2	45.5	102°15.0	00.9	244°46.4	54.0	61°21.2	59.3
2	255°48.1	181°33.4	46.0	117°16.4	00.5	259°48.4	53.8	76°23.8	59.4
3	270°50.5	196°32.6	·· 46.4	132°17.8	18°00.2	274°50.5	·· 53.6	91°26.3	·· 59.4
4	285°53.0	211°31.8	46.8	147°19.2	17°59.8	289°52.5	53.4	106°28.9	59.4
5	300°55.4	226°31.0	47.2	162°20.6	59.4	304°54.5	53.2	121°31.4	59.5
6	315°57.9	241°30.2	**N**23°47.7	177°22.0	**N**17°59.0	319°56.5	**S**02°53.1	136°34.0	**N**02°59.5
7	331°00.4	256°29.4	48.1	192°23.4	58.7	334°58.6	52.9	151°36.5	59.5
8	346°02.8	271°28.6	48.5	207°24.8	58.3	350°00.6	52.7	166°39.1	59.6
9	1°05.3	286°27.8	·· 48.9	222°26.1	·· 57.9	5°02.6	·· 52.5	181°41.6	·· 59.6
10	16°07.8	301°26.9	49.3	237°27.5	57.5	20°04.6	52.3	196°44.2	59.6
11	31°10.2	316°26.1	49.8	252°28.9	57.1	35°06.6	52.1	211°46.7	59.6
12	46°12.7	331°25.3	**N**23°50.2	267°30.3	**N**17°56.8	50°08.7	**S**02°52.0	226°49.3	**N**02°59.7
13	61°15.2	346°24.5	50.6	282°31.7	56.4	65°10.7	51.8	241°51.8	59.7
14	76°17.6	1°23.7	51.0	297°33.1	56.0	80°12.7	51.6	256°54.4	59.7
15	91°20.1	16°22.9	·· 51.4	312°34.5	·· 55.6	95°14.7	·· 51.4	271°56.9	·· 59.8
16	106°22.6	31°22.1	51.8	327°35.9	55.3	110°16.8	51.2	286°59.5	59.8
17	121°25.0	46°21.3	52.2	342°37.3	54.9	125°18.8	51.1	302°02.0	59.8
18	136°27.5	61°20.5	**N**23°52.7	357°38.7	**N**17°54.5	140°20.8	**S**02°50.9	317°04.6	**N**02°59.8
19	151°29.9	76°19.7	53.1	12°40.0	54.1	155°22.8	50.7	332°07.1	59.9
20	166°32.4	91°18.9	53.5	27°41.4	53.7	170°24.9	50.5	347°09.7	59.9
21	181°34.9	106°18.1	·· 53.9	42°42.8	·· 53.3	185°26.9	·· 50.3	2°12.2	02°59.9
22	196°37.3	121°17.3	54.3	57°44.2	53.0	200°28.9	50.1	17°14.8	03°00.0
23	211°39.8	136°16.5	54.7	72°45.6	52.6	215°30.9	50.0	32°17.3	00.0
Mer.pass.:08:56		v-0.8 d0.4 m-3.9		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.6 d0.0 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	226°42.3	151°15.6	**N**23°55.1	87°47.0	**N**17°52.2	230°33.0	**S**02°49.8	47°19.9	**N**03°00.0
1	241°44.7	166°14.8	55.5	102°48.4	51.8	245°35.0	49.6	62°22.4	00.1
2	256°47.2	181°14.0	55.9	117°49.8	51.4	260°37.0	49.4	77°25.0	00.1
3	271°49.7	196°13.2	·· 56.3	132°51.1	·· 51.1	275°39.0	·· 49.2	92°27.5	·· 00.1
4	286°52.1	211°12.4	56.7	147°52.5	50.7	290°41.1	49.1	107°30.1	00.1
5	301°54.6	226°11.6	57.1	162°53.9	50.3	305°43.1	48.9	122°32.6	00.2
6	316°57.0	241°10.8	**N**23°57.5	177°55.3	**N**17°49.9	320°45.1	**S**02°48.7	137°35.2	**N**03°00.2
7	331°59.5	256°10.0	57.9	192°56.7	49.5	335°47.1	48.5	152°37.7	00.2
8	347°02.0	271°09.2	58.3	207°58.1	49.2	350°49.2	48.3	167°40.3	00.3
9	2°04.4	286°08.3	·· 58.7	222°59.5	·· 48.8	5°51.2	·· 48.2	182°42.8	·· 00.3
10	17°06.9	301°07.5	59.1	238°00.8	48.4	20°53.2	48.0	197°45.4	00.3
11	32°09.4	316°06.7	59.4	253°02.2	48.0	35°55.2	47.8	212°47.9	00.3
12	47°11.8	331°05.9	**N**23°59.8	268°03.6	**N**17°47.6	50°57.3	**S**02°47.6	227°50.5	**N**03°00.4
13	62°14.3	346°05.1	24°00.2	283°05.0	47.2	65°59.3	47.4	242°53.0	00.4
14	77°16.8	1°04.3	00.6	298°06.4	46.9	81°01.3	47.3	257°55.6	00.4
15	92°19.2	16°03.5	·· 01.0	313°07.8	·· 46.5	96°03.4	·· 47.1	272°58.1	·· 00.5
16	107°21.7	31°02.7	01.4	328°09.1	46.1	111°05.4	46.9	288°00.7	00.5
17	122°24.2	46°01.9	01.8	343°10.5	45.7	126°07.4	46.7	303°03.2	00.5
18	137°26.6	61°01.0	**N**24°02.1	358°11.9	**N**17°45.3	141°09.4	**S**02°46.5	318°05.8	**N**03°00.5
19	152°29.1	76°00.2	02.5	13°13.3	44.9	156°11.5	46.4	333°08.3	00.6
20	167°31.5	90°59.4	02.9	28°14.7	44.5	171°13.5	46.2	348°10.8	00.6
21	182°34.0	105°58.6	·· 03.3	43°16.0	·· 44.2	186°15.5	·· 46.0	3°13.4	·· 00.6
22	197°36.5	120°57.8	03.7	58°17.4	43.8	201°17.5	45.8	18°15.9	00.6
23	212°38.9	135°57.0	04.0	73°18.8	43.4	216°19.6	45.6	33°18.5	00.7
Mer.pass.:08:52		v-0.8 d0.4 m-3.9		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°46.2	29°08.8
Ankaa	353°18.2	-42°14.8
Schedar	349°43.7	56°35.5
Diphda	348°58.4	-17°55.7
Achernar	335°28.8	-57°10.9
Hamal	328°03.7	23°30.6
Polaris	319°21.2	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.5	-52°42.3
Sirius	258°35.9	-16°44.0
Adhara	255°14.5	-28°59.4
Procyon	245°02.2	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.2	-59°32.9
Suhail	222°54.2	-43°28.8
Miaplacidus	221°40.4	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.8	11°54.9
Dubhe	193°54.0	61°41.8
Denebola	182°35.7	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.6	-63°09.7
Gacrux	172°03.2	-57°10.6
Alioth	166°22.0	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.6
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.4	74°06.7
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.6
Antares	112°28.7	-26°27.4
Atria	107°32.2	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.3	12°33.0
Eltanin	90°46.8	51°29.0
Kaus Aust.	83°46.5	-34°22.7
Vega	80°40.2	38°47.4
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°53.7
Peacock	53°22.6	-56°41.8
Deneb	49°33.0	45°18.8
Enif	33°49.4	9°55.3
Al Na'ir	27°46.6	-46°54.4
Fomalhaut	15°26.6	-29°33.9
Scheat	13°55.8	28°08.2
Markab	13°40.8	15°15.6

May 07 Fri	**SHA**	**Mer.pass**
Venus	287°10.2	13:53
Mars	221°56.0	18:12
Jupiter	4°11.9	08:43
Saturn	180°33.3	20:55

May 08 Sat	**SHA**	**Mer.pass**
Venus	285°51.9	13:54
Mars	221°30.5	18:09
Jupiter	4°01.3	08:40
Saturn	180°35.5	20:51

May 09 Sun	**SHA**	**Mer.pass**
Venus	284°33.4	13:56
Mars	221°04.7	18:07
Jupiter	3°50.7	08:37
Saturn	180°37.6	20:47

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°51.4	N16°43.5	258°20.1	15.8'	S09°53.7	11.7'	54.2'
1	195°51.5	44.2	272°55.0	15.9'	09°42.0	11.7'	54.2'
2	210°51.5	44.9	287°29.9	15.9'	09°30.3	11.7'	54.2'
3	225°51.6	· · 45.6	302°04.8	15.9'	09°18.6	11.8'	54.2'
4	240°51.6	46.3	316°39.7	16.0'	09°06.8	11.8'	54.2'
5	255°51.6	47.0	331°14.7	16.0'	08°54.9	11.8'	54.2'
6	270°51.7	N16°47.6	345°49.7	16.0'	S08°43.1	11.9'	54.3'
7	285°51.7	48.3	0°24.8	16.0'	08°31.2	11.9'	54.3'
8	300°51.8	49.0	14°59.8	16.1'	08°19.3	11.9'	54.3'
9	315°51.8	· · 49.7	29°34.9	16.1'	08°07.3	12.0'	54.3'
10	330°51.8	50.4	44°10.0	16.1'	07°55.3	12.0'	54.3'
11	345°51.9	51.1	58°45.1	16.1'	07°43.3	12.0'	54.3'
12	0°51.9	N16°51.8	73°20.3	16.2'	S07°31.2	12.1'	54.3'
13	15°52.0	52.5	87°55.4	16.2'	07°19.1	12.1'	54.3'
14	30°52.0	53.2	102°30.6	16.2'	07°07.0	12.1'	54.3'
15	45°52.0	· · 53.8	117°05.8	16.2'	06°54.9	12.2'	54.3'
16	60°52.1	54.5	131°41.1	16.2'	06°42.7	12.2'	54.3'
17	75°52.1	55.2	146°16.3	16.2'	06°30.5	12.2'	54.3'
18	90°52.2	N16°55.9	160°51.5	16.3'	S06°18.2	12.2'	54.3'
19	105°52.2	56.6	175°26.8	16.3'	06°06.0	12.3'	54.3'
20	120°52.2	57.3	190°02.1	16.3'	05°53.7	12.3'	54.3'
21	135°52.3	· · 58.0	204°37.4	16.3'	05°41.4	12.3'	54.3'
22	150°52.3	58.6	219°12.7	16.3'	05°29.1	12.3'	54.3'
23	165°52.3	59.3	233°48.0	16.3'	05°16.7	12.4'	54.3'
	SD.=15.8	d=0.7			S.D.=14.8		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°52.4	N17°00.0	248°23.3	16.3'	S05°04.3	12.4'	54.3'
1	195°52.4	00.7	262°58.7	16.3'	04°51.9	12.4'	54.3'
2	210°52.5	01.4	277°34.0	16.3'	04°39.5	12.4'	54.4'
3	225°52.5	· · 02.1	292°09.3	16.3'	04°27.0	12.5'	54.4'
4	240°52.5	02.7	306°44.7	16.4'	04°14.6	12.5'	54.4'
5	255°52.6	03.4	321°20.0	16.4'	04°02.1	12.5'	54.4'
6	270°52.6	N17°04.1	335°55.4	16.4'	S03°49.6	12.5'	54.4'
7	285°52.6	04.8	350°30.8	16.4'	03°37.0	12.5'	54.4'
8	300°52.7	05.5	5°06.1	16.4'	03°24.5	12.6'	54.4'
9	315°52.7	· · 06.1	19°41.5	16.4'	03°11.9	12.6'	54.4'
10	330°52.7	06.8	34°16.8	16.4'	02°59.3	12.6'	54.4'
11	345°52.8	07.5	48°52.2	16.4'	02°46.7	12.6'	54.4'
12	0°52.8	N17°08.2	63°27.5	16.4'	S02°34.1	12.6'	54.5'
13	15°52.8	08.8	78°02.9	16.3'	02°21.5	12.6'	54.5'
14	30°52.9	09.5	92°38.2	16.3'	02°08.9	12.7'	54.5'
15	45°52.9	· · 10.2	107°13.6	16.3'	01°56.2	12.7'	54.5'
16	60°52.9	10.9	121°48.9	16.3'	01°43.5	12.7'	54.5'
17	75°53.0	11.5	136°24.2	16.3'	01°30.8	12.7'	54.5'
18	90°53.0	N17°12.2	150°59.6	16.3'	S01°18.1	12.7'	54.5'
19	105°53.0	12.9	165°34.9	16.3'	01°05.4	12.7'	54.5'
20	120°53.1	13.6	180°10.2	16.3'	00°52.7	12.7'	54.5'
21	135°53.1	· · 14.2	194°45.5	16.3'	00°40.0	12.7'	54.6'
22	150°53.1	14.9	209°20.7	16.3'	00°27.2	12.7'	54.6'
23	165°53.2	15.6	223°56.0	16.3'	00°14.5	12.8'	54.6'
	SD.=15.8	d=0.7			S.D.=14.8		

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°53.2	N17°16.2	238°31.2	16.2'	S00°01.7	12.8'	54.6'
1	195°53.2	16.9	253°06.5	16.2'	N00°11.0	12.8'	54.6'
2	210°53.3	17.6	267°41.7	16.2'	00°23.8	12.8'	54.6'
3	225°53.3	· · 18.3	282°16.9	16.2'	00°36.6	12.8'	54.6'
4	240°53.3	18.9	296°52.0	16.2'	00°49.4	12.8'	54.7'
5	255°53.3	19.6	311°27.2	16.1'	01°02.1	12.8'	54.7'
6	270°53.4	N17°20.3	326°02.3	16.1'	N01°14.9	12.8'	54.7'
7	285°53.4	20.9	340°37.4	16.1'	01°27.7	12.8'	54.7'
8	300°53.4	21.6	355°12.5	16.1'	01°40.5	12.8'	54.7'
9	315°53.5	· · 22.3	9°47.6	16.1'	01°53.3	12.8'	54.7'
10	330°53.5	22.9	24°22.6	16.0'	02°06.1	12.8'	54.8'
11	345°53.5	23.6	38°57.6	16.0'	02°18.9	12.8'	54.8'
12	0°53.5	N17°24.3	53°32.6	16.0'	N02°31.7	12.8'	54.8'
13	15°53.6	24.9	68°07.6	15.9'	02°44.5	12.8'	54.8'
14	30°53.6	25.6	82°42.5	15.9'	02°57.3	12.8'	54.8'
15	45°53.6	· · 26.2	97°17.4	15.9'	03°10.1	12.8'	54.8'
16	60°53.7	26.9	111°52.3	15.8'	03°22.9	12.8'	54.9'
17	75°53.7	27.6	126°27.1	15.8'	03°35.7	12.8'	54.9'
18	90°53.7	N17°28.2	141°01.9	15.8'	N03°48.5	12.8'	54.9'
19	105°53.7	28.9	155°36.7	15.7'	04°01.2	12.8'	54.9'
20	120°53.8	29.6	170°11.4	15.7'	04°14.0	12.8'	54.9'
21	135°53.8	· · 30.2	184°46.1	15.7'	04°26.8	12.8'	54.9'
22	150°53.8	30.9	199°20.7	15.6'	04°39.5	12.8'	55.0'
23	165°53.8	31.5	213°55.4	15.6'	04°52.3	12.7'	55.0'
	SD.=15.8	d=0.7			S.D.=14.9		

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 23-25 38-21%
07	03:26	03:28	11:57	06:58	19:19	
08	03:30	03:31	11:56	07:39	19:59	
09	03:33	03:34	11:56	08:20	20:40	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	227°41.4	150°56.2	N24°04.4	88°20.2	N17°43.0	231°21.6	S02°45.5	48°21.0	N03°00.7
1	242°43.9	165°55.3	04.8	103°21.6	42.6	246°23.6	45.3	63°23.6	00.7
2	257°46.3	180°54.5	05.2	118°22.9	42.2	261°25.7	45.1	78°26.1	00.8
3	272°48.8	195°53.7	·· 05.5	133°24.3	·· 41.8	276°27.7	·· 44.9	93°28.7	·· 00.8
4	287°51.3	210°52.9	05.9	148°25.7	41.5	291°29.7	44.7	108°31.2	00.8
5	302°53.7	225°52.1	06.3	163°27.1	41.1	306°31.8	44.6	123°33.8	00.8
6	317°56.2	240°51.3	N24°06.6	178°28.5	N17°40.7	321°33.8	S02°44.4	138°36.3	N03°00.9
7	332°58.7	255°50.4	07.0	193°29.8	40.3	336°35.8	44.2	153°38.9	00.9
8	348°01.1	270°49.6	07.4	208°31.2	39.9	351°37.8	44.0	168°41.4	00.9
9	3°03.6	285°48.8	·· 07.7	223°32.6	·· 39.5	6°39.9	·· 43.8	183°43.9	·· 00.9
10	18°06.0	300°48.0	08.1	238°34.0	39.1	21°41.9	43.7	198°46.5	01.0
11	33°08.5	315°47.2	08.4	253°35.3	38.7	36°43.9	43.5	213°49.0	01.0
12	48°11.0	330°46.4	N24°08.8	268°36.7	N17°38.4	51°46.0	S02°43.3	228°51.6	N03°01.0
13	63°13.4	345°45.5	09.2	283°38.1	38.0	66°48.0	43.1	243°54.1	01.1
14	78°15.9	0°44.7	09.5	298°39.5	37.6	81°50.0	42.9	258°56.7	01.1
15	93°18.4	15°43.9	·· 09.9	313°40.8	·· 37.2	96°52.1	·· 42.8	273°59.2	·· 01.1
16	108°20.8	30°43.1	10.2	328°42.2	36.8	111°54.1	42.6	289°01.8	01.1
17	123°23.3	45°42.3	10.6	343°43.6	36.4	126°56.1	42.4	304°04.3	01.2
18	138°25.8	60°41.4	N24°10.9	358°45.0	N17°36.0	141°58.1	S02°42.2	319°06.8	N03°01.2
19	153°28.2	75°40.6	11.3	13°46.3	35.6	157°00.2	42.1	334°09.4	01.2
20	168°30.7	90°39.8	11.6	28°47.7	35.3	172°02.2	41.9	349°11.9	01.2
21	183°33.1	105°39.0	·· 12.0	43°49.1	·· 34.9	187°04.2	·· 41.7	4°14.5	·· 01.3
22	198°35.6	120°38.2	12.3	58°50.5	34.5	202°06.3	41.5	19°17.0	01.3
23	213°38.1	135°37.3	12.7	73°51.8	34.1	217°08.3	41.3	34°19.6	01.3
Mer.pass.:08:48		v-0.8 d0.4 m-3.9		v1.4 d-0.4 m0.8		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	228°40.5	150°36.5	N24°13.0	88°53.2	N17°33.7	232°10.3	S02°41.2	49°22.1	N03°01.3
1	243°43.0	165°35.7	13.4	103°54.6	33.3	247°12.4	41.0	64°24.6	01.4
2	258°45.5	180°34.9	13.7	118°55.9	32.9	262°14.4	40.8	79°27.2	01.4
3	273°47.9	195°34.1	·· 14.1	133°57.3	·· 32.5	277°16.4	·· 40.6	94°29.7	·· 01.4
4	288°50.4	210°33.2	14.4	148°58.7	32.1	292°18.5	40.5	109°32.3	01.4
5	303°52.9	225°32.4	14.8	164°00.1	31.7	307°20.5	40.3	124°34.8	01.5
6	318°55.3	240°31.6	N24°15.1	179°01.4	N17°31.3	322°22.5	S02°40.1	139°37.4	N03°01.5
7	333°57.8	255°30.8	15.4	194°02.8	31.0	337°24.6	39.9	154°39.9	01.5
8	349°00.3	270°30.0	15.8	209°04.2	30.6	352°26.6	39.7	169°42.4	01.5
9	4°02.7	285°29.1	·· 16.1	224°05.5	·· 30.2	7°28.6	·· 39.6	184°45.0	·· 01.6
10	19°05.2	300°28.3	16.4	239°06.9	29.8	22°30.7	39.4	199°47.5	01.6
11	34°07.6	315°27.5	16.8	254°08.3	29.4	37°32.7	39.2	214°50.1	01.6
12	49°10.1	330°26.7	N24°17.1	269°09.6	N17°29.0	52°34.7	S02°39.0	229°52.6	N03°01.6
13	64°12.6	345°25.9	17.4	284°11.0	28.6	67°36.8	38.9	244°55.1	01.7
14	79°15.0	0°25.0	17.8	299°12.4	28.2	82°38.8	38.7	259°57.7	01.7
15	94°17.5	15°24.2	·· 18.1	314°13.7	·· 27.8	97°40.8	·· 38.5	275°00.2	·· 01.7
16	109°20.0	30°23.4	18.4	329°15.1	27.4	112°42.9	38.3	290°02.8	01.7
17	124°22.4	45°22.6	18.7	344°16.5	27.0	127°44.9	38.2	305°05.3	01.8
18	139°24.9	60°21.7	N24°19.1	359°17.8	N17°26.6	142°46.9	S02°38.0	320°07.9	N03°01.8
19	154°27.4	75°20.9	19.4	14°19.2	26.2	157°49.0	37.8	335°10.4	01.8
20	169°29.8	90°20.1	19.7	29°20.6	25.9	172°51.0	37.6	350°12.9	01.8
21	184°32.3	105°19.3	·· 20.0	44°21.9	·· 25.5	187°53.0	·· 37.4	5°15.5	·· 01.9
22	199°34.7	120°18.4	20.4	59°23.3	25.1	202°55.1	37.3	20°18.0	01.9
23	214°37.2	135°17.6	20.7	74°24.7	24.7	217°57.1	37.1	35°20.5	01.9
Mer.pass.:08:44		v-0.8 d0.3 m-3.9		v1.4 d-0.4 m0.9		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	229°39.7	150°16.8	N24°21.0	89°26.0	N17°24.3	232°59.2	S02°36.9	50°23.1	N03°01.9
1	244°42.1	165°16.0	21.3	104°27.4	23.9	248°01.2	36.7	65°25.6	02.0
2	259°44.6	180°15.1	21.6	119°28.8	23.5	263°03.2	36.6	80°28.2	02.0
3	274°47.1	195°14.3	·· 21.9	134°30.1	·· 23.1	278°05.3	·· 36.4	95°30.7	·· 02.0
4	289°49.5	210°13.5	22.2	149°31.5	22.7	293°07.3	36.2	110°33.2	02.0
5	304°52.0	225°12.7	22.6	164°32.9	22.3	308°09.3	36.0	125°35.8	02.1
6	319°54.5	240°11.8	N24°22.9	179°34.2	N17°21.9	323°11.4	S02°35.9	140°38.3	N03°02.1
7	334°56.9	255°11.0	23.2	194°35.6	21.5	338°13.4	35.7	155°40.9	02.1
8	349°59.4	270°10.2	23.5	209°36.9	21.1	353°15.5	35.5	170°43.4	02.1
9	5°01.9	285°09.4	·· 23.8	224°38.3	·· 20.7	8°17.5	·· 35.3	185°45.9	·· 02.2
10	20°04.3	300°08.5	24.1	239°39.7	20.3	23°19.5	35.2	200°48.5	02.2
11	35°06.8	315°07.7	24.4	254°41.0	19.9	38°21.6	35.0	215°51.0	02.2
12	50°09.2	330°06.9	N24°24.7	269°42.4	N17°19.5	53°23.6	S02°34.8	230°53.5	N03°02.2
13	65°11.7	345°06.1	25.0	284°43.8	19.1	68°25.6	34.6	245°56.1	02.2
14	80°14.2	0°05.2	25.3	299°45.1	18.7	83°27.7	34.5	260°58.6	02.3
15	95°16.6	15°04.4	·· 25.6	314°46.5	·· 18.3	98°29.7	·· 34.3	276°01.2	·· 02.3
16	110°19.1	30°03.6	25.9	329°47.8	17.9	113°31.8	34.1	291°03.7	02.3
17	125°21.6	45°02.7	26.2	344°49.2	17.5	128°33.8	33.9	306°06.2	02.3
18	140°24.0	60°01.9	N24°26.5	359°50.6	N17°17.1	143°35.8	S02°33.8	321°08.8	N03°02.4
19	155°26.5	75°01.1	26.8	14°51.9	16.7	158°37.9	33.6	336°11.3	02.4
20	170°29.0	90°00.3	27.1	29°53.3	16.3	173°39.9	33.4	351°13.8	02.4
21	185°31.4	104°59.4	·· 27.4	44°54.6	·· 16.0	188°41.9	·· 33.2	6°16.4	·· 02.4
22	200°33.9	119°58.6	27.7	59°56.0	15.6	203°44.0	33.1	21°18.9	02.5
23	215°36.4	134°57.8	28.0	74°57.3	15.2	218°46.0	32.9	36°21.4	02.5
Mer.pass.:08:40		v-0.8 d0.3 m-3.9		v1.4 d-0.4 m0.9		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°46.2	29°08.8
Ankaa	353°18.1	-42°14.8
Schedar	349°43.7	56°35.5
Diphda	348°58.4	-17°55.7
Achernar	335°28.8	-57°10.9
Hamal	328°03.7	23°30.6
Polaris	319°20.9	89°18.6
Acamar	315°20.4	-40°15.8
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.3	46°00.6
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.3
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.4
Procyon	245°02.3	5°11.8
Pollux	243°30.6	28°00.1
Avior	234°19.2	-59°32.9
Suhail	222°54.2	-43°28.8
Miaplacidus	221°40.5	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.0	61°41.8
Denebola	182°35.8	14°30.7
Gienah	175°54.4	-17°36.2
Acrux	173°11.6	-63°09.7
Gacrux	172°03.2	-57°10.6
Alioth	166°22.1	55°54.2
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.7
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.5	74°06.7
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.6
Antares	112°28.7	-26°27.4
Atria	107°32.1	-69°02.7
Sabik	102°14.8	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.3	12°33.0
Eltanin	90°46.8	51°29.0
Kaus Aust.	83°46.5	-34°22.7
Vega	80°40.2	38°47.4
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°53.7
Peacock	53°22.5	-56°41.8
Deneb	49°33.0	45°18.8
Enif	33°49.4	9°55.3
Al Na'ir	27°46.5	-46°54.4
Fomalhaut	15°26.6	-29°33.9
Scheat	13°55.8	28°08.2
Markab	13°40.8	15°15.6

May 10 Mon	**SHA**	**Mer.pass**
Venus	283°14.8	13:57
Mars	220°38.8	18:05
Jupiter	3°40.2	08:33
Saturn	180°39.6	20:43

May 11 Tue	**SHA**	**Mer.pass**
Venus	281°56.0	13:58
Mars	220°12.7	18:03
Jupiter	3°29.8	08:30
Saturn	180°41.6	20:39

May 12 Wed	**SHA**	**Mer.pass**
Venus	280°37.1	14:00
Mars	219°46.4	18:01
Jupiter	3°19.5	08:27
Saturn	180°43.4	20:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°53.9	N17°32.2	228°29.9	15.6'	N05°05.0	12.7'	55.0'
1	195°53.9	32.8	243°04.5	15.5'	05°17.7	12.7'	55.0'
2	210°53.9	33.5	257°39.0	15.5'	05°30.4	12.7'	55.0'
3	225°53.9	· · 34.2	272°13.4	15.4'	05°43.2	12.7'	55.1'
4	240°54.0	34.8	286°47.8	15.4'	05°55.8	12.7'	55.1'
5	255°54.0	35.5	301°22.2	15.3'	06°08.5	12.7'	55.1'
6	270°54.0	N17°36.1	315°56.5	15.3'	N06°21.2	12.7'	55.1'
7	285°54.0	36.8	330°30.8	15.3'	06°33.8	12.6'	55.1'
8	300°54.0	37.4	345°05.0	15.2'	06°46.5	12.6'	55.2'
9	315°54.1	· · 38.1	359°39.2	15.2'	06°59.1	12.6'	55.2'
10	330°54.1	38.7	14°13.4	15.1'	07°11.7	12.6'	55.2'
11	345°54.1	39.4	28°47.4	15.1'	07°24.3	12.6'	55.2'
12	0°54.1	N17°40.1	43°21.5	15.0'	N07°36.8	12.5'	55.2'
13	15°54.2	40.7	57°55.4	15.0'	07°49.4	12.5'	55.3'
14	30°54.2	41.4	72°29.4	14.9'	08°01.9	12.5'	55.3'
15	45°54.2	· · 42.0	87°03.2	14.8'	08°14.4	12.5'	55.3'
16	60°54.2	42.7	101°37.0	14.8'	08°26.8	12.5'	55.3'
17	75°54.2	43.3	116°10.8	14.7'	08°39.3	12.4'	55.4'
18	90°54.3	N17°44.0	130°44.5	14.7'	N08°51.7	12.4'	55.4'
19	105°54.3	44.6	145°18.1	14.6'	09°04.1	12.4'	55.4'
20	120°54.3	45.3	159°51.7	14.6'	09°16.5	12.4'	55.4'
21	135°54.3	· · 45.9	174°25.3	14.5'	09°28.8	12.3'	55.4'
22	150°54.3	46.5	188°58.7	14.4'	09°41.1	12.3'	55.5'
23	165°54.4	47.2	203°32.1	14.4'	09°53.4	12.3'	55.5'
	SD.=15.8	d=0.7	S.D.=15.1				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.4	N17°47.8	218°05.5	14.3'	N10°05.7	12.2'	55.5'
1	195°54.4	48.5	232°38.7	14.2'	10°17.9	12.2'	55.5'
2	210°54.4	49.1	247°11.9	14.2'	10°30.1	12.2'	55.6'
3	225°54.4	· · 49.8	261°45.1	14.1'	10°42.2	12.1'	55.6'
4	240°54.4	50.4	276°18.2	14.0'	10°54.4	12.1'	55.6'
5	255°54.5	51.1	290°51.2	14.0'	11°06.4	12.1'	55.6'
6	270°54.5	N17°51.7	305°24.1	13.9'	N11°18.5	12.0'	55.7'
7	285°54.5	52.4	319°57.0	13.8'	11°30.5	12.0'	55.7'
8	300°54.5	53.0	334°29.8	13.8'	11°42.5	12.0'	55.7'
9	315°54.5	· · 53.6	349°02.5	13.7'	11°54.4	11.9'	55.7'
10	330°54.5	54.3	3°35.2	13.6'	12°06.3	11.9'	55.8'
11	345°54.6	54.9	18°07.8	13.6'	12°18.1	11.8'	55.8'
12	0°54.6	N17°55.6	32°40.3	13.5'	N12°29.9	11.8'	55.8'
13	15°54.6	56.2	47°12.7	13.4'	12°41.7	11.7'	55.8'
14	30°54.6	56.8	61°45.1	13.3'	12°53.4	11.7'	55.8'
15	45°54.6	· · 57.5	76°17.4	13.3'	13°05.1	11.6'	55.9'
16	60°54.6	58.1	90°49.6	13.2'	13°16.7	11.6'	55.9'
17	75°54.7	58.7	105°21.7	13.1'	13°28.3	11.5'	55.9'
18	90°54.7	N17°59.4	119°53.8	13.0'	N13°39.8	11.5'	55.9'
19	105°54.7	18°00.0	134°25.8	12.9'	13°51.3	11.4'	56.0'
20	120°54.7	00.7	148°57.6	12.9'	14°02.7	11.4'	56.0'
21	135°54.7	· · 01.3	163°29.5	12.8'	14°14.0	11.3'	56.0'
22	150°54.7	01.9	178°01.2	12.7'	14°25.4	11.3'	56.0'
23	165°54.7	02.6	192°32.9	12.6'	14°36.6	11.2'	56.1'
	SD.=15.8	d=0.6	S.D.=15.2				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.7	N18°03.2	207°04.4	12.5'	N14°47.8	11.2'	56.1'
1	195°54.8	03.8	221°35.9	12.4'	14°58.9	11.1'	56.1'
2	210°54.8	04.5	236°07.3	12.4'	15°10.0	11.0'	56.2'
3	225°54.8	· · 05.1	250°38.6	12.3'	15°21.0	11.0'	56.2'
4	240°54.8	05.7	265°09.9	12.2'	15°32.0	10.9'	56.2'
5	255°54.8	06.4	279°41.0	12.1'	15°42.9	10.9'	56.2'
6	270°54.8	N18°07.0	294°12.1	12.0'	N15°53.7	10.8'	56.3'
7	285°54.8	07.6	308°43.1	11.9'	16°04.5	10.7'	56.3'
8	300°54.8	08.2	323°14.0	11.8'	16°15.2	10.7'	56.3'
9	315°54.8	· · 08.9	337°44.8	11.8'	16°25.8	10.6'	56.3'
10	330°54.9	09.5	352°15.5	11.7'	16°36.4	10.5'	56.4'
11	345°54.9	10.1	6°46.1	11.6'	16°46.9	10.5'	56.4'
12	0°54.9	N18°10.8	21°16.6	11.5'	N16°57.3	10.4'	56.4'
13	15°54.9	11.4	35°47.1	11.4'	17°07.6	10.3'	56.4'
14	30°54.9	12.0	50°17.4	11.3'	17°17.9	10.2'	56.5'
15	45°54.9	· · 12.6	64°47.7	11.2'	17°28.1	10.2'	56.5'
16	60°54.9	13.3	79°17.8	11.1'	17°38.2	10.1'	56.5'
17	75°54.9	13.9	93°47.9	11.0'	17°48.2	10.0'	56.5'
18	90°54.9	N18°14.5	108°17.9	10.9'	N17°58.2	9.9'	56.6'
19	105°54.9	15.1	122°47.8	10.8'	18°08.1	9.8'	56.6'
20	120°54.9	15.8	137°17.6	10.8'	18°17.9	9.8'	56.6'
21	135°54.9	· · 16.4	151°47.3	10.7'	18°27.6	9.7'	56.6'
22	150°55.0	17.0	166°16.9	10.6'	18°37.2	9.6'	56.7'
23	165°55.0	17.6	180°46.5	10.5'	18°46.7	9.5'	56.7'
	SD.=15.8	d=0.6	S.D.=15.4				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 26-28 13-3%
10	03:35	03:37	11:56	09:01	21:23	●
11	03:37	03:38	11:56	09:45	22:08	
12	03:39	03:39	11:56	10:32	22:57	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	230°38.8	149°56.9	N24°28.2	89°58.7	N17°14.8	233°48.1	S02°32.7	51°24.0	N03°02.5
1	245°41.3	164°56.1	28.5	105°00.1	14.4	248°50.1	32.5	66°26.5	02.5
2	260°43.7	179°55.3	28.8	120°01.4	14.0	263°52.1	32.4	81°29.1	02.5
3	275°46.2	194°54.5	·· 29.1	135°02.8	·· 13.6	278°54.2	·· 32.2	96°31.6	·· 02.6
4	290°48.7	209°53.6	29.4	150°04.1	13.2	293°56.2	32.0	111°34.1	02.6
5	305°51.1	224°52.8	29.7	165°05.5	12.8	308°58.3	31.8	126°36.7	02.6
6	320°53.6	239°52.0	N24°29.9	180°06.8	N17°12.4	324°00.3	S02°31.7	141°39.2	N03°02.6
7	335°56.1	254°51.1	30.2	195°08.2	12.0	339°02.3	31.5	156°41.7	02.7
8	350°58.5	269°50.3	30.5	210°09.6	11.6	354°04.4	31.3	171°44.3	02.7
9	6°01.0	284°49.5	·· 30.8	225°10.9	·· 11.2	9°06.4	·· 31.1	186°46.8	·· 02.7
10	21°03.5	299°48.6	31.1	240°12.3	10.8	24°08.5	31.0	201°49.3	02.7
11	36°05.9	314°47.8	31.3	255°13.6	10.4	39°10.5	30.8	216°51.9	02.7
12	51°08.4	329°47.0	N24°31.6	270°15.0	N17°10.0	54°12.6	S02°30.6	231°54.4	N03°02.8
13	66°10.8	344°46.2	31.9	285°16.3	09.6	69°14.6	30.4	246°56.9	02.8
14	81°13.3	359°45.3	32.2	300°17.7	09.2	84°16.6	30.3	261°59.5	02.8
15	96°15.8	14°44.5	·· 32.4	315°19.0	·· 08.7	99°18.7	·· 30.1	277°02.0	·· 02.8
16	111°18.2	29°43.7	32.7	330°20.4	08.3	114°20.7	29.9	292°04.5	02.8
17	126°20.7	44°42.8	33.0	345°21.7	07.9	129°22.8	29.7	307°07.1	02.9
18	141°23.2	59°42.0	N24°33.2	0°23.1	N17°07.5	144°24.8	S02°29.6	322°09.6	N03°02.9
19	156°25.6	74°41.2	33.5	15°24.4	07.1	159°26.8	29.4	337°12.1	02.9
20	171°28.1	89°40.3	33.8	30°25.8	06.7	174°28.9	29.2	352°14.7	02.9
21	186°30.6	104°39.5	·· 34.0	45°27.2	·· 06.3	189°30.9	·· 29.1	7°17.2	·· 03.0
22	201°33.0	119°38.7	34.3	60°28.5	05.9	204°33.0	28.9	22°19.7	03.0
23	216°35.5	134°37.8	34.5	75°29.9	05.5	219°35.0	28.7	37°22.3	03.0
Mer.pass.:08:36		v-0.8 d0.3 m-3.9		v1.4 d-0.4 m0.9		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	231°38.0	149°37.0	N24°34.8	90°31.2	N17°05.1	234°37.1	S02°28.5	52°24.8	N03°03.0
1	246°40.4	164°36.2	35.1	105°32.6	04.7	249°39.1	28.4	67°27.3	03.0
2	261°42.9	179°35.3	35.3	120°33.9	04.3	264°41.2	28.2	82°29.9	03.1
3	276°45.3	194°34.5	·· 35.6	135°35.3	·· 03.9	279°43.2	·· 28.0	97°32.4	·· 03.1
4	291°47.8	209°33.7	35.8	150°36.6	03.5	294°45.2	27.8	112°34.9	03.1
5	306°50.3	224°32.8	36.1	165°38.0	03.1	309°47.3	27.7	127°37.5	03.1
6	321°52.7	239°32.0	N24°36.3	180°39.3	N17°02.7	324°49.3	S02°27.5	142°40.0	N03°03.1
7	336°55.2	254°31.2	36.6	195°40.7	02.3	339°51.4	27.3	157°42.5	03.2
8	351°57.7	269°30.3	36.8	210°42.0	01.9	354°53.4	27.2	172°45.0	03.2
9	7°00.1	284°29.5	·· 37.1	225°43.3	·· 01.5	9°55.5	·· 27.0	187°47.6	·· 03.2
10	22°02.6	299°28.7	37.3	240°44.7	01.1	24°57.5	26.8	202°50.1	03.2
11	37°05.1	314°27.8	37.6	255°46.0	00.7	39°59.6	26.6	217°52.6	03.2
12	52°07.5	329°27.0	N24°37.8	270°47.4	N17°00.3	55°01.6	S02°26.5	232°55.2	N03°03.3
13	67°10.0	344°26.2	38.1	285°48.7	16°59.9	70°03.6	26.3	247°57.7	03.3
14	82°12.5	359°25.3	38.3	300°50.1	59.5	85°05.7	26.1	263°00.2	03.3
15	97°14.9	14°24.5	·· 38.5	315°51.4	·· 59.1	100°07.7	·· 25.9	278°02.8	·· 03.3
16	112°17.4	29°23.7	38.8	330°52.8	58.6	115°09.8	25.8	293°05.3	03.3
17	127°19.8	44°22.8	39.0	345°54.1	58.2	130°11.8	25.6	308°07.8	03.4
18	142°22.3	59°22.0	N24°39.3	0°55.5	N16°57.8	145°13.9	S02°25.4	323°10.3	N03°03.4
19	157°24.8	74°21.2	39.5	15°56.8	57.4	160°15.9	25.3	338°12.9	03.4
20	172°27.2	89°20.3	39.7	30°58.2	57.0	175°18.0	25.1	353°15.4	03.4
21	187°29.7	104°19.5	·· 40.0	45°59.5	·· 56.6	190°20.0	·· 24.9	8°17.9	·· 03.4
22	202°32.2	119°18.7	40.2	61°00.9	56.2	205°22.1	24.7	23°20.5	03.5
23	217°34.6	134°17.8	40.4	76°02.2	55.8	220°24.1	24.6	38°23.0	03.5
Mer.pass.:08:32		v-0.8 d0.3 m-3.9		v1.4 d-0.4 m0.9		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	232°37.1	149°17.0	N24°40.7	91°03.5	N16°55.4	235°26.2	S02°24.4	53°25.5	N03°03.5
1	247°39.6	164°16.2	40.9	106°04.9	55.0	250°28.2	24.2	68°28.0	03.5
2	262°42.0	179°15.3	41.1	121°06.2	54.6	265°30.3	24.1	83°30.6	03.5
3	277°44.5	194°14.5	·· 41.3	136°07.6	·· 54.2	280°32.3	·· 23.9	98°33.1	·· 03.5
4	292°47.0	209°13.7	41.6	151°08.9	53.8	295°34.3	23.7	113°35.6	03.6
5	307°49.4	224°12.8	41.8	166°10.3	53.4	310°36.4	23.6	128°38.2	03.6
6	322°51.9	239°12.0	N24°42.0	181°11.6	N16°52.9	325°38.4	S02°23.4	143°40.7	N03°03.6
7	337°54.3	254°11.1	42.2	196°12.9	52.5	340°40.5	23.2	158°43.2	03.6
8	352°56.8	269°10.3	42.5	211°14.3	52.1	355°42.5	23.0	173°45.7	03.6
9	7°59.3	284°09.5	·· 42.7	226°15.6	·· 51.7	10°44.6	·· 22.9	188°48.3	·· 03.7
10	23°01.7	299°08.6	42.9	241°17.0	51.3	25°46.6	22.7	203°50.8	03.7
11	38°04.2	314°07.8	43.1	256°18.3	50.9	40°48.7	22.5	218°53.3	03.7
12	53°06.7	329°07.0	N24°43.3	271°19.6	N16°50.5	55°50.7	S02°22.4	233°55.8	N03°03.7
13	68°09.1	344°06.1	43.5	286°21.0	50.1	70°52.8	22.2	248°58.4	03.7
14	83°11.6	359°05.3	43.8	301°22.3	49.7	85°54.8	22.0	264°00.9	03.7
15	98°14.1	14°04.5	·· 44.0	316°23.7	·· 49.3	100°56.9	·· 21.8	279°03.4	·· 03.8
16	113°16.5	29°03.6	44.2	331°25.0	48.8	115°58.9	21.7	294°05.9	03.8
17	128°19.0	44°02.8	44.4	346°26.3	48.4	131°01.0	21.5	309°08.5	03.8
18	143°21.5	59°01.9	N24°44.6	1°27.7	N16°48.0	146°03.0	S02°21.3	324°11.0	N03°03.8
19	158°23.9	74°01.1	44.8	16°29.0	47.6	161°05.1	21.2	339°13.5	03.8
20	173°26.4	89°00.3	45.0	31°30.4	47.2	176°07.1	21.0	354°16.0	03.9
21	188°28.8	103°59.4	·· 45.2	46°31.7	·· 46.8	191°09.2	·· 20.8	9°18.6	·· 03.9
22	203°31.3	118°58.6	45.4	61°33.0	46.4	206°11.2	20.7	24°21.1	03.9
23	218°33.8	133°57.8	45.6	76°34.4	46.0	221°13.3	20.5	39°23.6	03.9
Mer.pass.:08:28		v-0.8 d0.2 m-3.9		v1.3 d-0.4 m0.9		v2.0 d0.2 m-2.0		v2.5 d0.0 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°46.1	29°08.8
Ankaa	353°18.1	-42°14.8
Schedar	349°43.7	56°35.5
Diphda	348°58.4	-17°55.7
Achernar	335°28.8	-57°10.9
Hamal	328°03.7	23°30.6
Polaris	319°20.3	89°18.5
Acamar	315°20.4	-40°15.7
Menkar	314°17.8	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.3	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.3
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.4
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.3	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.5	-69°46.0
Alphard	217°58.3	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.0	61°41.8
Denebola	182°35.8	14°30.7
Gienah	175°54.5	-17°36.2
Acrux	173°11.6	-63°09.7
Gacrux	172°03.2	-57°10.6
Alioth	166°22.1	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.7
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.5	74°06.7
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.7	-26°27.4
Atria	107°32.1	-69°02.7
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.6
Rasalhague	96°08.3	12°33.0
Eltanin	90°46.7	51°29.0
Kaus Aust.	83°46.5	-34°22.7
Vega	80°40.2	38°47.4
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°53.7
Peacock	53°22.5	-56°41.8
Deneb	49°33.0	45°18.8
Enif	33°49.4	9°55.3
Al Na'ir	27°46.5	-46°54.4
Fomalhaut	15°26.5	-29°33.9
Scheat	13°55.8	28°08.2
Markab	13°40.7	15°15.6

May 13 Thu	**SHA**	**Mer.pass**
Venus	279°18.1	14:01
Mars	219°19.9	17:58
Jupiter	3°09.3	08:24
Saturn	180°45.2	20:31

May 14 Fri	**SHA**	**Mer.pass**
Venus	277°59.1	14:02
Mars	218°53.3	17:56
Jupiter	2°59.1	08:20
Saturn	180°46.8	20:27

May 15 Sat	**SHA**	**Mer.pass**
Venus	276°39.9	14:04
Mars	218°26.4	17:54
Jupiter	2°49.1	08:17
Saturn	180°48.4	20:23

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0342 sec ΔT = TT-UT1 = +66.2182 sec

2010 May 13 to May. 15 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°55.0	N18°18.2	195°15.9	10.4'	N18°56.2	9.4'	56.7'
1	195°55.0	18.9	209°45.2	10.3'	19°05.6	9.3'	56.7'
2	210°55.0	19.5	224°14.5	10.2'	19°14.8	9.2'	56.8'
3	225°55.0	· · 20.1	238°43.6	10.1'	19°24.0	9.1'	56.8'
4	240°55.0	20.7	253°12.7	10.0'	19°33.1	9.0'	56.8'
5	255°55.0	21.3	267°41.6	9.9'	19°42.1	8.9'	56.9'
6	270°55.0	N18°22.0	282°10.5	9.8'	N19°51.0	8.8'	56.9'
7	285°55.0	22.6	296°39.3	9.7'	19°59.8	8.8'	56.9'
8	300°55.0	23.2	311°07.9	9.6'	20°08.5	8.7'	56.9'
9	315°55.0	· · 23.8	325°36.5	9.5'	20°17.1	8.6'	57.0'
10	330°55.0	24.4	340°05.0	9.4'	20°25.6	8.4'	57.0'
11	345°55.0	25.0	354°33.4	9.3'	20°34.0	8.3'	57.0'
12	0°55.0	N18°25.7	9°01.7	9.3'	N20°42.3	8.2'	57.0'
13	15°55.0	26.3	23°29.9	9.2'	20°50.5	8.1'	57.1'
14	30°55.0	26.9	37°58.0	9.1'	20°58.5	8.0'	57.1'
15	45°55.0	· · 27.5	52°26.0	9.0'	21°06.5	7.9'	57.1'
16	60°55.0	28.1	66°54.0	8.9'	21°14.4	7.8'	57.1'
17	75°55.0	28.7	81°21.8	8.8'	21°22.1	7.7'	57.2'
18	90°55.0	N18°29.3	95°49.6	8.7'	N21°29.8	7.6'	57.2'
19	105°55.0	29.9	110°17.2	8.6'	21°37.3	7.5'	57.2'
20	120°55.0	30.6	124°44.8	8.5'	21°44.7	7.4'	57.2'
21	135°55.0	· · 31.2	139°12.2	8.4'	21°52.0	7.2'	57.3'
22	150°55.0	31.8	153°39.6	8.3'	21°59.2	7.1'	57.3'
23	165°55.0	32.4	168°06.9	8.2'	22°06.3	7.0'	57.3'
	SD.=15.8	d=0.6	S.D.=15.5				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°55.0	N18°33.0	182°34.1	8.2'	N22°13.2	6.9'	57.3'
1	195°55.0	33.6	197°01.2	8.1'	22°20.0	6.8'	57.4'
2	210°55.0	34.2	211°28.3	8.0'	22°26.7	6.6'	57.4'
3	225°55.0	· · 34.8	225°55.2	7.9'	22°33.3	6.5'	57.4'
4	240°55.0	35.4	240°22.1	7.8'	22°39.7	6.4'	57.4'
5	255°55.0	36.0	254°48.8	7.7'	22°46.0	6.3'	57.5'
6	270°55.0	N18°36.6	269°15.5	7.6'	N22°52.2	6.1'	57.5'
7	285°55.0	37.2	283°42.1	7.6'	22°58.3	6.0'	57.5'
8	300°55.0	37.8	298°08.6	7.5'	23°04.2	5.9'	57.5'
9	315°55.0	· · 38.4	312°35.1	7.4'	23°10.0	5.7'	57.6'
10	330°55.0	39.0	327°01.4	7.3'	23°15.7	5.6'	57.6'
11	345°55.0	39.6	341°27.7	7.2'	23°21.2	5.5'	57.6'
12	0°55.0	N18°40.2	355°53.9	7.2'	N23°26.7	5.3'	57.6'
13	15°55.0	40.8	10°20.0	7.1'	23°31.9	5.2'	57.6'
14	30°55.0	41.4	24°46.0	7.0'	23°37.0	5.1'	57.7'
15	45°55.0	· · 42.0	39°12.0	6.9'	23°42.0	4.9'	57.7'
16	60°55.0	42.6	53°37.9	6.9'	23°46.9	4.8'	57.7'
17	75°55.0	43.2	68°03.7	6.8'	23°51.6	4.6'	57.7'
18	90°55.0	N18°43.8	82°29.4	6.7'	N23°56.2	4.5'	57.8'
19	105°55.0	44.4	96°55.1	6.6'	24°00.6	4.4'	57.8'
20	120°55.0	45.0	111°20.7	6.6'	24°04.9	4.2'	57.8'
21	135°55.0	· · 45.6	125°46.2	6.5'	24°09.0	4.1'	57.8'
22	150°55.0	46.2	140°11.7	6.4'	24°13.0	3.9'	57.9'
23	165°55.0	46.8	154°37.1	6.4'	24°16.8	3.8'	57.9'
	SD.=15.8	d=0.6	S.D.=15.7				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°55.0	N18°47.4	169°02.4	6.3'	N24°20.5	3.6'	57.9'
1	195°55.0	48.0	183°27.7	6.2'	24°24.1	3.5'	57.9'
2	210°55.0	48.6	197°52.9	6.2'	24°27.5	3.3'	57.9'
3	225°55.0	· · 49.2	212°18.1	6.1'	24°30.7	3.2'	58.0'
4	240°55.0	49.8	226°43.2	6.1'	24°33.8	3.0'	58.0'
5	255°55.0	50.4	241°08.2	6.0'	24°36.8	2.9'	58.0'
6	270°54.9	N18°51.0	255°33.2	6.0'	N24°39.6	2.7'	58.0'
7	285°54.9	51.6	269°58.1	5.9'	24°42.2	2.6'	58.0'
8	300°54.9	52.2	284°23.0	5.9'	24°44.7	2.4'	58.1'
9	315°54.9	· · 52.7	298°47.8	5.8'	24°47.0	2.3'	58.1'
10	330°54.9	53.3	313°12.6	5.8'	24°49.2	2.1'	58.1'
11	345°54.9	53.9	327°37.4	5.7'	24°51.2	1.9'	58.1'
12	0°54.9	N18°54.5	342°02.0	5.7'	N24°53.1	1.8'	58.1'
13	15°54.9	55.1	356°26.7	5.6'	24°54.8	1.6'	58.2'
14	30°54.9	55.7	10°51.3	5.6'	24°56.3	1.5'	58.2'
15	45°54.9	· · 56.3	25°15.9	5.5'	24°57.7	1.3'	58.2'
16	60°54.9	56.9	39°40.4	5.5'	24°59.0	1.1'	58.2'
17	75°54.9	57.4	54°04.9	5.5'	25°00.0	1.0'	58.2'
18	90°54.8	N18°58.0	68°29.4	5.4'	N25°00.9	0.8'	58.3'
19	105°54.8	58.6	82°53.8	5.4'	25°01.7	0.7'	58.3'
20	120°54.8	59.2	97°18.2	5.4'	25°02.3	0.5'	58.3'
21	135°54.8	18°59.8	111°42.6	5.4'	25°02.7	0.3'	58.3'
22	150°54.8	19°00.4	126°06.9	5.3'	25°02.9	0.2'	58.3'
23	165°54.8	00.9	140°31.2	5.3'	25°03.0	0.0'	58.4'
	SD.=15.8	d=0.6	S.D.=15.8				

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

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 29-1 0-3%
13	03:40	03:40	11:56	11:23	23:49	●
14	03:40	03:40	11:56	12:17	–:–	
15	03:40	03:40	11:56	13:15	00:46	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	233°36.2	148°56.9	N24°45.8	91°35.7	N16°45.6	236°15.3	S02°20.3	54°26.1	N03°03.9
1	248°38.7	163°56.1	46.0	106°37.1	45.1	251°17.4	20.1	69°28.7	03.9
2	263°41.2	178°55.2	46.2	121°38.4	44.7	266°19.4	20.0	84°31.2	04.0
3	278°43.6	193°54.4	·· 46.4	136°39.7	·· 44.3	281°21.5	·· 19.8	99°33.7	·· 04.0
4	293°46.1	208°53.6	46.6	151°41.1	43.9	296°23.5	19.6	114°36.2	04.0
5	308°48.6	223°52.7	46.8	166°42.4	43.5	311°25.6	19.5	129°38.8	04.0
6	323°51.0	238°51.9	N24°47.0	181°43.7	N16°43.1	326°27.7	S02°19.3	144°41.3	N03°04.0
7	338°53.5	253°51.1	47.2	196°45.1	42.7	341°29.7	19.1	159°43.8	04.0
8	353°55.9	268°50.2	47.4	211°46.4	42.2	356°31.8	19.0	174°46.3	04.1
9	8°58.4	283°49.4	·· 47.6	226°47.7	·· 41.8	11°33.8	·· 18.8	189°48.9	·· 04.1
10	24°00.9	298°48.5	47.8	241°49.1	41.4	26°35.9	18.6	204°51.4	04.1
11	39°03.3	313°47.7	47.9	256°50.4	41.0	41°37.9	18.5	219°53.9	04.1
12	54°05.8	328°46.9	N24°48.1	271°51.7	N16°40.6	56°40.0	S02°18.3	234°56.4	N03°04.1
13	69°08.3	343°46.0	48.3	286°53.1	40.2	71°42.0	18.1	249°58.9	04.1
14	84°10.7	358°45.2	48.5	301°54.4	39.8	86°44.1	18.0	265°01.5	04.2
15	99°13.2	13°44.4	·· 48.7	316°55.7	·· 39.4	101°46.1	·· 17.8	280°04.0	·· 04.2
16	114°15.7	28°43.5	48.9	331°57.1	38.9	116°48.2	17.6	295°06.5	04.2
17	129°18.1	43°42.7	49.0	346°58.4	38.5	131°50.2	17.4	310°09.0	04.2
18	144°20.6	58°41.8	N24°49.2	1°59.7	N16°38.1	146°52.3	S02°17.3	325°11.6	N03°04.2
19	159°23.1	73°41.0	49.4	17°01.1	37.7	161°54.3	17.1	340°14.1	04.2
20	174°25.5	88°40.2	49.6	32°02.4	37.3	176°56.4	16.9	355°16.6	04.3
21	189°28.0	103°39.3	·· 49.8	47°03.7	·· 36.9	191°58.5	·· 16.8	10°19.1	·· 04.3
22	204°30.4	118°38.5	49.9	62°05.1	36.4	207°00.5	16.6	25°21.6	04.3
23	219°32.9	133°37.6	50.1	77°06.4	36.0	222°02.6	16.4	40°24.2	04.3
Mer.pass.:08:24		v-0.8 d0.2 m-3.9		v1.3 d-0.4 m0.9		v2.1 d0.2 m-2.0		v2.5 d0.0 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	234°35.4	148°36.8	N24°50.3	92°07.7	N16°35.6	237°04.6	S02°16.3	55°26.7	N03°04.3
1	249°37.8	163°36.0	50.4	107°09.1	35.2	252°06.7	16.1	70°29.2	04.3
2	264°40.3	178°35.1	50.6	122°10.4	34.8	267°08.7	15.9	85°31.7	04.3
3	279°42.8	193°34.3	·· 50.8	137°11.7	·· 34.4	282°10.8	·· 15.8	100°34.2	·· 04.4
4	294°45.2	208°33.5	50.9	152°13.1	33.9	297°12.8	15.6	115°36.8	04.4
5	309°47.7	223°32.6	51.1	167°14.4	33.5	312°14.9	15.4	130°39.3	04.4
6	324°50.2	238°31.8	N24°51.3	182°15.7	N16°33.1	327°17.0	S02°15.3	145°41.8	N03°04.4
7	339°52.6	253°30.9	51.4	197°17.0	32.7	342°19.0	15.1	160°44.3	04.4
8	354°55.1	268°30.1	51.6	212°18.4	32.3	357°21.1	14.9	175°46.8	04.4
9	9°57.6	283°29.3	·· 51.8	227°19.7	·· 31.9	12°23.1	·· 14.8	190°49.4	·· 04.5
10	25°00.0	298°28.4	51.9	242°21.0	31.4	27°25.2	14.6	205°51.9	04.5
11	40°02.5	313°27.6	52.1	257°22.4	31.0	42°27.2	14.4	220°54.4	04.5
12	55°04.9	328°26.7	N24°52.2	272°23.7	N16°30.6	57°29.3	S02°14.3	235°56.9	N03°04.5
13	70°07.4	343°25.9	52.4	287°25.0	30.2	72°31.4	14.1	250°59.4	04.5
14	85°09.9	358°25.1	52.5	302°26.3	29.8	87°33.4	13.9	266°02.0	04.5
15	100°12.3	13°24.2	·· 52.7	317°27.7	·· 29.3	102°35.5	·· 13.8	281°04.5	·· 04.5
16	115°14.8	28°23.4	52.8	332°29.0	28.9	117°37.5	13.6	296°07.0	04.6
17	130°17.3	43°22.5	53.0	347°30.3	28.5	132°39.6	13.4	311°09.5	04.6
18	145°19.7	58°21.7	N24°53.1	2°31.6	N16°28.1	147°41.6	S02°13.3	326°12.0	N03°04.6
19	160°22.2	73°20.9	53.3	17°33.0	27.7	162°43.7	13.1	341°14.6	04.6
20	175°24.7	88°20.0	53.4	32°34.3	27.2	177°45.8	12.9	356°17.1	04.6
21	190°27.1	103°19.2	·· 53.6	47°35.6	·· 26.8	192°47.8	·· 12.8	11°19.6	·· 04.6
22	205°29.6	118°18.3	53.7	62°37.0	26.4	207°49.9	12.6	26°22.1	04.6
23	220°32.1	133°17.5	53.9	77°38.3	26.0	222°51.9	12.4	41°24.6	04.7
Mer.pass.:08:20		v-0.8 d0.2 m-3.9		v1.3 d-0.4 m0.9		v2.1 d0.2 m-2.0		v2.5 d0.0 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	235°34.5	148°16.7	N24°54.0	92°39.6	N16°25.6	237°54.0	S02°12.3	56°27.1	N03°04.7
1	250°37.0	163°15.8	54.2	107°40.9	25.1	252°56.1	12.1	71°29.7	04.7
2	265°39.4	178°15.0	54.3	122°42.3	24.7	267°58.1	11.9	86°32.2	04.7
3	280°41.9	193°14.1	·· 54.4	137°43.6	·· 24.3	283°00.2	·· 11.8	101°34.7	·· 04.7
4	295°44.4	208°13.3	54.6	152°44.9	23.9	298°02.2	11.6	116°37.2	04.7
5	310°46.8	223°12.5	54.7	167°46.2	23.5	313°04.3	11.4	131°39.7	04.7
6	325°49.3	238°11.6	N24°54.8	182°47.5	N16°23.0	328°06.4	S02°11.3	146°42.2	N03°04.7
7	340°51.8	253°10.8	55.0	197°48.9	22.6	343°08.4	11.1	161°44.8	04.8
8	355°54.2	268°09.9	55.1	212°50.2	22.2	358°10.5	10.9	176°47.3	04.8
9	10°56.7	283°09.1	·· 55.2	227°51.5	·· 21.8	13°12.5	·· 10.8	191°49.8	·· 04.8
10	25°59.2	298°08.3	55.4	242°52.8	21.3	28°14.6	10.6	206°52.3	04.8
11	41°01.6	313°07.4	55.5	257°54.2	20.9	43°16.7	10.5	221°54.8	04.8
12	56°04.1	328°06.6	N24°55.6	272°55.5	N16°20.5	58°18.7	S02°10.3	236°57.3	N03°04.8
13	71°06.6	343°05.7	55.7	287°56.8	20.1	73°20.8	10.1	251°59.8	04.8
14	86°09.0	358°04.9	55.9	302°58.1	19.7	88°22.8	10.0	267°02.4	04.9
15	101°11.5	13°04.1	·· 56.0	317°59.4	·· 19.2	103°24.9	·· 09.8	282°04.9	·· 04.9
16	116°13.9	28°03.2	56.1	333°00.8	18.8	118°27.0	09.6	297°07.4	04.9
17	131°16.4	43°02.4	56.2	348°02.1	18.4	133°29.0	09.5	312°09.9	04.9
18	146°18.9	58°01.5	N24°56.4	3°03.4	N16°18.0	148°31.1	S02°09.3	327°12.4	N03°04.9
19	161°21.3	73°00.7	56.5	18°04.7	17.5	163°33.2	09.1	342°14.9	04.9
20	176°23.8	87°59.9	56.6	33°06.0	17.1	178°35.2	09.0	357°17.4	04.9
21	191°26.3	102°59.0	·· 56.7	48°07.4	·· 16.7	193°37.3	·· 08.8	12°20.0	·· 04.9
22	206°28.7	117°58.2	56.8	63°08.7	16.3	208°39.3	08.6	27°22.5	05.0
23	221°31.2	132°57.4	56.9	78°10.0	15.8	223°41.4	08.5	42°25.0	05.0
Mer.pass.:08:16		v-0.8 d0.1 m-3.9		v1.3 d-0.4 m0.9		v2.1 d0.2 m-2.0		v2.5 d0.0 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°46.1	29°08.8
Ankaa	353°18.1	-42°14.8
Schedar	349°43.7	56°35.5
Diphda	348°58.3	-17°55.7
Achernar	335°28.8	-57°10.8
Hamal	328°03.7	23°30.6
Polaris	319°19.6	89°18.5
Acamar	315°20.4	-40°15.7
Menkar	314°17.7	4°07.8
Mirfak	308°44.2	49°53.9
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.5
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.3
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.4
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.3	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.5	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.0	61°41.8
Denebola	182°35.8	14°30.7
Gienah	175°54.5	-17°36.2
Acrux	173°11.6	-63°09.8
Gacrux	172°03.2	-57°10.6
Alioth	166°22.1	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.7
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.8
Kochab	137°18.5	74°06.7
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.7	-26°27.4
Atria	107°32.1	-69°02.7
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.6
Rasalhague	96°08.2	12°33.0
Eltanin	90°46.7	51°29.1
Kaus Aust.	83°46.5	-34°22.7
Vega	80°40.2	38°47.4
Nunki	76°00.8	-26°17.0
Altair	62°10.3	8°53.7
Peacock	53°22.5	-56°41.8
Deneb	49°32.9	45°18.8
Enif	33°49.3	9°55.3
Al Na'ir	27°46.5	-46°54.4
Fomalhaut	15°26.5	-29°33.8
Scheat	13°55.7	28°08.2
Markab	13°40.7	15°15.6

May 16 Sun	**SHA**	**Mer.pass**
Venus	275°20.7	14:05
Mars	217°59.5	17:52
Jupiter	2°39.1	08:14
Saturn	180°49.9	20:19

May 17 Mon	**SHA**	**Mer.pass**
Venus	274°01.4	14:06
Mars	217°32.4	17:50
Jupiter	2°29.2	08:11
Saturn	180°51.3	20:15

May 18 Tue	**SHA**	**Mer.pass**
Venus	272°42.1	14:08
Mars	217°05.1	17:48
Jupiter	2°19.5	08:07
Saturn	180°52.6	20:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N19°01.5	154°55.5	5.3'	N25°03.0	-0.1'	58.4'
1	195°54.8	02.1	169°19.8	5.3'	25°02.7	-0.3'	58.4'
2	210°54.8	02.7	183°44.1	5.3'	25°02.3	-0.5'	58.4'
3	225°54.7	·· 03.3	198°08.3	5.2'	25°01.8	-0.6'	58.4'
4	240°54.7	03.9	212°32.5	5.2'	25°01.1	-0.8'	58.4'
5	255°54.7	04.4	226°56.8	5.2'	25°00.2	-1.0'	58.5'
6	270°54.7	N19°05.0	241°21.0	5.2'	N24°59.1	-1.1'	58.5'
7	285°54.7	05.6	255°45.2	5.2'	24°57.9	-1.3'	58.5'
8	300°54.7	06.2	270°09.4	5.2'	24°56.6	-1.5'	58.5'
9	315°54.7	·· 06.7	284°33.5	5.2'	24°55.0	-1.6'	58.5'
10	330°54.7	07.3	298°57.7	5.2'	24°53.3	-1.8'	58.6'
11	345°54.6	07.9	313°21.9	5.2'	24°51.5	-1.9'	58.6'
12	0°54.6	N19°08.5	327°46.1	5.2'	N24°49.4	-2.1'	58.6'
13	15°54.6	09.0	342°10.3	5.2'	24°47.2	-2.3'	58.6'
14	30°54.6	09.6	356°34.5	5.2'	24°44.9	-2.4'	58.6'
15	45°54.6	·· 10.2	10°58.7	5.2'	24°42.4	-2.6'	58.6'
16	60°54.6	10.8	25°22.9	5.2'	24°39.7	-2.8'	58.6'
17	75°54.6	11.3	39°47.1	5.2'	24°36.8	-2.9'	58.7'
18	90°54.5	N19°11.9	54°11.4	5.2'	N24°33.8	-3.1'	58.7'
19	105°54.5	12.5	68°35.6	5.3'	24°30.6	-3.3'	58.7'
20	120°54.5	13.0	82°59.9	5.3'	24°27.3	-3.4'	58.7'
21	135°54.5	·· 13.6	97°24.2	5.3'	24°23.8	-3.6'	58.7'
22	150°54.5	14.2	111°48.5	5.3'	24°20.2	-3.7'	58.7'
23	165°54.5	14.8	126°12.8	5.3'	24°16.3	-3.9'	58.7'
	SD.=15.8	d=0.6		S.D.=16.0			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N19°15.3	140°37.1	5.4'	N24°12.4	-4.1'	58.8'
1	195°54.4	15.9	155°01.5	5.4'	24°08.2	-4.2'	58.8'
2	210°54.4	16.5	169°25.9	5.4'	24°03.9	-4.4'	58.8'
3	225°54.4	·· 17.0	183°50.4	5.4'	23°59.5	-4.5'	58.8'
4	240°54.4	17.6	198°14.8	5.5'	23°54.9	-4.7'	58.8'
5	255°54.4	18.2	212°39.3	5.5'	23°50.1	-4.8'	58.8'
6	270°54.3	N19°18.7	227°03.8	5.5'	N23°45.2	-5.0'	58.8'
7	285°54.3	19.3	241°28.4	5.6'	23°40.1	-5.2'	58.9'
8	300°54.3	19.8	255°53.0	5.6'	23°34.8	-5.3'	58.9'
9	315°54.3	·· 20.4	270°17.6	5.7'	23°29.5	-5.5'	58.9'
10	330°54.3	21.0	284°42.3	5.7'	23°23.9	-5.6'	58.9'
11	345°54.2	21.5	299°07.0	5.7'	23°18.2	-5.8'	58.9'
12	0°54.2	N19°22.1	313°31.8	5.8'	N23°12.3	-5.9'	58.9'
13	15°54.2	22.7	327°56.6	5.8'	23°06.3	-6.1'	58.9'
14	30°54.2	23.2	342°21.4	5.9'	23°00.2	-6.2'	58.9'
15	45°54.2	·· 23.8	356°46.3	5.9'	22°53.9	-6.4'	58.9'
16	60°54.1	24.3	11°11.3	6.0'	22°47.4	-6.5'	59.0'
17	75°54.1	24.9	25°36.3	6.0'	22°40.8	-6.7'	59.0'
18	90°54.1	N19°25.4	40°01.3	6.1'	N22°34.1	-6.8'	59.0'
19	105°54.1	26.0	54°26.4	6.1'	22°27.2	-7.0'	59.0'
20	120°54.1	26.6	68°51.5	6.2'	22°20.1	-7.1'	59.0'
21	135°54.0	·· 27.1	83°16.7	6.2'	22°12.9	-7.3'	59.0'
22	150°54.0	27.7	97°42.0	6.3'	22°05.6	-7.4'	59.0'
23	165°54.0	28.2	112°07.3	6.3'	21°58.1	-7.5'	59.0'
	SD.=15.8	d=0.6		S.D.=16.1			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.0	N19°28.8	126°32.7	6.4'	N21°50.5	-7.7'	59.0'
1	195°53.9	29.3	140°58.1	6.5'	21°42.8	-7.8'	59.0'
2	210°53.9	29.9	155°23.6	6.5'	21°34.9	-8.0'	59.1'
3	225°53.9	·· 30.4	169°49.1	6.6'	21°26.8	-8.1'	59.1'
4	240°53.9	31.0	184°14.7	6.6'	21°18.7	-8.2'	59.1'
5	255°53.8	31.5	198°40.4	6.7'	21°10.4	-8.4'	59.1'
6	270°53.8	N19°32.1	213°06.1	6.8'	N21°01.9	-8.5'	59.1'
7	285°53.8	32.6	227°31.9	6.8'	20°53.4	-8.6'	59.1'
8	300°53.8	33.2	241°57.7	6.9'	20°44.7	-8.8'	59.1'
9	315°53.7	·· 33.7	256°23.6	6.9'	20°35.8	-8.9'	59.1'
10	330°53.7	34.3	270°49.6	7.0'	20°26.9	-9.0'	59.1'
11	345°53.7	34.8	285°15.7	7.1'	20°17.8	-9.2'	59.1'
12	0°53.7	N19°35.4	299°41.8	7.1'	N20°08.6	-9.3'	59.1'
13	15°53.6	35.9	314°07.9	7.2'	19°59.2	-9.4'	59.1'
14	30°53.6	36.5	328°34.2	7.3'	19°49.7	-9.5'	59.2'
15	45°53.6	·· 37.0	343°00.5	7.3'	19°40.1	-9.7'	59.2'
16	60°53.6	37.6	357°26.8	7.4'	19°30.4	-9.8'	59.2'
17	75°53.5	38.1	11°53.3	7.5'	19°20.6	-9.9'	59.2'
18	90°53.5	N19°38.7	26°19.8	7.5'	N19°10.6	-10.0'	59.2'
19	105°53.5	39.2	40°46.3	7.6'	19°00.6	-10.1'	59.2'
20	120°53.5	39.7	55°13.0	7.7'	18°50.4	-10.2'	59.2'
21	135°53.4	·· 40.3	69°39.7	7.7'	18°40.1	-10.4'	59.2'
22	150°53.4	40.8	84°06.5	7.8'	18°29.6	-10.5'	59.2'
23	165°53.4	41.4	98°33.3	7.9'	18°19.1	-10.6'	59.2'
	SD.=15.8	d=0.6		S.D.=16.1			

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 2-4 7-23%
16	03:39	03:39	11:56	14:14	01:44	
17	03:38	03:37	11:56	15:13	02:44	
18	03:36	03:35	11:56	16:11	03:42	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	236°33.7	147°56.5	N24°57.0	93°11.3	N16°15.4	238°43.5	S02°08.3	57°27.5	N03°05.0
1	251°36.1	162°55.7	57.2	108°12.6	15.0	253°45.5	08.2	72°30.0	05.0
2	266°38.6	177°54.8	57.3	123°14.0	14.6	268°47.6	08.0	87°32.5	05.0
3	281°41.1	192°54.0	·· 57.4	138°15.3	·· 14.1	283°49.7	·· 07.8	102°35.0	·· 05.0
4	296°43.5	207°53.2	57.5	153°16.6	13.7	298°51.7	07.7	117°37.5	05.0
5	311°46.0	222°52.3	57.6	168°17.9	13.3	313°53.8	07.5	132°40.1	05.0
6	326°48.4	237°51.5	N24°57.7	183°19.2	N16°12.9	328°55.9	S02°07.3	147°42.6	N03°05.0
7	341°50.9	252°50.6	57.8	198°20.6	12.4	343°57.9	07.2	162°45.1	05.1
8	356°53.4	267°49.8	57.9	213°21.9	12.0	359°00.0	07.0	177°47.6	05.1
9	11°55.8	282°49.0	·· 58.0	228°23.2	·· 11.6	14°02.1	·· 06.8	192°50.1	·· 05.1
10	26°58.3	297°48.1	58.1	243°24.5	11.2	29°04.1	06.7	207°52.6	05.1
11	42°00.8	312°47.3	58.2	258°25.8	10.7	44°06.2	06.5	222°55.1	05.1
12	57°03.2	327°46.4	N24°58.3	273°27.1	N16°10.3	59°08.2	S02°06.4	237°57.6	N03°05.1
13	72°05.7	342°45.6	58.4	288°28.5	09.9	74°10.3	06.2	253°00.2	05.1
14	87°08.2	357°44.8	58.5	303°29.8	09.4	89°12.4	06.0	268°02.7	05.1
15	102°10.6	12°43.9	·· 58.6	318°31.1	·· 09.0	104°14.4	·· 05.9	283°05.2	·· 05.1
16	117°13.1	27°43.1	58.7	333°32.4	08.6	119°16.5	05.7	298°07.7	05.2
17	132°15.5	42°42.2	58.8	348°33.7	08.2	134°18.6	05.5	313°10.2	05.2
18	147°18.0	57°41.4	N24°58.8	3°35.0	N16°07.7	149°20.6	S02°05.4	328°12.7	N03°05.2
19	162°20.5	72°40.6	58.9	18°36.3	07.3	164°22.7	05.2	343°15.2	05.2
20	177°22.9	87°39.7	59.0	33°37.7	06.9	179°24.8	05.1	358°17.7	05.2
21	192°25.4	102°38.9	·· 59.1	48°39.0	·· 06.5	194°26.8	·· 04.9	13°20.2	·· 05.2
22	207°27.9	117°38.0	59.2	63°40.3	06.0	209°28.9	04.7	28°22.7	05.2
23	222°30.3	132°37.2	59.3	78°41.6	05.6	224°31.0	04.6	43°25.3	05.2
Mer.pass.:08:12		v-0.8 d0.1 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	237°32.8	147°36.4	N24°59.4	93°42.9	N16°05.2	239°33.0	S02°04.4	58°27.8	N03°05.2
1	252°35.3	162°35.5	59.4	108°44.2	04.7	254°35.1	04.2	73°30.3	05.3
2	267°37.7	177°34.7	59.5	123°45.5	04.3	269°37.2	04.1	88°32.8	05.3
3	282°40.2	192°33.8	·· 59.6	138°46.8	·· 03.9	284°39.3	·· 03.9	103°35.3	·· 05.3
4	297°42.7	207°33.0	59.7	153°48.2	03.4	299°41.3	03.8	118°37.8	05.3
5	312°45.1	222°32.2	59.8	168°49.5	03.0	314°43.4	03.6	133°40.3	05.3
6	327°47.6	237°31.3	N24°59.8	183°50.8	N16°02.6	329°45.5	S02°03.4	148°42.8	N03°05.3
7	342°50.0	252°30.5	24°59.9	198°52.1	02.2	344°47.5	03.3	163°45.3	05.3
8	357°52.5	267°29.7	25°00.0	213°53.4	01.7	359°49.6	03.1	178°47.8	05.3
9	12°55.0	282°28.8	·· 00.0	228°54.7	·· 01.3	14°51.7	·· 02.9	193°50.3	·· 05.3
10	27°57.4	297°28.0	00.1	243°56.0	00.9	29°53.7	02.8	208°52.9	05.3
11	42°59.9	312°27.1	00.2	258°57.3	00.4	44°55.8	02.6	223°55.4	05.4
12	58°02.4	327°26.3	N25°00.3	273°58.7	N16°00.0	59°57.9	S02°02.5	238°57.9	N03°05.4
13	73°04.8	342°25.5	00.3	289°00.0	15°59.6	74°59.9	02.3	254°00.4	05.4
14	88°07.3	357°24.6	00.4	304°01.3	59.1	90°02.0	02.1	269°02.9	05.4
15	103°09.8	12°23.8	·· 00.4	319°02.6	·· 58.7	105°04.1	·· 02.0	284°05.4	·· 05.4
16	118°12.2	27°22.9	00.5	334°03.9	58.3	120°06.2	01.8	299°07.9	05.4
17	133°14.7	42°22.1	00.6	349°05.2	57.8	135°08.2	01.7	314°10.4	05.4
18	148°17.2	57°21.3	N25°00.6	4°06.5	N15°57.4	150°10.3	S02°01.5	329°12.9	N03°05.4
19	163°19.6	72°20.4	00.7	19°07.8	57.0	165°12.4	01.3	344°15.4	05.4
20	178°22.1	87°19.6	00.7	34°09.1	56.5	180°14.4	01.2	359°17.9	05.4
21	193°24.5	102°18.8	·· 00.8	49°10.4	·· 56.1	195°16.5	·· 01.0	14°20.4	·· 05.4
22	208°27.0	117°17.9	00.9	64°11.7	55.7	210°18.6	00.9	29°22.9	05.5
23	223°29.5	132°17.1	00.9	79°13.1	55.2	225°20.7	00.7	44°25.4	05.5
Mer.pass.:08:08		v-0.8 d0.1 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	238°31.9	147°16.2	N25°01.0	94°14.4	N15°54.8	240°22.7	S02°00.5	59°27.9	N03°05.5
1	253°34.4	162°15.4	01.0	109°15.7	54.4	255°24.8	00.4	74°30.4	05.5
2	268°36.9	177°14.6	01.1	124°17.0	53.9	270°26.9	00.2	89°33.0	05.5
3	283°39.3	192°13.7	·· 01.1	139°18.3	·· 53.5	285°28.9	02°00.1	104°35.5	·· 05.5
4	298°41.8	207°12.9	01.2	154°19.6	53.1	300°31.0	01°59.9	119°38.0	05.5
5	313°44.3	222°12.1	01.2	169°20.9	52.6	315°33.1	59.7	134°40.5	05.5
6	328°46.7	237°11.2	N25°01.3	184°22.2	N15°52.2	330°35.2	S01°59.6	149°43.0	N03°05.5
7	343°49.2	252°10.4	01.3	199°23.5	51.8	345°37.2	59.4	164°45.5	05.5
8	358°51.6	267°09.5	01.3	214°24.8	51.3	0°39.3	59.3	179°48.0	05.5
9	13°54.1	282°08.7	·· 01.4	229°26.1	·· 50.9	15°41.4	·· 59.1	194°50.5	·· 05.5
10	28°56.6	297°07.9	01.4	244°27.4	50.5	30°43.5	58.9	209°53.0	05.6
11	43°59.0	312°07.0	01.5	259°28.7	50.0	45°45.5	58.8	224°55.5	05.6
12	59°01.5	327°06.2	N25°01.5	274°30.0	N15°49.6	60°47.6	S01°58.6	239°58.0	N03°05.6
13	74°04.0	342°05.4	01.5	289°31.3	49.2	75°49.7	58.5	255°00.5	05.6
14	89°06.4	357°04.5	01.6	304°32.6	48.7	90°51.7	58.3	270°03.0	05.6
15	104°08.9	12°03.7	·· 01.6	319°33.9	·· 48.3	105°53.8	·· 58.1	285°05.5	·· 05.6
16	119°11.4	27°02.8	01.6	334°35.2	47.9	120°55.9	58.0	300°08.0	05.6
17	134°13.8	42°02.0	01.7	349°36.6	47.4	135°58.0	57.8	315°10.5	05.6
18	149°16.3	57°01.2	N25°01.7	4°37.9	N15°47.0	151°00.0	S01°57.7	330°13.0	N03°05.6
19	164°18.8	72°00.3	01.7	19°39.2	46.5	166°02.1	57.5	345°15.5	05.6
20	179°21.2	86°59.5	01.8	34°40.5	46.1	181°04.2	57.4	0°18.0	05.6
21	194°23.7	101°58.7	·· 01.8	49°41.8	·· 45.7	196°06.3	·· 57.2	15°20.5	·· 05.6
22	209°26.1	116°57.8	01.8	64°43.1	45.2	211°08.3	57.0	30°23.0	05.6
23	224°28.6	131°57.0	01.8	79°44.4	44.8	226°10.4	56.9	45°25.5	05.7
Mer.pass.:08:05		v-0.8 d0.1 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°46.1	29°08.8
Ankaa	353°18.1	-42°14.7
Schedar	349°43.6	56°35.5
Diphda	348°58.3	-17°55.7
Achernar	335°28.8	-57°10.8
Hamal	328°03.6	23°30.6
Polaris	319°19.0	89°18.5
Acamar	315°20.4	-40°15.7
Menkar	314°17.7	4°07.8
Mirfak	308°44.2	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.3
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.4
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.3	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.6	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.1	61°41.8
Denebola	182°35.8	14°30.7
Gienah	175°54.5	-17°36.2
Acrux	173°11.6	-63°09.8
Gacrux	172°03.2	-57°10.6
Alioth	166°22.1	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.7
Hadar	148°50.7	-60°25.6
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.5	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.7	-26°27.4
Atria	107°32.0	-69°02.8
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.7
Rasalhague	96°08.2	12°33.0
Eltanin	90°46.7	51°29.1
Kaus Aust.	83°46.4	-34°22.7
Vega	80°40.2	38°47.4
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°53.7
Peacock	53°22.4	-56°41.8
Deneb	49°32.9	45°18.8
Enif	33°49.3	9°55.3
Al Na'ir	27°46.4	-46°54.3
Fomalhaut	15°26.5	-29°33.8
Scheat	13°55.7	28°08.2
Markab	13°40.7	15°15.6

May 19 Wed	**SHA**	**Mer.pass**
Venus	271°22.9	14:09
Mars	216°37.7	17:46
Jupiter	2°09.8	08:04
Saturn	180°53.8	20:07

May 20 Thu	**SHA**	**Mer.pass**
Venus	270°03.6	14:10
Mars	216°10.1	17:44
Jupiter	2°00.3	08:01
Saturn	180°55.0	20:03

May 21 Fri	**SHA**	**Mer.pass**
Venus	268°44.3	14:12
Mars	215°42.4	17:42
Jupiter	1°50.8	07:57
Saturn	180°56.0	19:59

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h

Wed	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	180°53.3	N19°41.9	113°00.2	7.9'	N18°08.5	-10.7'	59.2'
1	195°53.3	42.4	127°27.2	8.0'	17°57.7	-10.8'	59.2'
2	210°53.3	43.0	141°54.3	8.1'	17°46.9	-10.9'	59.2'
3	225°53.3	· · 43.5	156°21.4	8.2'	17°35.9	-11.0'	59.2'
4	240°53.2	44.1	170°48.6	8.2'	17°24.8	-11.1'	59.2'
5	255°53.2	44.6	185°15.8	8.3'	17°13.6	-11.2'	59.2'
6	270°53.2	N19°45.1	199°43.1	8.4'	N17°02.3	-11.3'	59.2'
7	285°53.1	45.7	214°10.5	8.4'	16°51.0	-11.4'	59.2'
8	300°53.1	46.2	228°38.0	8.5'	16°39.5	-11.5'	59.2'
9	315°53.1	· · 46.7	243°05.5	8.6'	16°27.9	-11.6'	59.2'
10	330°53.1	47.3	257°33.1	8.6'	16°16.2	-11.7'	59.3'
11	345°53.0	47.8	272°00.8	8.7'	16°04.4	-11.8'	59.3'
12	0°53.0	N19°48.3	286°28.5	8.8'	N15°52.6	-11.9'	59.3'
13	15°53.0	48.9	300°56.3	8.8'	15°40.6	-12.0'	59.3'
14	30°52.9	49.4	315°24.1	8.9'	15°28.5	-12.1'	59.3'
15	45°52.9	· · 49.9	329°52.1	9.0'	15°16.4	-12.2'	59.3'
16	60°52.9	50.5	344°20.0	9.0'	15°04.2	-12.3'	59.3'
17	75°52.8	51.0	358°48.1	9.1'	14°51.8	-12.4'	59.3'
18	90°52.8	N19°51.5	13°16.2	9.2'	N14°39.4	-12.4'	59.3'
19	105°52.8	52.1	27°44.4	9.2'	14°26.9	-12.5'	59.3'
20	120°52.7	52.6	42°12.6	9.3'	14°14.4	-12.6'	59.3'
21	135°52.7	· · 53.1	56°41.0	9.3'	14°01.7	-12.7'	59.3'
22	150°52.7	53.6	71°09.3	9.4'	13°49.0	-12.8'	59.3'
23	165°52.6	54.2	85°37.8	9.5'	13°36.2	-12.9'	59.3'
	SD.=15.8	d=0.5			S.D.=16.2		

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.6	N19°54.7	100°06.2	9.5'	N13°23.3	-12.9'	59.3'
1	195°52.6	55.2	114°34.8	9.6'	13°10.3	-13.0'	59.3'
2	210°52.5	55.8	129°03.4	9.6'	12°57.3	-13.1'	59.3'
3	225°52.5	· · 56.3	143°32.1	9.7'	12°44.1	-13.2'	59.3'
4	240°52.5	56.8	158°00.8	9.8'	12°31.0	-13.2'	59.3'
5	255°52.4	57.3	172°29.6	9.8'	12°17.7	-13.3'	59.3'
6	270°52.4	N19°57.8	186°58.4	9.9'	N12°04.4	-13.4'	59.3'
7	285°52.4	58.4	201°27.4	9.9'	11°51.0	-13.4'	59.3'
8	300°52.3	58.9	215°56.3	10.0'	11°37.5	-13.5'	59.3'
9	315°52.3	· · 59.4	230°25.3	10.0'	11°24.0	-13.6'	59.3'
10	330°52.3	19°59.9	244°54.4	10.1'	11°10.4	-13.6'	59.3'
11	345°52.2	20°00.5	259°23.5	10.1'	10°56.8	-13.7'	59.3'
12	0°52.2	N20°01.0	273°52.7	10.2'	N10°43.1	-13.7'	59.3'
13	15°52.1	01.5	288°21.9	10.2'	10°29.3	-13.8'	59.3'
14	30°52.1	02.0	302°51.2	10.3'	10°15.5	-13.8'	59.3'
15	45°52.1	· · 02.5	317°20.5	10.3'	10°01.6	-13.9'	59.3'
16	60°52.0	03.0	331°49.9	10.4'	09°47.7	-14.0'	59.3'
17	75°52.0	03.6	346°19.3	10.4'	09°33.7	-14.0'	59.3'
18	90°52.0	N20°04.1	0°48.7	10.5'	N09°19.7	-14.1'	59.3'
19	105°51.9	04.6	15°18.3	10.5'	09°05.6	-14.1'	59.3'
20	120°51.9	05.1	29°47.8	10.6'	08°51.5	-14.2'	59.3'
21	135°51.8	· · 05.6	44°17.4	10.6'	08°37.3	-14.2'	59.3'
22	150°51.8	06.1	58°47.1	10.7'	08°23.0	-14.2'	59.3'
23	165°51.8	06.6	73°16.7	10.7'	08°08.8	-14.3'	59.3'
	SD.=15.8	d=0.5			S.D.=16.2		

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.7	N20°07.2	87°46.5	10.7'	N07°54.5	-14.3'	59.3'
1	195°51.7	07.7	102°16.2	10.8'	07°40.1	-14.4'	59.3'
2	210°51.6	08.2	116°46.0	10.8'	07°25.7	-14.4'	59.3'
3	225°51.6	· · 08.7	131°15.9	10.9'	07°11.3	-14.5'	59.3'
4	240°51.6	09.2	145°45.8	10.9'	06°56.8	-14.5'	59.3'
5	255°51.5	09.7	160°15.7	10.9'	06°42.3	-14.5'	59.3'
6	270°51.5	N20°10.2	174°45.6	11.0'	N06°27.8	-14.6'	59.3'
7	285°51.4	10.7	189°15.6	11.0'	06°13.2	-14.6'	59.3'
8	300°51.4	11.2	203°45.7	11.0'	05°58.6	-14.6'	59.3'
9	315°51.4	· · 11.7	218°15.7	11.1'	05°44.0	-14.6'	59.2'
10	330°51.3	12.2	232°45.8	11.1'	05°29.3	-14.7'	59.2'
11	345°51.3	12.7	247°15.9	11.1'	05°14.6	-14.7'	59.2'
12	0°51.2	N20°13.3	261°46.1	11.2'	N04°59.9	-14.7'	59.2'
13	15°51.2	13.8	276°16.2	11.2'	04°45.1	-14.8'	59.2'
14	30°51.2	14.3	290°46.4	11.2'	04°30.4	-14.8'	59.2'
15	45°51.1	· · 14.8	305°16.6	11.2'	04°15.6	-14.8'	59.2'
16	60°51.1	15.3	319°46.9	11.3'	04°00.8	-14.8'	59.2'
17	75°51.0	15.8	334°17.2	11.3'	03°46.0	-14.8'	59.2'
18	90°51.0	N20°16.3	348°47.5	11.3'	N03°31.1	-14.9'	59.2'
19	105°50.9	16.8	3°17.8	11.3'	03°16.3	-14.9'	59.2'
20	120°50.9	17.3	17°48.1	11.3'	03°01.4	-14.9'	59.2'
21	135°50.9	· · 17.8	32°18.5	11.4'	02°46.5	-14.9'	59.2'
22	150°50.8	18.3	46°48.8	11.4'	02°31.6	-14.9'	59.2'
23	165°50.8	18.8	61°19.2	11.4'	02°16.7	-14.9'	59.2'
	SD.=15.8	d=0.5			S.D.=16.1		

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

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

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 5-7 33-56%
19	03:33	03:32	11:56	17:05	04:38	
20	03:30	03:29	11:57	17:57	05:31	
21	03:27	03:25	11:57	18:46	06:22	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	239°31.1	146°56.2	N25°01.9	94°45.7	N15°44.4	241°12.5	S01°56.7	60°28.0	N03°05.7
1	254°33.5	161°55.3	01.9	109°47.0	43.9	256°14.6	56.6	75°30.5	05.7
2	269°36.0	176°54.5	01.9	124°48.3	43.5	271°16.7	56.4	90°33.0	05.7
3	284°38.5	191°53.7	·· 01.9	139°49.6	·· 43.1	286°18.7	·· 56.2	105°35.5	·· 05.7
4	299°40.9	206°52.8	01.9	154°50.9	42.6	301°20.8	56.1	120°38.0	05.7
5	314°43.4	221°52.0	02.0	169°52.2	42.2	316°22.9	55.9	135°40.5	05.7
6	329°45.9	236°51.1	N25°02.0	184°53.5	N15°41.7	331°25.0	S01°55.8	150°43.0	N03°05.7
7	344°48.3	251°50.3	02.0	199°54.8	41.3	346°27.0	55.6	165°45.5	05.7
8	359°50.8	266°49.5	02.0	214°56.1	40.9	1°29.1	55.5	180°48.0	05.7
9	14°53.3	281°48.6	·· 02.0	229°57.4	·· 40.4	16°31.2	·· 55.3	195°50.5	·· 05.7
10	29°55.7	296°47.8	02.0	244°58.7	40.0	31°33.3	55.1	210°53.0	05.7
11	44°58.2	311°47.0	02.0	260°00.0	39.5	46°35.3	55.0	225°55.5	05.7
12	60°00.6	326°46.1	N25°02.0	275°01.3	N15°39.1	61°37.4	S01°54.8	240°58.0	N03°05.7
13	75°03.1	341°45.3	02.0	290°02.6	38.7	76°39.5	54.7	256°00.5	05.7
14	90°05.6	356°44.5	02.0	305°03.9	38.2	91°41.6	54.5	271°03.0	05.8
15	105°08.0	11°43.6	·· 02.1	320°05.2	·· 37.8	106°43.7	·· 54.4	286°05.5	·· 05.8
16	120°10.5	26°42.8	02.1	335°06.5	37.3	121°45.7	54.2	301°08.0	05.8
17	135°13.0	41°42.0	02.1	350°07.8	36.9	136°47.8	54.0	316°10.5	05.8
18	150°15.4	56°41.1	N25°02.1	5°09.1	N15°36.5	151°49.9	S01°53.9	331°13.0	N03°05.8
19	165°17.9	71°40.3	02.1	20°10.4	36.0	166°52.0	53.7	346°15.5	05.8
20	180°20.4	86°39.5	02.1	35°11.7	35.6	181°54.1	53.6	1°18.0	05.8
21	195°22.8	101°38.6	·· 02.1	50°13.0	·· 35.1	196°56.1	·· 53.4	16°20.5	·· 05.8
22	210°25.3	116°37.8	02.0	65°14.3	34.7	211°58.2	53.3	31°23.0	05.8
23	225°27.7	131°37.0	02.0	80°15.6	34.3	227°00.3	53.1	46°25.5	05.8
Mer.pass.:08:01		v-0.8 d0.0 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	240°30.2	146°36.1	N25°02.0	95°16.9	N15°33.8	242°02.4	S01°52.9	61°28.0	N03°05.8
1	255°32.7	161°35.3	02.0	110°18.2	33.4	257°04.5	52.8	76°30.5	05.8
2	270°35.1	176°34.5	02.0	125°19.5	32.9	272°06.5	52.6	91°33.0	05.8
3	285°37.6	191°33.6	·· 02.0	140°20.8	·· 32.5	287°08.6	·· 52.5	106°35.5	·· 05.8
4	300°40.1	206°32.8	02.0	155°22.0	32.0	302°10.7	52.3	121°38.0	05.8
5	315°42.5	221°32.0	02.0	170°23.3	31.6	317°12.8	52.2	136°40.5	05.8
6	330°45.0	236°31.1	N25°02.0	185°24.6	N15°31.2	332°14.9	S01°52.0	151°43.0	N03°05.8
7	345°47.5	251°30.3	02.0	200°25.9	30.7	347°16.9	51.9	166°45.5	05.8
8	0°49.9	266°29.5	01.9	215°27.2	30.3	2°19.0	51.7	181°48.0	05.8
9	15°52.4	281°28.6	·· 01.9	230°28.5	·· 29.8	17°21.1	·· 51.5	196°50.5	·· 05.9
10	30°54.9	296°27.8	01.9	245°29.8	29.4	32°23.2	51.4	211°53.0	05.9
11	45°57.3	311°27.0	01.9	260°31.1	28.9	47°25.3	51.2	226°55.5	05.9
12	60°59.8	326°26.2	N25°01.9	275°32.4	N15°28.5	62°27.4	S01°51.1	241°58.0	N03°05.9
13	76°02.2	341°25.3	01.8	290°33.7	28.1	77°29.4	50.9	257°00.5	05.9
14	91°04.7	356°24.5	01.8	305°35.0	27.6	92°31.5	50.8	272°03.0	05.9
15	106°07.2	11°23.7	·· 01.8	320°36.3	·· 27.2	107°33.6	·· 50.6	287°05.5	·· 05.9
16	121°09.6	26°22.8	01.8	335°37.6	26.7	122°35.7	50.5	302°08.0	05.9
17	136°12.1	41°22.0	01.7	350°38.9	26.3	137°37.8	50.3	317°10.5	05.9
18	151°14.6	56°21.2	N25°01.7	5°40.2	N15°25.8	152°39.9	S01°50.1	332°13.0	N03°05.9
19	166°17.0	71°20.3	01.7	20°41.5	25.4	167°41.9	50.0	347°15.4	05.9
20	181°19.5	86°19.5	01.6	35°42.8	24.9	182°44.0	49.8	2°17.9	05.9
21	196°22.0	101°18.7	·· 01.6	50°44.1	·· 24.5	197°46.1	·· 49.7	17°20.4	·· 05.9
22	211°24.4	116°17.8	01.6	65°45.3	24.1	212°48.2	49.5	32°22.9	05.9
23	226°26.9	131°17.0	01.5	80°46.6	23.6	227°50.3	49.4	47°25.4	05.9
Mer.pass.:07:57		v-0.8 d-0.0 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	241°29.3	146°16.2	N25°01.5	95°47.9	N15°23.2	242°52.4	S01°49.2	62°27.9	N03°05.9
1	256°31.8	161°15.4	01.5	110°49.2	22.7	257°54.4	49.1	77°30.4	05.9
2	271°34.3	176°14.5	01.4	125°50.5	22.3	272°56.5	48.9	92°32.9	05.9
3	286°36.7	191°13.7	·· 01.4	140°51.8	·· 21.8	287°58.6	·· 48.8	107°35.4	·· 05.9
4	301°39.2	206°12.9	01.3	155°53.1	21.4	303°00.7	48.6	122°37.9	05.9
5	316°41.7	221°12.0	01.3	170°54.4	20.9	318°02.8	48.4	137°40.4	05.9
6	331°44.1	236°11.2	N25°01.3	185°55.7	N15°20.5	333°04.9	S01°48.3	152°42.9	N03°05.9
7	346°46.6	251°10.4	01.2	200°57.0	20.0	348°07.0	48.1	167°45.4	05.9
8	1°49.1	266°09.6	01.2	215°58.3	19.6	3°09.0	48.0	182°47.9	05.9
9	16°51.5	281°08.7	·· 01.1	230°59.5	·· 19.1	18°11.1	·· 47.8	197°50.4	·· 05.9
10	31°54.0	296°07.9	01.1	246°00.8	18.7	33°13.2	47.7	212°52.9	05.9
11	46°56.5	311°07.1	01.0	261°02.1	18.3	48°15.3	47.5	227°55.3	05.9
12	61°58.9	326°06.2	N25°01.0	276°03.4	N15°17.8	63°17.4	S01°47.4	242°57.8	N03°05.9
13	77°01.4	341°05.4	00.9	291°04.7	17.4	78°19.5	47.2	258°00.3	05.9
14	92°03.8	356°04.6	00.9	306°06.0	16.9	93°21.6	47.1	273°02.8	06.0
15	107°06.3	11°03.8	·· 00.8	321°07.3	·· 16.5	108°23.7	·· 46.9	288°05.3	·· 06.0
16	122°08.8	26°02.9	00.7	336°08.6	16.0	123°25.7	46.8	303°07.8	06.0
17	137°11.2	41°02.1	00.7	351°09.9	15.6	138°27.8	46.6	318°10.3	06.0
18	152°13.7	56°01.3	N25°00.6	6°11.2	N15°15.1	153°29.9	S01°46.5	333°12.8	N03°06.0
19	167°16.2	71°00.5	00.6	21°12.4	14.7	168°32.0	46.3	348°15.3	06.0
20	182°18.6	85°59.6	00.5	36°13.7	14.2	183°34.1	46.1	3°17.8	06.0
21	197°21.1	100°58.8	·· 00.4	51°15.0	·· 13.8	198°36.2	·· 46.0	18°20.3	·· 06.0
22	212°23.6	115°58.0	00.4	66°16.3	13.3	213°38.3	45.8	33°22.7	06.0
23	227°26.0	130°57.1	00.3	81°17.6	12.9	228°40.4	45.7	48°25.2	06.0
Mer.pass.:07:53		v-0.8 d-0.0 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°46.1	29°08.8
Ankaa	353°18.0	-42°14.7
Schedar	349°43.6	56°35.5
Diphda	348°58.3	-17°55.7
Achernar	335°28.8	-57°10.8
Hamal	328°03.6	23°30.6
Polaris	319°18.5	89°18.5
Acamar	315°20.4	-40°15.7
Menkar	314°17.7	4°07.8
Mirfak	308°44.2	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.3
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.4
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.3	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.6	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.1	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.7	-63°09.8
Gacrux	172°03.2	-57°10.6
Alioth	166°22.1	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.7
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.5	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.7	-26°27.4
Atria	107°32.0	-69°02.8
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.7
Rasalhague	96°08.2	12°33.1
Eltanin	90°46.7	51°29.1
Kaus Aust.	83°46.4	-34°22.7
Vega	80°40.1	38°47.4
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°53.7
Peacock	53°22.4	-56°41.8
Deneb	49°32.9	45°18.8
Enif	33°49.3	9°55.3
Al Na'ir	27°46.4	-46°54.3
Fomalhaut	15°26.5	-29°33.8
Scheat	13°55.7	28°08.2
Markab	13°40.7	15°15.6

May 22 Sat	**SHA**	**Mer.pass**
Venus	267°25.1	14:13
Mars	215°14.6	17:39
Jupiter	1°41.4	07:54
Saturn	180°57.0	19:55

May 23 Sun	**SHA**	**Mer.pass**
Venus	266°05.9	14:14
Mars	214°46.7	17:37
Jupiter	1°32.2	07:51
Saturn	180°57.8	19:51

May 24 Mon	**SHA**	**Mer.pass**
Venus	264°46.8	14:16
Mars	214°18.6	17:35
Jupiter	1°23.0	07:47
Saturn	180°58.6	19:47

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0424 sec ΔT = TT-UT1 = +66.2264 sec

2010 May 22 to May. 24 UT

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.7	N20°19.3	75°49.6	11.4'	N02°01.8	-14.9'	59.2'
1	195°50.7	19.8	90°20.1	11.4'	01°46.8	-14.9'	59.2'
2	210°50.6	20.3	104°50.5	11.4'	01°31.9	-14.9'	59.2'
3	225°50.6	·· 20.8	119°20.9	11.5'	01°17.0	-14.9'	59.2'
4	240°50.5	21.2	133°51.4	11.5'	01°02.0	-14.9'	59.2'
5	255°50.5	21.7	148°21.9	11.5'	00°47.1	-15.0'	59.2'
6	270°50.5	N20°22.2	162°52.3	11.5'	N00°32.1	-15.0'	59.1'
7	285°50.4	22.7	177°22.8	11.5'	00°17.2	-15.0'	59.1'
8	300°50.4	23.2	191°53.3	11.5'	N00°02.2	-14.9'	59.1'
9	315°50.3	·· 23.7	206°23.8	11.5'	S00°12.7	-14.9'	59.1'
10	330°50.3	24.2	220°54.3	11.5'	00°27.7	-14.9'	59.1'
11	345°50.2	24.7	235°24.8	11.5'	00°42.6	-14.9'	59.1'
12	0°50.2	N20°25.2	249°55.3	11.5'	S00°57.6	-14.9'	59.1'
13	15°50.1	25.7	264°25.9	11.5'	01°12.5	-14.9'	59.1'
14	30°50.1	26.2	278°56.4	11.5'	01°27.4	-14.9'	59.1'
15	45°50.0	·· 26.7	293°26.9	11.5'	01°42.3	-14.9'	59.1'
16	60°50.0	27.1	307°57.4	11.5'	01°57.2	-14.9'	59.1'
17	75°49.9	27.6	322°27.9	11.5'	02°12.1	-14.9'	59.1'
18	90°49.9	N20°28.1	336°58.4	11.5'	S02°26.9	-14.9'	59.1'
19	105°49.8	28.6	351°28.9	11.5'	02°41.8	-14.8'	59.1'
20	120°49.8	29.1	5°59.4	11.5'	02°56.6	-14.8'	59.0'
21	135°49.7	·· 29.6	20°29.9	11.5'	03°11.4	-14.8'	59.0'
22	150°49.7	30.1	35°00.4	11.5'	03°26.2	-14.8'	59.0'
23	165°49.6	30.5	49°30.8	11.5'	03°41.0	-14.8'	59.0'
	SD.=15.8	d=0.5	S.D.=16.1				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.6	N20°31.0	64°01.3	11.5'	S03°55.7	-14.7'	59.0'
1	195°49.5	31.5	78°31.7	11.4'	04°10.4	-14.7'	59.0'
2	210°49.5	32.0	93°02.2	11.4'	04°25.1	-14.7'	59.0'
3	225°49.4	·· 32.5	107°32.6	11.4'	04°39.8	-14.7'	59.0'
4	240°49.4	32.9	122°03.0	11.4'	04°54.5	-14.6'	59.0'
5	255°49.3	33.4	136°33.4	11.4'	05°09.1	-14.6'	59.0'
6	270°49.3	N20°33.9	151°03.8	11.4'	S05°23.6	-14.6'	59.0'
7	285°49.2	34.4	165°34.1	11.4'	05°38.2	-14.5'	58.9'
8	300°49.2	34.9	180°04.5	11.3'	05°52.7	-14.5'	58.9'
9	315°49.1	·· 35.3	194°34.8	11.3'	06°07.2	-14.5'	58.9'
10	330°49.1	35.8	209°05.1	11.3'	06°21.6	-14.4'	58.9'
11	345°49.0	36.3	223°35.4	11.3'	06°36.1	-14.4'	58.9'
12	0°49.0	N20°36.8	238°05.6	11.2'	S06°50.4	-14.3'	58.9'
13	15°48.9	37.2	252°35.9	11.2'	07°04.7	-14.3'	58.9'
14	30°48.9	37.7	267°06.1	11.2'	07°19.0	-14.3'	58.9'
15	45°48.8	·· 38.2	281°36.3	11.2'	07°33.3	-14.2'	58.9'
16	60°48.8	38.7	296°06.4	11.1'	07°47.5	-14.2'	58.9'
17	75°48.7	39.1	310°36.6	11.1'	08°01.6	-14.1'	58.8'
18	90°48.7	N20°39.6	325°06.7	11.1'	S08°15.8	-14.1'	58.8'
19	105°48.6	40.1	339°36.8	11.1'	08°29.8	-14.0'	58.8'
20	120°48.6	40.5	354°06.8	11.0'	08°43.8	-14.0'	58.8'
21	135°48.5	·· 41.0	8°36.8	11.0'	08°57.8	-13.9'	58.8'
22	150°48.4	41.5	23°06.8	11.0'	09°11.7	-13.9'	58.8'
23	165°48.4	42.0	37°36.8	10.9'	09°25.5	-13.8'	58.8'
	SD.=15.8	d=0.5	S.D.=16.1				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.3	N20°42.4	52°06.7	10.9'	S09°39.4	-13.8'	58.8'
1	195°48.3	42.9	66°36.6	10.9'	09°53.1	-13.7'	58.7'
2	210°48.2	43.4	81°06.5	10.8'	10°06.8	-13.7'	58.7'
3	225°48.2	·· 43.8	95°36.3	10.8'	10°20.4	-13.6'	58.7'
4	240°48.1	44.3	110°06.1	10.8'	10°34.0	-13.5'	58.7'
5	255°48.1	44.8	124°35.8	10.7'	10°47.5	-13.5'	58.7'
6	270°48.0	N20°45.2	139°05.5	10.7'	S11°00.9	-13.4'	58.7'
7	285°47.9	45.7	153°35.2	10.7'	11°14.3	-13.3'	58.7'
8	300°47.9	46.1	168°04.9	10.6'	11°27.6	-13.3'	58.7'
9	315°47.8	·· 46.6	182°34.5	10.6'	11°40.9	-13.2'	58.6'
10	330°47.8	47.1	197°04.0	10.5'	11°54.1	-13.1'	58.6'
11	345°47.7	47.5	211°33.6	10.5'	12°07.2	-13.1'	58.6'
12	0°47.7	N20°48.0	226°03.0	10.5'	S12°20.2	-13.0'	58.6'
13	15°47.6	48.5	240°32.5	10.4'	12°33.2	-12.9'	58.6'
14	30°47.5	48.9	255°01.9	10.4'	12°46.1	-12.9'	58.6'
15	45°47.5	·· 49.4	269°31.2	10.3'	12°58.9	-12.8'	58.6'
16	60°47.4	49.8	284°00.6	10.3'	13°11.7	-12.7'	58.5'
17	75°47.4	50.3	298°29.8	10.3'	13°24.3	-12.6'	58.5'
18	90°47.3	N20°50.7	312°59.1	10.2'	S13°36.9	-12.6'	58.5'
19	105°47.3	51.2	327°28.2	10.2'	13°49.4	-12.5'	58.5'
20	120°47.2	51.7	341°57.4	10.1'	14°01.9	-12.4'	58.5'
21	135°47.1	·· 52.1	356°26.5	10.1'	14°14.2	-12.3'	58.5'
22	150°47.1	52.6	10°55.5	10.0'	14°26.5	-12.2'	58.4'
23	165°47.0	53.0	25°24.5	10.0'	14°38.7	-12.1'	58.4'
	SD.=15.8	d=0.5	S.D.=16.0				

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

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

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 67-86%
22	03:23	03:21	11:57	19:35	07:11	
23	03:18	03:16	11:57	20:24	08:00	
24	03:13	03:11	11:57	21:15	08:49	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	242°28.5	145°56.3	N25°00.3	96°18.9	N15°12.4	243°42.5	S01°45.5	63°27.7	N03°06.0
1	257°31.0	160°55.5	00.2	111°20.2	12.0	258°44.5	45.4	78°30.2	06.0
2	272°33.4	175°54.7	00.1	126°21.4	11.5	273°46.6	45.2	93°32.7	06.0
3	287°35.9	190°53.8	·· 00.0	141°22.7	·· 11.1	288°48.7	·· 45.1	108°35.2	·· 06.0
4	302°38.3	205°53.0	25°00.0	156°24.0	10.6	303°50.8	44.9	123°37.7	06.0
5	317°40.8	220°52.2	24°59.9	171°25.3	10.2	318°52.9	44.8	138°40.2	06.0
6	332°43.3	235°51.4	N24°59.8	186°26.6	N15°09.7	333°55.0	S01°44.6	153°42.7	N03°06.0
7	347°45.7	250°50.5	59.8	201°27.9	09.3	348°57.1	44.5	168°45.2	06.0
8	2°48.2	265°49.7	59.7	216°29.2	08.8	3°59.2	44.3	183°47.6	06.0
9	17°50.7	280°48.9	·· 59.6	231°30.5	·· 08.4	19°01.3	·· 44.2	198°50.1	·· 06.0
10	32°53.1	295°48.1	59.5	246°31.7	07.9	34°03.4	44.0	213°52.6	06.0
11	47°55.6	310°47.3	59.4	261°33.0	07.5	49°05.4	43.9	228°55.1	06.0
12	62°58.1	325°46.4	N24°59.4	276°34.3	N15°07.0	64°07.5	S01°43.7	243°57.6	N03°06.0
13	78°00.5	340°45.6	59.3	291°35.6	06.6	79°09.6	43.6	259°00.1	06.0
14	93°03.0	355°44.8	59.2	306°36.9	06.1	94°11.7	43.4	274°02.6	06.0
15	108°05.4	10°44.0	·· 59.1	321°38.2	·· 05.7	109°13.8	·· 43.3	289°05.1	·· 06.0
16	123°07.9	25°43.1	59.0	336°39.4	05.2	124°15.9	43.1	304°07.5	06.0
17	138°10.4	40°42.3	58.9	351°40.7	04.7	139°18.0	43.0	319°10.0	06.0
18	153°12.8	55°41.5	N24°58.9	6°42.0	N15°04.3	154°20.1	S01°42.8	334°12.5	N03°06.0
19	168°15.3	70°40.7	58.8	21°43.3	03.8	169°22.2	42.7	349°15.0	06.0
20	183°17.8	85°39.9	58.7	36°44.6	03.4	184°24.3	42.5	4°17.5	06.0
21	198°20.2	100°39.0	·· 58.6	51°45.9	·· 02.9	199°26.4	·· 42.4	19°20.0	·· 06.0
22	213°22.7	115°38.2	58.5	66°47.1	02.5	214°28.5	42.2	34°22.5	06.0
23	228°25.2	130°37.4	58.4	81°48.4	02.0	229°30.6	42.1	49°25.0	06.0
Mer.pass.:07:49		v-0.8 d-0.1 m-3.9		v1.3 d-0.4 m1.0		v2.1 d0.2 m-2.1		v2.5 d0.0 m1.0	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	243°27.6	145°36.6	N24°58.3	96°49.7	N15°01.6	244°32.7	S01°41.9	64°27.4	N03°06.0
1	258°30.1	160°35.7	58.2	111°51.0	01.1	259°34.7	41.8	79°29.9	06.0
2	273°32.6	175°34.9	58.1	126°52.3	00.7	274°36.8	41.6	94°32.4	06.0
3	288°35.0	190°34.1	·· 58.0	141°53.6	15°00.2	289°38.9	·· 41.5	109°34.9	·· 06.0
4	303°37.5	205°33.3	57.9	156°54.8	14°59.8	304°41.0	41.3	124°37.4	06.0
5	318°39.9	220°32.5	57.8	171°56.1	59.3	319°43.1	41.2	139°39.9	06.0
6	333°42.4	235°31.6	N24°57.7	186°57.4	N14°58.9	334°45.2	S01°41.0	154°42.4	N03°06.0
7	348°44.9	250°30.8	57.6	201°58.7	58.4	349°47.3	40.9	169°44.8	06.0
8	3°47.3	265°30.0	57.5	217°00.0	57.9	4°49.4	40.7	184°47.3	06.0
9	18°49.8	280°29.2	·· 57.4	232°01.2	·· 57.5	19°51.5	·· 40.6	199°49.8	·· 06.0
10	33°52.3	295°28.4	57.3	247°02.5	57.0	34°53.6	40.4	214°52.3	06.0
11	48°54.7	310°27.6	57.2	262°03.8	56.6	49°55.7	40.3	229°54.8	06.0
12	63°57.2	325°26.7	N24°57.0	277°05.1	N14°56.1	64°57.8	S01°40.1	244°57.3	N03°06.0
13	78°59.7	340°25.9	56.9	292°06.4	55.7	79°59.9	40.0	259°59.8	06.0
14	94°02.1	355°25.1	56.8	307°07.6	55.2	95°02.0	39.8	275°02.2	06.0
15	109°04.6	10°24.3	·· 56.7	322°08.9	·· 54.8	110°04.1	·· 39.7	290°04.7	·· 06.0
16	124°07.1	25°23.5	56.6	337°10.2	54.3	125°06.2	39.5	305°07.2	06.0
17	139°09.5	40°22.6	56.5	352°11.5	53.8	140°08.3	39.4	320°09.7	06.0
18	154°12.0	55°21.8	N24°56.4	7°12.8	N14°53.4	155°10.4	S01°39.2	335°12.2	N03°06.0
19	169°14.4	70°21.0	56.2	22°14.0	52.9	170°12.5	39.1	350°14.7	06.0
20	184°16.9	85°20.2	56.1	37°15.3	52.5	185°14.6	38.9	5°17.1	06.0
21	199°19.4	100°19.4	·· 56.0	52°16.6	·· 52.0	200°16.7	·· 38.8	20°19.6	·· 06.0
22	214°21.8	115°18.6	55.9	67°17.9	51.6	215°18.8	38.6	35°22.1	06.0
23	229°24.3	130°17.7	55.8	82°19.1	51.1	230°20.9	38.5	50°24.6	06.0
Mer.pass.:07:45		v-0.8 d-0.1 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.2 m-2.1		v2.5 d-0.0 m1.0	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	244°26.8	145°16.9	N24°55.6	97°20.4	N14°50.6	245°23.0	S01°38.3	65°27.1	N03°06.0
1	259°29.2	160°16.1	55.5	112°21.7	50.2	260°25.1	38.2	80°29.5	06.0
2	274°31.7	175°15.3	55.4	127°23.0	49.7	275°27.2	38.0	95°32.0	06.0
3	289°34.2	190°14.5	·· 55.2	142°24.3	·· 49.3	290°29.3	·· 37.9	110°34.5	·· 06.0
4	304°36.6	205°13.7	55.1	157°25.5	48.8	305°31.3	37.7	125°37.0	06.0
5	319°39.1	220°12.9	55.0	172°26.8	48.3	320°33.4	37.6	140°39.5	06.0
6	334°41.6	235°12.0	N24°54.9	187°28.1	N14°47.9	335°35.5	S01°37.4	155°42.0	N03°06.0
7	349°44.0	250°11.2	54.7	202°29.4	47.4	350°37.6	37.3	170°44.4	06.0
8	4°46.5	265°10.4	54.6	217°30.6	47.0	5°39.7	37.1	185°46.9	06.0
9	19°48.9	280°09.6	·· 54.4	232°31.9	·· 46.5	20°41.8	·· 37.0	200°49.4	·· 06.0
10	34°51.4	295°08.8	54.3	247°33.2	46.1	35°43.9	36.8	215°51.9	06.0
11	49°53.9	310°08.0	54.2	262°34.5	45.6	50°46.0	36.7	230°54.4	05.9
12	64°56.3	325°07.2	N24°54.0	277°35.7	N14°45.1	65°48.1	S01°36.5	245°56.8	N03°05.9
13	79°58.8	340°06.4	53.9	292°37.0	44.7	80°50.2	36.4	260°59.3	05.9
14	95°01.3	355°05.5	53.7	307°38.3	44.2	95°52.3	36.3	276°01.8	05.9
15	110°03.7	10°04.7	·· 53.6	322°39.6	·· 43.8	110°54.4	·· 36.1	291°04.3	·· 05.9
16	125°06.2	25°03.9	53.5	337°40.8	43.3	125°56.6	36.0	306°06.8	05.9
17	140°08.7	40°03.1	53.3	352°42.1	42.8	140°58.7	35.8	321°09.2	05.9
18	155°11.1	55°02.3	N24°53.2	7°43.4	N14°42.4	156°00.8	S01°35.7	336°11.7	N03°05.9
19	170°13.6	70°01.5	53.0	22°44.7	41.9	171°02.9	35.5	351°14.2	05.9
20	185°16.0	85°00.7	52.9	37°45.9	41.4	186°05.0	35.4	6°16.7	05.9
21	200°18.5	99°59.9	·· 52.7	52°47.2	·· 41.0	201°07.1	·· 35.2	21°19.2	·· 05.9
22	215°21.0	114°59.1	52.6	67°48.5	40.5	216°09.2	35.1	36°21.6	05.9
23	230°23.4	129°58.2	52.4	82°49.8	40.1	231°11.3	34.9	51°24.1	05.9
Mer.pass.:07:41		v-0.8 d-0.1 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°46.0	29°08.8
Ankaa	353°18.0	-42°14.7
Schedar	349°43.6	56°35.5
Diphda	348°58.3	-17°55.6
Achernar	335°28.7	-57°10.8
Hamal	328°03.6	23°30.6
Polaris	319°17.7	89°18.5
Acamar	315°20.4	-40°15.7
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.2
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.4
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.4	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.7	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.1	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.7	-63°09.8
Gacrux	172°03.2	-57°10.7
Alioth	166°22.1	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.1	49°15.7
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.5	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.6	-26°27.4
Atria	107°32.0	-69°02.8
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.7
Rasalhague	96°08.2	12°33.1
Eltanin	90°46.7	51°29.1
Kaus Aust.	83°46.4	-34°22.7
Vega	80°40.1	38°47.5
Nunki	76°00.8	-26°16.9
Altair	62°10.2	8°53.7
Peacock	53°22.3	-56°41.8
Deneb	49°32.9	45°18.9
Enif	33°49.3	9°55.3
Al Na'ir	27°46.4	-46°54.3
Fomalhaut	15°26.4	-29°33.8
Scheat	13°55.7	28°08.2
Markab	13°40.6	15°15.6

May 25 Tue	**SHA**	**Mer.pass**
Venus	263°27.8	14:17
Mars	213°50.4	17:33
Jupiter	1°14.0	07:44
Saturn	180°59.2	19:43

May 26 Wed	**SHA**	**Mer.pass**
Venus	262°08.9	14:18
Mars	213°22.1	17:31
Jupiter	1°05.0	07:41
Saturn	180°59.8	19:39

May 27 Thu	**SHA**	**Mer.pass**
Venus	260°50.2	14:20
Mars	212°53.7	17:29
Jupiter	0°56.2	07:37
Saturn	181°00.3	19:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°47.0	**N**20°53.5	39°53.5	9.9'	**S**14°50.8	-12.1'	58.4'
1	195°46.9	53.9	54°22.4	9.9'	15°02.8	-12.0'	58.4'
2	210°46.8	54.4	68°51.3	9.8'	15°14.7	-11.9'	58.4'
3	225°46.8	· · 54.8	83°20.1	9.8'	15°26.6	-11.8'	58.4'
4	240°46.7	55.3	97°48.9	9.7'	15°38.3	-11.7'	58.4'
5	255°46.7	55.7	112°17.6	9.7'	15°50.0	-11.6'	58.3'
6	270°46.6	**N**20°56.2	126°46.2	9.7'	**S**16°01.5	-11.5'	58.3'
7	285°46.5	56.6	141°14.9	9.6'	16°13.0	-11.4'	58.3'
8	300°46.5	57.1	155°43.5	9.6'	16°24.3	-11.3'	58.3'
9	315°46.4	· · 57.5	170°12.0	9.5'	16°35.6	-11.2'	58.3'
10	330°46.3	58.0	184°40.5	9.5'	16°46.8	-11.1'	58.3'
11	345°46.3	58.4	199°08.9	9.4'	16°57.9	-11.0'	58.2'
12	0°46.2	**N**20°58.9	213°37.3	9.4'	**S**17°08.8	-10.9'	58.2'
13	15°46.2	59.3	228°05.6	9.3'	17°19.7	-10.8'	58.2'
14	30°46.1	20°59.8	242°33.9	9.3'	17°30.5	-10.7'	58.2'
15	45°46.0	21°00.2	257°02.1	9.2'	17°41.1	-10.6'	58.2'
16	60°46.0	00.6	271°30.3	9.2'	17°51.7	-10.5'	58.1'
17	75°45.9	01.1	285°58.5	9.1'	18°02.2	-10.4'	58.1'
18	90°45.8	**N**21°01.5	300°26.6	9.1'	**S**18°12.5	-10.3'	58.1'
19	105°45.8	02.0	314°54.6	9.0'	18°22.8	-10.2'	58.1'
20	120°45.7	02.4	329°22.6	9.0'	18°32.9	-10.1'	58.1'
21	135°45.7	· · 02.8	343°50.6	8.9'	18°42.9	-10.0'	58.1'
22	150°45.6	03.3	358°18.5	8.9'	18°52.8	-9.9'	58.0'
23	165°45.5	03.7	12°46.3	8.8'	19°02.6	-9.7'	58.0'
	SD.=15.8	d=0.5			S.D.=15.9		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°45.5	**N**21°04.2	27°14.1	8.8'	**S**19°12.3	-9.6'	58.0'
1	195°45.4	04.6	41°41.9	8.7'	19°21.9	-9.5'	58.0'
2	210°45.3	05.0	56°09.6	8.7'	19°31.3	-9.4'	58.0'
3	225°45.3	· · 05.5	70°37.3	8.6'	19°40.6	-9.3'	57.9'
4	240°45.2	05.9	85°04.9	8.6'	19°49.9	-9.2'	57.9'
5	255°45.1	06.3	99°32.5	8.6'	19°59.0	-9.0'	57.9'
6	270°45.1	**N**21°06.8	114°00.0	8.5'	**S**20°07.9	-8.9'	57.9'
7	285°45.0	07.2	128°27.5	8.5'	20°16.8	-8.8'	57.9'
8	300°44.9	07.6	142°55.0	8.4'	20°25.5	-8.7'	57.8'
9	315°44.9	· · 08.1	157°22.4	8.4'	20°34.1	-8.6'	57.8'
10	330°44.8	08.5	171°49.8	8.3'	20°42.6	-8.4'	57.8'
11	345°44.7	08.9	186°17.1	8.3'	20°51.0	-8.3'	57.8'
12	0°44.7	**N**21°09.4	200°44.4	8.3'	**S**20°59.2	-8.2'	57.8'
13	15°44.6	09.8	215°11.6	8.2'	21°07.3	-8.0'	57.7'
14	30°44.5	10.2	229°38.8	8.2'	21°15.3	-7.9'	57.7'
15	45°44.5	· · 10.7	244°06.0	8.1'	21°23.2	-7.8'	57.7'
16	60°44.4	11.1	258°33.1	8.1'	21°30.9	-7.7'	57.7'
17	75°44.3	11.5	273°00.2	8.1'	21°38.5	-7.5'	57.6'
18	90°44.3	**N**21°11.9	287°27.2	8.0'	**S**21°46.0	-7.4'	57.6'
19	105°44.2	12.4	301°54.2	8.0'	21°53.3	-7.3'	57.6'
20	120°44.1	12.8	316°21.2	8.0'	22°00.5	-7.1'	57.6'
21	135°44.0	· · 13.2	330°48.2	7.9'	22°07.6	-7.0'	57.6'
22	150°44.0	13.6	345°15.1	7.9'	22°14.5	-6.9'	57.5'
23	165°43.9	14.1	359°41.9	7.9'	22°21.3	-6.7'	57.5'
	SD.=15.8	d=0.4			S.D.=15.7		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°43.8	**N**21°14.5	14°08.8	7.8'	**S**22°28.0	-6.6'	57.5'
1	195°43.8	14.9	28°35.6	7.8'	22°34.5	-6.5'	57.5'
2	210°43.7	15.3	43°02.4	7.8'	22°40.9	-6.3'	57.5'
3	225°43.6	· · 15.8	57°29.2	7.7'	22°47.2	-6.2'	57.4'
4	240°43.6	16.2	71°55.9	7.7'	22°53.3	-6.1'	57.4'
5	255°43.5	16.6	86°22.6	7.7'	22°59.3	-5.9'	57.4'
6	270°43.4	**N**21°17.0	100°49.3	7.7'	**S**23°05.2	-5.8'	57.4'
7	285°43.3	17.4	115°15.9	7.6'	23°10.9	-5.6'	57.3'
8	300°43.3	17.8	129°42.6	7.6'	23°16.4	-5.5'	57.3'
9	315°43.2	· · 18.3	144°09.2	7.6'	23°21.9	-5.4'	57.3'
10	330°43.1	18.7	158°35.8	7.6'	23°27.2	-5.2'	57.3'
11	345°43.1	19.1	173°02.3	7.6'	23°32.3	-5.1'	57.2'
12	0°43.0	**N**21°19.5	187°28.9	7.5'	**S**23°37.3	-4.9'	57.2'
13	15°42.9	19.9	201°55.4	7.5'	23°42.2	-4.8'	57.2'
14	30°42.8	20.3	216°22.0	7.5'	23°46.9	-4.6'	57.2'
15	45°42.8	· · 20.8	230°48.5	7.5'	23°51.5	-4.5'	57.2'
16	60°42.7	21.2	245°15.0	7.5'	23°55.9	-4.4'	57.1'
17	75°42.6	21.6	259°41.5	7.5'	24°00.2	-4.2'	57.1'
18	90°42.5	**N**21°22.0	274°07.9	7.5'	**S**24°04.3	-4.1'	57.1'
19	105°42.5	22.4	288°34.4	7.5'	24°08.3	-3.9'	57.1'
20	120°42.4	22.8	303°00.9	7.5'	24°12.2	-3.8'	57.0'
21	135°42.3	· · 23.2	317°27.3	7.5'	24°15.9	-3.6'	57.0'
22	150°42.3	23.6	331°53.8	7.4'	24°19.5	-3.5'	57.0'
23	165°42.2	24.0	346°20.2	7.4'	24°22.9	-3.4'	57.0'
	SD.=15.8	d=0.4			S.D.=15.6		

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 11-13 93-100%
25	03:08	03:05	11:57	22:07	09:41	
26	03:02	02:59	11:57	23:01	10:34	●
27	02:55	02:52	11:57	23:57	11:29	

May 28, 29, 30 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	245°25.9	144°57.4	**N**24°52.3	97°51.0	**N**14°39.6	246°13.4	**S**01°34.8	66°26.6	**N**03°05.9
1	260°28.4	159°56.6	52.1	112°52.3	39.1	261°15.5	34.6	81°29.1	05.9
2	275°30.8	174°55.8	51.9	127°53.6	38.7	276°17.6	34.5	96°31.6	05.9
3	290°33.3	189°55.0	·· 51.8	142°54.9	·· 38.2	291°19.7	·· 34.3	111°34.0	·· 05.9
4	305°35.8	204°54.2	51.6	157°56.1	37.8	306°21.8	34.2	126°36.5	05.9
5	320°38.2	219°53.4	51.5	172°57.4	37.3	321°23.9	34.1	141°39.0	05.9
6	335°40.7	234°52.6	**N**24°51.3	187°58.7	**N**14°36.8	336°26.0	**S**01°33.9	156°41.5	**N**03°05.9
7	350°43.2	249°51.8	51.1	202°59.9	36.4	351°28.1	33.8	171°43.9	05.9
8	5°45.6	264°51.0	51.0	218°01.2	35.9	6°30.2	33.6	186°46.4	05.9
9	20°48.1	279°50.2	·· 50.8	233°02.5	·· 35.4	21°32.3	·· 33.5	201°48.9	·· 05.9
10	35°50.5	294°49.4	50.6	248°03.8	35.0	36°34.4	33.3	216°51.4	05.9
11	50°53.0	309°48.5	50.5	263°05.0	34.5	51°36.5	33.2	231°53.8	05.9
12	65°55.5	324°47.7	**N**24°50.3	278°06.3	**N**14°34.0	66°38.6	**S**01°33.0	246°56.3	**N**03°05.9
13	80°57.9	339°46.9	50.1	293°07.6	33.6	81°40.7	32.9	261°58.8	05.9
14	96°00.4	354°46.1	50.0	308°08.8	33.1	96°42.8	32.7	277°01.3	05.9
15	111°02.9	9°45.3	·· 49.8	323°10.1	·· 32.7	111°44.9	·· 32.6	292°03.8	·· 05.8
16	126°05.3	24°44.5	49.6	338°11.4	32.2	126°47.0	32.5	307°06.2	05.8
17	141°07.8	39°43.7	49.4	353°12.7	31.7	141°49.1	32.3	322°08.7	05.8
18	156°10.3	54°42.9	**N**24°49.3	8°13.9	**N**14°31.3	156°51.3	**S**01°32.2	337°11.2	**N**03°05.8
19	171°12.7	69°42.1	49.1	23°15.2	30.8	171°53.4	32.0	352°13.7	05.8
20	186°15.2	84°41.3	48.9	38°16.5	30.3	186°55.5	31.9	7°16.1	05.8
21	201°17.7	99°40.5	·· 48.7	53°17.7	·· 29.9	201°57.6	·· 31.7	22°18.6	·· 05.8
22	216°20.1	114°39.7	48.6	68°19.0	29.4	216°59.7	31.6	37°21.1	05.8
23	231°22.6	129°38.9	48.4	83°20.3	28.9	232°01.8	31.4	52°23.6	05.8
Mer.pass.:07:37		v-0.8 d-0.2 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	246°25.0	144°38.1	**N**24°48.2	98°21.5	**N**14°28.5	247°03.9	**S**01°31.3	67°26.0	**N**03°05.8
1	261°27.5	159°37.3	48.0	113°22.8	28.0	262°06.0	31.2	82°28.5	05.8
2	276°30.0	174°36.5	47.8	128°24.1	27.5	277°08.1	31.0	97°31.0	05.8
3	291°32.4	189°35.7	·· 47.6	143°25.3	·· 27.1	292°10.2	·· 30.9	112°33.5	·· 05.8
4	306°34.9	204°34.9	47.4	158°26.6	26.6	307°12.3	30.7	127°35.9	05.8
5	321°37.4	219°34.1	47.2	173°27.9	26.1	322°14.4	30.6	142°38.4	05.8
6	336°39.8	234°33.3	**N**24°47.1	188°29.1	**N**14°25.7	337°16.5	**S**01°30.4	157°40.9	**N**03°05.8
7	351°42.3	249°32.5	46.9	203°30.4	25.2	352°18.6	30.3	172°43.4	05.8
8	6°44.8	264°31.7	46.7	218°31.7	24.7	7°20.8	30.1	187°45.8	05.8
9	21°47.2	279°30.9	·· 46.5	233°32.9	·· 24.3	22°22.9	·· 30.0	202°48.3	·· 05.8
10	36°49.7	294°30.1	46.3	248°34.2	23.8	37°25.0	29.9	217°50.8	05.7
11	51°52.2	309°29.3	46.1	263°35.5	23.3	52°27.1	29.7	232°53.2	05.7
12	66°54.6	324°28.5	**N**24°45.9	278°36.7	**N**14°22.9	67°29.2	**S**01°29.6	247°55.7	**N**03°05.7
13	81°57.1	339°27.7	45.7	293°38.0	22.4	82°31.3	29.4	262°58.2	05.7
14	96°59.5	354°26.9	45.5	308°39.3	21.9	97°33.4	29.3	278°00.7	05.7
15	112°02.0	9°26.1	·· 45.3	323°40.5	·· 21.5	112°35.5	·· 29.1	293°03.1	·· 05.7
16	127°04.5	24°25.3	45.1	338°41.8	21.0	127°37.6	29.0	308°05.6	05.7
17	142°06.9	39°24.5	44.9	353°43.1	20.5	142°39.7	28.9	323°08.1	05.7
18	157°09.4	54°23.7	**N**24°44.7	8°44.3	**N**14°20.1	157°41.9	**S**01°28.7	338°10.5	**N**03°05.7
19	172°11.9	69°22.9	44.5	23°45.6	19.6	172°44.0	28.6	353°13.0	05.7
20	187°14.3	84°22.1	44.3	38°46.9	19.1	187°46.1	28.4	8°15.5	05.7
21	202°16.8	99°21.3	·· 44.0	53°48.1	·· 18.7	202°48.2	·· 28.3	23°18.0	·· 05.7
22	217°19.3	114°20.5	43.8	68°49.4	18.2	217°50.3	28.2	38°20.4	05.7
23	232°21.7	129°19.7	43.6	83°50.7	17.7	232°52.4	28.0	53°22.9	05.7
Mer.pass.:07:33		v-0.8 d-0.2 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	247°24.2	144°18.9	**N**24°43.4	98°51.9	**N**14°17.2	247°54.5	**S**01°27.9	68°25.4	**N**03°05.7
1	262°26.7	159°18.1	43.2	113°53.2	16.8	262°56.6	27.7	83°27.8	05.7
2	277°29.1	174°17.3	43.0	128°54.5	16.3	277°58.8	27.6	98°30.3	05.6
3	292°31.6	189°16.5	·· 42.8	143°55.7	·· 15.8	293°00.9	·· 27.4	113°32.8	·· 05.6
4	307°34.0	204°15.7	42.6	158°57.0	15.4	308°03.0	27.3	128°35.3	05.6
5	322°36.5	219°14.9	42.3	173°58.3	14.9	323°05.1	27.2	143°37.7	05.6
6	337°39.0	234°14.1	**N**24°42.1	188°59.5	**N**14°14.4	338°07.2	**S**01°27.0	158°40.2	**N**03°05.6
7	352°41.4	249°13.3	41.9	204°00.8	14.0	353°09.3	26.9	173°42.7	05.6
8	7°43.9	264°12.5	41.7	219°02.0	13.5	8°11.4	26.7	188°45.1	05.6
9	22°46.4	279°11.8	·· 41.4	234°03.3	·· 13.0	23°13.5	·· 26.6	203°47.6	·· 05.6
10	37°48.8	294°11.0	41.2	249°04.6	12.5	38°15.7	26.5	218°50.1	05.6
11	52°51.3	309°10.2	41.0	264°05.8	12.1	53°17.8	26.3	233°52.5	05.6
12	67°53.8	324°09.4	**N**24°40.8	279°07.1	**N**14°11.6	68°19.9	**S**01°26.2	248°55.0	**N**03°05.6
13	82°56.2	339°08.6	40.5	294°08.4	11.1	83°22.0	26.0	263°57.5	05.6
14	97°58.7	354°07.8	40.3	309°09.6	10.7	98°24.1	25.9	278°59.9	05.6
15	113°01.2	9°07.0	·· 40.1	324°10.9	·· 10.2	113°26.2	·· 25.7	294°02.4	·· 05.5
16	128°03.6	24°06.2	39.8	339°12.1	09.7	128°28.3	25.6	309°04.9	05.5
17	143°06.1	39°05.4	39.6	354°13.4	09.2	143°30.5	25.5	324°07.4	05.5
18	158°08.5	54°04.6	**N**24°39.4	9°14.7	**N**14°08.8	158°32.6	**S**01°25.3	339°09.8	**N**03°05.5
19	173°11.0	69°03.8	39.1	24°15.9	08.3	173°34.7	25.2	354°12.3	05.5
20	188°13.5	84°03.1	38.9	39°17.2	07.8	188°36.8	25.0	9°14.8	05.5
21	203°15.9	99°02.3	·· 38.7	54°18.4	·· 07.3	203°38.9	·· 24.9	24°17.2	·· 05.5
22	218°18.4	114°01.5	38.4	69°19.7	06.9	218°41.0	24.8	39°19.7	05.5
23	233°20.9	129°00.7	38.2	84°21.0	06.4	233°43.2	24.6	54°22.2	05.5
Mer.pass.:07:29		v-0.8 d-0.2 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°46.0	29°08.8
Ankaa	353°18.0	-42°14.7
Schedar	349°43.5	56°35.5
Diphda	348°58.3	-17°55.6
Achernar	335°28.7	-57°10.8
Hamal	328°03.6	23°30.6
Polaris	319°16.7	89°18.5
Acamar	315°20.4	-40°15.7
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°49.0	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.6	-52°42.2
Sirius	258°36.0	-16°44.0
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.4	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.7	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.1	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.7	-63°09.8
Gacrux	172°03.2	-57°10.7
Alioth	166°22.2	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.7
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.6	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.6	-26°27.4
Atria	107°32.0	-69°02.8
Sabik	102°14.8	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.2	12°33.1
Eltanin	90°46.7	51°29.1
Kaus Aust.	83°46.4	-34°22.7
Vega	80°40.1	38°47.5
Nunki	76°00.7	-26°16.9
Altair	62°10.2	8°53.7
Peacock	53°22.3	-56°41.8
Deneb	49°32.8	45°18.9
Enif	33°49.2	9°55.4
Al Na'ir	27°46.4	-46°54.3
Fomalhaut	15°26.4	-29°33.8
Scheat	13°55.6	28°08.3
Markab	13°40.6	15°15.6

May 28 Fri	**SHA**	**Mer.pass**
Venus	259°31.5	14:21
Mars	212°25.1	17:27
Jupiter	0°47.5	07:34
Saturn	181°00.7	19:31

May 29 Sat	**SHA**	**Mer.pass**
Venus	258°13.0	14:22
Mars	211°56.5	17:25
Jupiter	0°38.8	07:31
Saturn	181°01.0	19:27

May 30 Sun	**SHA**	**Mer.pass**
Venus	256°54.7	14:24
Mars	211°27.7	17:23
Jupiter	0°30.3	07:27
Saturn	181°01.2	19:23

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0479 sec ΔT = TT-UT1 = +66.2319 sec

2010 May 28 to May. 30 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°42.1	N21°24.4	0°46.7	7.4'	S24°26.2	-3.2'	56.9'
1	195°42.0	24.9	15°13.1	7.4'	24°29.3	-3.1'	56.9'
2	210°42.0	25.3	29°39.5	7.4'	24°32.3	-2.9'	56.9'
3	225°41.9	·· 25.7	44°06.0	7.5'	24°35.2	-2.8'	56.9'
4	240°41.8	26.1	58°32.4	7.5'	24°37.9	-2.6'	56.8'
5	255°41.7	26.5	72°58.9	7.5'	24°40.4	-2.5'	56.8'
6	270°41.7	N21°26.9	87°25.4	7.5'	S24°42.8	-2.3'	56.8'
7	285°41.6	27.3	101°51.8	7.5'	24°45.1	-2.2'	56.8'
8	300°41.5	27.7	116°18.3	7.5'	24°47.2	-2.0'	56.7'
9	315°41.4	·· 28.1	130°44.8	7.5'	24°49.2	-1.9'	56.7'
10	330°41.3	28.5	145°11.3	7.5'	24°51.0	-1.8'	56.7'
11	345°41.3	28.9	159°37.8	7.5'	24°52.7	-1.6'	56.7'
12	0°41.2	N21°29.3	174°04.4	7.5'	S24°54.2	-1.5'	56.7'
13	15°41.1	29.7	188°30.9	7.6'	24°55.6	-1.3'	56.6'
14	30°41.0	30.1	202°57.5	7.6'	24°56.9	-1.2'	56.6'
15	45°41.0	·· 30.5	217°24.1	7.6'	24°58.0	-1.0'	56.6'
16	60°40.9	30.9	231°50.7	7.6'	24°58.9	-0.9'	56.6'
17	75°40.8	31.3	246°17.4	7.7'	24°59.8	-0.7'	56.5'
18	90°40.7	N21°31.7	260°44.0	7.7'	S25°00.4	-0.6'	56.5'
19	105°40.6	32.1	275°10.7	7.7'	25°01.0	-0.5'	56.5'
20	120°40.6	32.5	289°37.4	7.7'	25°01.3	-0.3'	56.5'
21	135°40.5	·· 32.9	304°04.2	7.8'	25°01.6	-0.2'	56.4'
22	150°40.4	33.3	318°31.0	7.8'	25°01.7	-0.0'	56.4'
23	165°40.3	33.6	332°57.8	7.8'	25°01.6	0.1'	56.4'
	SD.=15.8	d=0.4	S.D.=15.4				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°40.3	N21°34.0	347°24.6	7.9'	S25°01.4	0.3'	56.4'
1	195°40.2	34.4	1°51.5	7.9'	25°01.1	0.4'	56.3'
2	210°40.1	34.8	16°18.4	7.9'	25°00.7	0.5'	56.3'
3	225°40.0	·· 35.2	30°45.3	8.0'	25°00.0	0.7'	56.3'
4	240°39.9	35.6	45°12.3	8.0'	24°59.3	0.8'	56.3'
5	255°39.9	36.0	59°39.4	8.0'	24°58.4	1.0'	56.2'
6	270°39.8	N21°36.4	74°06.4	8.1'	S24°57.4	1.1'	56.2'
7	285°39.7	36.8	88°33.5	8.1'	24°56.2	1.2'	56.2'
8	300°39.6	37.2	103°00.7	8.2'	24°54.9	1.4'	56.2'
9	315°39.5	·· 37.5	117°27.9	8.2'	24°53.5	1.5'	56.1'
10	330°39.4	37.9	131°55.1	8.3'	24°51.9	1.6'	56.1'
11	345°39.4	38.3	146°22.4	8.3'	24°50.2	1.8'	56.1'
12	0°39.3	N21°38.7	160°49.8	8.4'	S24°48.3	1.9'	56.1'
13	15°39.2	39.1	175°17.2	8.4'	24°46.4	2.1'	56.0'
14	30°39.1	39.5	189°44.6	8.5'	24°44.2	2.2'	56.0'
15	45°39.0	·· 39.8	204°12.1	8.5'	24°42.0	2.3'	56.0'
16	60°39.0	40.2	218°39.7	8.6'	24°39.6	2.5'	56.0'
17	75°38.9	40.6	233°07.3	8.6'	24°37.1	2.6'	55.9'
18	90°38.8	N21°41.0	247°34.9	8.7'	S24°34.4	2.7'	55.9'
19	105°38.7	41.4	262°02.6	8.7'	24°31.7	2.8'	55.9'
20	120°38.6	41.7	276°30.4	8.8'	24°28.7	3.0'	55.9'
21	135°38.5	·· 42.1	290°58.2	8.9'	24°25.7	3.1'	55.9'
22	150°38.5	42.5	305°26.1	8.9'	24°22.5	3.2'	55.8'
23	165°38.4	42.9	319°54.1	9.0'	24°19.2	3.4'	55.8'
	SD.=15.8	d=0.4	S.D.=15.3				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°38.3	N21°43.3	334°22.1	9.0'	S24°15.8	3.5'	55.8'
1	195°38.2	43.6	348°50.2	9.1'	24°12.3	3.6'	55.8'
2	210°38.1	44.0	3°18.3	9.2'	24°08.6	3.7'	55.7'
3	225°38.0	·· 44.4	17°46.5	9.2'	24°04.8	3.9'	55.7'
4	240°37.9	44.8	32°14.8	9.3'	24°00.9	4.0'	55.7'
5	255°37.9	45.1	46°43.1	9.4'	23°56.8	4.1'	55.7'
6	270°37.8	N21°45.5	61°11.5	9.4'	S23°52.7	4.2'	55.6'
7	285°37.7	45.9	75°40.0	9.5'	23°48.4	4.3'	55.6'
8	300°37.6	46.2	90°08.5	9.6'	23°44.0	4.5'	55.6'
9	315°37.5	·· 46.6	104°37.1	9.6'	23°39.4	4.6'	55.6'
10	330°37.4	47.0	119°05.8	9.7'	23°34.8	4.7'	55.6'
11	345°37.4	47.4	133°34.5	9.8'	23°30.0	4.8'	55.5'
12	0°37.3	N21°47.7	148°03.3	9.8'	S23°25.1	4.9'	55.5'
13	15°37.2	48.1	162°32.2	9.9'	23°20.2	5.1'	55.5'
14	30°37.1	48.5	177°01.2	10.0'	23°15.0	5.2'	55.5'
15	45°37.0	·· 48.8	191°30.2	10.1'	23°09.8	5.3'	55.4'
16	60°36.9	49.2	205°59.3	10.1'	23°04.5	5.4'	55.4'
17	75°36.8	49.6	220°28.5	10.2'	22°59.0	5.5'	55.4'
18	90°36.7	N21°49.9	234°57.7	10.3'	S22°53.5	5.6'	55.4'
19	105°36.7	50.3	249°27.1	10.4'	22°47.8	5.7'	55.4'
20	120°36.6	50.7	263°56.5	10.4'	22°42.0	5.8'	55.3'
21	135°36.5	·· 51.0	278°25.9	10.5'	22°36.1	5.9'	55.3'
22	150°36.4	51.4	292°55.5	10.6'	22°30.1	6.0'	55.3'
23	165°36.3	51.7	307°25.1	10.7'	22°24.0	6.2'	55.3'
	SD.=15.8	d=0.4	S.D.=15.1				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 14-16 100-93%
28	02:48	02:45	11:57	–:–	12:25	○
29	02:41	02:37	11:57	00:52	13:20	
30	02:33	02:29	11:58	01:46	14:12	

May 31, 01, 02 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	248°23.3	143°59.9	N24°38.0	99°22.2	N14°05.9	248°45.3	S01°24.5	69°24.6	N03°05.5
1	263°25.8	158°59.1	37.7	114°23.5	05.5	263°47.4	24.3	84°27.1	05.5
2	278°28.3	173°58.3	37.5	129°24.7	05.0	278°49.5	24.2	99°29.6	05.5
3	293°30.7	188°57.5	·· 37.2	144°26.0	·· 04.5	293°51.6	·· 24.1	114°32.0	·· 05.4
4	308°33.2	203°56.8	37.0	159°27.3	04.0	308°53.7	23.9	129°34.5	05.4
5	323°35.6	218°56.0	36.7	174°28.5	03.6	323°55.9	23.8	144°37.0	05.4
6	338°38.1	233°55.2	N24°36.5	189°29.8	N14°03.1	338°58.0	S01°23.6	159°39.4	N03°05.4
7	353°40.6	248°54.4	36.2	204°31.0	02.6	354°00.1	23.5	174°41.9	05.4
8	8°43.0	263°53.6	36.0	219°32.3	02.1	9°02.2	23.4	189°44.4	05.4
9	23°45.5	278°52.8	·· 35.7	234°33.6	·· 01.7	24°04.3	·· 23.2	204°46.8	·· 05.4
10	38°48.0	293°52.0	35.5	249°34.8	01.2	39°06.5	23.1	219°49.3	05.4
11	53°50.4	308°51.3	35.2	264°36.1	00.7	54°08.6	22.9	234°51.8	05.4
12	68°52.9	323°50.5	N24°35.0	279°37.3	N14°00.2	69°10.7	S01°22.8	249°54.2	N03°05.4
13	83°55.4	338°49.7	34.7	294°38.6	13°59.8	84°12.8	22.7	264°56.7	05.4
14	98°57.8	353°48.9	34.4	309°39.9	59.3	99°14.9	22.5	279°59.1	05.3
15	114°00.3	8°48.1	·· 34.2	324°41.1	·· 58.8	114°17.1	·· 22.4	295°01.6	·· 05.3
16	129°02.8	23°47.3	33.9	339°42.4	58.3	129°19.2	22.3	310°04.1	05.3
17	144°05.2	38°46.6	33.7	354°43.6	57.9	144°21.3	22.1	325°06.5	05.3
18	159°07.7	53°45.8	N24°33.4	9°44.9	N13°57.4	159°23.4	S01°22.0	340°09.0	N03°05.3
19	174°10.1	68°45.0	33.1	24°46.1	56.9	174°25.5	21.8	355°11.5	05.3
20	189°12.6	83°44.2	32.9	39°47.4	56.4	189°27.7	21.7	10°13.9	05.3
21	204°15.1	98°43.4	·· 32.6	54°48.7	·· 55.9	204°29.8	·· 21.6	25°16.4	·· 05.3
22	219°17.5	113°42.7	32.3	69°49.9	55.5	219°31.9	21.4	40°18.9	05.3
23	234°20.0	128°41.9	32.1	84°51.2	55.0	234°34.0	21.3	55°21.3	05.3
Mer.pass.:07:25		v-0.8 d-0.2 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	249°22.5	143°41.1	N24°31.8	99°52.4	N13°54.5	249°36.1	S01°21.2	70°23.8	N03°05.2
1	264°24.9	158°40.3	31.5	114°53.7	54.0	264°38.3	21.0	85°26.2	05.2
2	279°27.4	173°39.5	31.3	129°54.9	53.6	279°40.4	20.9	100°28.7	05.2
3	294°29.9	188°38.8	·· 31.0	144°56.2	·· 53.1	294°42.5	·· 20.7	115°31.2	·· 05.2
4	309°32.3	203°38.0	30.7	159°57.4	52.6	309°44.6	20.6	130°33.6	05.2
5	324°34.8	218°37.2	30.4	174°58.7	52.1	324°46.8	20.5	145°36.1	05.2
6	339°37.3	233°36.4	N24°30.2	190°00.0	N13°51.6	339°48.9	S01°20.3	160°38.6	N03°05.2
7	354°39.7	248°35.7	29.9	205°01.2	51.2	354°51.0	20.2	175°41.0	05.2
8	9°42.2	263°34.9	29.6	220°02.5	50.7	9°53.1	20.1	190°43.5	05.2
9	24°44.6	278°34.1	·· 29.3	235°03.7	·· 50.2	24°55.2	·· 19.9	205°45.9	·· 05.1
10	39°47.1	293°33.3	29.0	250°05.0	49.7	39°57.4	19.8	220°48.4	05.1
11	54°49.6	308°32.5	28.7	265°06.2	49.3	54°59.5	19.6	235°50.9	05.1
12	69°52.0	323°31.8	N24°28.5	280°07.5	N13°48.8	70°01.6	S01°19.5	250°53.3	N03°05.1
13	84°54.5	338°31.0	28.2	295°08.7	48.3	85°03.7	19.4	265°55.8	05.1
14	99°57.0	353°30.2	27.9	310°10.0	47.8	100°05.9	19.2	280°58.2	05.1
15	114°59.4	8°29.5	·· 27.6	325°11.2	·· 47.3	115°08.0	·· 19.1	296°00.7	·· 05.1
16	130°01.9	23°28.7	27.3	340°12.5	46.9	130°10.1	19.0	311°03.2	05.1
17	145°04.4	38°27.9	27.0	355°13.7	46.4	145°12.2	18.8	326°05.6	05.1
18	160°06.8	53°27.1	N24°26.7	10°15.0	N13°45.9	160°14.4	S01°18.7	341°08.1	N03°05.0
19	175°09.3	68°26.4	26.4	25°16.3	45.4	175°16.5	18.6	356°10.5	05.0
20	190°11.8	83°25.6	26.1	40°17.5	44.9	190°18.6	18.4	11°13.0	05.0
21	205°14.2	98°24.8	·· 25.9	55°18.8	·· 44.5	205°20.7	·· 18.3	26°15.5	·· 05.0
22	220°16.7	113°24.0	25.6	70°20.0	44.0	220°22.9	18.1	41°17.9	05.0
23	235°19.1	128°23.3	25.3	85°21.3	43.5	235°25.0	18.0	56°20.4	05.0
Mer.pass.:07:21		v-0.8 d-0.3 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	250°21.6	143°22.5	N24°25.0	100°22.5	N13°43.0	250°27.1	S01°17.9	71°22.8	N03°05.0
1	265°24.1	158°21.7	24.7	115°23.8	42.5	265°29.2	17.7	86°25.3	05.0
2	280°26.5	173°21.0	24.4	130°25.0	42.0	280°31.4	17.6	101°27.8	05.0
3	295°29.0	188°20.2	·· 24.1	145°26.3	·· 41.6	295°33.5	·· 17.5	116°30.2	·· 04.9
4	310°31.5	203°19.4	23.8	160°27.5	41.1	310°35.6	17.3	131°32.7	04.9
5	325°33.9	218°18.7	23.4	175°28.8	40.6	325°37.8	17.2	146°35.1	04.9
6	340°36.4	233°17.9	N24°23.1	190°30.0	N13°40.1	340°39.9	S01°17.1	161°37.6	N03°04.9
7	355°38.9	248°17.1	22.8	205°31.3	39.6	355°42.0	16.9	176°40.1	04.9
8	10°41.3	263°16.4	22.5	220°32.5	39.2	10°44.1	16.8	191°42.5	04.9
9	25°43.8	278°15.6	·· 22.2	235°33.8	·· 38.7	25°46.3	·· 16.7	206°45.0	·· 04.9
10	40°46.2	293°14.8	21.9	250°35.0	38.2	40°48.4	16.5	221°47.4	04.9
11	55°48.7	308°14.1	21.6	265°36.3	37.7	55°50.5	16.4	236°49.9	04.8
12	70°51.2	323°13.3	N24°21.3	280°37.5	N13°37.2	70°52.7	S01°16.3	251°52.3	N03°04.8
13	85°53.6	338°12.5	21.0	295°38.8	36.7	85°54.8	16.1	266°54.8	04.8
14	100°56.1	353°11.8	20.7	310°40.0	36.3	100°56.9	16.0	281°57.3	04.8
15	115°58.6	8°11.0	·· 20.3	325°41.3	·· 35.8	115°59.0	·· 15.9	296°59.7	·· 04.8
16	131°01.0	23°10.2	20.0	340°42.5	35.3	131°01.2	15.7	312°02.2	04.8
17	146°03.5	38°09.5	19.7	355°43.8	34.8	146°03.3	15.6	327°04.6	04.8
18	161°06.0	53°08.7	N24°19.4	10°45.0	N13°34.3	161°05.4	S01°15.5	342°07.1	N03°04.7
19	176°08.4	68°07.9	19.1	25°46.3	33.8	176°07.6	15.3	357°09.5	04.7
20	191°10.9	83°07.2	18.7	40°47.5	33.3	191°09.7	15.2	12°12.0	04.7
21	206°13.4	98°06.4	·· 18.4	55°48.8	·· 32.9	206°11.8	·· 15.0	27°14.5	·· 04.7
22	221°15.8	113°05.7	18.1	70°50.0	32.4	221°14.0	14.9	42°16.9	04.7
23	236°18.3	128°04.9	17.8	85°51.3	31.9	236°16.1	14.8	57°19.4	04.7
Mer.pass.:07:17		v-0.8 d-0.3 m-3.9		v1.3 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°46.0	29°08.8
Ankaa	353°18.0	-42°14.7
Schedar	349°43.5	56°35.5
Diphda	348°58.2	-17°55.6
Achernar	335°28.7	-57°10.8
Hamal	328°03.6	23°30.7
Polaris	319°15.9	89°18.5
Acamar	315°20.3	-40°15.6
Menkar	314°17.7	4°07.8
Mirfak	308°44.1	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.2
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.4	-59°32.9
Suhail	222°54.3	-43°28.8
Miaplacidus	221°40.7	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.2	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.7	-63°09.8
Gacrux	172°03.3	-57°10.7
Alioth	166°22.2	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.7
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.6	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.8
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.2	12°33.1
Eltanin	90°46.6	51°29.1
Kaus Aust.	83°46.4	-34°22.7
Vega	80°40.1	38°47.5
Nunki	76°00.7	-26°16.9
Altair	62°10.2	8°53.7
Peacock	53°22.3	-56°41.8
Deneb	49°32.8	45°18.9
Enif	33°49.2	9°55.4
Al Na'ir	27°46.3	-46°54.3
Fomalhaut	15°26.4	-29°33.8
Scheat	13°55.6	28°08.3
Markab	13°40.6	15°15.7

May 31 Mon	**SHA**	**Mer.pass**
Venus	255°36.6	14:25
Mars	210°58.9	17:21
Jupiter	0°21.9	07:24
Saturn	181°01.3	19:19

Jun 01 Tue	**SHA**	**Mer.pass**
Venus	254°18.6	14:26
Mars	210°30.0	17:19
Jupiter	0°13.7	07:21
Saturn	181°01.3	19:15

Jun 02 Wed	**SHA**	**Mer.pass**
Venus	253°00.9	14:27
Mars	210°00.9	17:17
Jupiter	0°05.5	07:17
Saturn	181°01.2	19:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°36.2	N21°52.1	321°54.8	10.7'	S22°17.8	6.3'	55.3'
1	195°36.1	52.5	336°24.6	10.8'	22°11.5	6.4'	55.2'
2	210°36.0	52.8	350°54.4	10.9'	22°05.1	6.5'	55.2'
3	225°35.9	·· 53.2	5°24.3	11.0'	21°58.6	6.6'	55.2'
4	240°35.9	53.5	19°54.3	11.0'	21°51.9	6.7'	55.2'
5	255°35.8	53.9	34°24.4	11.1'	21°45.2	6.8'	55.2'
6	270°35.7	N21°54.2	48°54.6	11.2'	S21°38.4	6.9'	55.1'
7	285°35.6	54.6	63°24.8	11.3'	21°31.5	7.0'	55.1'
8	300°35.5	55.0	77°55.1	11.3'	21°24.5	7.1'	55.1'
9	315°35.4	·· 55.3	92°25.5	11.4'	21°17.4	7.2'	55.1'
10	330°35.3	55.7	106°56.0	11.5'	21°10.1	7.3'	55.1'
11	345°35.2	56.0	121°26.5	11.6'	21°02.8	7.4'	55.0'
12	0°35.1	N21°56.4	135°57.1	11.7'	S20°55.4	7.4'	55.0'
13	15°35.0	56.7	150°27.8	11.7'	20°48.0	7.5'	55.0'
14	30°35.0	57.1	164°58.6	11.8'	20°40.4	7.6'	55.0'
15	45°34.9	·· 57.4	179°29.5	11.9'	20°32.7	7.7'	55.0'
16	60°34.8	57.8	194°00.4	12.0'	20°24.9	7.8'	54.9'
17	75°34.7	58.1	208°31.4	12.0'	20°17.1	7.9'	54.9'
18	90°34.6	N21°58.5	223°02.5	12.1'	S20°09.2	8.0'	54.9'
19	105°34.5	58.8	237°33.6	12.2'	20°01.1	8.1'	54.9'
20	120°34.4	59.2	252°04.9	12.3'	19°53.0	8.2'	54.9'
21	135°34.3	·· 59.5	266°36.2	12.3'	19°44.8	8.2'	54.9'
22	150°34.2	21°59.9	281°07.5	12.4'	19°36.5	8.3'	54.8'
23	165°34.1	22°00.2	295°39.0	12.5'	19°28.2	8.4'	54.8'
	SD.=15.8	d=0.4	S.D.=15.0				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°34.0	N22°00.6	310°10.5	12.6'	S19°19.7	8.5'	54.8'
1	195°33.9	00.9	324°42.1	12.6'	19°11.2	8.6'	54.8'
2	210°33.8	01.2	339°13.8	12.7'	19°02.6	8.6'	54.8'
3	225°33.8	·· 01.6	353°45.6	12.8'	18°53.9	8.7'	54.8'
4	240°33.7	01.9	8°17.4	12.9'	18°45.2	8.8'	54.7'
5	255°33.6	02.3	22°49.3	12.9'	18°36.3	8.9'	54.7'
6	270°33.5	N22°02.6	37°21.3	13.0'	S18°27.4	9.0'	54.7'
7	285°33.4	03.0	51°53.3	13.1'	18°18.4	9.0'	54.7'
8	300°33.3	03.3	66°25.5	13.2'	18°09.3	9.1'	54.7'
9	315°33.2	·· 03.6	80°57.7	13.2'	18°00.2	9.2'	54.7'
10	330°33.1	04.0	95°29.9	13.3'	17°51.0	9.2'	54.7'
11	345°33.0	04.3	110°02.3	13.4'	17°41.7	9.3'	54.6'
12	0°32.9	N22°04.6	124°34.7	13.4'	S17°32.4	9.4'	54.6'
13	15°32.8	05.0	139°07.1	13.5'	17°22.9	9.5'	54.6'
14	30°32.7	05.3	153°39.7	13.6'	17°13.4	9.5'	54.6'
15	45°32.6	·· 05.7	168°12.3	13.6'	17°03.9	9.6'	54.6'
16	60°32.5	06.0	182°45.0	13.7'	16°54.2	9.7'	54.6'
17	75°32.4	06.3	197°17.7	13.8'	16°44.5	9.7'	54.6'
18	90°32.3	N22°06.7	211°50.5	13.8'	S16°34.8	9.8'	54.5'
19	105°32.2	07.0	226°23.4	13.9'	16°25.0	9.9'	54.5'
20	120°32.1	07.3	240°56.4	14.0'	16°15.1	9.9'	54.5'
21	135°32.0	·· 07.6	255°29.4	14.0'	16°05.1	10.0'	54.5'
22	150°31.9	08.0	270°02.5	14.1'	15°55.1	10.0'	54.5'
23	165°31.8	08.3	284°35.6	14.2'	15°45.0	10.1'	54.5'
	SD.=15.8	d=0.3	S.D.=14.9				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°31.7	N22°08.6	299°08.8	14.2'	S15°34.9	10.2'	54.5'
1	195°31.6	09.0	313°42.1	14.3'	15°24.7	10.2'	54.5'
2	210°31.6	09.3	328°15.4	14.4'	15°14.4	10.3'	54.4'
3	225°31.5	·· 09.6	342°48.8	14.4'	15°04.1	10.3'	54.4'
4	240°31.4	09.9	357°22.2	14.5'	14°53.8	10.4'	54.4'
5	255°31.3	10.3	11°55.7	14.5'	14°43.3	10.5'	54.4'
6	270°31.2	N22°10.6	26°29.3	14.6'	S14°32.9	10.5'	54.4'
7	285°31.1	10.9	41°02.9	14.7'	14°22.3	10.6'	54.4'
8	300°31.0	11.2	55°36.6	14.7'	14°11.7	10.6'	54.4'
9	315°30.9	·· 11.6	70°10.4	14.8'	14°01.1	10.7'	54.4'
10	330°30.8	11.9	84°44.2	14.8'	13°50.4	10.7'	54.4'
11	345°30.7	12.2	99°18.0	14.9'	13°39.7	10.8'	54.4'
12	0°30.6	N22°12.5	113°51.9	14.9'	S13°28.9	10.8'	54.4'
13	15°30.5	12.9	128°25.9	15.0'	13°18.0	10.9'	54.3'
14	30°30.4	13.2	142°59.9	15.0'	13°07.1	10.9'	54.3'
15	45°30.3	·· 13.5	157°34.0	15.1'	12°56.2	11.0'	54.3'
16	60°30.2	13.8	172°08.1	15.1'	12°45.2	11.0'	54.3'
17	75°30.1	14.1	186°42.2	15.2'	12°34.1	11.1'	54.3'
18	90°30.0	N22°14.4	201°16.4	15.2'	S12°23.1	11.1'	54.3'
19	105°29.9	14.8	215°50.7	15.3'	12°11.9	11.2'	54.3'
20	120°29.8	15.1	230°25.0	15.3'	12°00.8	11.2'	54.3'
21	135°29.7	·· 15.4	244°59.4	15.4'	11°49.5	11.2'	54.3'
22	150°29.6	15.7	259°33.8	15.4'	11°38.3	11.3'	54.3'
23	165°29.5	16.0	274°08.2	15.5'	11°27.0	11.3'	54.3'
	SD.=15.8	d=0.3	S.D.=14.8				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	01:13	22:47	▭	▭
64°	▭	▭	01:58	21:59	▭	▭
62°	▭	▭	02:28	21:30	▭	▭
60°	▭	01:27	02:50	21:07	22:32	▭
N 58°	▭	02:01	03:07	20:49	21:57	▭
56°	▭	02:25	03:22	20:34	21:32	▭
54°	01:19	02:44	03:35	20:21	21:13	22:39
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	21:03
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	19:23	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°	06:56	07:52	08:46	15:09	16:04	16:59

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 17-19 88-72%
31	02:25	02:21	11:58	02:38	15:02	
01	02:16	02:12	11:58	03:26	15:49	
02	02:07	02:02	11:58	04:11	16:32	

June 03, 04, 05 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	251°20.7	143°04.1	N24°17.4	100°52.5	N13°31.4	251°18.2	S01°14.6	72°21.8	N03°04.7
1	266°23.2	158°03.4	17.1	115°53.8	30.9	266°20.4	14.5	87°24.3	04.7
2	281°25.7	173°02.6	16.8	130°55.0	30.4	281°22.5	14.4	102°26.7	04.6
3	296°28.1	188°01.8	·· 16.5	145°56.3	·· 30.0	296°24.6	·· 14.3	117°29.2	·· 04.6
4	311°30.6	203°01.1	16.1	160°57.5	29.5	311°26.7	14.1	132°31.6	04.6
5	326°33.1	218°00.3	15.8	175°58.8	29.0	326°28.9	14.0	147°34.1	04.6
6	341°35.5	232°59.6	N24°15.5	191°00.0	N13°28.5	341°31.0	S01°13.9	162°36.5	N03°04.6
7	356°38.0	247°58.8	15.1	206°01.2	28.0	356°33.1	13.7	177°39.0	04.6
8	11°40.5	262°58.1	14.8	221°02.5	27.5	11°35.3	13.6	192°41.5	04.6
9	26°42.9	277°57.3	·· 14.4	236°03.7	·· 27.0	26°37.4	·· 13.5	207°43.9	·· 04.5
10	41°45.4	292°56.5	14.1	251°05.0	26.5	41°39.5	13.3	222°46.4	04.5
11	56°47.9	307°55.8	13.8	266°06.2	26.1	56°41.7	13.2	237°48.8	04.5
12	71°50.3	322°55.0	N24°13.4	281°07.5	N13°25.6	71°43.8	S01°13.1	252°51.3	N03°04.5
13	86°52.8	337°54.3	13.1	296°08.7	25.1	86°45.9	12.9	267°53.7	04.5
14	101°55.2	352°53.5	12.7	311°10.0	24.6	101°48.1	12.8	282°56.2	04.5
15	116°57.7	7°52.8	·· 12.4	326°11.2	·· 24.1	116°50.2	·· 12.7	297°58.6	·· 04.5
16	132°00.2	22°52.0	12.1	341°12.5	23.6	131°52.4	12.5	313°01.1	04.4
17	147°02.6	37°51.3	11.7	356°13.7	23.1	146°54.5	12.4	328°03.5	04.4
18	162°05.1	52°50.5	N24°11.4	11°15.0	N13°22.6	161°56.6	S01°12.3	343°06.0	N03°04.4
19	177°07.6	67°49.8	11.0	26°16.2	22.2	176°58.8	12.1	358°08.4	04.4
20	192°10.0	82°49.0	10.7	41°17.4	21.7	192°00.9	12.0	13°10.9	04.4
21	207°12.5	97°48.2	·· 10.3	56°18.7	·· 21.2	207°03.0	·· 11.9	28°13.3	·· 04.4
22	222°15.0	112°47.5	10.0	71°19.9	20.7	222°05.2	11.7	43°15.8	04.3
23	237°17.4	127°46.7	09.6	86°21.2	20.2	237°07.3	11.6	58°18.2	04.3
Mer.pass.:07:13		v-0.8 d-0.3 m-3.9		v1.2 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	252°19.9	142°46.0	N24°09.3	101°22.4	N13°19.7	252°09.4	S01°11.5	73°20.7	N03°04.3
1	267°22.3	157°45.2	08.9	116°23.7	19.2	267°11.6	11.3	88°23.1	04.3
2	282°24.8	172°44.5	08.5	131°24.9	18.7	282°13.7	11.2	103°25.6	04.3
3	297°27.3	187°43.7	·· 08.2	146°26.2	·· 18.3	297°15.9	·· 11.1	118°28.0	·· 04.3
4	312°29.7	202°43.0	07.8	161°27.4	17.8	312°18.0	11.0	133°30.5	04.3
5	327°32.2	217°42.2	07.5	176°28.6	17.3	327°20.1	10.8	148°32.9	04.2
6	342°34.7	232°41.5	N24°07.1	191°29.9	N13°16.8	342°22.3	S01°10.7	163°35.4	N03°04.2
7	357°37.1	247°40.7	06.7	206°31.1	16.3	357°24.4	10.6	178°37.8	04.2
8	12°39.6	262°40.0	06.4	221°32.4	15.8	12°26.5	10.4	193°40.3	04.2
9	27°42.1	277°39.3	·· 06.0	236°33.6	·· 15.3	27°28.7	·· 10.3	208°42.7	·· 04.2
10	42°44.5	292°38.5	05.6	251°34.9	14.8	42°30.8	10.2	223°45.2	04.2
11	57°47.0	307°37.8	05.3	266°36.1	14.3	57°33.0	10.0	238°47.6	04.1
12	72°49.5	322°37.0	N24°04.9	281°37.3	N13°13.8	72°35.1	S01°09.9	253°50.1	N03°04.1
13	87°51.9	337°36.3	04.5	296°38.6	13.3	87°37.2	09.8	268°52.5	04.1
14	102°54.4	352°35.5	04.2	311°39.8	12.9	102°39.4	09.7	283°55.0	04.1
15	117°56.8	7°34.8	·· 03.8	326°41.1	·· 12.4	117°41.5	·· 09.5	298°57.4	·· 04.1
16	132°59.3	22°34.0	03.4	341°42.3	11.9	132°43.7	09.4	313°59.9	04.1
17	148°01.8	37°33.3	03.0	356°43.5	11.4	147°45.8	09.3	329°02.3	04.0
18	163°04.2	52°32.6	N24°02.7	11°44.8	N13°10.9	162°47.9	S01°09.1	344°04.8	N03°04.0
19	178°06.7	67°31.8	02.3	26°46.0	10.4	177°50.1	09.0	359°07.2	04.0
20	193°09.2	82°31.1	01.9	41°47.3	09.9	192°52.2	08.9	14°09.7	04.0
21	208°11.6	97°30.3	·· 01.5	56°48.5	·· 09.4	207°54.4	·· 08.8	29°12.1	·· 04.0
22	223°14.1	112°29.6	01.2	71°49.8	08.9	222°56.5	08.6	44°14.6	04.0
23	238°16.6	127°28.8	00.8	86°51.0	08.4	237°58.6	08.5	59°17.0	03.9
Mer.pass.:07:09		v-0.8 d-0.4 m-3.9		v1.2 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.5 d-0.0 m1.0	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	253°19.0	142°28.1	N24°00.4	101°52.2	N13°07.9	253°00.8	S01°08.4	74°19.5	N03°03.9
1	268°21.5	157°27.4	24°00.0	116°53.5	07.4	268°02.9	08.2	89°21.9	03.9
2	283°24.0	172°26.6	23°59.6	131°54.7	06.9	283°05.1	08.1	104°24.4	03.9
3	298°26.4	187°25.9	·· 59.2	146°56.0	·· 06.5	298°07.2	·· 08.0	119°26.8	·· 03.9
4	313°28.9	202°25.1	58.9	161°57.2	06.0	313°09.3	07.9	134°29.3	03.9
5	328°31.3	217°24.4	58.5	176°58.4	05.5	328°11.5	07.7	149°31.7	03.8
6	343°33.8	232°23.7	N23°58.1	191°59.7	N13°05.0	343°13.6	S01°07.6	164°34.2	N03°03.8
7	358°36.3	247°22.9	57.7	207°00.9	04.5	358°15.8	07.5	179°36.6	03.8
8	13°38.7	262°22.2	57.3	222°02.1	04.0	13°17.9	07.3	194°39.0	03.8
9	28°41.2	277°21.5	·· 56.9	237°03.4	·· 03.5	28°20.1	·· 07.2	209°41.5	·· 03.8
10	43°43.7	292°20.7	56.5	252°04.6	03.0	43°22.2	07.1	224°43.9	03.8
11	58°46.1	307°20.0	56.1	267°05.9	02.5	58°24.4	07.0	239°46.4	03.7
12	73°48.6	322°19.3	N23°55.7	282°07.1	N13°02.0	73°26.5	S01°06.8	254°48.8	N03°03.7
13	88°51.1	337°18.5	55.3	297°08.3	01.5	88°28.6	06.7	269°51.3	03.7
14	103°53.5	352°17.8	54.9	312°09.6	01.0	103°30.8	06.6	284°53.7	03.7
15	118°56.0	7°17.1	·· 54.5	327°10.8	·· 00.5	118°32.9	·· 06.4	299°56.2	·· 03.7
16	133°58.4	22°16.3	54.1	342°12.1	13°00.0	133°35.1	06.3	314°58.6	03.6
17	149°00.9	37°15.6	53.7	357°13.3	12°59.5	148°37.2	06.2	330°01.1	03.6
18	164°03.4	52°14.9	N23°53.3	12°14.5	N12°59.0	163°39.4	S01°06.1	345°03.5	N03°03.6
19	179°05.8	67°14.1	52.9	27°15.8	58.5	178°41.5	05.9	0°05.9	03.6
20	194°08.3	82°13.4	52.5	42°17.0	58.0	193°43.7	05.8	15°08.4	03.6
21	209°10.8	97°12.7	·· 52.1	57°18.2	·· 57.6	208°45.8	·· 05.7	30°10.8	·· 03.5
22	224°13.2	112°11.9	51.7	72°19.5	57.1	223°48.0	05.6	45°13.3	03.5
23	239°15.7	127°11.2	51.3	87°20.7	56.6	238°50.1	05.4	60°15.7	03.5
Mer.pass.:07:06		v-0.7 d-0.4 m-3.9		v1.2 d-0.5 m1.1		v2.1 d0.1 m-2.1		v2.4 d-0.0 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°46.0	29°08.8
Ankaa	353°17.9	-42°14.7
Schedar	349°43.5	56°35.5
Diphda	348°58.2	-17°55.6
Achernar	335°28.7	-57°10.7
Hamal	328°03.6	23°30.7
Polaris	319°15.2	89°18.4
Acamar	315°20.3	-40°15.6
Menkar	314°17.7	4°07.9
Mirfak	308°44.1	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.2
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.4	-59°32.9
Suhail	222°54.4	-43°28.8
Miaplacidus	221°40.8	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.2	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.7	-63°09.8
Gacrux	172°03.3	-57°10.7
Alioth	166°22.2	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.7
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.4	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.6	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.7
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.8
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.2	12°33.1
Eltanin	90°46.6	51°29.2
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.1	38°47.5
Nunki	76°00.7	-26°16.9
Altair	62°10.1	8°53.7
Peacock	53°22.2	-56°41.8
Deneb	49°32.8	45°18.9
Enif	33°49.2	9°55.4
Al Na'ir	27°46.3	-46°54.3
Fomalhaut	15°26.3	-29°33.8
Scheat	13°55.6	28°08.3
Markab	13°40.6	15°15.7

Jun 03 Thu	**SHA**	**Mer.pass**
Venus	251°43.4	14:28
Mars	209°31.8	17:15
Jupiter	359°57.5	07:14
Saturn	181°01.1	19:07

Jun 04 Fri	**SHA**	**Mer.pass**
Venus	250°26.1	14:30
Mars	209°02.5	17:13
Jupiter	359°49.6	07:10
Saturn	181°00.8	19:04

Jun 05 Sat	**SHA**	**Mer.pass**
Venus	249°09.1	14:31
Mars	208°33.2	17:11
Jupiter	359°41.8	07:07
Saturn	181°00.5	19:00

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°29.4	N22°16.3	288°42.7	15.5'	S11°15.6	11.4'	54.3'
1	195°29.3	16.6	303°17.3	15.6'	11°04.3	11.4'	54.3'
2	210°29.2	17.0	317°51.8	15.6'	10°52.8	11.4'	54.3'
3	225°29.1	·· 17.3	332°26.5	15.6'	10°41.4	11.5'	54.3'
4	240°29.0	17.6	347°01.1	15.7'	10°29.9	11.5'	54.3'
5	255°28.9	17.9	1°35.8	15.7'	10°18.3	11.6'	54.3'
6	270°28.7	N22°18.2	16°10.6	15.8'	S10°06.7	11.6'	54.3'
7	285°28.6	18.5	30°45.3	15.8'	09°55.1	11.6'	54.3'
8	300°28.5	18.8	45°20.2	15.8'	09°43.5	11.7'	54.2'
9	315°28.4	·· 19.1	59°55.0	15.9'	09°31.8	11.7'	54.2'
10	330°28.3	19.4	74°29.9	15.9'	09°20.1	11.7'	54.2'
11	345°28.2	19.7	89°04.8	15.9'	09°08.3	11.8'	54.2'
12	0°28.1	N22°20.0	103°39.8	16.0'	S08°56.5	11.8'	54.2'
13	15°28.0	20.3	118°14.8	16.0'	08°44.7	11.8'	54.2'
14	30°27.9	20.6	132°49.8	16.0'	08°32.8	11.9'	54.2'
15	45°27.8	·· 20.9	147°24.8	16.1'	08°21.0	11.9'	54.2'
16	60°27.7	21.2	161°59.9	16.1'	08°09.0	11.9'	54.2'
17	75°27.6	21.5	176°35.0	16.1'	07°57.1	12.0'	54.2'
18	90°27.5	N22°21.8	191°10.1	16.1'	S07°45.1	12.0'	54.2'
19	105°27.4	22.1	205°45.3	16.2'	07°33.1	12.0'	54.2'
20	120°27.3	22.4	220°20.5	16.2'	07°21.1	12.0'	54.2'
21	135°27.2	·· 22.7	234°55.7	16.2'	07°09.0	12.1'	54.2'
22	150°27.1	23.0	249°30.9	16.2'	06°56.9	12.1'	54.2'
23	165°27.0	23.3	264°06.2	16.3'	06°44.8	12.1'	54.2'
	SD.=15.8	d=0.3	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°26.9	N22°23.6	278°41.5	16.3'	S06°32.7	12.2'	54.2'
1	195°26.8	23.9	293°16.8	16.3'	06°20.5	12.2'	54.2'
2	210°26.7	24.2	307°52.1	16.3'	06°08.3	12.2'	54.2'
3	225°26.6	·· 24.5	322°27.4	16.3'	05°56.1	12.2'	54.3'
4	240°26.5	24.8	337°02.8	16.4'	05°43.9	12.2'	54.3'
5	255°26.3	25.1	351°38.2	16.4'	05°31.6	12.3'	54.3'
6	270°26.2	N22°25.4	6°13.5	16.4'	S05°19.4	12.3'	54.3'
7	285°26.1	25.7	20°49.0	16.4'	05°07.1	12.3'	54.3'
8	300°26.0	26.0	35°24.4	16.4'	04°54.7	12.3'	54.3'
9	315°25.9	·· 26.3	49°59.8	16.4'	04°42.4	12.4'	54.3'
10	330°25.8	26.6	64°35.2	16.4'	04°30.0	12.4'	54.3'
11	345°25.7	26.9	79°10.7	16.5'	04°17.7	12.4'	54.3'
12	0°25.6	N22°27.1	93°46.2	16.5'	S04°05.3	12.4'	54.3'
13	15°25.5	27.4	108°21.6	16.5'	03°52.8	12.4'	54.3'
14	30°25.4	27.7	122°57.1	16.5'	03°40.4	12.4'	54.3'
15	45°25.3	·· 28.0	137°32.6	16.5'	03°28.0	12.5'	54.3'
16	60°25.2	28.3	152°08.1	16.5'	03°15.5	12.5'	54.3'
17	75°25.1	28.6	166°43.6	16.5'	03°03.0	12.5'	54.3'
18	90°25.0	N22°28.9	181°19.1	16.5'	S02°50.5	12.5'	54.3'
19	105°24.8	29.1	195°54.6	16.5'	02°38.0	12.5'	54.3'
20	120°24.7	29.4	210°30.1	16.5'	02°25.5	12.5'	54.3'
21	135°24.6	·· 29.7	225°05.6	16.5'	02°13.0	12.5'	54.4'
22	150°24.5	30.0	239°41.1	16.5'	02°00.4	12.6'	54.4'
23	165°24.4	30.3	254°16.6	16.5'	01°47.9	12.6'	54.4'
	SD.=15.8	d=0.3	S.D.=14.8				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°24.3	N22°30.5	268°52.1	16.5'	S01°35.3	12.6'	54.4'
1	195°24.2	30.8	283°27.6	16.5'	01°22.7	12.6'	54.4'
2	210°24.1	31.1	298°03.1	16.5'	01°10.1	12.6'	54.4'
3	225°24.0	·· 31.4	312°38.5	16.5'	00°57.6	12.6'	54.4'
4	240°23.9	31.7	327°14.0	16.5'	00°44.9	12.6'	54.4'
5	255°23.8	31.9	341°49.5	16.5'	00°32.3	12.6'	54.4'
6	270°23.6	N22°32.2	356°25.0	16.5'	S00°19.7	12.6'	54.4'
7	285°23.5	32.5	11°00.4	16.4'	S00°07.1	12.6'	54.5'
8	300°23.4	32.8	25°35.8	16.4'	N00°05.5	12.6'	54.5'
9	315°23.3	·· 33.0	40°11.3	16.4'	00°18.2	12.6'	54.5'
10	330°23.2	33.3	54°46.7	16.4'	00°30.8	12.6'	54.5'
11	345°23.1	33.6	69°22.1	16.4'	00°43.5	12.6'	54.5'
12	0°23.0	N22°33.9	83°57.5	16.4'	N00°56.1	12.6'	54.5'
13	15°22.9	34.1	98°32.8	16.4'	01°08.8	12.7'	54.5'
14	30°22.8	34.4	113°08.2	16.3'	01°21.4	12.7'	54.5'
15	45°22.6	·· 34.7	127°43.5	16.3'	01°34.1	12.7'	54.6'
16	60°22.5	34.9	142°18.8	16.3'	01°46.7	12.7'	54.6'
17	75°22.4	35.2	156°54.1	16.3'	01°59.4	12.7'	54.6'
18	90°22.3	N22°35.5	171°29.4	16.3'	N02°12.0	12.7'	54.6'
19	105°22.2	35.7	186°04.6	16.2'	02°24.7	12.7'	54.6'
20	120°22.1	36.0	200°39.8	16.2'	02°37.3	12.6'	54.6'
21	135°22.0	·· 36.3	215°15.0	16.2'	02°50.0	12.6'	54.6'
22	150°21.9	36.5	229°50.2	16.2'	03°02.6	12.6'	54.7'
23	165°21.8	36.8	244°25.3	16.1'	03°15.3	12.6'	54.7'
	SD.=15.8	d=0.3	S.D.=14.9				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	01:00	23:01	▭	▭
64°	▭	▭	01:51	22:07	▭	▭
62°	▭	▭	02:22	21:36	▭	▭
60°	▭	01:18	02:45	21:12	22:41	▭
N 58°	▭	01:55	03:04	20:54	22:03	▭
56°	▭	02:21	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	20:46	21:48
45°	02:51	03:39	04:15	19:42	20:18	21:07
N 40°	03:19	04:00	04:32	19:25	19:57	20:38
35°	03:41	04:17	04:47	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	17:00	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	17:21
54°	06:41	07:27	08:09	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	07:55	08:51	15:05	16:01	16:56

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 20-22 64-45%
03	01:57	01:53	11:58	04:53	17:14	
04	01:48	01:42	11:58	05:34	17:55	
05	01:37	01:32	11:58	06:15	18:35	

June 06, 07, 08 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	254°18.2	142°10.5	N23°50.9	102°22.0	N12°56.1	253°52.2	S01°05.3	75°18.2	N03°03.5
1	269°20.6	157°09.7	50.5	117°23.2	55.6	268°54.4	05.2	90°20.6	03.5
2	284°23.1	172°09.0	50.1	132°24.4	55.1	283°56.5	05.1	105°23.1	03.5
3	299°25.6	187°08.3	·· 49.6	147°25.7	·· 54.6	298°58.7	·· 04.9	120°25.5	·· 03.4
4	314°28.0	202°07.6	49.2	162°26.9	54.1	314°00.8	04.8	135°27.9	03.4
5	329°30.5	217°06.8	48.8	177°28.1	53.6	329°03.0	04.7	150°30.4	03.4
6	344°32.9	232°06.1	N23°48.4	192°29.4	N12°53.1	344°05.1	S01°04.6	165°32.8	N03°03.4
7	359°35.4	247°05.4	48.0	207°30.6	52.6	359°07.3	04.4	180°35.3	03.4
8	14°37.9	262°04.7	47.6	222°31.8	52.1	14°09.4	04.3	195°37.7	03.3
9	29°40.3	277°03.9	·· 47.1	237°33.1	·· 51.6	29°11.6	·· 04.2	210°40.2	·· 03.3
10	44°42.8	292°03.2	46.7	252°34.3	51.1	44°13.7	04.0	225°42.6	03.3
11	59°45.3	307°02.5	46.3	267°35.5	50.6	59°15.9	03.9	240°45.0	03.3
12	74°47.7	322°01.8	N23°45.9	282°36.8	N12°50.1	74°18.0	S01°03.8	255°47.5	N03°03.3
13	89°50.2	337°01.0	45.4	297°38.0	49.6	89°20.2	03.7	270°49.9	03.2
14	104°52.7	352°00.3	45.0	312°39.2	49.1	104°22.3	03.5	285°52.4	03.2
15	119°55.1	6°59.6	·· 44.6	327°40.5	·· 48.6	119°24.5	·· 03.4	300°54.8	·· 03.2
16	134°57.6	21°58.9	44.2	342°41.7	48.1	134°26.6	03.3	315°57.2	03.2
17	150°00.1	36°58.2	43.7	357°42.9	47.6	149°28.8	03.2	330°59.7	03.2
18	165°02.5	51°57.4	N23°43.3	12°44.2	N12°47.1	164°30.9	S01°03.0	346°02.1	N03°03.1
19	180°05.0	66°56.7	42.9	27°45.4	46.6	179°33.1	02.9	1°04.6	03.1
20	195°07.4	81°56.0	42.4	42°46.6	46.1	194°35.2	02.8	16°07.0	03.1
21	210°09.9	96°55.3	·· 42.0	57°47.9	·· 45.6	209°37.4	·· 02.7	31°09.4	·· 03.1
22	225°12.4	111°54.6	41.6	72°49.1	45.1	224°39.5	02.6	46°11.9	03.1
23	240°14.8	126°53.8	41.1	87°50.3	44.6	239°41.7	02.4	61°14.3	03.0
Mer.pass.:07:02		v-0.7 d-0.4 m-3.9		v1.2 d-0.5 m1.1		v2.1 d0.1 m-2.2		v2.4 d-0.0 m1.0	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	255°17.3	141°53.1	N23°40.7	102°51.6	N12°44.1	254°43.8	S01°02.3	76°16.8	N03°03.0
1	270°19.8	156°52.4	40.3	117°52.8	43.6	269°46.0	02.2	91°19.2	03.0
2	285°22.2	171°51.7	39.8	132°54.0	43.1	284°48.1	02.1	106°21.6	03.0
3	300°24.7	186°51.0	·· 39.4	147°55.3	·· 42.6	299°50.3	·· 01.9	121°24.1	·· 03.0
4	315°27.2	201°50.3	38.9	162°56.5	42.1	314°52.4	01.8	136°26.5	02.9
5	330°29.6	216°49.5	38.5	177°57.7	41.6	329°54.6	01.7	151°29.0	02.9
6	345°32.1	231°48.8	N23°38.1	192°59.0	N12°41.1	344°56.7	S01°01.6	166°31.4	N03°02.9
7	0°34.5	246°48.1	37.6	208°00.2	40.6	359°58.9	01.4	181°33.8	02.9
8	15°37.0	261°47.4	37.2	223°01.4	40.1	15°01.1	01.3	196°36.3	02.9
9	30°39.5	276°46.7	·· 36.7	238°02.7	·· 39.6	30°03.2	·· 01.2	211°38.7	·· 02.8
10	45°41.9	291°46.0	36.3	253°03.9	39.1	45°05.4	01.1	226°41.1	02.8
11	60°44.4	306°45.3	35.8	268°05.1	38.6	60°07.5	00.9	241°43.6	02.8
12	75°46.9	321°44.5	N23°35.4	283°06.4	N12°38.1	75°09.7	S01°00.8	256°46.0	N03°02.8
13	90°49.3	336°43.8	34.9	298°07.6	37.6	90°11.8	00.7	271°48.5	02.7
14	105°51.8	351°43.1	34.5	313°08.8	37.1	105°14.0	00.6	286°50.9	02.7
15	120°54.3	6°42.4	·· 34.0	328°10.1	·· 36.6	120°16.1	·· 00.5	301°53.3	·· 02.7
16	135°56.7	21°41.7	33.6	343°11.3	36.1	135°18.3	00.3	316°55.8	02.7
17	150°59.2	36°41.0	33.1	358°12.5	35.6	150°20.4	00.2	331°58.2	02.7
18	166°01.7	51°40.3	N23°32.7	13°13.7	N12°35.1	165°22.6	S01°00.1	347°00.6	N03°02.6
19	181°04.1	66°39.6	32.2	28°15.0	34.6	180°24.8	01°00.0	2°03.1	02.6
20	196°06.6	81°38.9	31.7	43°16.2	34.1	195°26.9	00°59.8	17°05.5	02.6
21	211°09.0	96°38.2	·· 31.3	58°17.4	·· 33.6	210°29.1	·· 59.7	32°08.0	·· 02.6
22	226°11.5	111°37.5	30.8	73°18.7	33.1	225°31.2	59.6	47°10.4	02.6
23	241°14.0	126°36.8	30.3	88°19.9	32.5	240°33.4	59.5	62°12.8	02.5
Mer.pass.:06:58		v-0.7 d-0.4 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.0	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	256°16.4	141°36.1	N23°29.9	103°21.1	N12°32.0	255°35.5	S00°59.4	77°15.3	N03°02.5
1	271°18.9	156°35.3	29.4	118°22.3	31.5	270°37.7	59.2	92°17.7	02.5
2	286°21.4	171°34.6	29.0	133°23.6	31.0	285°39.9	59.1	107°20.1	02.5
3	301°23.8	186°33.9	·· 28.5	148°24.8	·· 30.5	300°42.0	·· 59.0	122°22.6	·· 02.4
4	316°26.3	201°33.2	28.0	163°26.0	30.0	315°44.2	58.9	137°25.0	02.4
5	331°28.8	216°32.5	27.6	178°27.3	29.5	330°46.3	58.8	152°27.4	02.4
6	346°31.2	231°31.8	N23°27.1	193°28.5	N12°29.0	345°48.5	S00°58.6	167°29.9	N03°02.4
7	1°33.7	246°31.1	26.6	208°29.7	28.5	0°50.7	58.5	182°32.3	02.3
8	16°36.2	261°30.4	26.1	223°30.9	28.0	15°52.8	58.4	197°34.7	02.3
9	31°38.6	276°29.7	·· 25.7	238°32.2	·· 27.5	30°55.0	·· 58.3	212°37.2	·· 02.3
10	46°41.1	291°29.0	25.2	253°33.4	27.0	45°57.1	58.1	227°39.6	02.3
11	61°43.5	306°28.3	24.7	268°34.6	26.5	60°59.3	58.0	242°42.0	02.3
12	76°46.0	321°27.6	N23°24.2	283°35.9	N12°26.0	76°01.5	S00°57.9	257°44.5	N03°02.2
13	91°48.5	336°26.9	23.8	298°37.1	25.5	91°03.6	57.8	272°46.9	02.2
14	106°50.9	351°26.2	23.3	313°38.3	25.0	106°05.8	57.7	287°49.3	02.2
15	121°53.4	6°25.5	·· 22.8	328°39.5	·· 24.5	121°07.9	·· 57.5	302°51.8	·· 02.2
16	136°55.9	21°24.8	22.3	343°40.8	24.0	136°10.1	57.4	317°54.2	02.1
17	151°58.3	36°24.1	21.8	358°42.0	23.4	151°12.3	57.3	332°56.6	02.1
18	167°00.8	51°23.4	N23°21.4	13°43.2	N12°22.9	166°14.4	S00°57.2	347°59.1	N03°02.1
19	182°03.3	66°22.7	20.9	28°44.4	22.4	181°16.6	57.1	3°01.5	02.1
20	197°05.7	81°22.0	20.4	43°45.7	21.9	196°18.7	56.9	18°03.9	02.0
21	212°08.2	96°21.4	·· 19.9	58°46.9	·· 21.4	211°20.9	·· 56.8	33°06.4	·· 02.0
22	227°10.6	111°20.7	19.4	73°48.1	20.9	226°23.1	56.7	48°08.8	02.0
23	242°13.1	126°20.0	18.9	88°49.3	20.4	241°25.2	56.6	63°11.2	02.0
Mer.pass.:06:54		v-0.7 d-0.5 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°45.9	29°08.8
Ankaa	353°17.9	-42°14.7
Schedar	349°43.4	56°35.5
Diphda	348°58.2	-17°55.6
Achernar	335°28.6	-57°10.7
Hamal	328°03.5	23°30.7
Polaris	319°14.3	89°18.4
Acamar	315°20.3	-40°15.6
Menkar	314°17.7	4°07.9
Mirfak	308°44.1	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°37.0
Alnilam	275°48.9	-1°11.8
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.2
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.5	-59°32.9
Suhail	222°54.4	-43°28.8
Miaplacidus	221°40.8	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.2	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.8	-63°09.8
Gacrux	172°03.3	-57°10.7
Alioth	166°22.2	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.8
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.5	19°07.6
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.7	74°06.8
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.8
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.2	12°33.1
Eltanin	90°46.6	51°29.2
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.1	38°47.5
Nunki	76°00.7	-26°16.9
Altair	62°10.1	8°53.7
Peacock	53°22.2	-56°41.8
Deneb	49°32.8	45°18.9
Enif	33°49.2	9°55.4
Al Na'ir	27°46.3	-46°54.3
Fomalhaut	15°26.3	-29°33.8
Scheat	13°55.6	28°08.3
Markab	13°40.5	15°15.7

Jun 06 Sun	**SHA**	**Mer.pass**
Venus	247°52.3	14:32
Mars	208°03.8	17:09
Jupiter	359°34.1	07:04
Saturn	181°00.0	18:56

Jun 07 Mon	**SHA**	**Mer.pass**
Venus	246°35.8	14:33
Mars	207°34.3	17:07
Jupiter	359°26.5	07:00
Saturn	180°59.5	18:52

Jun 08 Tue	**SHA**	**Mer.pass**
Venus	245°19.6	14:34
Mars	207°04.7	17:05
Jupiter	359°19.1	06:57
Saturn	180°58.8	18:48

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.6	N22°37.1	259°00.5	16.1'	N03°27.9	12.6'	54.7'
1	195°21.5	37.3	273°35.5	16.1'	03°40.5	12.6'	54.7'
2	210°21.4	37.6	288°10.6	16.0'	03°53.2	12.6'	54.7'
3	225°21.3	· · 37.9	302°45.6	16.0'	04°05.8	12.6'	54.7'
4	240°21.2	38.1	317°20.6	16.0'	04°18.4	12.6'	54.8'
5	255°21.1	38.4	331°55.6	15.9'	04°31.0	12.6'	54.8'
6	270°21.0	N22°38.6	346°30.5	15.9'	N04°43.6	12.6'	54.8'
7	285°20.8	38.9	1°05.4	15.9'	04°56.2	12.6'	54.8'
8	300°20.7	39.1	15°40.2	15.8'	05°08.7	12.6'	54.8'
9	315°20.6	· · 39.4	30°15.0	15.8'	05°21.3	12.6'	54.8'
10	330°20.5	39.7	44°49.8	15.8'	05°33.9	12.5'	54.9'
11	345°20.4	39.9	59°24.5	15.7'	05°46.4	12.5'	54.9'
12	0°20.3	N22°40.2	73°59.2	15.7'	N05°58.9	12.5'	54.9'
13	15°20.2	40.4	88°33.9	15.6'	06°11.4	12.5'	54.9'
14	30°20.0	40.7	103°08.5	15.6'	06°23.9	12.5'	54.9'
15	45°19.9	· · 40.9	117°43.0	15.5'	06°36.4	12.5'	55.0'
16	60°19.8	41.2	132°17.6	15.5'	06°48.9	12.5'	55.0'
17	75°19.7	41.4	146°52.0	15.4'	07°01.3	12.4'	55.0'
18	90°19.6	N22°41.7	161°26.4	15.4'	N07°13.8	12.4'	55.0'
19	105°19.5	41.9	176°00.8	15.3'	07°26.2	12.4'	55.0'
20	120°19.4	42.2	190°35.1	15.3'	07°38.6	12.4'	55.1'
21	135°19.2	· · 42.4	205°09.4	15.2'	07°51.0	12.4'	55.1'
22	150°19.1	42.7	219°43.6	15.2'	08°03.3	12.3'	55.1'
23	165°19.0	42.9	234°17.8	15.1'	08°15.6	12.3'	55.1'
	SD.=15.7	d=0.3	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.9	N22°43.2	248°51.9	15.1'	N08°27.9	12.3'	55.2'
1	195°18.8	43.4	263°26.0	15.0'	08°40.2	12.3'	55.2'
2	210°18.7	43.7	278°00.0	15.0'	08°52.5	12.2'	55.2'
3	225°18.5	· · 43.9	292°33.9	14.9'	09°04.7	12.2'	55.2'
4	240°18.4	44.2	307°07.8	14.9'	09°16.9	12.2'	55.2'
5	255°18.3	44.4	321°41.6	14.8'	09°29.1	12.2'	55.3'
6	270°18.2	N22°44.7	336°15.4	14.7'	N09°41.3	12.1'	55.3'
7	285°18.1	44.9	350°49.1	14.7'	09°53.4	12.1'	55.3'
8	300°18.0	45.1	5°22.7	14.6'	10°05.5	12.1'	55.3'
9	315°17.8	· · 45.4	19°56.3	14.5'	10°17.6	12.1'	55.4'
10	330°17.7	45.6	34°29.8	14.5'	10°29.6	12.0'	55.4'
11	345°17.6	45.9	49°03.3	14.4'	10°41.6	12.0'	55.4'
12	0°17.5	N22°46.1	63°36.7	14.3'	N10°53.6	12.0'	55.4'
13	15°17.4	46.3	78°10.0	14.3'	11°05.5	11.9'	55.5'
14	30°17.3	46.6	92°43.2	14.2'	11°17.4	11.9'	55.5'
15	45°17.1	· · 46.8	107°16.4	14.1'	11°29.3	11.8'	55.5'
16	60°17.0	47.0	121°49.5	14.1'	11°41.1	11.8'	55.5'
17	75°16.9	47.3	136°22.5	14.0'	11°52.9	11.8'	55.6'
18	90°16.8	N22°47.5	150°55.5	13.9'	N12°04.7	11.7'	55.6'
19	105°16.7	47.7	165°28.4	13.9'	12°16.4	11.7'	55.6'
20	120°16.5	48.0	180°01.2	13.8'	12°28.0	11.6'	55.7'
21	135°16.4	· · 48.2	194°33.9	13.7'	12°39.7	11.6'	55.7'
22	150°16.3	48.4	209°06.6	13.6'	12°51.3	11.6'	55.7'
23	165°16.2	48.7	223°39.2	13.5'	13°02.8	11.5'	55.7'
	SD.=15.7	d=0.2	S.D.=15.1				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.1	N22°48.9	238°11.7	13.5'	N13°14.3	11.5'	55.8'
1	195°16.0	49.1	252°44.1	13.4'	13°25.7	11.4'	55.8'
2	210°15.8	49.4	267°16.5	13.3'	13°37.1	11.4'	55.8'
3	225°15.7	· · 49.6	281°48.7	13.2'	13°48.5	11.3'	55.8'
4	240°15.6	49.8	296°20.9	13.1'	13°59.8	11.3'	55.9'
5	255°15.5	50.0	310°53.0	13.1'	14°11.1	11.2'	55.9'
6	270°15.4	N22°50.3	325°25.0	13.0'	N14°22.3	11.2'	55.9'
7	285°15.2	50.5	339°57.0	12.9'	14°33.4	11.1'	56.0'
8	300°15.1	50.7	354°28.8	12.8'	14°44.5	11.1'	56.0'
9	315°15.0	· · 50.9	9°00.6	12.7'	14°55.5	11.0'	56.0'
10	330°14.9	51.2	23°32.3	12.6'	15°06.5	11.0'	56.0'
11	345°14.8	51.4	38°03.8	12.5'	15°17.5	10.9'	56.1'
12	0°14.6	N22°51.6	52°35.3	12.5'	N15°28.3	10.8'	56.1'
13	15°14.5	51.8	67°06.8	12.4'	15°39.1	10.8'	56.1'
14	30°14.4	52.1	81°38.1	12.3'	15°49.9	10.7'	56.2'
15	45°14.3	· · 52.3	96°09.3	12.2'	16°00.6	10.7'	56.2'
16	60°14.1	52.5	110°40.4	12.1'	16°11.2	10.6'	56.2'
17	75°14.0	52.7	125°11.5	12.0'	16°21.7	10.5'	56.3'
18	90°13.9	N22°52.9	139°42.4	11.9'	N16°32.2	10.5'	56.3'
19	105°13.8	53.2	154°13.3	11.8'	16°42.7	10.4'	56.3'
20	120°13.7	53.4	168°44.1	11.7'	16°53.0	10.3'	56.3'
21	135°13.5	· · 53.6	183°14.7	11.6'	17°03.3	10.3'	56.4'
22	150°13.4	53.8	197°45.3	11.5'	17°13.5	10.2'	56.4'
23	165°13.3	54.0	212°15.8	11.4'	17°23.7	10.1'	56.4'
	SD.=15.7	d=0.2	S.D.=15.3				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	00:46	23:17	▭	▭
64°	▭	▭	01:45	22:14	▭	▭
62°	▭	▭	02:18	21:41	▭	▭
60°	▭	01:10	02:42	21:17	22:50	▭
N 58°	▭	01:50	03:01	20:57	22:09	▭
56°	▭	02:17	03:17	20:41	21:42	▭
54°	01:04	02:38	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	20:49	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	19:41	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	19:31
N 10°	04:48	05:15	05:38	18:20	18:43	19:09
0°	05:07	05:33	05:55	18:02	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	07:21	08:02	15:56	16:36	17:19
54°	06:43	07:29	08:12	15:45	16:28	17:14
56°	06:49	07:38	08:25	15:33	16:20	17:08
58°	06:56	07:48	08:38	15:19	16:10	17:02
S 60°	07:03	07:59	08:55	15:02	15:59	16:55

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

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 23-25 35-18%
06	01:27	01:21	11:59	06:56	19:16	
07	01:16	01:10	11:59	07:38	20:00	
08	01:04	00:59	11:59	08:23	20:47	

June 09, 10, 11 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	257°15.6	141°19.3	N23°18.4	103°50.6	N12°19.9	256°27.4	S00°56.5	78°13.7	N03°02.0
1	272°18.0	156°18.6	17.9	118°51.8	19.4	271°29.6	56.4	93°16.1	01.9
2	287°20.5	171°17.9	17.4	133°53.0	18.9	286°31.7	56.2	108°18.5	01.9
3	302°23.0	186°17.2	·· 17.0	148°54.2	·· 18.4	301°33.9	·· 56.1	123°21.0	·· 01.9
4	317°25.4	201°16.5	16.5	163°55.5	17.9	316°36.0	56.0	138°23.4	01.9
5	332°27.9	216°15.8	16.0	178°56.7	17.4	331°38.2	55.9	153°25.8	01.8
6	347°30.4	231°15.1	N23°15.5	193°57.9	N12°16.8	346°40.4	S00°55.8	168°28.3	N03°01.8
7	2°32.8	246°14.4	15.0	208°59.1	16.3	1°42.5	55.6	183°30.7	01.8
8	17°35.3	261°13.8	14.5	224°00.4	15.8	16°44.7	55.5	198°33.1	01.8
9	32°37.8	276°13.1	·· 14.0	239°01.6	·· 15.3	31°46.9	·· 55.4	213°35.6	·· 01.7
10	47°40.2	291°12.4	13.5	254°02.8	14.8	46°49.0	55.3	228°38.0	01.7
11	62°42.7	306°11.7	13.0	269°04.0	14.3	61°51.2	55.2	243°40.4	01.7
12	77°45.1	321°11.0	N23°12.5	284°05.3	N12°13.8	76°53.4	S00°55.0	258°42.8	N03°01.7
13	92°47.6	336°10.3	12.0	299°06.5	13.3	91°55.5	54.9	273°45.3	01.6
14	107°50.1	351°09.6	11.5	314°07.7	12.8	106°57.7	54.8	288°47.7	01.6
15	122°52.5	6°08.9	·· 11.0	329°08.9	·· 12.3	121°59.9	·· 54.7	303°50.1	·· 01.6
16	137°55.0	21°08.3	10.4	344°10.2	11.8	137°02.0	54.6	318°52.6	01.6
17	152°57.5	36°07.6	09.9	359°11.4	11.2	152°04.2	54.5	333°55.0	01.5
18	167°59.9	51°06.9	N23°09.4	14°12.6	N12°10.7	167°06.4	S00°54.3	348°57.4	N03°01.5
19	183°02.4	66°06.2	08.9	29°13.8	10.2	182°08.5	54.2	3°59.8	01.5
20	198°04.9	81°05.5	08.4	44°15.1	09.7	197°10.7	54.1	19°02.3	01.5
21	213°07.3	96°04.8	·· 07.9	59°16.3	·· 09.2	212°12.9	·· 54.0	34°04.7	·· 01.4
22	228°09.8	111°04.2	07.4	74°17.5	08.7	227°15.0	53.9	49°07.1	01.4
23	243°12.3	126°03.5	06.9	89°18.7	08.2	242°17.2	53.8	64°09.6	01.4
Mer.pass.:06:50		v-0.7 d-0.5 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.0	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	258°14.7	141°02.8	N23°06.3	104°19.9	N12°07.7	257°19.4	S00°53.6	79°12.0	N03°01.4
1	273°17.2	156°02.1	05.8	119°21.2	07.2	272°21.5	53.5	94°14.4	01.3
2	288°19.6	171°01.4	05.3	134°22.4	06.6	287°23.7	53.4	109°16.8	01.3
3	303°22.1	186°00.8	·· 04.8	149°23.6	·· 06.1	302°25.9	·· 53.3	124°19.3	·· 01.3
4	318°24.6	201°00.1	04.3	164°24.8	05.6	317°28.0	53.2	139°21.7	01.3
5	333°27.0	215°59.4	03.8	179°26.0	05.1	332°30.2	53.1	154°24.1	01.2
6	348°29.5	230°58.7	N23°03.2	194°27.3	N12°04.6	347°32.4	S00°52.9	169°26.6	N03°01.2
7	3°32.0	245°58.1	02.7	209°28.5	04.1	2°34.5	52.8	184°29.0	01.2
8	18°34.4	260°57.4	02.2	224°29.7	03.6	17°36.7	52.7	199°31.4	01.2
9	33°36.9	275°56.7	·· 01.7	239°30.9	·· 03.1	32°38.9	·· 52.6	214°33.8	·· 01.1
10	48°39.4	290°56.0	01.1	254°32.1	02.5	47°41.1	52.5	229°36.3	01.1
11	63°41.8	305°55.4	00.6	269°33.4	02.0	62°43.2	52.4	244°38.7	01.1
12	78°44.3	320°54.7	N23°00.1	284°34.6	N12°01.5	77°45.4	S00°52.2	259°41.1	N03°01.0
13	93°46.7	335°54.0	22°59.5	299°35.8	01.0	92°47.6	52.1	274°43.5	01.0
14	108°49.2	350°53.3	59.0	314°37.0	00.5	107°49.7	52.0	289°46.0	01.0
15	123°51.7	5°52.7	·· 58.5	329°38.2	12°00.0	122°51.9	·· 51.9	304°48.4	·· 01.0
16	138°54.1	20°52.0	57.9	344°39.5	11°59.5	137°54.1	51.8	319°50.8	00.9
17	153°56.6	35°51.3	57.4	359°40.7	58.9	152°56.3	51.7	334°53.2	00.9
18	168°59.1	50°50.7	N22°56.9	14°41.9	N11°58.4	167°58.4	S00°51.6	349°55.7	N03°00.9
19	184°01.5	65°50.0	56.3	29°43.1	57.9	183°00.6	51.4	4°58.1	00.9
20	199°04.0	80°49.3	55.8	44°44.3	57.4	198°02.8	51.3	20°00.5	00.8
21	214°06.5	95°48.7	·· 55.3	59°45.6	·· 56.9	213°04.9	·· 51.2	35°02.9	·· 00.8
22	229°08.9	110°48.0	54.7	74°46.8	56.4	228°07.1	51.1	50°05.4	00.8
23	244°11.4	125°47.3	54.2	89°48.0	55.9	243°09.3	51.0	65°07.8	00.7
Mer.pass.:06:46		v-0.7 d-0.5 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.0	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	259°13.9	140°46.7	N22°53.6	104°49.2	N11°55.3	258°11.5	S00°50.9	80°10.2	N03°00.7
1	274°16.3	155°46.0	53.1	119°50.4	54.8	273°13.6	50.8	95°12.6	00.7
2	289°18.8	170°45.3	52.6	134°51.7	54.3	288°15.8	50.6	110°15.1	00.7
3	304°21.2	185°44.7	·· 52.0	149°52.9	·· 53.8	303°18.0	·· 50.5	125°17.5	·· 00.6
4	319°23.7	200°44.0	51.5	164°54.1	53.3	318°20.2	50.4	140°19.9	00.6
5	334°26.2	215°43.3	50.9	179°55.3	52.8	333°22.3	50.3	155°22.3	00.6
6	349°28.6	230°42.7	N22°50.4	194°56.5	N11°52.2	348°24.5	S00°50.2	170°24.8	N03°00.6
7	4°31.1	245°42.0	49.8	209°57.7	51.7	3°26.7	50.1	185°27.2	00.5
8	19°33.6	260°41.3	49.3	224°59.0	51.2	18°28.9	50.0	200°29.6	00.5
9	34°36.0	275°40.7	·· 48.7	240°00.2	·· 50.7	33°31.0	·· 49.8	215°32.0	·· 00.5
10	49°38.5	290°40.0	48.2	255°01.4	50.2	48°33.2	49.7	230°34.4	00.4
11	64°41.0	305°39.4	47.6	270°02.6	49.7	63°35.4	49.6	245°36.9	00.4
12	79°43.4	320°38.7	N22°47.1	285°03.8	N11°49.1	78°37.6	S00°49.5	260°39.3	N03°00.4
13	94°45.9	335°38.0	46.5	300°05.0	48.6	93°39.7	49.4	275°41.7	00.4
14	109°48.4	350°37.4	45.9	315°06.3	48.1	108°41.9	49.3	290°44.1	00.3
15	124°50.8	5°36.7	·· 45.4	330°07.5	·· 47.6	123°44.1	·· 49.2	305°46.6	·· 00.3
16	139°53.3	20°36.1	44.8	345°08.7	47.1	138°46.3	49.1	320°49.0	00.3
17	154°55.7	35°35.4	44.3	0°09.9	46.6	153°48.5	48.9	335°51.4	00.2
18	169°58.2	50°34.7	N22°43.7	15°11.1	N11°46.0	168°50.6	S00°48.8	350°53.8	N03°00.2
19	185°00.7	65°34.1	43.1	30°12.3	45.5	183°52.8	48.7	5°56.2	00.2
20	200°03.1	80°33.4	42.6	45°13.6	45.0	198°55.0	48.6	20°58.7	00.2
21	215°05.6	95°32.8	·· 42.0	60°14.8	·· 44.5	213°57.2	·· 48.5	36°01.1	·· 00.1
22	230°08.1	110°32.1	41.5	75°16.0	44.0	228°59.3	48.4	51°03.5	00.1
23	245°10.5	125°31.5	40.9	90°17.2	43.5	244°01.5	48.3	66°05.9	00.1
Mer.pass.:06:42		v-0.7 d-0.5 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.9	29°08.8
Ankaa	353°17.9	-42°14.7
Schedar	349°43.4	56°35.5
Diphda	348°58.2	-17°55.6
Achernar	335°28.6	-57°10.7
Hamal	328°03.5	23°30.7
Polaris	319°13.2	89°18.4
Acamar	315°20.3	-40°15.6
Menkar	314°17.6	4°07.9
Mirfak	308°44.0	49°53.8
Aldebaran	290°52.3	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.2
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.5	-59°32.9
Suhail	222°54.4	-43°28.8
Miaplacidus	221°40.9	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.3	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.8	-63°09.8
Gacrux	172°03.3	-57°10.7
Alioth	166°22.2	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.8
Hadar	148°50.7	-60°25.7
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.7	74°06.9
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.8
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.1	12°33.1
Eltanin	90°46.6	51°29.2
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.0	38°47.5
Nunki	76°00.7	-26°16.9
Altair	62°10.1	8°53.8
Peacock	53°22.2	-56°41.8
Deneb	49°32.7	45°18.9
Enif	33°49.2	9°55.4
Al Na'ir	27°46.2	-46°54.3
Fomalhaut	15°26.3	-29°33.8
Scheat	13°55.5	28°08.3
Markab	13°40.5	15°15.7

Jun 09 Wed	**SHA**	**Mer.pass**
Venus	244°03.7	14:35
Mars	206°35.0	17:03
Jupiter	359°11.8	06:53
Saturn	180°58.1	18:44

Jun 10 Thu	**SHA**	**Mer.pass**
Venus	242°48.1	14:36
Mars	206°05.2	17:01
Jupiter	359°04.6	06:50
Saturn	180°57.3	18:40

Jun 11 Fri	**SHA**	**Mer.pass**
Venus	241°32.8	14:38
Mars	205°35.4	16:59
Jupiter	358°57.6	06:46
Saturn	180°56.4	18:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°13.2	**N**22°54.2	226°46.2	11.3'	**N**17°33.7	10.0'	56.5'
1	195°13.1	54.4	241°16.5	11.2'	17°43.7	10.0'	56.5'
2	210°12.9	54.7	255°46.6	11.1'	17°53.6	9.9'	56.5'
3	225°12.8	· · 54.9	270°16.7	11.0'	18°03.5	9.8'	56.6'
4	240°12.7	55.1	284°46.7	10.9'	18°13.3	9.7'	56.6'
5	255°12.6	55.3	299°16.6	10.8'	18°22.9	9.6'	56.6'
6	270°12.4	**N**22°55.5	313°46.4	10.7'	**N**18°32.5	9.6'	56.7'
7	285°12.3	55.7	328°16.1	10.6'	18°42.1	9.5'	56.7'
8	300°12.2	55.9	342°45.7	10.5'	18°51.5	9.4'	56.7'
9	315°12.1	· · 56.1	357°15.2	10.4'	19°00.8	9.3'	56.7'
10	330°11.9	56.3	11°44.6	10.3'	19°10.1	9.2'	56.8'
11	345°11.8	56.5	26°13.8	10.2'	19°19.3	9.1'	56.8'
12	0°11.7	**N**22°56.7	40°43.0	10.1'	**N**19°28.4	9.0'	56.8'
13	15°11.6	56.9	55°12.1	10.0'	19°37.4	8.9'	56.9'
14	30°11.5	57.1	69°41.1	9.9'	19°46.3	8.9'	56.9'
15	45°11.3	· · 57.3	84°10.0	9.8'	19°55.1	8.8'	56.9'
16	60°11.2	57.5	98°38.7	9.7'	20°03.8	8.7'	57.0'
17	75°11.1	57.8	113°07.4	9.6'	20°12.4	8.6'	57.0'
18	90°11.0	**N**22°58.0	127°36.0	9.5'	**N**20°20.9	8.5'	57.0'
19	105°10.8	58.2	142°04.5	9.4'	20°29.3	8.4'	57.1'
20	120°10.7	58.4	156°32.8	9.3'	20°37.7	8.3'	57.1'
21	135°10.6	· · 58.6	171°01.1	9.2'	20°45.9	8.2'	57.1'
22	150°10.5	58.7	185°29.2	9.1'	20°54.0	8.1'	57.2'
23	165°10.3	58.9	199°57.3	9.0'	21°02.0	8.0'	57.2'
	SD.=15.7	d=0.2	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°10.2	**N**22°59.1	214°25.3	8.9'	**N**21°09.9	7.8'	57.2'
1	195°10.1	59.3	228°53.1	8.8'	21°17.7	7.7'	57.3'
2	210°10.0	59.5	243°20.9	8.7'	21°25.4	7.6'	57.3'
3	225°09.8	· · 59.7	257°48.5	8.6'	21°33.0	7.5'	57.3'
4	240°09.7	22°59.9	272°16.1	8.5'	21°40.4	7.4'	57.4'
5	255°09.6	23°00.1	286°43.5	8.4'	21°47.8	7.3'	57.4'
6	270°09.5	**N**23°00.3	301°10.8	8.3'	**N**21°55.0	7.2'	57.4'
7	285°09.3	00.5	315°38.1	8.2'	22°02.1	7.1'	57.5'
8	300°09.2	00.7	330°05.2	8.1'	22°09.1	6.9'	57.5'
9	315°09.1	· · 00.9	344°32.3	8.0'	22°16.0	6.8'	57.5'
10	330°09.0	01.1	358°59.2	7.9'	22°22.8	6.7'	57.5'
11	345°08.8	01.3	13°26.1	7.8'	22°29.4	6.6'	57.6'
12	0°08.7	**N**23°01.5	27°52.8	7.7'	**N**22°35.9	6.5'	57.6'
13	15°08.6	01.6	42°19.5	7.6'	22°42.3	6.3'	57.6'
14	30°08.5	01.8	56°46.0	7.5'	22°48.6	6.2'	57.7'
15	45°08.3	· · 02.0	71°12.5	7.4'	22°54.7	6.1'	57.7'
16	60°08.2	02.2	85°38.8	7.3'	23°00.7	5.9'	57.7'
17	75°08.1	02.4	100°05.1	7.2'	23°06.6	5.8'	57.8'
18	90°07.9	**N**23°02.6	114°31.3	7.1'	**N**23°12.4	5.7'	57.8'
19	105°07.8	02.7	128°57.4	7.0'	23°18.0	5.5'	57.8'
20	120°07.7	02.9	143°23.3	6.9'	23°23.5	5.4'	57.9'
21	135°07.6	· · 03.1	157°49.2	6.9'	23°28.8	5.3'	57.9'
22	150°07.4	03.3	172°15.0	6.8'	23°34.0	5.1'	57.9'
23	165°07.3	03.5	186°40.8	6.7'	23°39.1	5.0'	58.0'
	SD.=15.7	d=0.2	S.D.=15.7				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°07.2	**N**23°03.7	201°06.4	6.6'	**N**23°44.0	4.9'	58.0'
1	195°07.1	03.8	215°31.9	6.5'	23°48.8	4.7'	58.0'
2	210°06.9	04.0	229°57.4	6.4'	23°53.5	4.6'	58.0'
3	225°06.8	· · 04.2	244°22.8	6.3'	23°58.0	4.4'	58.1'
4	240°06.7	04.4	258°48.1	6.2'	24°02.3	4.3'	58.1'
5	255°06.6	04.5	273°13.3	6.2'	24°06.5	4.1'	58.1'
6	270°06.4	**N**23°04.7	287°38.4	6.1'	**N**24°10.6	4.0'	58.2'
7	285°06.3	04.9	302°03.4	6.0'	24°14.5	3.8'	58.2'
8	300°06.2	05.1	316°28.4	5.9'	24°18.3	3.7'	58.2'
9	315°06.0	· · 05.2	330°53.3	5.9'	24°21.9	3.5'	58.3'
10	330°05.9	05.4	345°18.1	5.8'	24°25.4	3.4'	58.3'
11	345°05.8	05.6	359°42.9	5.7'	24°28.7	3.2'	58.3'
12	0°05.7	**N**23°05.8	14°07.6	5.6'	**N**24°31.9	3.1'	58.3'
13	15°05.5	05.9	28°32.2	5.6'	24°34.9	2.9'	58.4'
14	30°05.4	06.1	42°56.7	5.5'	24°37.8	2.8'	58.4'
15	45°05.3	· · 06.3	57°21.2	5.4'	24°40.5	2.6'	58.4'
16	60°05.1	06.4	71°45.6	5.4'	24°43.0	2.5'	58.5'
17	75°05.0	06.6	86°09.9	5.3'	24°45.4	2.3'	58.5'
18	90°04.9	**N**23°06.8	100°34.2	5.3'	**N**24°47.6	2.1'	58.5'
19	105°04.8	06.9	114°58.4	5.2'	24°49.7	2.0'	58.5'
20	120°04.6	07.1	129°22.6	5.1'	24°51.6	1.8'	58.6'
21	135°04.5	· · 07.3	143°46.7	5.1'	24°53.3	1.7'	58.6'
22	150°04.4	07.4	158°10.7	5.0'	24°54.9	1.5'	58.6'
23	165°04.2	07.6	172°34.7	5.0'	24°56.4	1.3'	58.7'
	SD.=15.7	d=0.2	S.D.=15.9				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	00:30	23:36	▭	▭
64°	▭	▭	01:40	22:21	▭	▭
62°	▭	▭	02:14	21:45	▭	▭
60°	▭	01:03	02:39	21:20	22:58	▭
N 58°	▭	01:46	02:59	21:01	22:14	▭
56°	▭	02:14	03:15	20:44	21:46	▭
54°	00:57	02:35	03:29	20:31	21:24	23:03
52°	01:37	02:53	03:41	20:19	21:07	22:22
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	19:13	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	19:03	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°	06:13	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	17:01
S 60°	07:05	08:02	08:59	15:00	15:57	16:53

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 26-28 11-1%
09	00:53	00:47	11:59	09:11	21:37	●
10	00:41	00:35	11:59	10:04	22:32	
11	00:29	00:23	12:00	11:01	23:31	

June 12, 13, 14 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	260°13.0	140°30.8	N22°40.3	105°18.4	N11°42.9	259°03.7	S00°48.2	81°08.3	N03°00.0
1	275°15.5	155°30.2	39.8	120°19.6	42.4	274°05.9	48.0	96°10.8	00.0
2	290°17.9	170°29.5	39.2	135°20.8	41.9	289°08.1	47.9	111°13.2	00.0
3	305°20.4	185°28.9	·· 38.6	150°22.1	·· 41.4	304°10.2	·· 47.8	126°15.6	03°00.0
4	320°22.9	200°28.2	38.0	165°23.3	40.9	319°12.4	47.7	141°18.0	02°59.9
5	335°25.3	215°27.6	37.5	180°24.5	40.3	334°14.6	47.6	156°20.4	59.9
6	350°27.8	230°26.9	N22°36.9	195°25.7	N11°39.8	349°16.8	S00°47.5	171°22.9	N02°59.9
7	5°30.2	245°26.3	36.3	210°26.9	39.3	4°19.0	47.4	186°25.3	59.8
8	20°32.7	260°25.6	35.8	225°28.1	38.8	19°21.1	47.3	201°27.7	59.8
9	35°35.2	275°25.0	·· 35.2	240°29.3	·· 38.3	34°23.3	·· 47.2	216°30.1	·· 59.8
10	50°37.6	290°24.3	34.6	255°30.6	37.7	49°25.5	47.0	231°32.5	59.8
11	65°40.1	305°23.7	34.0	270°31.8	37.2	64°27.7	46.9	246°35.0	59.7
12	80°42.6	320°23.0	N22°33.4	285°33.0	N11°36.7	79°29.9	S00°46.8	261°37.4	N02°59.7
13	95°45.0	335°22.4	32.9	300°34.2	36.2	94°32.1	46.7	276°39.8	59.7
14	110°47.5	350°21.7	32.3	315°35.4	35.7	109°34.2	46.6	291°42.2	59.6
15	125°50.0	5°21.1	·· 31.7	330°36.6	·· 35.1	124°36.4	·· 46.5	306°44.6	·· 59.6
16	140°52.4	20°20.5	31.1	345°37.8	34.6	139°38.6	46.4	321°47.0	59.6
17	155°54.9	35°19.8	30.5	0°39.1	34.1	154°40.8	46.3	336°49.5	59.5
18	170°57.4	50°19.2	N22°29.9	15°40.3	N11°33.6	169°43.0	S00°46.2	351°51.9	N02°59.5
19	185°59.8	65°18.5	29.4	30°41.5	33.0	184°45.2	46.1	6°54.3	59.5
20	201°02.3	80°17.9	28.8	45°42.7	32.5	199°47.3	45.9	21°56.7	59.5
21	216°04.7	95°17.2	·· 28.2	60°43.9	·· 32.0	214°49.5	·· 45.8	36°59.1	·· 59.4
22	231°07.2	110°16.6	27.6	75°45.1	31.5	229°51.7	45.7	52°01.5	59.4
23	246°09.7	125°16.0	27.0	90°46.3	31.0	244°53.9	45.6	67°04.0	59.4
Mer.pass.:06:38		v-0.7 d-0.6 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	261°12.1	140°15.3	N22°26.4	105°47.5	N11°30.4	259°56.1	S00°45.5	82°06.4	N02°59.3
1	276°14.6	155°14.7	25.8	120°48.7	29.9	274°58.3	45.4	97°08.8	59.3
2	291°17.1	170°14.1	25.2	135°50.0	29.4	290°00.4	45.3	112°11.2	59.3
3	306°19.5	185°13.4	·· 24.6	150°51.2	·· 28.9	305°02.6	·· 45.2	127°13.6	·· 59.2
4	321°22.0	200°12.8	24.0	165°52.4	28.3	320°04.8	45.1	142°16.0	59.2
5	336°24.5	215°12.1	23.4	180°53.6	27.8	335°07.0	45.0	157°18.5	59.2
6	351°26.9	230°11.5	N22°22.8	195°54.8	N11°27.3	350°09.2	S00°44.9	172°20.9	N02°59.1
7	6°29.4	245°10.9	22.2	210°56.0	26.8	5°11.4	44.7	187°23.3	59.1
8	21°31.9	260°10.2	21.6	225°57.2	26.3	20°13.6	44.6	202°25.7	59.1
9	36°34.3	275°09.6	·· 21.0	240°58.4	·· 25.7	35°15.8	·· 44.5	217°28.1	·· 59.1
10	51°36.8	290°09.0	20.4	255°59.6	25.2	50°17.9	44.4	232°30.5	59.0
11	66°39.2	305°08.3	19.8	271°00.9	24.7	65°20.1	44.3	247°33.0	59.0
12	81°41.7	320°07.7	N22°19.2	286°02.1	N11°24.2	80°22.3	S00°44.2	262°35.4	N02°59.0
13	96°44.2	335°07.1	18.6	301°03.3	23.6	95°24.5	44.1	277°37.8	58.9
14	111°46.6	350°06.5	18.0	316°04.5	23.1	110°26.7	44.0	292°40.2	58.9
15	126°49.1	5°05.8	·· 17.4	331°05.7	·· 22.6	125°28.9	·· 43.9	307°42.6	·· 58.9
16	141°51.6	20°05.2	16.8	346°06.9	22.1	140°31.1	43.8	322°45.0	58.8
17	156°54.0	35°04.6	16.2	1°08.1	21.5	155°33.3	43.7	337°47.4	58.8
18	171°56.5	50°03.9	N22°15.6	16°09.3	N11°21.0	170°35.4	S00°43.6	352°49.8	N02°58.8
19	186°59.0	65°03.3	15.0	31°10.5	20.5	185°37.6	43.5	7°52.3	58.7
20	202°01.4	80°02.7	14.4	46°11.7	20.0	200°39.8	43.3	22°54.7	58.7
21	217°03.9	95°02.1	·· 13.7	61°12.9	·· 19.4	215°42.0	·· 43.2	37°57.1	·· 58.7
22	232°06.4	110°01.4	13.1	76°14.2	18.9	230°44.2	43.1	52°59.5	58.6
23	247°08.8	125°00.8	12.5	91°15.4	18.4	245°46.4	43.0	68°01.9	58.6
Mer.pass.:06:34		v-0.6 d-0.6 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	262°11.3	140°00.2	N22°11.9	106°16.6	N11°17.9	260°48.6	S00°42.9	83°04.3	N02°58.6
1	277°13.7	154°59.6	11.3	121°17.8	17.3	275°50.8	42.8	98°06.7	58.5
2	292°16.2	169°58.9	10.7	136°19.0	16.8	290°53.0	42.7	113°09.2	58.5
3	307°18.7	184°58.3	·· 10.0	151°20.2	·· 16.3	305°55.2	·· 42.6	128°11.6	·· 58.5
4	322°21.1	199°57.7	09.4	166°21.4	15.8	320°57.4	42.5	143°14.0	58.4
5	337°23.6	214°57.1	08.8	181°22.6	15.2	335°59.5	42.4	158°16.4	58.4
6	352°26.1	229°56.4	N22°08.2	196°23.8	N11°14.7	351°01.7	S00°42.3	173°18.8	N02°58.4
7	7°28.5	244°55.8	07.6	211°25.0	14.2	6°03.9	42.2	188°21.2	58.3
8	22°31.0	259°55.2	06.9	226°26.2	13.6	21°06.1	42.1	203°23.6	58.3
9	37°33.5	274°54.6	·· 06.3	241°27.4	·· 13.1	36°08.3	·· 42.0	218°26.0	·· 58.3
10	52°35.9	289°54.0	05.7	256°28.6	12.6	51°10.5	41.9	233°28.4	58.2
11	67°38.4	304°53.4	05.1	271°29.9	12.1	66°12.7	41.8	248°30.9	58.2
12	82°40.9	319°52.7	N22°04.4	286°31.1	N11°11.5	81°14.9	S00°41.7	263°33.3	N02°58.2
13	97°43.3	334°52.1	03.8	301°32.3	11.0	96°17.1	41.5	278°35.7	58.1
14	112°45.8	349°51.5	03.2	316°33.5	10.5	111°19.3	41.4	293°38.1	58.1
15	127°48.2	4°50.9	·· 02.5	331°34.7	·· 10.0	126°21.5	·· 41.3	308°40.5	·· 58.1
16	142°50.7	19°50.3	01.9	346°35.9	09.4	141°23.7	41.2	323°42.9	58.0
17	157°53.2	34°49.7	01.3	1°37.1	08.9	156°25.9	41.1	338°45.3	58.0
18	172°55.6	49°49.1	N22°00.6	16°38.3	N11°08.4	171°28.1	S00°41.0	353°47.7	N02°58.0
19	187°58.1	64°48.4	22°00.0	31°39.5	07.8	186°30.3	40.9	8°50.1	57.9
20	203°00.6	79°47.8	21°59.4	46°40.7	07.3	201°32.4	40.8	23°52.5	57.9
21	218°03.0	94°47.2	·· 58.7	61°41.9	·· 06.8	216°34.6	·· 40.7	38°55.0	·· 57.9
22	233°05.5	109°46.6	58.1	76°43.1	06.3	231°36.8	40.6	53°57.4	57.8
23	248°08.0	124°46.0	57.4	91°44.3	05.7	246°39.0	40.5	68°59.8	57.8
Mer.pass.:06:30		v-0.6 d-0.6 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.9	29°08.8
Ankaa	353°17.9	-42°14.6
Schedar	349°43.3	56°35.5
Diphda	348°58.2	-17°55.6
Achernar	335°28.6	-57°10.7
Hamal	328°03.5	23°30.7
Polaris	319°11.9	89°18.4
Acamar	315°20.3	-40°15.6
Menkar	314°17.6	4°07.9
Mirfak	308°44.0	49°53.8
Aldebaran	290°52.2	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.2
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.5	-59°32.8
Suhail	222°54.4	-43°28.8
Miaplacidus	221°40.9	-69°46.0
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.3	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.8	-63°09.8
Gacrux	172°03.3	-57°10.7
Alioth	166°22.2	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.8
Hadar	148°50.7	-60°25.7
Menkent	148°09.9	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.3	-60°52.9
Kochab	137°18.7	74°06.9
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.8
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.1	12°33.1
Eltanin	90°46.6	51°29.2
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.7	-26°16.9
Altair	62°10.1	8°53.8
Peacock	53°22.1	-56°41.8
Deneb	49°32.7	45°18.9
Enif	33°49.1	9°55.4
Al Na'ir	27°46.2	-46°54.3
Fomalhaut	15°26.3	-29°33.8
Scheat	13°55.5	28°08.3
Markab	13°40.5	15°15.7

Jun 12 Sat	**SHA**	**Mer.pass**
Venus	240°17.8	14:39
Mars	205°05.4	16:57
Jupiter	358°50.7	06:43
Saturn	180°55.3	18:32

Jun 13 Sun	**SHA**	**Mer.pass**
Venus	239°03.2	14:40
Mars	204°35.4	16:55
Jupiter	358°43.9	06:39
Saturn	180°54.2	18:29

Jun 14 Mon	**SHA**	**Mer.pass**
Venus	237°48.9	14:41
Mars	204°05.3	16:54
Jupiter	358°37.3	06:36
Saturn	180°53.0	18:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°04.1	**N**23°07.8	186°58.7	4.9'	**N**24°57.6	1.2'	58.7'
1	195°04.0	07.9	201°22.6	4.9'	24°58.7	1.0'	58.7'
2	210°03.9	08.1	215°46.5	4.8'	24°59.6	0.8'	58.7'
3	225°03.7	· · 08.2	230°10.3	4.8'	25°00.4	0.7'	58.8'
4	240°03.6	08.4	244°34.0	4.8'	25°01.0	0.5'	58.8'
5	255°03.5	08.6	258°57.8	4.7'	25°01.4	0.3'	58.8'
6	270°03.3	**N**23°08.7	273°21.5	4.7'	**N**25°01.7	0.2'	58.8'
7	285°03.2	08.9	287°45.1	4.6'	25°01.8	0.0'	58.9'
8	300°03.1	09.0	302°08.7	4.6'	25°01.7	-0.2'	58.9'
9	315°02.9	· · 09.2	316°32.3	4.6'	25°01.5	-0.3'	58.9'
10	330°02.8	09.4	330°55.9	4.5'	25°01.0	-0.5'	58.9'
11	345°02.7	09.5	345°19.4	4.5'	25°00.5	-0.7'	59.0'
12	0°02.6	**N**23°09.7	359°43.0	4.5'	**N**24°59.7	-0.8'	59.0'
13	15°02.4	09.8	14°06.4	4.5'	24°58.8	-1.0'	59.0'
14	30°02.3	10.0	28°29.9	4.5'	24°57.7	-1.2'	59.0'
15	45°02.2	· · 10.1	42°53.4	4.4'	24°56.4	-1.3'	59.1'
16	60°02.0	10.3	57°16.8	4.4'	24°55.0	-1.5'	59.1'
17	75°01.9	10.4	71°40.2	4.4'	24°53.4	-1.7'	59.1'
18	90°01.8	**N**23°10.6	86°03.6	4.4'	**N**24°51.6	-1.9'	59.1'
19	105°01.6	10.7	100°27.0	4.4'	24°49.7	-2.0'	59.1'
20	120°01.5	10.9	114°50.4	4.4'	24°47.6	-2.2'	59.2'
21	135°01.4	· · 11.0	129°13.8	4.4'	24°45.3	-2.4'	59.2'
22	150°01.2	11.2	143°37.2	4.4'	24°42.8	-2.5'	59.2'
23	165°01.1	11.3	158°00.5	4.4'	24°40.2	-2.7'	59.2'
	SD.=15.7	d=0.2	S.D.=16.1				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°01.0	**N**23°11.5	172°23.9	4.4'	**N**24°37.4	-2.9'	59.3'
1	195°00.9	11.6	186°47.3	4.4'	24°34.4	-3.1'	59.3'
2	210°00.7	11.7	201°10.7	4.4'	24°31.3	-3.2'	59.3'
3	225°00.6	· · 11.9	215°34.1	4.4'	24°28.0	-3.4'	59.3'
4	240°00.5	12.0	229°57.5	4.4'	24°24.5	-3.6'	59.3'
5	255°00.3	12.2	244°20.9	4.4'	24°20.9	-3.7'	59.4'
6	270°00.2	**N**23°12.3	258°44.4	4.4'	**N**24°17.0	-3.9'	59.4'
7	285°00.1	12.5	273°07.8	4.5'	24°13.1	-4.1'	59.4'
8	299°59.9	12.6	287°31.3	4.5'	24°08.9	-4.2'	59.4'
9	314°59.8	· · 12.7	301°54.8	4.5'	24°04.6	-4.4'	59.4'
10	329°59.7	12.9	316°18.3	4.5'	24°00.1	-4.6'	59.4'
11	344°59.5	13.0	330°41.8	4.5'	23°55.4	-4.7'	59.5'
12	359°59.4	**N**23°13.2	345°05.4	4.6'	**N**23°50.6	-4.9'	59.5'
13	14°59.3	13.3	359°29.0	4.6'	23°45.6	-5.1'	59.5'
14	29°59.1	13.4	13°52.6	4.6'	23°40.5	-5.2'	59.5'
15	44°59.0	· · 13.6	28°16.3	4.7'	23°35.2	-5.4'	59.5'
16	59°58.9	13.7	42°39.9	4.7'	23°29.7	-5.6'	59.5'
17	74°58.7	13.8	57°03.7	4.7'	23°24.0	-5.7'	59.6'
18	89°58.6	**N**23°14.0	71°27.4	4.8'	**N**23°18.2	-5.9'	59.6'
19	104°58.5	14.1	85°51.2	4.8'	23°12.3	-6.0'	59.6'
20	119°58.3	14.2	100°15.1	4.9'	23°06.2	-6.2'	59.6'
21	134°58.2	· · 14.4	114°38.9	4.9'	22°59.9	-6.4'	59.6'
22	149°58.1	14.5	129°02.9	4.9'	22°53.4	-6.5'	59.6'
23	164°57.9	14.6	143°26.8	5.0'	22°46.8	-6.7'	59.6'
	SD.=15.7	d=0.1	S.D.=16.2				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°57.8	**N**23°14.7	157°50.9	5.0'	**N**22°40.1	-6.8'	59.7'
1	194°57.7	14.9	172°14.9	5.1'	22°33.2	-7.0'	59.7'
2	209°57.6	15.0	186°39.0	5.1'	22°26.1	-7.1'	59.7'
3	224°57.4	· · 15.1	201°03.2	5.2'	22°18.9	-7.3'	59.7'
4	239°57.3	15.3	215°27.4	5.2'	22°11.5	-7.4'	59.7'
5	254°57.2	15.4	229°51.7	5.3'	22°04.0	-7.6'	59.7'
6	269°57.0	**N**23°15.5	244°16.0	5.4'	**N**21°56.3	-7.7'	59.7'
7	284°56.9	15.6	258°40.4	5.4'	21°48.5	-7.9'	59.7'
8	299°56.8	15.8	273°04.9	5.5'	21°40.5	-8.0'	59.8'
9	314°56.6	· · 15.9	287°29.4	5.5'	21°32.4	-8.2'	59.8'
10	329°56.5	16.0	301°54.0	5.6'	21°24.1	-8.3'	59.8'
11	344°56.4	16.1	316°18.6	5.7'	21°15.7	-8.5'	59.8'
12	359°56.2	**N**23°16.2	330°43.3	5.7'	**N**21°07.2	-8.6'	59.8'
13	14°56.1	16.4	345°08.0	5.8'	20°58.5	-8.8'	59.8'
14	29°56.0	16.5	359°32.9	5.9'	20°49.7	-8.9'	59.8'
15	44°55.8	· · 16.6	13°57.8	5.9'	20°40.7	-9.0'	59.8'
16	59°55.7	16.7	28°22.7	6.0'	20°31.6	-9.2'	59.8'
17	74°55.6	16.8	42°47.7	6.1'	20°22.4	-9.3'	59.8'
18	89°55.4	**N**23°16.9	57°12.8	6.1'	**N**20°13.0	-9.4'	59.8'
19	104°55.3	17.1	71°38.0	6.2'	20°03.5	-9.6'	59.8'
20	119°55.2	17.2	86°03.2	6.3'	19°53.8	-9.7'	59.9'
21	134°55.0	· · 17.3	100°28.5	6.3'	19°44.1	-9.8'	59.9'
22	149°54.9	17.4	114°53.9	6.4'	19°34.1	-10.0'	59.9'
23	164°54.7	17.5	129°19.3	6.5'	19°24.1	-10.1'	59.9'
	SD.=15.7	d=0.1	S.D.=16.3				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 0-2 0-6%
12	00:16	00:10	12:00	12:01	–:–	●
13	00:04	00:02	12:00	13:02	00:32	
14	00:09	00:15	12:00	14:02	01:32	

June 15, 16, 17 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	263°10.4	139°45.4	N21°56.8	106°45.5	N11°05.2	261°41.2	S00°40.4	84°02.2	N02°57.8
1	278°12.9	154°44.8	56.2	121°46.7	04.7	276°43.4	40.3	99°04.6	57.7
2	293°15.3	169°44.2	55.5	136°47.9	04.1	291°45.6	40.2	114°07.0	57.7
3	308°17.8	184°43.6	·· 54.9	151°49.1	·· 03.6	306°47.8	·· 40.1	129°09.4	·· 57.7
4	323°20.3	199°43.0	54.2	166°50.3	03.1	321°50.0	40.0	144°11.8	57.6
5	338°22.7	214°42.3	53.6	181°51.5	02.5	336°52.2	39.9	159°14.2	57.6
6	353°25.2	229°41.7	N21°52.9	196°52.8	N11°02.0	351°54.4	S00°39.8	174°16.6	N02°57.6
7	8°27.7	244°41.1	52.3	211°54.0	01.5	6°56.6	39.7	189°19.0	57.5
8	23°30.1	259°40.5	51.7	226°55.2	01.0	21°58.8	39.6	204°21.4	57.5
9	38°32.6	274°39.9	·· 51.0	241°56.4	11°00.4	37°01.0	·· 39.5	219°23.9	·· 57.5
10	53°35.1	289°39.3	50.4	256°57.6	10°59.9	52°03.2	39.4	234°26.3	57.4
11	68°37.5	304°38.7	49.7	271°58.8	59.4	67°05.4	39.3	249°28.7	57.4
12	83°40.0	319°38.1	N21°49.0	287°00.0	N10°58.8	82°07.6	S00°39.2	264°31.1	N02°57.4
13	98°42.5	334°37.5	48.4	302°01.2	58.3	97°09.8	39.1	279°33.5	57.3
14	113°44.9	349°36.9	47.7	317°02.4	57.8	112°12.0	39.0	294°35.9	57.3
15	128°47.4	4°36.3	·· 47.1	332°03.6	·· 57.2	127°14.2	·· 38.8	309°38.3	·· 57.3
16	143°49.8	19°35.7	46.4	347°04.8	56.7	142°16.4	38.7	324°40.7	57.2
17	158°52.3	34°35.1	45.8	2°06.0	56.2	157°18.6	38.6	339°43.1	57.2
18	173°54.8	49°34.5	N21°45.1	17°07.2	N10°55.6	172°20.8	S00°38.5	354°45.5	N02°57.2
19	188°57.2	64°33.9	44.5	32°08.4	55.1	187°23.0	38.4	9°47.9	57.1
20	203°59.7	79°33.3	43.8	47°09.6	54.6	202°25.2	38.3	24°50.3	57.1
21	219°02.2	94°32.7	·· 43.1	62°10.8	·· 54.0	217°27.4	·· 38.2	39°52.7	·· 57.0
22	234°04.6	109°32.1	42.5	77°12.0	53.5	232°29.6	38.1	54°55.1	57.0
23	249°07.1	124°31.5	41.8	92°13.2	53.0	247°31.8	38.0	69°57.5	57.0
Mer.pass.:06:26		v-0.6 d-0.6 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	264°09.6	139°31.0	N21°41.1	107°14.4	N10°52.4	262°34.0	S00°37.9	84°59.9	N02°56.9
1	279°12.0	154°30.4	40.5	122°15.6	51.9	277°36.2	37.8	100°02.3	56.9
2	294°14.5	169°29.8	39.8	137°16.8	51.4	292°38.4	37.7	115°04.8	56.9
3	309°17.0	184°29.2	·· 39.1	152°18.0	·· 50.9	307°40.6	·· 37.6	130°07.2	·· 56.8
4	324°19.4	199°28.6	38.5	167°19.2	50.3	322°42.8	37.5	145°09.6	56.8
5	339°21.9	214°28.0	37.8	182°20.4	49.8	337°45.0	37.4	160°12.0	56.8
6	354°24.3	229°27.4	N21°37.1	197°21.6	N10°49.3	352°47.2	S00°37.3	175°14.4	N02°56.7
7	9°26.8	244°26.8	36.5	212°22.8	48.7	7°49.4	37.2	190°16.8	56.7
8	24°29.3	259°26.2	35.8	227°24.0	48.2	22°51.6	37.1	205°19.2	56.7
9	39°31.7	274°25.6	·· 35.1	242°25.2	·· 47.6	37°53.9	·· 37.0	220°21.6	·· 56.6
10	54°34.2	289°25.0	34.5	257°26.4	47.1	52°56.1	36.9	235°24.0	56.6
11	69°36.7	304°24.5	33.8	272°27.6	46.6	67°58.3	36.8	250°26.4	56.5
12	84°39.1	319°23.9	N21°33.1	287°28.8	N10°46.0	83°00.5	S00°36.7	265°28.8	N02°56.5
13	99°41.6	334°23.3	32.4	302°30.0	45.5	98°02.7	36.6	280°31.2	56.5
14	114°44.1	349°22.7	31.8	317°31.2	45.0	113°04.9	36.5	295°33.6	56.4
15	129°46.5	4°22.1	·· 31.1	332°32.4	·· 44.4	128°07.1	·· 36.4	310°36.0	·· 56.4
16	144°49.0	19°21.5	30.4	347°33.6	43.9	143°09.3	36.3	325°38.4	56.4
17	159°51.5	34°20.9	29.7	2°34.8	43.4	158°11.5	36.2	340°40.8	56.3
18	174°53.9	49°20.4	N21°29.0	17°36.0	N10°42.8	173°13.7	S00°36.1	355°43.2	N02°56.3
19	189°56.4	64°19.8	28.3	32°37.2	42.3	188°15.9	36.0	10°45.6	56.3
20	204°58.8	79°19.2	27.7	47°38.4	41.8	203°18.1	35.9	25°48.0	56.2
21	220°01.3	94°18.6	·· 27.0	62°39.6	·· 41.2	218°20.3	·· 35.8	40°50.4	·· 56.2
22	235°03.8	109°18.0	26.3	77°40.8	40.7	233°22.5	35.7	55°52.8	56.1
23	250°06.2	124°17.5	25.6	92°42.0	40.2	248°24.7	35.6	70°55.2	56.1
Mer.pass.:06:22		v-0.6 d-0.7 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	265°08.7	139°16.9	N21°24.9	107°43.2	N10°39.6	263°26.9	S00°35.5	85°57.6	N02°56.1
1	280°11.2	154°16.3	24.2	122°44.4	39.1	278°29.2	35.4	101°00.0	56.0
2	295°13.6	169°15.7	23.5	137°45.6	38.6	293°31.4	35.3	116°02.4	56.0
3	310°16.1	184°15.2	·· 22.9	152°46.8	·· 38.0	308°33.6	·· 35.2	131°04.8	·· 56.0
4	325°18.6	199°14.6	22.2	167°48.0	37.5	323°35.8	35.1	146°07.2	55.9
5	340°21.0	214°14.0	21.5	182°49.2	36.9	338°38.0	35.0	161°09.6	55.9
6	355°23.5	229°13.4	N21°20.8	197°50.4	N10°36.4	353°40.2	S00°34.9	176°12.0	N02°55.8
7	10°25.9	244°12.9	20.1	212°51.6	35.9	8°42.4	34.8	191°14.4	55.8
8	25°28.4	259°12.3	19.4	227°52.8	35.3	23°44.6	34.7	206°16.8	55.8
9	40°30.9	274°11.7	·· 18.7	242°54.0	·· 34.8	38°46.8	·· 34.6	221°19.2	·· 55.7
10	55°33.3	289°11.1	18.0	257°55.2	34.3	53°49.0	34.6	236°21.6	55.7
11	70°35.8	304°10.6	17.3	272°56.4	33.7	68°51.3	34.5	251°24.0	55.7
12	85°38.3	319°10.0	N21°16.6	287°57.6	N10°33.2	83°53.5	S00°34.4	266°26.4	N02°55.6
13	100°40.7	334°09.4	15.9	302°58.8	32.6	98°55.7	34.3	281°28.8	55.6
14	115°43.2	349°08.9	15.2	318°00.0	32.1	113°57.9	34.2	296°31.2	55.5
15	130°45.7	4°08.3	·· 14.5	333°01.2	·· 31.6	129°00.1	·· 34.1	311°33.6	·· 55.5
16	145°48.1	19°07.7	13.8	348°02.4	31.0	144°02.3	34.0	326°36.0	55.5
17	160°50.6	34°07.1	13.1	3°03.6	30.5	159°04.5	33.9	341°38.4	55.4
18	175°53.1	49°06.6	N21°12.4	18°04.8	N10°29.9	174°06.7	S00°33.8	356°40.8	N02°55.4
19	190°55.5	64°06.0	11.7	33°06.0	29.4	189°08.9	33.7	11°43.2	55.4
20	205°58.0	79°05.5	11.0	48°07.2	28.9	204°11.2	33.6	26°45.6	55.3
21	221°00.4	94°04.9	·· 10.3	63°08.4	·· 28.3	219°13.4	·· 33.5	41°48.0	·· 55.3
22	236°02.9	109°04.3	09.6	78°09.6	27.8	234°15.6	33.4	56°50.4	55.2
23	251°05.4	124°03.8	08.9	93°10.7	27.3	249°17.8	33.3	71°52.8	55.2
Mer.pass.:06:18		v-0.6 d-0.7 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.8	29°08.8
Ankaa	353°17.8	-42°14.6
Schedar	349°43.3	56°35.5
Diphda	348°58.1	-17°55.6
Achernar	335°28.5	-57°10.7
Hamal	328°03.5	23°30.7
Polaris	319°10.9	89°18.4
Acamar	315°20.3	-40°15.6
Menkar	314°17.6	4°07.9
Mirfak	308°44.0	49°53.8
Aldebaran	290°52.2	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.1
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.5	-59°32.8
Suhail	222°54.4	-43°28.8
Miaplacidus	221°40.9	-69°45.9
Alphard	217°58.4	-8°42.4
Regulus	207°45.9	11°54.9
Dubhe	193°54.3	61°41.9
Denebola	182°35.8	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.8	-63°09.8
Gacrux	172°03.4	-57°10.7
Alioth	166°22.3	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.8
Hadar	148°50.7	-60°25.7
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.3	-60°53.0
Kochab	137°18.8	74°06.9
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.7
Rasalhague	96°08.1	12°33.1
Eltanin	90°46.6	51°29.2
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.6	-26°16.9
Altair	62°10.1	8°53.8
Peacock	53°22.1	-56°41.8
Deneb	49°32.7	45°19.0
Enif	33°49.1	9°55.4
Al Na'ir	27°46.2	-46°54.3
Fomalhaut	15°26.2	-29°33.7
Scheat	13°55.5	28°08.3
Markab	13°40.5	15°15.7

Jun 15 Tue	**SHA**	**Mer.pass**
Venus	236°35.0	14:42
Mars	203°35.1	16:52
Jupiter	358°30.8	06:32
Saturn	180°51.8	18:21

Jun 16 Wed	**SHA**	**Mer.pass**
Venus	235°21.4	14:43
Mars	203°04.8	16:50
Jupiter	358°24.5	06:29
Saturn	180°50.4	18:17

Jun 17 Thu	**SHA**	**Mer.pass**
Venus	234°08.2	14:43
Mars	202°34.5	16:48
Jupiter	358°18.2	06:25
Saturn	180°48.9	18:13

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0541 sec ΔT = TT-UT1 = +66.2381 sec

2010 June 15 to Jun. 17 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°54.6	N23°17.6	143°44.9	6.6'	N19°14.0	-10.2'	59.9'
1	194°54.5	17.7	158°10.5	6.6'	19°03.7	-10.3'	59.9'
2	209°54.3	17.8	172°36.1	6.7'	18°53.3	-10.5'	59.9'
3	224°54.2	· · 18.0	187°01.9	6.8'	18°42.8	-10.6'	59.9'
4	239°54.1	18.1	201°27.7	6.8'	18°32.1	-10.7'	59.9'
5	254°53.9	18.2	215°53.5	6.9'	18°21.4	-10.8'	59.9'
6	269°53.8	N23°18.3	230°19.5	7.0'	N18°10.5	-10.9'	59.9'
7	284°53.7	18.4	244°45.5	7.1'	17°59.5	-11.0'	59.9'
8	299°53.5	18.5	259°11.7	7.1'	17°48.4	-11.2'	59.9'
9	314°53.4	· · 18.6	273°37.8	7.2'	17°37.2	-11.3'	59.9'
10	329°53.3	18.7	288°04.1	7.3'	17°25.8	-11.4'	59.9'
11	344°53.1	18.8	302°30.4	7.4'	17°14.4	-11.5'	59.9'
12	359°53.0	N23°18.9	316°56.9	7.5'	N17°02.9	-11.6'	59.9'
13	14°52.9	19.0	331°23.4	7.5'	16°51.2	-11.7'	59.9'
14	29°52.7	19.1	345°49.9	7.6'	16°39.5	-11.8'	59.9'
15	44°52.6	· · 19.2	0°16.6	7.7'	16°27.6	-11.9'	59.9'
16	59°52.5	19.3	14°43.3	7.8'	16°15.6	-12.0'	59.9'
17	74°52.3	19.4	29°10.1	7.8'	16°03.6	-12.1'	59.9'
18	89°52.2	N23°19.5	43°36.9	7.9'	N15°51.4	-12.2'	59.9'
19	104°52.1	19.6	58°03.9	8.0'	15°39.2	-12.3'	59.9'
20	119°51.9	19.7	72°30.9	8.1'	15°26.8	-12.4'	59.9'
21	134°51.8	· · 19.8	86°58.0	8.1'	15°14.4	-12.5'	59.9'
22	149°51.7	19.9	101°25.2	8.2'	15°01.9	-12.6'	59.9'
23	164°51.5	20.0	115°52.4	8.3'	14°49.3	-12.7'	59.9'
	SD.=15.7	d=0.1	S.D.=16.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°51.4	N23°20.1	130°19.7	8.4'	N14°36.6	-12.7'	59.9'
1	194°51.3	20.2	144°47.1	8.4'	14°23.8	-12.8'	59.9'
2	209°51.1	20.3	159°14.6	8.5'	14°10.9	-12.9'	59.9'
3	224°51.0	· · 20.4	173°42.1	8.6'	13°58.0	-13.0'	59.9'
4	239°50.8	20.5	188°09.7	8.6'	13°44.9	-13.1'	59.9'
5	254°50.7	20.6	202°37.4	8.7'	13°31.8	-13.1'	59.9'
6	269°50.6	N23°20.6	217°05.2	8.8'	N13°18.6	-13.2'	59.9'
7	284°50.4	20.7	231°33.0	8.9'	13°05.4	-13.3'	59.9'
8	299°50.3	20.8	246°00.9	8.9'	12°52.0	-13.4'	59.9'
9	314°50.2	· · 20.9	260°28.8	9.0'	12°38.6	-13.4'	59.9'
10	329°50.0	21.0	274°56.9	9.1'	12°25.1	-13.5'	59.9'
11	344°49.9	21.1	289°25.0	9.1'	12°11.6	-13.6'	59.8'
12	359°49.8	N23°21.2	303°53.1	9.2'	N11°58.0	-13.6'	59.8'
13	14°49.6	21.3	318°21.4	9.3'	11°44.3	-13.7'	59.8'
14	29°49.5	21.3	332°49.7	9.3'	11°30.6	-13.8'	59.8'
15	44°49.4	· · 21.4	347°18.0	9.4'	11°16.7	-13.8'	59.8'
16	59°49.2	21.5	1°46.5	9.5'	11°02.9	-13.9'	59.8'
17	74°49.1	21.6	16°15.0	9.5'	10°48.9	-14.0'	59.8'
18	89°49.0	N23°21.7	30°43.5	9.6'	N10°35.0	-14.0'	59.8'
19	104°48.8	21.8	45°12.1	9.7'	10°20.9	-14.1'	59.8'
20	119°48.7	21.8	59°40.8	9.7'	10°06.8	-14.1'	59.8'
21	134°48.5	· · 21.9	74°09.6	9.8'	09°52.7	-14.2'	59.8'
22	149°48.4	22.0	88°38.4	9.8'	09°38.5	-14.2'	59.8'
23	164°48.3	22.1	103°07.2	9.9'	09°24.2	-14.3'	59.8'
	SD.=15.7	d=0.1	S.D.=16.3				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°48.1	N23°22.2	117°36.2	9.9'	N09°09.9	-14.3'	59.7'
1	194°48.0	22.2	132°05.1	10.0'	08°55.6	-14.4'	59.7'
2	209°47.9	22.3	146°34.2	10.1'	08°41.2	-14.4'	59.7'
3	224°47.7	· · 22.4	161°03.3	10.1'	08°26.8	-14.5'	59.7'
4	239°47.6	22.5	175°32.4	10.2'	08°12.3	-14.5'	59.7'
5	254°47.5	22.5	190°01.6	10.2'	07°57.8	-14.5'	59.7'
6	269°47.3	N23°22.6	204°30.8	10.3'	N07°43.2	-14.6'	59.7'
7	284°47.2	22.7	219°00.1	10.3'	07°28.6	-14.6'	59.7'
8	299°47.1	22.7	233°29.5	10.4'	07°14.0	-14.6'	59.7'
9	314°46.9	· · 22.8	247°58.9	10.4'	06°59.4	-14.7'	59.7'
10	329°46.8	22.9	262°28.4	10.5'	06°44.7	-14.7'	59.6'
11	344°46.6	23.0	276°57.9	10.5'	06°30.0	-14.7'	59.6'
12	359°46.5	N23°23.0	291°27.4	10.6'	N06°15.2	-14.8'	59.6'
13	14°46.4	23.1	305°57.0	10.6'	06°00.4	-14.8'	59.6'
14	29°46.2	23.2	320°26.6	10.7'	05°45.6	-14.8'	59.6'
15	44°46.1	· · 23.2	334°56.3	10.7'	05°30.8	-14.8'	59.6'
16	59°46.0	23.3	349°26.0	10.7'	05°16.0	-14.9'	59.6'
17	74°45.8	23.4	3°55.8	10.8'	05°01.1	-14.9'	59.6'
18	89°45.7	N23°23.4	18°25.6	10.8'	N04°46.2	-14.9'	59.5'
19	104°45.6	23.5	32°55.4	10.9'	04°31.3	-14.9'	59.5'
20	119°45.4	23.5	47°25.3	10.9'	04°16.4	-14.9'	59.5'
21	134°45.3	· · 23.6	61°55.2	10.9'	04°01.4	-14.9'	59.5'
22	149°45.2	23.7	76°25.2	11.0'	03°46.5	-15.0'	59.5'
23	164°45.0	23.7	90°55.2	11.0'	03°31.5	-15.0'	59.5'
	SD.=15.7	d=0.1	S.D.=16.2				

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 3-5 12-31%
15	00:22	00:28	12:00	14:59	02:31	
16	00:34	00:41	12:01	15:53	03:26	
17	00:47	00:54	12:01	16:44	04:18	

June 18, 19, 20 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	266°07.8	139°03.2	N21°08.2	108°11.9	N10°26.7	264°20.0	S00°33.2	86°55.2	N02°55.2
1	281°10.3	154°02.6	07.4	123°13.1	26.2	279°22.2	33.1	101°57.6	55.1
2	296°12.8	169°02.1	06.7	138°14.3	25.6	294°24.4	33.0	117°00.0	55.1
3	311°15.2	184°01.5	·· 06.0	153°15.5	·· 25.1	309°26.7	·· 32.9	132°02.4	·· 55.0
4	326°17.7	199°01.0	05.3	168°16.7	24.6	324°28.9	32.8	147°04.8	55.0
5	341°20.2	214°00.4	04.6	183°17.9	24.0	339°31.1	32.7	162°07.2	55.0
6	356°22.6	228°59.8	N21°03.9	198°19.1	N10°23.5	354°33.3	S00°32.6	177°09.6	N02°54.9
7	11°25.1	243°59.3	03.2	213°20.3	22.9	9°35.5	32.5	192°12.0	54.9
8	26°27.6	258°58.7	02.4	228°21.5	22.4	24°37.7	32.4	207°14.4	54.8
9	41°30.0	273°58.2	·· 01.7	243°22.7	·· 21.9	39°40.0	·· 32.3	222°16.8	·· 54.8
10	56°32.5	288°57.6	01.0	258°23.9	21.3	54°42.2	32.2	237°19.2	54.8
11	71°34.9	303°57.0	21°00.3	273°25.1	20.8	69°44.4	32.1	252°21.6	54.7
12	86°37.4	318°56.5	N20°59.6	288°26.3	N10°20.2	84°46.6	S00°32.1	267°23.9	N02°54.7
13	101°39.9	333°55.9	58.8	303°27.5	19.7	99°48.8	32.0	282°26.3	54.6
14	116°42.3	348°55.4	58.1	318°28.7	19.2	114°51.0	31.9	297°28.7	54.6
15	131°44.8	3°54.8	·· 57.4	333°29.9	·· 18.6	129°53.3	·· 31.8	312°31.1	·· 54.6
16	146°47.3	18°54.3	56.7	348°31.1	18.1	144°55.5	31.7	327°33.5	54.5
17	161°49.7	33°53.7	55.9	3°32.3	17.5	159°57.7	31.6	342°35.9	54.5
18	176°52.2	48°53.2	N20°55.2	18°33.4	N10°17.0	174°59.9	S00°31.5	357°38.3	N02°54.4
19	191°54.7	63°52.6	54.5	33°34.6	16.4	190°02.1	31.4	12°40.7	54.4
20	206°57.1	78°52.1	53.8	48°35.8	15.9	205°04.4	31.3	27°43.1	54.4
21	221°59.6	93°51.5	·· 53.0	63°37.0	·· 15.4	220°06.6	·· 31.2	42°45.5	·· 54.3
22	237°02.0	108°51.0	52.3	78°38.2	14.8	235°08.8	31.1	57°47.9	54.3
23	252°04.5	123°50.4	51.6	93°39.4	14.3	250°11.0	31.0	72°50.3	54.2
Mer.pass.:06:14		v-0.6 d-0.7 m-3.9		v1.2 d-0.5 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	267°07.0	138°49.9	N20°50.8	108°40.6	N10°13.7	265°13.2	S00°30.9	87°52.7	N02°54.2
1	282°09.4	153°49.3	50.1	123°41.8	13.2	280°15.5	30.8	102°55.1	54.2
2	297°11.9	168°48.8	49.4	138°43.0	12.6	295°17.7	30.7	117°57.5	54.1
3	312°14.4	183°48.3	·· 48.6	153°44.2	·· 12.1	310°19.9	·· 30.6	132°59.9	·· 54.1
4	327°16.8	198°47.7	47.9	168°45.4	11.6	325°22.1	30.6	148°02.3	54.0
5	342°19.3	213°47.2	47.2	183°46.6	11.0	340°24.3	30.5	163°04.6	54.0
6	357°21.8	228°46.6	N20°46.4	198°47.8	N10°10.5	355°26.6	S00°30.4	178°07.0	N02°54.0
7	12°24.2	243°46.1	45.7	213°49.0	09.9	10°28.8	30.3	193°09.4	53.9
8	27°26.7	258°45.5	45.0	228°50.1	09.4	25°31.0	30.2	208°11.8	53.9
9	42°29.2	273°45.0	·· 44.2	243°51.3	·· 08.8	40°33.2	·· 30.1	223°14.2	·· 53.8
10	57°31.6	288°44.5	43.5	258°52.5	08.3	55°35.4	30.0	238°16.6	53.8
11	72°34.1	303°43.9	42.7	273°53.7	07.8	70°37.7	29.9	253°19.0	53.8
12	87°36.5	318°43.4	N20°42.0	288°54.9	N10°07.2	85°39.9	S00°29.8	268°21.4	N02°53.7
13	102°39.0	333°42.8	41.2	303°56.1	06.7	100°42.1	29.7	283°23.8	53.7
14	117°41.5	348°42.3	40.5	318°57.3	06.1	115°44.3	29.6	298°26.2	53.6
15	132°43.9	3°41.8	·· 39.8	333°58.5	·· 05.6	130°46.6	·· 29.5	313°28.6	·· 53.6
16	147°46.4	18°41.2	39.0	348°59.7	05.0	145°48.8	29.4	328°31.0	53.6
17	162°48.9	33°40.7	38.3	4°00.9	04.5	160°51.0	29.4	343°33.3	53.5
18	177°51.3	48°40.2	N20°37.5	19°02.1	N10°03.9	175°53.2	S00°29.3	358°35.7	N02°53.5
19	192°53.8	63°39.6	36.8	34°03.2	03.4	190°55.5	29.2	13°38.1	53.4
20	207°56.3	78°39.1	36.0	49°04.4	02.8	205°57.7	29.1	28°40.5	53.4
21	222°58.7	93°38.6	·· 35.3	64°05.6	·· 02.3	220°59.9	·· 29.0	43°42.9	·· 53.3
22	238°01.2	108°38.0	34.5	79°06.8	01.8	236°02.1	28.9	58°45.3	53.3
23	253°03.7	123°37.5	33.8	94°08.0	01.2	251°04.4	28.8	73°47.7	53.3
Mer.pass.:06:11		v-0.5 d-0.7 m-3.9		v1.2 d-0.5 m1.3		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	268°06.1	138°37.0	N20°33.0	109°09.2	N10°00.7	266°06.6	S00°28.7	88°50.1	N02°53.2
1	283°08.6	153°36.4	32.2	124°10.4	10°00.1	281°08.8	28.6	103°52.5	53.2
2	298°11.0	168°35.9	31.5	139°11.6	09°59.6	296°11.0	28.5	118°54.9	53.1
3	313°13.5	183°35.4	·· 30.7	154°12.8	·· 59.0	311°13.3	·· 28.4	133°57.2	·· 53.1
4	328°16.0	198°34.9	30.0	169°14.0	58.5	326°15.5	28.4	148°59.6	53.1
5	343°18.4	213°34.3	29.2	184°15.1	57.9	341°17.7	28.3	164°02.0	53.0
6	358°20.9	228°33.8	N20°28.5	199°16.3	N09°57.4	356°20.0	S00°28.2	179°04.4	N02°53.0
7	13°23.4	243°33.3	27.7	214°17.5	56.8	11°22.2	28.1	194°06.8	52.9
8	28°25.8	258°32.7	26.9	229°18.7	56.3	26°24.4	28.0	209°09.2	52.9
9	43°28.3	273°32.2	·· 26.2	244°19.9	·· 55.7	41°26.6	·· 27.9	224°11.6	·· 52.8
10	58°30.8	288°31.7	25.4	259°21.1	55.2	56°28.9	27.8	239°14.0	52.8
11	73°33.2	303°31.2	24.7	274°22.3	54.7	71°31.1	27.7	254°16.4	52.8
12	88°35.7	318°30.7	N20°23.9	289°23.5	N09°54.1	86°33.3	S00°27.6	269°18.7	N02°52.7
13	103°38.1	333°30.1	23.1	304°24.7	53.6	101°35.6	27.6	284°21.1	52.7
14	118°40.6	348°29.6	22.4	319°25.8	53.0	116°37.8	27.5	299°23.5	52.6
15	133°43.1	3°29.1	·· 21.6	334°27.0	·· 52.5	131°40.0	·· 27.4	314°25.9	·· 52.6
16	148°45.5	18°28.6	20.8	349°28.2	51.9	146°42.2	27.3	329°28.3	52.5
17	163°48.0	33°28.1	20.1	4°29.4	51.4	161°44.5	27.2	344°30.7	52.5
18	178°50.5	48°27.5	N20°19.3	19°30.6	N09°50.8	176°46.7	S00°27.1	359°33.1	N02°52.5
19	193°52.9	63°27.0	18.5	34°31.8	50.3	191°48.9	27.0	14°35.5	52.4
20	208°55.4	78°26.5	17.7	49°33.0	49.7	206°51.2	26.9	29°37.8	52.4
21	223°57.9	93°26.0	·· 17.0	64°34.2	·· 49.2	221°53.4	·· 26.8	44°40.2	·· 52.3
22	239°00.3	108°25.5	16.2	79°35.3	48.6	236°55.6	26.8	59°42.6	52.3
23	254°02.8	123°25.0	15.4	94°36.5	48.1	251°57.9	26.7	74°45.0	52.2
Mer.pass.:06:07		v-0.5 d-0.8 m-3.9		v1.2 d-0.5 m1.3		v2.2 d0.1 m-2.2		v2.4 d-0.0 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.8	29°08.8
Ankaa	353°17.8	-42°14.6
Schedar	349°43.3	56°35.5
Diphda	348°58.1	-17°55.5
Achernar	335°28.5	-57°10.7
Hamal	328°03.5	23°30.7
Polaris	319°09.9	89°18.4
Acamar	315°20.2	-40°15.5
Menkar	314°17.6	4°07.9
Mirfak	308°44.0	49°53.8
Aldebaran	290°52.2	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.2	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.8	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.1
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.5	-59°32.8
Suhail	222°54.4	-43°28.8
Miaplacidus	221°41.0	-69°45.9
Alphard	217°58.4	-8°42.4
Regulus	207°46.0	11°54.9
Dubhe	193°54.3	61°41.9
Denebola	182°35.9	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.8	-63°09.8
Gacrux	172°03.4	-57°10.7
Alioth	166°22.3	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.2	49°15.8
Hadar	148°50.8	-60°25.7
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.3	-60°53.0
Kochab	137°18.8	74°06.9
Zuben'ubi	137°07.6	-16°05.3
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.1
Eltanin	90°46.6	51°29.2
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.6	-26°16.9
Altair	62°10.1	8°53.8
Peacock	53°22.1	-56°41.8
Deneb	49°32.7	45°19.0
Enif	33°49.1	9°55.4
Al Na'ir	27°46.1	-46°54.3
Fomalhaut	15°26.2	-29°33.7
Scheat	13°55.5	28°08.3
Markab	13°40.4	15°15.7

Jun 18 Fri	**SHA**	**Mer.pass**
Venus	232°55.4	14:44
Mars	202°04.1	16:46
Jupiter	358°12.2	06:22
Saturn	180°47.4	18:09

Jun 19 Sat	**SHA**	**Mer.pass**
Venus	231°42.9	14:45
Mars	201°33.6	16:44
Jupiter	358°06.3	06:18
Saturn	180°45.7	18:06

Jun 20 Sun	**SHA**	**Mer.pass**
Venus	230°30.9	14:46
Mars	201°03.1	16:42
Jupiter	358°00.5	06:15
Saturn	180°44.0	18:02

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°44.9	N23°23.8	105°25.2	11.0'	N03°16.5	-15.0'	59.5'
1	194°44.7	23.9	119°55.2	11.1'	03°01.5	-15.0'	59.5'
2	209°44.6	23.9	134°25.3	11.1'	02°46.5	-15.0'	59.4'
3	224°44.5	· · 24.0	148°55.4	11.1'	02°31.5	-15.0'	59.4'
4	239°44.3	24.0	163°25.6	11.2'	02°16.5	-15.0'	59.4'
5	254°44.2	24.1	177°55.8	11.2'	02°01.5	-15.0'	59.4'
6	269°44.1	N23°24.1	192°26.0	11.2'	N01°46.5	-15.0'	59.4'
7	284°43.9	24.2	206°56.2	11.2'	01°31.4	-15.0'	59.4'
8	299°43.8	24.3	221°26.4	11.3'	01°16.4	-15.0'	59.4'
9	314°43.7	· · 24.3	235°56.7	11.3'	01°01.4	-15.0'	59.3'
10	329°43.5	24.4	250°27.0	11.3'	00°46.4	-15.0'	59.3'
11	344°43.4	24.4	264°57.3	11.3'	00°31.4	-15.0'	59.3'
12	359°43.2	N23°24.5	279°27.7	11.3'	N00°16.4	-15.0'	59.3'
13	14°43.1	24.5	293°58.0	11.4'	N00°01.4	-15.0'	59.3'
14	29°43.0	24.6	308°28.4	11.4'	S00°13.6	-15.0'	59.3'
15	44°42.8	· · 24.6	322°58.8	11.4'	00°28.6	-15.0'	59.2'
16	59°42.7	24.7	337°29.2	11.4'	00°43.6	-15.0'	59.2'
17	74°42.6	24.7	351°59.6	11.4'	00°58.5	-15.0'	59.2'
18	89°42.4	N23°24.8	6°30.1	11.4'	S01°13.5	-14.9'	59.2'
19	104°42.3	24.8	21°00.5	11.5'	01°28.4	-14.9'	59.2'
20	119°42.2	24.8	35°31.0	11.5'	01°43.3	-14.9'	59.2'
21	134°42.0	· · 24.9	50°01.4	11.5'	01°58.2	-14.9'	59.1'
22	149°41.9	24.9	64°31.9	11.5'	02°13.1	-14.9'	59.1'
23	164°41.7	25.0	79°02.4	11.5'	02°28.0	-14.8'	59.1'
	SD.=15.7	d=0.1	S.D.=16.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°41.6	N23°25.0	93°32.9	11.5'	S02°42.8	-14.8'	59.1'
1	194°41.5	25.1	108°03.4	11.5'	02°57.6	-14.8'	59.1'
2	209°41.3	25.1	122°33.9	11.5'	03°12.4	-14.8'	59.1'
3	224°41.2	· · 25.1	137°04.4	11.5'	03°27.2	-14.8'	59.0'
4	239°41.1	25.2	151°34.9	11.5'	03°41.9	-14.7'	59.0'
5	254°40.9	25.2	166°05.4	11.5'	03°56.6	-14.7'	59.0'
6	269°40.8	N23°25.3	180°35.9	11.5'	S04°11.3	-14.7'	59.0'
7	284°40.7	25.3	195°06.4	11.5'	04°25.9	-14.6'	59.0'
8	299°40.5	25.3	209°36.9	11.5'	04°40.6	-14.6'	59.0'
9	314°40.4	· · 25.4	224°07.5	11.5'	04°55.1	-14.6'	58.9'
10	329°40.3	25.4	238°38.0	11.5'	05°09.7	-14.5'	58.9'
11	344°40.1	25.5	253°08.4	11.5'	05°24.2	-14.5'	58.9'
12	359°40.0	N23°25.5	267°38.9	11.5'	S05°38.7	-14.5'	58.9'
13	14°39.8	25.5	282°09.4	11.5'	05°53.1	-14.4'	58.9'
14	29°39.7	25.6	296°39.9	11.5'	06°07.5	-14.4'	58.8'
15	44°39.6	· · 25.6	311°10.4	11.5'	06°21.9	-14.3'	58.8'
16	59°39.4	25.6	325°40.8	11.5'	06°36.2	-14.3'	58.8'
17	74°39.3	25.6	340°11.3	11.4'	06°50.5	-14.3'	58.8'
18	89°39.2	N23°25.7	354°41.7	11.4'	S07°04.7	-14.2'	58.8'
19	104°39.0	25.7	9°12.1	11.4'	07°18.9	-14.2'	58.7'
20	119°38.9	25.7	23°42.5	11.4'	07°33.1	-14.1'	58.7'
21	134°38.8	· · 25.8	38°12.9	11.4'	07°47.1	-14.1'	58.7'
22	149°38.6	25.8	52°43.3	11.4'	08°01.2	-14.0'	58.7'
23	164°38.5	25.8	67°13.7	11.3'	08°15.2	-14.0'	58.7'
	SD.=15.7	d=0.0	S.D.=16.0				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°38.3	N23°25.8	81°44.0	11.3'	S08°29.1	-13.9'	58.7'
1	194°38.2	25.9	96°14.3	11.3'	08°43.0	-13.9'	58.6'
2	209°38.1	25.9	110°44.6	11.3'	08°56.9	-13.8'	58.6'
3	224°37.9	· · 25.9	125°14.9	11.3'	09°10.6	-13.8'	58.6'
4	239°37.8	25.9	139°45.2	11.2'	09°24.4	-13.7'	58.6'
5	254°37.7	26.0	154°15.4	11.2'	09°38.0	-13.6'	58.6'
6	269°37.5	N23°26.0	168°45.6	11.2'	S09°51.6	-13.6'	58.5'
7	284°37.4	26.0	183°15.8	11.2'	10°05.2	-13.5'	58.5'
8	299°37.3	26.0	197°46.0	11.2'	10°18.7	-13.5'	58.5'
9	314°37.1	· · 26.0	212°16.1	11.1'	10°32.1	-13.4'	58.5'
10	329°37.0	26.1	226°46.2	11.1'	10°45.5	-13.3'	58.5'
11	344°36.8	26.1	241°16.3	11.1'	10°58.8	-13.3'	58.4'
12	359°36.7	N23°26.1	255°46.4	11.0'	S11°12.0	-13.2'	58.4'
13	14°36.6	26.1	270°16.4	11.0'	11°25.2	-13.1'	58.4'
14	29°36.4	26.1	284°46.4	11.0'	11°38.3	-13.1'	58.4'
15	44°36.3	· · 26.1	299°16.4	11.0'	11°51.3	-13.0'	58.4'
16	59°36.2	26.2	313°46.3	10.9'	12°04.3	-12.9'	58.3'
17	74°36.0	26.2	328°16.2	10.9'	12°17.2	-12.9'	58.3'
18	89°35.9	N23°26.2	342°46.1	10.9'	S12°30.0	-12.8'	58.3'
19	104°35.8	26.2	357°15.9	10.8'	12°42.7	-12.7'	58.3'
20	119°35.6	26.2	11°45.7	10.8'	12°55.4	-12.6'	58.3'
21	134°35.5	· · 26.2	26°15.5	10.8'	13°08.0	-12.6'	58.2'
22	149°35.4	26.2	40°45.3	10.7'	13°20.5	-12.5'	58.2'
23	164°35.2	26.2	55°15.0	10.7'	13°32.9	-12.4'	58.2'
	SD.=15.7	d=0.0	S.D.=15.9				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	01:31	22:32	▭	▭
62°	▭	▭	02:09	21:54	▭	▭
60°	▭	00:50	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	07:04	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	15:42	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:06
58°	07:03	07:56	08:48	15:15	16:07	17:00
S 60°	07:10	08:07	09:05	14:57	15:55	16:52

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 6-8 42-65%
18	01:00	01:07	12:01	17:33	05:09	
19	01:14	01:20	12:01	18:22	05:58	
20	01:27	01:33	12:02	19:11	06:46	

June 21, 22, 23 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	269°05.3	138°24.4	N20°14.7	109°37.7	N09°47.5	267°00.1	S00°26.6	89°47.4	N02°52.2
1	284°07.7	153°23.9	13.9	124°38.9	47.0	282°02.3	26.5	104°49.8	52.2
2	299°10.2	168°23.4	13.1	139°40.1	46.4	297°04.6	26.4	119°52.2	52.1
3	314°12.6	183°22.9	·· 12.3	154°41.3	·· 45.9	312°06.8	·· 26.3	134°54.5	·· 52.1
4	329°15.1	198°22.4	11.5	169°42.5	45.3	327°09.0	26.2	149°56.9	52.0
5	344°17.6	213°21.9	10.8	184°43.7	44.8	342°11.3	26.1	164°59.3	52.0
6	359°20.0	228°21.4	N20°10.0	199°44.8	N09°44.2	357°13.5	S00°26.1	180°01.7	N02°51.9
7	14°22.5	243°20.9	09.2	214°46.0	43.7	12°15.7	26.0	195°04.1	51.9
8	29°25.0	258°20.4	08.4	229°47.2	43.1	27°18.0	25.9	210°06.5	51.8
9	44°27.4	273°19.8	·· 07.6	244°48.4	·· 42.6	42°20.2	·· 25.8	225°08.9	·· 51.8
10	59°29.9	288°19.3	06.9	259°49.6	42.0	57°22.4	25.7	240°11.2	51.8
11	74°32.4	303°18.8	06.1	274°50.8	41.5	72°24.7	25.6	255°13.6	51.7
12	89°34.8	318°18.3	N20°05.3	289°52.0	N09°40.9	87°26.9	S00°25.5	270°16.0	N02°51.7
13	104°37.3	333°17.8	04.5	304°53.1	40.4	102°29.1	25.4	285°18.4	51.6
14	119°39.8	348°17.3	03.7	319°54.3	39.8	117°31.4	25.4	300°20.8	51.6
15	134°42.2	3°16.8	·· 02.9	334°55.5	·· 39.3	132°33.6	·· 25.3	315°23.2	·· 51.5
16	149°44.7	18°16.3	02.1	349°56.7	38.7	147°35.8	25.2	330°25.5	51.5
17	164°47.1	33°15.8	01.3	4°57.9	38.2	162°38.1	25.1	345°27.9	51.4
18	179°49.6	48°15.3	N20°00.6	19°59.1	N09°37.6	177°40.3	S00°25.0	0°30.3	N02°51.4
19	194°52.1	63°14.8	19°59.8	35°00.3	37.1	192°42.6	24.9	15°32.7	51.4
20	209°54.5	78°14.3	59.0	50°01.4	36.5	207°44.8	24.8	30°35.1	51.3
21	224°57.0	93°13.8	·· 58.2	65°02.6	·· 36.0	222°47.0	·· 24.8	45°37.5	·· 51.3
22	239°59.5	108°13.3	57.4	80°03.8	35.4	237°49.3	24.7	60°39.8	51.2
23	255°01.9	123°12.8	56.6	95°05.0	34.9	252°51.5	24.6	75°42.2	51.2
Mer.pass.:06:03		v-0.5 d-0.8 m-3.9		v1.2 d-0.5 m1.3		v2.2 d0.1 m-2.3		v2.4 d-0.0 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	270°04.4	138°12.3	N19°55.8	110°06.2	N09°34.3	267°53.7	S00°24.5	90°44.6	N02°51.1
1	285°06.9	153°11.8	55.0	125°07.4	33.8	282°56.0	24.4	105°47.0	51.1
2	300°09.3	168°11.3	54.2	140°08.5	33.2	297°58.2	24.3	120°49.4	51.0
3	315°11.8	183°10.8	·· 53.4	155°09.7	·· 32.7	313°00.5	·· 24.2	135°51.8	·· 51.0
4	330°14.2	198°10.3	52.6	170°10.9	32.1	328°02.7	24.2	150°54.1	51.0
5	345°16.7	213°09.8	51.8	185°12.1	31.5	343°04.9	24.1	165°56.5	50.9
6	0°19.2	228°09.3	N19°51.0	200°13.3	N09°31.0	358°07.2	S00°24.0	180°58.9	N02°50.9
7	15°21.6	243°08.8	50.2	215°14.5	30.4	13°09.4	23.9	196°01.3	50.8
8	30°24.1	258°08.4	49.4	230°15.6	29.9	28°11.7	23.8	211°03.7	50.8
9	45°26.6	273°07.9	·· 48.6	245°16.8	·· 29.3	43°13.9	·· 23.7	226°06.0	·· 50.7
10	60°29.0	288°07.4	47.8	260°18.0	28.8	58°16.1	23.7	241°08.4	50.7
11	75°31.5	303°06.9	47.0	275°19.2	28.2	73°18.4	23.6	256°10.8	50.6
12	90°34.0	318°06.4	N19°46.2	290°20.4	N09°27.7	88°20.6	S00°23.5	271°13.2	N02°50.6
13	105°36.4	333°05.9	45.4	305°21.6	27.1	103°22.9	23.4	286°15.6	50.5
14	120°38.9	348°05.4	44.6	320°22.7	26.6	118°25.1	23.3	301°18.0	50.5
15	135°41.4	3°04.9	·· 43.8	335°23.9	·· 26.0	133°27.4	·· 23.2	316°20.3	·· 50.4
16	150°43.8	18°04.4	42.9	350°25.1	25.5	148°29.6	23.2	331°22.7	50.4
17	165°46.3	33°04.0	42.1	5°26.3	24.9	163°31.8	23.1	346°25.1	50.4
18	180°48.7	48°03.5	N19°41.3	20°27.5	N09°24.3	178°34.1	S00°23.0	1°27.5	N02°50.3
19	195°51.2	63°03.0	40.5	35°28.7	23.8	193°36.3	22.9	16°29.9	50.3
20	210°53.7	78°02.5	39.7	50°29.8	23.2	208°38.6	22.8	31°32.2	50.2
21	225°56.1	93°02.0	·· 38.9	65°31.0	·· 22.7	223°40.8	·· 22.7	46°34.6	·· 50.2
22	240°58.6	108°01.5	38.1	80°32.2	22.1	238°43.1	22.7	61°37.0	50.1
23	256°01.1	123°01.1	37.3	95°33.4	21.6	253°45.3	22.6	76°39.4	50.1
Mer.pass.:05:59		v-0.5 d-0.8 m-3.9		v1.2 d-0.6 m1.3		v2.2 d0.1 m-2.3		v2.4 d-0.0 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	271°03.5	138°00.6	N19°36.4	110°34.6	N09°21.0	268°47.5	S00°22.5	91°41.7	N02°50.0
1	286°06.0	153°00.1	35.6	125°35.7	20.5	283°49.8	22.4	106°44.1	50.0
2	301°08.5	167°59.6	34.8	140°36.9	19.9	298°52.0	22.3	121°46.5	49.9
3	316°10.9	182°59.1	·· 34.0	155°38.1	·· 19.4	313°54.3	·· 22.2	136°48.9	·· 49.9
4	331°13.4	197°58.7	33.2	170°39.3	18.8	328°56.5	22.2	151°51.3	49.8
5	346°15.9	212°58.2	32.3	185°40.5	18.2	343°58.8	22.1	166°53.6	49.8
6	1°18.3	227°57.7	N19°31.5	200°41.7	N09°17.7	359°01.0	S00°22.0	181°56.0	N02°49.8
7	16°20.8	242°57.2	30.7	215°42.8	17.1	14°03.3	21.9	196°58.4	49.7
8	31°23.2	257°56.8	29.9	230°44.0	16.6	29°05.5	21.8	212°00.8	49.7
9	46°25.7	272°56.3	·· 29.1	245°45.2	·· 16.0	44°07.8	·· 21.8	227°03.2	·· 49.6
10	61°28.2	287°55.8	28.2	260°46.4	15.5	59°10.0	21.7	242°05.5	49.6
11	76°30.6	302°55.3	27.4	275°47.6	14.9	74°12.3	21.6	257°07.9	49.5
12	91°33.1	317°54.9	N19°26.6	290°48.7	N09°14.3	89°14.5	S00°21.5	272°10.3	N02°49.5
13	106°35.6	332°54.4	25.8	305°49.9	13.8	104°16.8	21.4	287°12.7	49.4
14	121°38.0	347°53.9	24.9	320°51.1	13.2	119°19.0	21.3	302°15.0	49.4
15	136°40.5	2°53.4	·· 24.1	335°52.3	·· 12.7	134°21.2	·· 21.3	317°17.4	·· 49.3
16	151°43.0	17°53.0	23.3	350°53.5	12.1	149°23.5	21.2	332°19.8	49.3
17	166°45.4	32°52.5	22.4	5°54.6	11.6	164°25.7	21.1	347°22.2	49.2
18	181°47.9	47°52.0	N19°21.6	20°55.8	N09°11.0	179°28.0	S00°21.0	2°24.5	N02°49.2
19	196°50.4	62°51.6	20.8	35°57.0	10.4	194°30.2	20.9	17°26.9	49.1
20	211°52.8	77°51.1	19.9	50°58.2	09.9	209°32.5	20.9	32°29.3	49.1
21	226°55.3	92°50.6	·· 19.1	65°59.4	·· 09.3	224°34.7	·· 20.8	47°31.7	·· 49.0
22	241°57.7	107°50.2	18.3	81°00.5	08.8	239°37.0	20.7	62°34.0	49.0
23	257°00.2	122°49.7	17.4	96°01.7	08.2	254°39.2	20.6	77°36.4	48.9
Mer.pass.:05:55		v-0.5 d-0.8 m-3.9		v1.2 d-0.6 m1.3		v2.2 d0.1 m-2.3		v2.4 d-0.0 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.8	29°08.8
Ankaa	353°17.8	-42°14.6
Schedar	349°43.2	56°35.5
Diphda	348°58.1	-17°55.5
Achernar	335°28.5	-57°10.7
Hamal	328°03.4	23°30.7
Polaris	319°08.6	89°18.4
Acamar	315°20.2	-40°15.5
Menkar	314°17.6	4°07.9
Mirfak	308°43.9	49°53.8
Aldebaran	290°52.2	16°31.8
Rigel	281°14.5	-8°11.4
Capella	280°38.1	46°00.5
Bellatrix	278°34.7	6°21.5
Elnath	278°15.7	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.1
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.3
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.1
Avior	234°19.5	-59°32.8
Suhail	222°54.4	-43°28.7
Miaplacidus	221°41.0	-69°45.9
Alphard	217°58.4	-8°42.4
Regulus	207°46.0	11°54.9
Dubhe	193°54.3	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.9	-63°09.8
Gacrux	172°03.4	-57°10.7
Alioth	166°22.3	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.3	49°15.8
Hadar	148°50.8	-60°25.7
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.3	-60°53.0
Kochab	137°18.9	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.3
Kaus Aust.	83°46.3	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.6	-26°16.9
Altair	62°10.0	8°53.8
Peacock	53°22.0	-56°41.8
Deneb	49°32.6	45°19.0
Enif	33°49.1	9°55.4
Al Na'ir	27°46.1	-46°54.3
Fomalhaut	15°26.2	-29°33.7
Scheat	13°55.4	28°08.3
Markab	13°40.4	15°15.7

Jun 21 Mon	**SHA**	**Mer.pass**
Venus	229°19.2	14:47
Mars	200°32.5	16:40
Jupiter	357°54.8	06:11
Saturn	180°42.1	17:58

Jun 22 Tue	**SHA**	**Mer.pass**
Venus	228°07.9	14:48
Mars	200°01.8	16:38
Jupiter	357°49.4	06:08
Saturn	180°40.2	17:54

Jun 23 Wed	**SHA**	**Mer.pass**
Venus	226°57.0	14:48
Mars	199°31.0	16:36
Jupiter	357°44.0	06:04
Saturn	180°38.2	17:50

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°35.1	N23°26.2	69°44.6	10.7'	S13°45.3	-12.3'	58.2'
1	194°34.9	26.3	84°14.3	10.6'	13°57.6	-12.2'	58.2'
2	209°34.8	26.3	98°43.9	10.6'	14°09.8	-12.2'	58.1'
3	224°34.7	· · 26.3	113°13.4	10.5'	14°21.9	-12.1'	58.1'
4	239°34.5	26.3	127°42.9	10.5'	14°33.9	-12.0'	58.1'
5	254°34.4	26.3	142°12.4	10.5'	14°45.9	-11.9'	58.1'
6	269°34.3	N23°26.3	156°41.9	10.4'	S14°57.7	-11.8'	58.1'
7	284°34.1	26.3	171°11.3	10.4'	15°09.5	-11.7'	58.0'
8	299°34.0	26.3	185°40.6	10.3'	15°21.2	-11.6'	58.0'
9	314°33.9	· · 26.3	200°09.9	10.3'	15°32.8	-11.6'	58.0'
10	329°33.7	26.3	214°39.2	10.3'	15°44.3	-11.5'	58.0'
11	344°33.6	26.3	229°08.5	10.2'	15°55.7	-11.4'	58.0'
12	359°33.5	N23°26.3	243°37.7	10.2'	S16°07.0	-11.3'	57.9'
13	14°33.3	26.3	258°06.8	10.1'	16°18.2	-11.2'	57.9'
14	29°33.2	26.3	272°35.9	10.1'	16°29.4	-11.1'	57.9'
15	44°33.0	· · 26.3	287°05.0	10.1'	16°40.4	-11.0'	57.9'
16	59°32.9	26.3	301°34.0	10.0'	16°51.4	-10.9'	57.9'
17	74°32.8	26.3	316°03.0	10.0'	17°02.2	-10.8'	57.8'
18	89°32.6	N23°26.3	330°32.0	9.9'	S17°13.0	-10.7'	57.8'
19	104°32.5	26.3	345°00.9	9.9'	17°23.6	-10.6'	57.8'
20	119°32.4	26.3	359°29.7	9.8'	17°34.2	-10.5'	57.8'
21	134°32.2	· · 26.3	13°58.6	9.8'	17°44.6	-10.4'	57.8'
22	149°32.1	26.3	28°27.3	9.8'	17°54.9	-10.3'	57.7'
23	164°32.0	26.2	42°56.1	9.7'	18°05.2	-10.2'	57.7'
	SD.=15.7	d=0.0	S.D.=15.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°31.8	N23°26.2	57°24.7	9.7'	S18°15.3	-10.1'	57.7'
1	194°31.7	26.2	71°53.4	9.6'	18°25.4	-10.0'	57.7'
2	209°31.6	26.2	86°22.0	9.6'	18°35.3	-9.9'	57.6'
3	224°31.4	· · 26.2	100°50.5	9.5'	18°45.1	-9.8'	57.6'
4	239°31.3	26.2	115°19.1	9.5'	18°54.8	-9.7'	57.6'
5	254°31.2	26.2	129°47.5	9.4'	19°04.4	-9.5'	57.6'
6	269°31.0	N23°26.2	144°15.9	9.4'	S19°13.9	-9.4'	57.6'
7	284°30.9	26.2	158°44.3	9.4'	19°23.3	-9.3'	57.5'
8	299°30.7	26.1	173°12.7	9.3'	19°32.5	-9.2'	57.5'
9	314°30.6	· · 26.1	187°41.0	9.3'	19°41.7	-9.1'	57.5'
10	329°30.5	26.1	202°09.2	9.2'	19°50.7	-9.0'	57.5'
11	344°30.3	26.1	216°37.4	9.2'	19°59.7	-8.9'	57.5'
12	359°30.2	N23°26.1	231°05.6	9.1'	S20°08.5	-8.8'	57.4'
13	14°30.1	26.1	245°33.7	9.1'	20°17.2	-8.6'	57.4'
14	29°29.9	26.0	260°01.8	9.1'	20°25.7	-8.5'	57.4'
15	44°29.8	· · 26.0	274°29.9	9.0'	20°34.2	-8.4'	57.4'
16	59°29.7	26.0	288°57.9	9.0'	20°42.5	-8.3'	57.4'
17	74°29.5	26.0	303°25.8	8.9'	20°50.7	-8.2'	57.3'
18	89°29.4	N23°26.0	317°53.7	8.9'	S20°58.8	-8.0'	57.3'
19	104°29.3	25.9	332°21.6	8.9'	21°06.8	-7.9'	57.3'
20	119°29.1	25.9	346°49.5	8.8'	21°14.7	-7.8'	57.3'
21	134°29.0	· · 25.9	1°17.3	8.8'	21°22.4	-7.7'	57.3'
22	149°28.9	25.9	15°45.1	8.8'	21°30.0	-7.5'	57.2'
23	164°28.7	25.8	30°12.8	8.7'	21°37.5	-7.4'	57.2'
	SD.=15.7	d=-0.0	S.D.=15.7				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°28.6	N23°25.8	44°40.5	8.7'	S21°44.8	-7.3'	57.2'
1	194°28.5	25.8	59°08.1	8.6'	21°52.1	-7.2'	57.2'
2	209°28.3	25.8	73°35.8	8.6'	21°59.2	-7.0'	57.1'
3	224°28.2	· · 25.7	88°03.4	8.6'	22°06.2	-6.9'	57.1'
4	239°28.1	25.7	102°30.9	8.5'	22°13.0	-6.8'	57.1'
5	254°27.9	25.7	116°58.4	8.5'	22°19.7	-6.7'	57.1'
6	269°27.8	N23°25.6	131°25.9	8.5'	S22°26.3	-6.5'	57.1'
7	284°27.6	25.6	145°53.4	8.4'	22°32.8	-6.4'	57.0'
8	299°27.5	25.6	160°20.8	8.4'	22°39.1	-6.3'	57.0'
9	314°27.4	· · 25.6	174°48.2	8.4'	22°45.3	-6.1'	57.0'
10	329°27.2	25.5	189°15.6	8.4'	22°51.4	-6.0'	57.0'
11	344°27.1	25.5	203°42.9	8.3'	22°57.3	-5.9'	57.0'
12	359°27.0	N23°25.4	218°10.2	8.3'	S23°03.1	-5.7'	56.9'
13	14°26.8	25.4	232°37.5	8.3'	23°08.8	-5.6'	56.9'
14	29°26.7	25.4	247°04.8	8.2'	23°14.3	-5.5'	56.9'
15	44°26.6	· · 25.3	261°32.0	8.2'	23°19.7	-5.3'	56.9'
16	59°26.4	25.3	275°59.2	8.2'	23°25.0	-5.2'	56.9'
17	74°26.3	25.3	290°26.4	8.2'	23°30.1	-5.1'	56.8'
18	89°26.2	N23°25.2	304°53.6	8.2'	S23°35.1	-4.9'	56.8'
19	104°26.0	25.2	319°20.7	8.1'	23°40.0	-4.8'	56.8'
20	119°25.9	25.1	333°47.8	8.1'	23°44.7	-4.7'	56.8'
21	134°25.8	· · 25.1	348°14.9	8.1'	23°49.3	-4.5'	56.8'
22	149°25.6	25.1	2°42.0	8.1'	23°53.7	-4.4'	56.7'
23	164°25.5	25.0	17°09.1	8.1'	23°58.0	-4.2'	56.7'
	SD.=15.7	d=-0.0	S.D.=15.5				

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 9-11 75-91%
21	01:40	01:46	12:02	20:02	07:36	
22	01:53	01:59	12:02	20:55	08:28	
23	02:06	02:12	12:02	21:49	09:22	

June 24, 25, 26 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	272°02.7	137°49.2	N19°16.6	111°02.9	N09°07.7	269°41.5	S00°20.5	92°38.8	N02°48.9
1	287°05.1	152°48.8	15.8	126°04.1	07.1	284°43.7	20.5	107°41.2	48.8
2	302°07.6	167°48.3	14.9	141°05.3	06.5	299°46.0	20.4	122°43.5	48.8
3	317°10.1	182°47.9	·· 14.1	156°06.4	·· 06.0	314°48.3	·· 20.3	137°45.9	·· 48.8
4	332°12.5	197°47.4	13.3	171°07.6	05.4	329°50.5	20.2	152°48.3	48.7
5	347°15.0	212°46.9	12.4	186°08.8	04.9	344°52.8	20.2	167°50.7	48.7
6	2°17.5	227°46.5	N19°11.6	201°10.0	N09°04.3	359°55.0	S00°20.1	182°53.0	N02°48.6
7	17°19.9	242°46.0	10.7	216°11.1	03.7	14°57.3	20.0	197°55.4	48.6
8	32°22.4	257°45.6	09.9	231°12.3	03.2	29°59.5	19.9	212°57.8	48.5
9	47°24.8	272°45.1	·· 09.0	246°13.5	·· 02.6	45°01.8	·· 19.8	228°00.2	·· 48.5
10	62°27.3	287°44.6	08.2	261°14.7	02.1	60°04.0	19.8	243°02.5	48.4
11	77°29.8	302°44.2	07.4	276°15.9	01.5	75°06.3	19.7	258°04.9	48.4
12	92°32.2	317°43.7	N19°06.5	291°17.0	N09°00.9	90°08.5	S00°19.6	273°07.3	N02°48.3
13	107°34.7	332°43.3	05.7	306°18.2	09°00.4	105°10.8	19.5	288°09.7	48.3
14	122°37.2	347°42.8	04.8	321°19.4	08°59.8	120°13.0	19.4	303°12.0	48.2
15	137°39.6	2°42.4	·· 04.0	336°20.6	·· 59.3	135°15.3	·· 19.4	318°14.4	·· 48.2
16	152°42.1	17°41.9	03.1	351°21.7	58.7	150°17.5	19.3	333°16.8	48.1
17	167°44.6	32°41.5	02.3	6°22.9	58.1	165°19.8	19.2	348°19.2	48.1
18	182°47.0	47°41.0	N19°01.4	21°24.1	N08°57.6	180°22.1	S00°19.1	3°21.5	N02°48.0
19	197°49.5	62°40.6	19°00.6	36°25.3	57.0	195°24.3	19.1	18°23.9	48.0
20	212°52.0	77°40.1	18°59.7	51°26.5	56.5	210°26.6	19.0	33°26.3	47.9
21	227°54.4	92°39.7	·· 58.9	66°27.6	·· 55.9	225°28.8	·· 18.9	48°28.6	·· 47.9
22	242°56.9	107°39.2	58.0	81°28.8	55.3	240°31.1	18.8	63°31.0	47.8
23	257°59.3	122°38.8	57.2	96°30.0	54.8	255°33.3	18.7	78°33.4	47.8
Mer.pass.:05:51		v-0.5 d-0.8 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.0 m1.1	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	273°01.8	137°38.3	N18°56.3	111°31.2	N08°54.2	270°35.6	S00°18.7	93°35.8	N02°47.7
1	288°04.3	152°37.9	55.4	126°32.3	53.7	285°37.9	18.6	108°38.1	47.7
2	303°06.7	167°37.4	54.6	141°33.5	53.1	300°40.1	18.5	123°40.5	47.6
3	318°09.2	182°37.0	·· 53.7	156°34.7	·· 52.5	315°42.4	·· 18.4	138°42.9	·· 47.6
4	333°11.7	197°36.5	52.9	171°35.9	52.0	330°44.6	18.4	153°45.2	47.5
5	348°14.1	212°36.1	52.0	186°37.0	51.4	345°46.9	18.3	168°47.6	47.5
6	3°16.6	227°35.7	N18°51.2	201°38.2	N08°50.9	0°49.1	S00°18.2	183°50.0	N02°47.4
7	18°19.1	242°35.2	50.3	216°39.4	50.3	15°51.4	18.1	198°52.4	47.4
8	33°21.5	257°34.8	49.4	231°40.6	49.7	30°53.7	18.1	213°54.7	47.3
9	48°24.0	272°34.3	·· 48.6	246°41.7	·· 49.2	45°55.9	·· 18.0	228°57.1	·· 47.3
10	63°26.5	287°33.9	47.7	261°42.9	48.6	60°58.2	17.9	243°59.5	47.2
11	78°28.9	302°33.4	46.8	276°44.1	48.0	76°00.4	17.8	259°01.8	47.2
12	93°31.4	317°33.0	N18°46.0	291°45.3	N08°47.5	91°02.7	S00°17.8	274°04.2	N02°47.1
13	108°33.8	332°32.6	45.1	306°46.4	46.9	106°05.0	17.7	289°06.6	47.1
14	123°36.3	347°32.1	44.2	321°47.6	46.4	121°07.2	17.6	304°08.9	47.0
15	138°38.8	2°31.7	·· 43.4	336°48.8	·· 45.8	136°09.5	·· 17.5	319°11.3	·· 47.0
16	153°41.2	17°31.3	42.5	351°50.0	45.2	151°11.8	17.5	334°13.7	46.9
17	168°43.7	32°30.8	41.6	6°51.1	44.7	166°14.0	17.4	349°16.1	46.9
18	183°46.2	47°30.4	N18°40.8	21°52.3	N08°44.1	181°16.3	S00°17.3	4°18.4	N02°46.8
19	198°48.6	62°30.0	39.9	36°53.5	43.5	196°18.5	17.2	19°20.8	46.8
20	213°51.1	77°29.5	39.0	51°54.7	43.0	211°20.8	17.2	34°23.2	46.7
21	228°53.6	92°29.1	·· 38.2	66°55.8	·· 42.4	226°23.1	·· 17.1	49°25.5	·· 46.7
22	243°56.0	107°28.7	37.3	81°57.0	41.8	241°25.3	17.0	64°27.9	46.6
23	258°58.5	122°28.2	36.4	96°58.2	41.3	256°27.6	16.9	79°30.3	46.6
Mer.pass.:05:47		v-0.4 d-0.9 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.0 m1.1	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	274°01.0	137°27.8	N18°35.5	111°59.4	N08°40.7	271°29.9	S00°16.9	94°32.6	N02°46.5
1	289°03.4	152°27.4	34.7	127°00.5	40.1	286°32.1	16.8	109°35.0	46.5
2	304°05.9	167°26.9	33.8	142°01.7	39.6	301°34.4	16.7	124°37.4	46.4
3	319°08.3	182°26.5	·· 32.9	157°02.9	·· 39.0	316°36.6	·· 16.6	139°39.7	·· 46.4
4	334°10.8	197°26.1	32.0	172°04.1	38.5	331°38.9	16.6	154°42.1	46.3
5	349°13.3	212°25.7	31.2	187°05.2	37.9	346°41.2	16.5	169°44.5	46.3
6	4°15.7	227°25.2	N18°30.3	202°06.4	N08°37.3	1°43.4	S00°16.4	184°46.8	N02°46.2
7	19°18.2	242°24.8	29.4	217°07.6	36.8	16°45.7	16.3	199°49.2	46.2
8	34°20.7	257°24.4	28.5	232°08.7	36.2	31°48.0	16.3	214°51.6	46.1
9	49°23.1	272°24.0	·· 27.6	247°09.9	·· 35.6	46°50.2	·· 16.2	229°53.9	·· 46.0
10	64°25.6	287°23.5	26.8	262°11.1	35.1	61°52.5	16.1	244°56.3	46.0
11	79°28.1	302°23.1	25.9	277°12.3	34.5	76°54.8	16.1	259°58.7	45.9
12	94°30.5	317°22.7	N18°25.0	292°13.4	N08°33.9	91°57.0	S00°16.0	275°01.0	N02°45.9
13	109°33.0	332°22.3	24.1	307°14.6	33.4	106°59.3	15.9	290°03.4	45.8
14	124°35.5	347°21.8	23.2	322°15.8	32.8	122°01.6	15.8	305°05.8	45.8
15	139°37.9	2°21.4	·· 22.3	337°16.9	·· 32.2	137°03.8	·· 15.8	320°08.1	·· 45.7
16	154°40.4	17°21.0	21.4	352°18.1	31.7	152°06.1	15.7	335°10.5	45.7
17	169°42.8	32°20.6	20.6	7°19.3	31.1	167°08.4	15.6	350°12.9	45.6
18	184°45.3	47°20.2	N18°19.7	22°20.5	N08°30.5	182°10.6	S00°15.5	5°15.2	N02°45.6
19	199°47.8	62°19.8	18.8	37°21.6	30.0	197°12.9	15.5	20°17.6	45.5
20	214°50.2	77°19.3	17.9	52°22.8	29.4	212°15.2	15.4	35°20.0	45.5
21	229°52.7	92°18.9	·· 17.0	67°24.0	·· 28.8	227°17.5	·· 15.3	50°22.3	·· 45.4
22	244°55.2	107°18.5	16.1	82°25.2	28.3	242°19.7	15.3	65°24.7	45.4
23	259°57.6	122°18.1	15.2	97°26.3	27.7	257°22.0	15.2	80°27.1	45.3
Mer.pass.:05:43		v-0.4 d-0.9 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.8	29°08.9
Ankaa	353°17.8	-42°14.6
Schedar	349°43.2	56°35.5
Diphda	348°58.1	-17°55.5
Achernar	335°28.5	-57°10.6
Hamal	328°03.4	23°30.7
Polaris	319°07.2	89°18.4
Acamar	315°20.2	-40°15.5
Menkar	314°17.5	4°07.9
Mirfak	308°43.9	49°53.8
Aldebaran	290°52.2	16°31.8
Rigel	281°14.5	-8°11.3
Capella	280°38.1	46°00.4
Bellatrix	278°34.7	6°21.5
Elnath	278°15.7	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.1
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.8
Suhail	222°54.4	-43°28.7
Miaplacidus	221°41.0	-69°45.9
Alphard	217°58.4	-8°42.4
Regulus	207°46.0	11°54.9
Dubhe	193°54.4	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.9	-63°09.8
Gacrux	172°03.4	-57°10.7
Alioth	166°22.3	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.3	49°15.8
Hadar	148°50.8	-60°25.7
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.4	-60°53.0
Kochab	137°18.9	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.3
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.6	-26°16.9
Altair	62°10.0	8°53.8
Peacock	53°22.0	-56°41.8
Deneb	49°32.6	45°19.0
Enif	33°49.0	9°55.4
Al Na'ir	27°46.1	-46°54.3
Fomalhaut	15°26.2	-29°33.7
Scheat	13°55.4	28°08.3
Markab	13°40.4	15°15.7

Jun 24 Thu	**SHA**	**Mer.pass**
Venus	225°46.6	14:49
Mars	199°00.2	16:35
Jupiter	357°38.8	06:00
Saturn	180°36.1	17:47

Jun 25 Fri	**SHA**	**Mer.pass**
Venus	224°36.5	14:50
Mars	198°29.3	16:33
Jupiter	357°33.8	05:57
Saturn	180°33.9	17:43

Jun 26 Sat	**SHA**	**Mer.pass**
Venus	223°26.8	14:51
Mars	197°58.4	16:31
Jupiter	357°28.9	05:53
Saturn	180°31.7	17:39

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0557 sec ΔT = TT-UT1 = +66.2397 sec

2010 June 24 to Jun. 26 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°25.4	N23°25.0	31°36.2	8.1'	S24°02.2	-4.1'	56.7'
1	194°25.2	24.9	46°03.2	8.0'	24°06.2	-4.0'	56.7'
2	209°25.1	24.9	60°30.2	8.0'	24°10.1	-3.8'	56.6'
3	224°25.0	· · 24.8	74°57.3	8.0'	24°13.9	-3.7'	56.6'
4	239°24.8	24.8	89°24.3	8.0'	24°17.5	-3.5'	56.6'
5	254°24.7	24.8	103°51.3	8.0'	24°20.9	-3.4'	56.6'
6	269°24.6	N23°24.7	118°18.3	8.0'	S24°24.3	-3.3'	56.6'
7	284°24.4	24.7	132°45.3	8.0'	24°27.5	-3.1'	56.5'
8	299°24.3	24.6	147°12.2	8.0'	24°30.5	-3.0'	56.5'
9	314°24.2	· · 24.6	161°39.2	8.0'	24°33.4	-2.8'	56.5'
10	329°24.0	24.5	176°06.2	8.0'	24°36.2	-2.7'	56.5'
11	344°23.9	24.5	190°33.2	8.0'	24°38.8	-2.6'	56.5'
12	359°23.8	N23°24.4	205°00.1	8.0'	S24°41.3	-2.4'	56.4'
13	14°23.6	24.4	219°27.1	8.0'	24°43.7	-2.3'	56.4'
14	29°23.5	24.3	233°54.1	8.0'	24°45.9	-2.1'	56.4'
15	44°23.4	· · 24.3	248°21.1	8.0'	24°48.0	-2.0'	56.4'
16	59°23.2	24.2	262°48.1	8.0'	24°49.9	-1.9'	56.4'
17	74°23.1	24.1	277°15.1	8.0'	24°51.7	-1.7'	56.3'
18	89°23.0	N23°24.1	291°42.1	8.0'	S24°53.3	-1.6'	56.3'
19	104°22.8	24.0	306°09.1	8.0'	24°54.8	-1.4'	56.3'
20	119°22.7	24.0	320°36.1	8.0'	24°56.2	-1.3'	56.3'
21	134°22.6	· · 23.9	335°03.1	8.0'	24°57.4	-1.2'	56.3'
22	149°22.4	23.9	349°30.2	8.1'	24°58.5	-1.0'	56.2'
23	164°22.3	23.8	3°57.2	8.1'	24°59.5	-0.9'	56.2'
	SD.=15.7	d=-0.0	S.D.=15.4				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°22.2	N23°23.7	18°24.3	8.1'	S25°00.3	-0.7'	56.2'
1	194°22.0	23.7	32°51.4	8.1'	25°00.9	-0.6'	56.2'
2	209°21.9	23.6	47°18.5	8.1'	25°01.5	-0.5'	56.2'
3	224°21.8	· · 23.6	61°45.6	8.1'	25°01.8	-0.3'	56.1'
4	239°21.6	23.5	76°12.8	8.2'	25°02.1	-0.2'	56.1'
5	254°21.5	23.4	90°39.9	8.2'	25°02.2	-0.0'	56.1'
6	269°21.4	N23°23.4	105°07.1	8.2'	S25°02.2	0.1'	56.1'
7	284°21.3	23.3	119°34.4	8.2'	25°02.0	0.2'	56.0'
8	299°21.1	23.2	134°01.6	8.3'	25°01.7	0.4'	56.0'
9	314°21.0	· · 23.2	148°28.9	8.3'	25°01.2	0.5'	56.0'
10	329°20.9	23.1	162°56.2	8.3'	25°00.6	0.7'	56.0'
11	344°20.7	23.0	177°23.5	8.4'	24°59.9	0.8'	56.0'
12	359°20.6	N23°23.0	191°50.9	8.4'	S24°59.1	0.9'	55.9'
13	14°20.5	22.9	206°18.3	8.4'	24°58.1	1.1'	55.9'
14	29°20.3	22.8	220°45.7	8.5'	24°56.9	1.2'	55.9'
15	44°20.2	· · 22.7	235°13.2	8.5'	24°55.7	1.3'	55.9'
16	59°20.1	22.7	249°40.7	8.5'	24°54.3	1.5'	55.9'
17	74°19.9	22.6	264°08.3	8.6'	24°52.7	1.6'	55.8'
18	89°19.8	N23°22.5	278°35.9	8.6'	S24°51.0	1.7'	55.8'
19	104°19.7	22.5	293°03.5	8.6'	24°49.2	1.9'	55.8'
20	119°19.5	22.4	307°31.2	8.7'	24°47.3	2.0'	55.8'
21	134°19.4	· · 22.3	321°58.9	8.7'	24°45.2	2.1'	55.8'
22	149°19.3	22.2	336°26.6	8.8'	24°43.0	2.3'	55.7'
23	164°19.1	22.2	350°54.4	8.8'	24°40.7	2.4'	55.7'
	SD.=15.7	d=-0.1	S.D.=15.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°19.0	N23°22.1	5°22.3	8.9'	S24°38.2	2.5'	55.7'
1	194°18.9	22.0	19°50.2	8.9'	24°35.6	2.7'	55.7'
2	209°18.8	21.9	34°18.1	9.0'	24°32.9	2.8'	55.7'
3	224°18.6	· · 21.8	48°46.1	9.0'	24°30.1	2.9'	55.7'
4	239°18.5	21.8	63°14.1	9.1'	24°27.1	3.0'	55.6'
5	254°18.4	21.7	77°42.2	9.1'	24°24.0	3.2'	55.6'
6	269°18.2	N23°21.6	92°10.4	9.2'	S24°20.7	3.3'	55.6'
7	284°18.1	21.5	106°38.6	9.2'	24°17.4	3.4'	55.6'
8	299°18.0	21.4	121°06.8	9.3'	24°13.9	3.6'	55.6'
9	314°17.8	· · 21.4	135°35.1	9.3'	24°10.3	3.7'	55.5'
10	329°17.7	21.3	150°03.5	9.4'	24°06.5	3.8'	55.5'
11	344°17.6	21.2	164°31.9	9.4'	24°02.7	3.9'	55.5'
12	359°17.4	N23°21.1	179°00.4	9.5'	S23°58.7	4.0'	55.5'
13	14°17.3	21.0	193°28.9	9.6'	23°54.6	4.2'	55.5'
14	29°17.2	20.9	207°57.5	9.6'	23°50.3	4.3'	55.4'
15	44°17.1	· · 20.8	222°26.2	9.7'	23°46.0	4.4'	55.4'
16	59°16.9	20.7	236°54.9	9.7'	23°41.5	4.5'	55.4'
17	74°16.8	20.7	251°23.7	9.8'	23°36.9	4.6'	55.4'
18	89°16.7	N23°20.6	265°52.5	9.9'	S23°32.2	4.8'	55.4'
19	104°16.5	20.5	280°21.4	9.9'	23°27.4	4.9'	55.3'
20	119°16.4	20.4	294°50.4	10.0'	23°22.5	5.0'	55.3'
21	134°16.3	· · 20.3	309°19.4	10.1'	23°17.4	5.1'	55.3'
22	149°16.1	20.2	323°48.5	10.1'	23°12.3	5.2'	55.3'
23	164°16.0	20.1	338°17.7	10.2'	23°07.0	5.3'	55.3'
	SD.=15.7	d=-0.1	S.D.=15.1				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	▭	▭	01:33	22:31	▭	▭
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	03:59	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	07:08	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	15:31	16:19	17:08
58°	07:04	07:57	08:49	15:17	16:09	17:01
S 60°	07:11	08:08	09:06	14:59	15:57	16:54

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 12-14 96-100%
24	02:19	02:25	12:02	22:44	10:16	○
25	02:31	02:38	12:03	23:38	11:11	
26	02:44	02:50	12:03	–:–	12:04	

June 27, 28, 29 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	275°00.1	137°17.7	N18°14.3	112°27.5	N08°27.1	272°24.3	S00°15.1	95°29.4	N02°45.3
1	290°02.6	152°17.3	13.4	127°28.7	26.6	287°26.5	15.0	110°31.8	45.2
2	305°05.0	167°16.9	12.5	142°29.8	26.0	302°28.8	15.0	125°34.1	45.2
3	320°07.5	182°16.4	· · 11.6	157°31.0	· · 25.4	317°31.1	· · 14.9	140°36.5	· · 45.1
4	335°10.0	197°16.0	10.7	172°32.2	24.9	332°33.3	14.8	155°38.9	45.1
5	350°12.4	212°15.6	09.9	187°33.3	24.3	347°35.6	14.8	170°41.2	45.0
6	5°14.9	227°15.2	N18°09.0	202°34.5	N08°23.7	2°37.9	S00°14.7	185°43.6	N02°44.9
7	20°17.3	242°14.8	08.1	217°35.7	23.2	17°40.2	14.6	200°46.0	44.9
8	35°19.8	257°14.4	07.2	232°36.9	22.6	32°42.4	14.6	215°48.3	44.8
9	50°22.3	272°14.0	· · 06.3	247°38.0	· · 22.0	47°44.7	· · 14.5	230°50.7	· · 44.8
10	65°24.7	287°13.6	05.4	262°39.2	21.5	62°47.0	14.4	245°53.1	44.7
11	80°27.2	302°13.2	04.5	277°40.4	20.9	77°49.3	14.3	260°55.4	44.7
12	95°29.7	317°12.8	N18°03.6	292°41.5	N08°20.3	92°51.5	S00°14.3	275°57.8	N02°44.6
13	110°32.1	332°12.4	02.7	307°42.7	19.8	107°53.8	14.2	291°00.1	44.6
14	125°34.6	347°12.0	01.8	322°43.9	19.2	122°56.1	14.1	306°02.5	44.5
15	140°37.1	2°11.6	18°00.8	337°45.0	· · 18.6	137°58.3	· · 14.1	321°04.9	· · 44.5
16	155°39.5	17°11.2	17°59.9	352°46.2	18.0	153°00.6	14.0	336°07.2	44.4
17	170°42.0	32°10.8	59.0	7°47.4	17.5	168°02.9	13.9	351°09.6	44.4
18	185°44.4	47°10.4	N17°58.1	22°48.6	N08°16.9	183°05.2	S00°13.9	6°12.0	N02°44.3
19	200°46.9	62°10.0	57.2	37°49.7	16.3	198°07.4	13.8	21°14.3	44.3
20	215°49.4	77°09.6	56.3	52°50.9	15.8	213°09.7	13.7	36°16.7	44.2
21	230°51.8	92°09.2	· · 55.4	67°52.1	· · 15.2	228°12.0	· · 13.7	51°19.0	· · 44.1
22	245°54.3	107°08.8	54.5	82°53.2	14.6	243°14.3	13.6	66°21.4	44.1
23	260°56.8	122°08.4	53.6	97°54.4	14.1	258°16.5	13.5	81°23.8	44.0
Mer.pass.:05:39		v-0.4 d-0.9 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.1 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	275°59.2	137°08.0	N17°52.7	112°55.6	N08°13.5	273°18.8	S00°13.4	96°26.1	N02°44.0
1	291°01.7	152°07.6	51.8	127°56.7	12.9	288°21.1	13.4	111°28.5	43.9
2	306°04.2	167°07.2	50.9	142°57.9	12.4	303°23.4	13.3	126°30.8	43.9
3	321°06.6	182°06.8	· · 49.9	157°59.1	· · 11.8	318°25.7	· · 13.2	141°33.2	· · 43.8
4	336°09.1	197°06.4	49.0	173°00.2	11.2	333°27.9	13.2	156°35.6	43.8
5	351°11.6	212°06.0	48.1	188°01.4	10.6	348°30.2	13.1	171°37.9	43.7
6	6°14.0	227°05.6	N17°47.2	203°02.6	N08°10.1	3°32.5	S00°13.0	186°40.3	N02°43.7
7	21°16.5	242°05.2	46.3	218°03.7	09.5	18°34.8	13.0	201°42.6	43.6
8	36°18.9	257°04.8	45.4	233°04.9	08.9	33°37.0	12.9	216°45.0	43.5
9	51°21.4	272°04.4	· · 44.5	248°06.1	· · 08.4	48°39.3	· · 12.8	231°47.4	· · 43.5
10	66°23.9	287°04.0	43.5	263°07.2	07.8	63°41.6	12.8	246°49.7	43.4
11	81°26.3	302°03.7	42.6	278°08.4	07.2	78°43.9	12.7	261°52.1	43.4
12	96°28.8	317°03.3	N17°41.7	293°09.6	N08°06.6	93°46.2	S00°12.6	276°54.4	N02°43.3
13	111°31.3	332°02.9	40.8	308°10.7	06.1	108°48.4	12.6	291°56.8	43.3
14	126°33.7	347°02.5	39.9	323°11.9	05.5	123°50.7	12.5	306°59.2	43.2
15	141°36.2	2°02.1	· · 38.9	338°13.1	· · 04.9	138°53.0	· · 12.4	322°01.5	· · 43.2
16	156°38.7	17°01.7	38.0	353°14.2	04.4	153°55.3	12.4	337°03.9	43.1
17	171°41.1	32°01.3	37.1	8°15.4	03.8	168°57.6	12.3	352°06.2	43.1
18	186°43.6	47°00.9	N17°36.2	23°16.6	N08°03.2	183°59.8	S00°12.2	7°08.6	N02°43.0
19	201°46.1	62°00.6	35.2	38°17.7	02.6	199°02.1	12.2	22°11.0	42.9
20	216°48.5	77°00.2	34.3	53°18.9	02.1	214°04.4	12.1	37°13.3	42.9
21	231°51.0	91°59.8	· · 33.4	68°20.1	· · 01.5	229°06.7	· · 12.0	52°15.7	· · 42.8
22	246°53.4	106°59.4	32.5	83°21.2	00.9	244°09.0	12.0	67°18.0	42.8
23	261°55.9	121°59.0	31.5	98°22.4	00.3	259°11.3	11.9	82°20.4	42.7
Mer.pass.:05:35		v-0.4 d-0.9 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.1 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	276°58.4	136°58.7	N17°30.6	113°23.6	N07°59.8	274°13.5	S00°11.8	97°22.7	N02°42.7
1	292°00.8	151°58.3	29.7	128°24.7	59.2	289°15.8	11.8	112°25.1	42.6
2	307°03.3	166°57.9	28.8	143°25.9	58.6	304°18.1	11.7	127°27.5	42.6
3	322°05.8	181°57.5	· · 27.8	158°27.1	· · 58.1	319°20.4	· · 11.7	142°29.8	· · 42.5
4	337°08.2	196°57.1	26.9	173°28.2	57.5	334°22.7	11.6	157°32.2	42.4
5	352°10.7	211°56.8	26.0	188°29.4	56.9	349°25.0	11.5	172°34.5	42.4
6	7°13.2	226°56.4	N17°25.0	203°30.6	N07°56.3	4°27.2	S00°11.5	187°36.9	N02°42.3
7	22°15.6	241°56.0	24.1	218°31.7	55.8	19°29.5	11.4	202°39.2	42.3
8	37°18.1	256°55.6	23.2	233°32.9	55.2	34°31.8	11.3	217°41.6	42.2
9	52°20.6	271°55.3	· · 22.2	248°34.1	· · 54.6	49°34.1	· · 11.3	232°44.0	· · 42.2
10	67°23.0	286°54.9	21.3	263°35.2	54.0	64°36.4	11.2	247°46.3	42.1
11	82°25.5	301°54.5	20.4	278°36.4	53.5	79°38.7	11.1	262°48.7	42.1
12	97°27.9	316°54.2	N17°19.4	293°37.6	N07°52.9	94°41.0	S00°11.1	277°51.0	N02°42.0
13	112°30.4	331°53.8	18.5	308°38.7	52.3	109°43.3	11.0	292°53.4	41.9
14	127°32.9	346°53.4	17.5	323°39.9	51.7	124°45.5	10.9	307°55.7	41.9
15	142°35.3	1°53.0	· · 16.6	338°41.1	· · 51.2	139°47.8	· · 10.9	322°58.1	· · 41.8
16	157°37.8	16°52.7	15.7	353°42.2	50.6	154°50.1	10.8	338°00.4	41.8
17	172°40.3	31°52.3	14.7	8°43.4	50.0	169°52.4	10.8	353°02.8	41.7
18	187°42.7	46°51.9	N17°13.8	23°44.5	N07°49.4	184°54.7	S00°10.7	8°05.2	N02°41.7
19	202°45.2	61°51.6	12.8	38°45.7	48.9	199°57.0	10.6	23°07.5	41.6
20	217°47.7	76°51.2	11.9	53°46.9	48.3	214°59.3	10.6	38°09.9	41.5
21	232°50.1	91°50.8	· · 11.0	68°48.0	· · 47.7	230°01.6	· · 10.5	53°12.2	· · 41.5
22	247°52.6	106°50.5	10.0	83°49.2	47.1	245°03.8	10.4	68°14.6	41.4
23	262°55.0	121°50.1	09.1	98°50.4	46.6	260°06.1	10.4	83°16.9	41.4
Mer.pass.:05:31		v-0.4 d-0.9 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.7	29°08.9
Ankaa	353°17.7	-42°14.6
Schedar	349°43.2	56°35.5
Diphda	348°58.0	-17°55.5
Achernar	335°28.4	-57°10.6
Hamal	328°03.4	23°30.7
Polaris	319°05.9	89°18.4
Acamar	315°20.2	-40°15.5
Menkar	314°17.5	4°07.9
Mirfak	308°43.9	49°53.8
Aldebaran	290°52.2	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.1	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.7	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°04.0	7°24.5
Canopus	263°57.7	-52°42.1
Sirius	258°36.0	-16°43.9
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.8
Suhail	222°54.4	-43°28.7
Miaplacidus	221°41.0	-69°45.9
Alphard	217°58.4	-8°42.4
Regulus	207°46.0	11°54.9
Dubhe	193°54.4	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.5	-17°36.2
Acrux	173°11.9	-63°09.8
Gacrux	172°03.4	-57°10.7
Alioth	166°22.3	55°54.3
Spica	158°33.4	-11°13.1
Alkaid	153°00.3	49°15.8
Hadar	148°50.8	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.4	-60°53.0
Kochab	137°18.9	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.3
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.6	-26°16.9
Altair	62°10.0	8°53.8
Peacock	53°22.0	-56°41.8
Deneb	49°32.6	45°19.0
Enif	33°49.0	9°55.5
Al Na'ir	27°46.0	-46°54.3
Fomalhaut	15°26.1	-29°33.7
Scheat	13°55.4	28°08.4
Markab	13°40.4	15°15.7

Jun 27 Sun	**SHA**	**Mer.pass**
Venus	222°17.6	14:51
Mars	197°27.4	16:29
Jupiter	357°24.2	05:50
Saturn	180°29.3	17:35

Jun 28 Mon	**SHA**	**Mer.pass**
Venus	221°08.7	14:52
Mars	196°56.3	16:27
Jupiter	357°19.6	05:46
Saturn	180°26.9	17:32

Jun 29 Tue	**SHA**	**Mer.pass**
Venus	220°00.3	14:52
Mars	196°25.2	16:25
Jupiter	357°15.2	05:42
Saturn	180°24.4	17:28

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = -0.0562 sec ΔT = TT-UT1 = +66.2402 sec

2010 June 27 to Jun. 29 UT

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.9	N23°20.0	352°46.9	10.3'	S23°01.6	5.4'	55.3'
1	194°15.8	19.9	7°16.2	10.3'	22°56.1	5.6'	55.2'
2	209°15.6	19.8	21°45.6	10.4'	22°50.5	5.7'	55.2'
3	224°15.5	· · 19.7	36°15.0	10.5'	22°44.7	5.8'	55.2'
4	239°15.4	19.6	50°44.5	10.5'	22°38.9	5.9'	55.2'
5	254°15.2	19.5	65°14.1	10.6'	22°33.0	6.0'	55.2'
6	269°15.1	N23°19.4	79°43.8	10.7'	S22°26.9	6.1'	55.2'
7	284°15.0	19.3	94°13.5	10.7'	22°20.8	6.2'	55.1'
8	299°14.9	19.2	108°43.3	10.8'	22°14.5	6.3'	55.1'
9	314°14.7	· · 19.1	123°13.1	10.9'	22°08.1	6.4'	55.1'
10	329°14.6	19.0	137°43.0	11.0'	22°01.7	6.5'	55.1'
11	344°14.5	18.9	152°13.0	11.0'	21°55.1	6.6'	55.1'
12	359°14.3	N23°18.8	166°43.1	11.1'	S21°48.4	6.7'	55.0'
13	14°14.2	18.7	181°13.2	11.2'	21°41.7	6.8'	55.0'
14	29°14.1	18.6	195°43.5	11.2'	21°34.8	6.9'	55.0'
15	44°14.0	· · 18.5	210°13.7	11.3'	21°27.8	7.0'	55.0'
16	59°13.8	18.4	224°44.1	11.4'	21°20.7	7.1'	55.0'
17	74°13.7	18.3	239°14.5	11.5'	21°13.6	7.2'	55.0'
18	89°13.6	N23°18.2	253°45.0	11.5'	S21°06.3	7.3'	54.9'
19	104°13.4	18.1	268°15.6	11.6'	20°58.9	7.4'	54.9'
20	119°13.3	18.0	282°46.2	11.7'	20°51.5	7.5'	54.9'
21	134°13.2	· · 17.9	297°17.0	11.8'	20°43.9	7.6'	54.9'
22	149°13.1	17.8	311°47.7	11.8'	20°36.3	7.7'	54.9'
23	164°12.9	17.6	326°18.6	11.9'	20°28.6	7.8'	54.9'
	SD.=15.7	d=-0.1	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.8	N23°17.5	340°49.5	12.0'	S20°20.8	7.9'	54.9'
1	194°12.7	17.4	355°20.6	12.0'	20°12.9	8.0'	54.8'
2	209°12.5	17.3	9°51.6	12.1'	20°04.9	8.0'	54.8'
3	224°12.4	· · 17.2	24°22.8	12.2'	19°56.8	8.1'	54.8'
4	239°12.3	17.1	38°54.0	12.3'	19°48.6	8.2'	54.8'
5	254°12.2	17.0	53°25.3	12.3'	19°40.3	8.3'	54.8'
6	269°12.0	N23°16.9	67°56.7	12.4'	S19°32.0	8.4'	54.8'
7	284°11.9	16.7	82°28.1	12.5'	19°23.6	8.5'	54.7'
8	299°11.8	16.6	96°59.7	12.6'	19°15.1	8.5'	54.7'
9	314°11.7	· · 16.5	111°31.3	12.6'	19°06.5	8.6'	54.7'
10	329°11.5	16.4	126°02.9	12.7'	18°57.8	8.7'	54.7'
11	344°11.4	16.3	140°34.6	12.8'	18°49.1	8.8'	54.7'
12	359°11.3	N23°16.1	155°06.5	12.8'	S18°40.2	8.9'	54.7'
13	14°11.1	16.0	169°38.3	12.9'	18°31.3	8.9'	54.7'
14	29°11.0	15.9	184°10.3	13.0'	18°22.4	9.0'	54.6'
15	44°10.9	· · 15.8	198°42.3	13.1'	18°13.3	9.1'	54.6'
16	59°10.8	15.7	213°14.4	13.1'	18°04.2	9.2'	54.6'
17	74°10.6	15.5	227°46.5	13.2'	17°55.0	9.2'	54.6'
18	89°10.5	N23°15.4	242°18.8	13.3'	S17°45.7	9.3'	54.6'
19	104°10.4	15.3	256°51.1	13.3'	17°36.3	9.4'	54.6'
20	119°10.3	15.2	271°23.4	13.4'	17°26.9	9.5'	54.6'
21	134°10.1	· · 15.0	285°55.8	13.5'	17°17.4	9.5'	54.6'
22	149°10.0	14.9	300°28.3	13.5'	17°07.9	9.6'	54.5'
23	164°09.9	14.8	315°00.9	13.6'	16°58.2	9.7'	54.5'
	SD.=15.7	d=-0.1	S.D.=14.9				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.8	N23°14.6	329°33.5	13.7'	S16°48.5	9.7'	54.5'
1	194°09.6	14.5	344°06.2	13.7'	16°38.8	9.8'	54.5'
2	209°09.5	14.4	358°39.0	13.8'	16°29.0	9.9'	54.5'
3	224°09.4	· · 14.3	13°11.8	13.9'	16°19.1	9.9'	54.5'
4	239°09.3	14.1	27°44.7	13.9'	16°09.1	10.0'	54.5'
5	254°09.1	14.0	42°17.7	14.0'	15°59.1	10.1'	54.5'
6	269°09.0	N23°13.9	56°50.7	14.1'	S15°49.0	10.1'	54.4'
7	284°08.9	13.7	71°23.8	14.1'	15°38.9	10.2'	54.4'
8	299°08.8	13.6	85°57.0	14.2'	15°28.7	10.2'	54.4'
9	314°08.6	· · 13.5	100°30.2	14.2'	15°18.4	10.3'	54.4'
10	329°08.5	13.3	115°03.5	14.3'	15°08.1	10.3'	54.4'
11	344°08.4	13.2	129°36.8	14.4'	14°57.7	10.4'	54.4'
12	359°08.3	N23°13.1	144°10.2	14.4'	S14°47.3	10.5'	54.4'
13	14°08.1	12.9	158°43.6	14.5'	14°36.8	10.5'	54.4'
14	29°08.0	12.8	173°17.2	14.5'	14°26.2	10.6'	54.4'
15	44°07.9	· · 12.6	187°50.7	14.6'	14°15.6	10.6'	54.4'
16	59°07.8	12.5	202°24.4	14.7'	14°05.0	10.7'	54.3'
17	74°07.6	12.4	216°58.1	14.7'	13°54.3	10.7'	54.3'
18	89°07.5	N23°12.2	231°31.8	14.8'	S13°43.5	10.8'	54.3'
19	104°07.4	12.1	246°05.6	14.8'	13°32.7	10.8'	54.3'
20	119°07.3	11.9	260°39.5	14.9'	13°21.8	10.9'	54.3'
21	134°07.1	· · 11.8	275°13.4	14.9'	13°10.9	10.9'	54.3'
22	149°07.0	11.6	289°47.3	15.0'	13°00.0	11.0'	54.3'
23	164°06.9	11.5	304°21.4	15.0'	12°49.0	11.0'	54.3'
	SD.=15.7	d=-0.1	S.D.=14.8				

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

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 15-17 99-91%
27	02:56	03:03	12:03	00:30	12:55	
28	03:09	03:15	12:03	01:19	13:43	
29	03:21	03:27	12:03	02:06	14:28	

June 30, 01, 02 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	277°57.5	136°49.8	N17°08.1	113°51.5	N07°46.0	275°08.4	S00°10.3	98°19.3	N02°41.3
1	293°00.0	151°49.4	07.2	128°52.7	45.4	290°10.7	10.3	113°21.6	41.3
2	308°02.4	166°49.0	06.2	143°53.8	44.8	305°13.0	10.2	128°24.0	41.2
3	323°04.9	181°48.7	·· 05.3	158°55.0	·· 44.3	320°15.3	·· 10.1	143°26.3	·· 41.1
4	338°07.4	196°48.3	04.3	173°56.2	43.7	335°17.6	10.1	158°28.7	41.1
5	353°09.8	211°48.0	03.4	188°57.3	43.1	350°19.9	10.0	173°31.0	41.0
6	8°12.3	226°47.6	N17°02.4	203°58.5	N07°42.5	5°22.2	S00°09.9	188°33.4	N02°41.0
7	23°14.8	241°47.2	01.5	218°59.7	42.0	20°24.5	09.9	203°35.8	40.9
8	38°17.2	256°46.9	17°00.5	234°00.8	41.4	35°26.8	09.8	218°38.1	40.9
9	53°19.7	271°46.5	16°59.6	249°02.0	·· 40.8	50°29.0	·· 09.8	233°40.5	·· 40.8
10	68°22.2	286°46.2	58.6	264°03.1	40.2	65°31.3	09.7	248°42.8	40.7
11	83°24.6	301°45.8	57.7	279°04.3	39.7	80°33.6	09.6	263°45.2	40.7
12	98°27.1	316°45.5	N16°56.7	294°05.5	N07°39.1	95°35.9	S00°09.6	278°47.5	N02°40.6
13	113°29.5	331°45.1	55.8	309°06.6	38.5	110°38.2	09.5	293°49.9	40.6
14	128°32.0	346°44.8	54.8	324°07.8	37.9	125°40.5	09.5	308°52.2	40.5
15	143°34.5	1°44.4	·· 53.9	339°09.0	·· 37.3	140°42.8	·· 09.4	323°54.6	·· 40.5
16	158°36.9	16°44.0	52.9	354°10.1	36.8	155°45.1	09.3	338°56.9	40.4
17	173°39.4	31°43.7	52.0	9°11.3	36.2	170°47.4	09.3	353°59.3	40.3
18	188°41.9	46°43.3	N16°51.0	24°12.4	N07°35.6	185°49.7	S00°09.2	9°01.6	N02°40.3
19	203°44.3	61°43.0	50.0	39°13.6	35.0	200°52.0	09.2	24°04.0	40.2
20	218°46.8	76°42.6	49.1	54°14.8	34.5	215°54.3	09.1	39°06.3	40.2
21	233°49.3	91°42.3	·· 48.1	69°15.9	·· 33.9	230°56.6	·· 09.0	54°08.7	·· 40.1
22	248°51.7	106°42.0	47.2	84°17.1	33.3	245°58.9	09.0	69°11.0	40.0
23	263°54.2	121°41.6	46.2	99°18.2	32.7	261°01.2	08.9	84°13.4	40.0
Mer.pass.:05:27		v-0.4 d-0.9 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.1 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	278°56.7	136°41.3	N16°45.2	114°19.4	N07°32.1	276°03.5	S00°08.9	99°15.7	N02°39.9
1	293°59.1	151°40.9	44.3	129°20.6	31.6	291°05.8	08.8	114°18.1	39.9
2	309°01.6	166°40.6	43.3	144°21.7	31.0	306°08.1	08.7	129°20.4	39.8
3	324°04.0	181°40.2	·· 42.4	159°22.9	·· 30.4	321°10.4	·· 08.7	144°22.8	·· 39.8
4	339°06.5	196°39.9	41.4	174°24.0	29.8	336°12.6	08.6	159°25.1	39.7
5	354°09.0	211°39.5	40.4	189°25.2	29.3	351°14.9	08.6	174°27.5	39.6
6	9°11.4	226°39.2	N16°39.5	204°26.4	N07°28.7	6°17.2	S00°08.5	189°29.8	N02°39.6
7	24°13.9	241°38.9	38.5	219°27.5	28.1	21°19.5	08.4	204°32.2	39.5
8	39°16.4	256°38.5	37.5	234°28.7	27.5	36°21.8	08.4	219°34.5	39.5
9	54°18.8	271°38.2	·· 36.6	249°29.8	·· 26.9	51°24.1	·· 08.3	234°36.9	·· 39.4
10	69°21.3	286°37.8	35.6	264°31.0	26.4	66°26.4	08.3	249°39.2	39.3
11	84°23.8	301°37.5	34.6	279°32.2	25.8	81°28.7	08.2	264°41.6	39.3
12	99°26.2	316°37.2	N16°33.7	294°33.3	N07°25.2	96°31.0	S00°08.2	279°43.9	N02°39.2
13	114°28.7	331°36.8	32.7	309°34.5	24.6	111°33.3	08.1	294°46.3	39.2
14	129°31.1	346°36.5	31.7	324°35.6	24.0	126°35.6	08.0	309°48.6	39.1
15	144°33.6	1°36.1	·· 30.7	339°36.8	·· 23.5	141°37.9	·· 08.0	324°51.0	·· 39.0
16	159°36.1	16°35.8	29.8	354°38.0	22.9	156°40.2	07.9	339°53.3	39.0
17	174°38.5	31°35.5	28.8	9°39.1	22.3	171°42.5	07.9	354°55.7	38.9
18	189°41.0	46°35.1	N16°27.8	24°40.3	N07°21.7	186°44.8	S00°07.8	9°58.0	N02°38.9
19	204°43.5	61°34.8	26.9	39°41.4	21.1	201°47.1	07.7	25°00.4	38.8
20	219°45.9	76°34.5	25.9	54°42.6	20.6	216°49.4	07.7	40°02.7	38.7
21	234°48.4	91°34.2	·· 24.9	69°43.8	·· 20.0	231°51.7	·· 07.6	55°05.1	·· 38.7
22	249°50.9	106°33.8	23.9	84°44.9	19.4	246°54.1	07.6	70°07.4	38.6
23	264°53.3	121°33.5	22.9	99°46.1	18.8	261°56.4	07.5	85°09.8	38.6
Mer.pass.:05:23		v-0.3 d-1.0 m-4.0		v1.2 d-0.6 m1.3		v2.3 d0.1 m-2.3		v2.4 d-0.1 m1.1	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	279°55.8	136°33.2	N16°22.0	114°47.2	N07°18.2	276°58.7	S00°07.5	100°12.1	N02°38.5
1	294°58.3	151°32.8	21.0	129°48.4	17.7	292°01.0	07.4	115°14.5	38.4
2	310°00.7	166°32.5	20.0	144°49.5	17.1	307°03.3	07.4	130°16.8	38.4
3	325°03.2	181°32.2	·· 19.0	159°50.7	·· 16.5	322°05.6	·· 07.3	145°19.1	·· 38.3
4	340°05.6	196°31.8	18.1	174°51.9	15.9	337°07.9	07.2	160°21.5	38.3
5	355°08.1	211°31.5	17.1	189°53.0	15.3	352°10.2	07.2	175°23.8	38.2
6	10°10.6	226°31.2	N16°16.1	204°54.2	N07°14.7	7°12.5	S00°07.1	190°26.2	N02°38.1
7	25°13.0	241°30.9	15.1	219°55.3	14.2	22°14.8	07.1	205°28.5	38.1
8	40°15.5	256°30.5	14.1	234°56.5	13.6	37°17.1	07.0	220°30.9	38.0
9	55°18.0	271°30.2	·· 13.1	249°57.6	·· 13.0	52°19.4	·· 07.0	235°33.2	·· 38.0
10	70°20.4	286°29.9	12.2	264°58.8	12.4	67°21.7	06.9	250°35.6	37.9
11	85°22.9	301°29.6	11.2	280°00.0	11.8	82°24.0	06.9	265°37.9	37.8
12	100°25.4	316°29.3	N16°10.2	295°01.1	N07°11.3	97°26.3	S00°06.8	280°40.3	N02°37.8
13	115°27.8	331°28.9	09.2	310°02.3	10.7	112°28.6	06.7	295°42.6	37.7
14	130°30.3	346°28.6	08.2	325°03.4	10.1	127°30.9	06.7	310°45.0	37.7
15	145°32.8	1°28.3	·· 07.2	340°04.6	·· 09.5	142°33.2	·· 06.6	325°47.3	·· 37.6
16	160°35.2	16°28.0	06.2	355°05.7	08.9	157°35.5	06.6	340°49.6	37.5
17	175°37.7	31°27.7	05.3	10°06.9	08.3	172°37.9	06.5	355°52.0	37.5
18	190°40.1	46°27.3	N16°04.3	25°08.1	N07°07.8	187°40.2	S00°06.5	10°54.3	N02°37.4
19	205°42.6	61°27.0	03.3	40°09.2	07.2	202°42.5	06.4	25°56.7	37.4
20	220°45.1	76°26.7	02.3	55°10.4	06.6	217°44.8	06.4	40°59.0	37.3
21	235°47.5	91°26.4	·· 01.3	70°11.5	·· 06.0	232°47.1	·· 06.3	56°01.4	·· 37.2
22	250°50.0	106°26.1	16°00.3	85°12.7	05.4	247°49.4	06.3	71°03.7	37.2
23	265°52.5	121°25.8	15°59.3	100°13.8	04.8	262°51.7	06.2	86°06.1	37.1
Mer.pass.:05:19		v-0.3 d-1.0 m-4.0		v1.2 d-0.6 m1.4		v2.3 d0.1 m-2.3		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.7	29°08.9
Ankaa	353°17.7	-42°14.6
Schedar	349°43.1	56°35.5
Diphda	348°58.0	-17°55.5
Achernar	335°28.4	-57°10.6
Hamal	328°03.4	23°30.7
Polaris	319°04.8	89°18.4
Acamar	315°20.2	-40°15.5
Menkar	314°17.5	4°07.9
Mirfak	308°43.8	49°53.8
Aldebaran	290°52.1	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.1	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.7	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.7	-52°42.1
Sirius	258°36.0	-16°43.8
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.8
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.8
Suhail	222°54.4	-43°28.7
Miaplacidus	221°41.1	-69°45.9
Alphard	217°58.4	-8°42.4
Regulus	207°46.0	11°54.9
Dubhe	193°54.4	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°11.9	-63°09.8
Gacrux	172°03.4	-57°10.7
Alioth	166°22.4	55°54.4
Spica	158°33.4	-11°13.1
Alkaid	153°00.3	49°15.8
Hadar	148°50.8	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.4	-60°53.0
Kochab	137°19.0	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.3
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.6
Nunki	76°00.6	-26°16.9
Altair	62°10.0	8°53.8
Peacock	53°22.0	-56°41.8
Deneb	49°32.6	45°19.0
Enif	33°49.0	9°55.5
Al Na'ir	27°46.0	-46°54.3
Fomalhaut	15°26.1	-29°33.7
Scheat	13°55.3	28°08.4
Markab	13°40.4	15°15.8

Jun 30 Wed	**SHA**	**Mer.pass**
Venus	218°52.2	14:53
Mars	195°54.0	16:23
Jupiter	357°10.9	05:39
Saturn	180°21.8	17:24

Jul 01 Thu	**SHA**	**Mer.pass**
Venus	217°44.6	14:54
Mars	195°22.8	16:21
Jupiter	357°06.8	05:35
Saturn	180°19.1	17:20

Jul 02 Fri	**SHA**	**Mer.pass**
Venus	216°37.4	14:54
Mars	194°51.4	16:20
Jupiter	357°02.9	05:31
Saturn	180°16.3	17:16

Horizontal parallax	
Venus:	0.1
Mars:	0.1

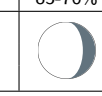
h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°06.8	N23°11.4	318°55.4	15.1'	S12°37.9	11.1'	54.3'
1	194°06.6	11.2	333°29.5	15.1'	12°26.8	11.1'	54.3'
2	209°06.5	11.1	348°03.7	15.2'	12°15.7	11.2'	54.3'
3	224°06.4	· · 10.9	2°37.9	15.2'	12°04.5	11.2'	54.2'
4	239°06.3	10.8	17°12.2	15.3'	11°53.3	11.2'	54.2'
5	254°06.1	10.6	31°46.5	15.3'	11°42.0	11.3'	54.2'
6	269°06.0	N23°10.5	46°20.9	15.4'	S11°30.7	11.3'	54.2'
7	284°05.9	10.3	60°55.3	15.4'	11°19.4	11.4'	54.2'
8	299°05.8	10.2	75°29.8	15.5'	11°08.0	11.4'	54.2'
9	314°05.7	· · 10.0	90°04.3	15.5'	10°56.5	11.5'	54.2'
10	329°05.5	09.9	104°38.8	15.6'	10°45.1	11.5'	54.2'
11	344°05.4	09.7	119°13.4	15.6'	10°33.5	11.5'	54.2'
12	359°05.3	N23°09.6	133°48.1	15.7'	S10°22.0	11.6'	54.2'
13	14°05.2	09.4	148°22.7	15.7'	10°10.4	11.6'	54.2'
14	29°05.0	09.2	162°57.5	15.7'	09°58.8	11.6'	54.2'
15	44°04.9	· · 09.1	177°32.2	15.8'	09°47.1	11.7'	54.2'
16	59°04.8	08.9	192°07.0	15.8'	09°35.4	11.7'	54.2'
17	74°04.7	08.8	206°41.9	15.9'	09°23.7	11.7'	54.2'
18	89°04.6	N23°08.6	221°16.7	15.9'	S09°12.0	11.8'	54.2'
19	104°04.4	08.5	235°51.7	15.9'	09°00.2	11.8'	54.2'
20	119°04.3	08.3	250°26.6	16.0'	08°48.4	11.8'	54.2'
21	134°04.2	· · 08.1	265°01.6	16.0'	08°36.5	11.9'	54.2'
22	149°04.1	08.0	279°36.6	16.0'	08°24.6	11.9'	54.2'
23	164°03.9	07.8	294°11.7	16.1'	08°12.7	11.9'	54.1'
	SD.=15.7	d=-0.1	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°03.8	N23°07.7	308°46.8	16.1'	S08°00.8	12.0'	54.1'
1	194°03.7	07.5	323°21.9	16.1'	07°48.8	12.0'	54.1'
2	209°03.6	07.3	337°57.0	16.2'	07°36.8	12.0'	54.1'
3	224°03.5	· · 07.2	352°32.2	16.2'	07°24.8	12.0'	54.1'
4	239°03.3	07.0	7°07.4	16.2'	07°12.8	12.1'	54.1'
5	254°03.2	06.8	21°42.6	16.2'	07°00.7	12.1'	54.1'
6	269°03.1	N23°06.7	36°17.9	16.3'	S06°48.6	12.1'	54.1'
7	284°03.0	06.5	50°53.2	16.3'	06°36.5	12.1'	54.1'
8	299°02.9	06.3	65°28.5	16.3'	06°24.3	12.2'	54.1'
9	314°02.7	· · 06.2	80°03.8	16.3'	06°12.2	12.2'	54.1'
10	329°02.6	06.0	94°39.2	16.4'	06°00.0	12.2'	54.1'
11	344°02.5	05.8	109°14.6	16.4'	05°47.8	12.2'	54.1'
12	359°02.4	N23°05.7	123°50.0	16.4'	S05°35.5	12.2'	54.1'
13	14°02.3	05.5	138°25.4	16.4'	05°23.3	12.3'	54.1'
14	29°02.1	05.3	153°00.8	16.5'	05°11.0	12.3'	54.1'
15	44°02.0	· · 05.1	167°36.3	16.5'	04°58.7	12.3'	54.1'
16	59°01.9	05.0	182°11.8	16.5'	04°46.4	12.3'	54.1'
17	74°01.8	04.8	196°47.3	16.5'	04°34.1	12.3'	54.1'
18	89°01.7	N23°04.6	211°22.8	16.5'	S04°21.8	12.3'	54.1'
19	104°01.5	04.4	225°58.3	16.5'	04°09.4	12.4'	54.1'
20	119°01.4	04.3	240°33.9	16.5'	03°57.0	12.4'	54.1'
21	134°01.3	· · 04.1	255°09.4	16.6'	03°44.7	12.4'	54.1'
22	149°01.2	03.9	269°45.0	16.6'	03°32.3	12.4'	54.2'
23	164°01.1	03.7	284°20.6	16.6'	03°19.8	12.4'	54.2'
	SD.=15.7	d=-0.2	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°00.9	N23°03.6	298°56.2	16.6'	S03°07.4	12.4'	54.2'
1	194°00.8	03.4	313°31.8	16.6'	02°55.0	12.4'	54.2'
2	209°00.7	03.2	328°07.4	16.6'	02°42.5	12.5'	54.2'
3	224°00.6	· · 03.0	342°43.0	16.6'	02°30.1	12.5'	54.2'
4	239°00.5	02.8	357°18.6	16.6'	02°17.6	12.5'	54.2'
5	254°00.4	02.6	11°54.2	16.6'	02°05.1	12.5'	54.2'
6	269°00.2	N23°02.5	26°29.8	16.6'	S01°52.6	12.5'	54.2'
7	284°00.1	02.3	41°05.5	16.6'	01°40.1	12.5'	54.2'
8	299°00.0	02.1	55°41.1	16.6'	01°27.6	12.5'	54.2'
9	313°59.9	· · 01.9	70°16.7	16.6'	01°15.1	12.5'	54.2'
10	328°59.8	01.7	84°52.4	16.6'	01°02.6	12.5'	54.2'
11	343°59.6	01.5	99°28.0	16.6'	00°50.1	12.5'	54.2'
12	358°59.5	N23°01.4	114°03.6	16.6'	S00°37.5	12.5'	54.2'
13	13°59.4	01.2	128°39.3	16.6'	00°25.0	12.5'	54.2'
14	28°59.3	01.0	143°14.9	16.6'	S00°12.5	12.5'	54.2'
15	43°59.2	· · 00.8	157°50.5	16.6'	N00°00.1	12.5'	54.2'
16	58°59.1	00.6	172°26.1	16.6'	00°12.6	12.5'	54.3'
17	73°58.9	00.4	187°01.7	16.6'	00°25.2	12.5'	54.3'
18	88°58.8	N23°00.2	201°37.3	16.6'	N00°37.7	12.5'	54.3'
19	103°58.7	23°00.0	216°12.9	16.6'	00°50.3	12.6'	54.3'
20	118°58.6	22°59.8	230°48.5	16.6'	01°02.8	12.6'	54.3'
21	133°58.5	· · 59.6	245°24.0	16.6'	01°15.4	12.6'	54.3'
22	148°58.4	59.4	259°59.6	16.5'	01°27.9	12.5'	54.3'
23	163°58.2	59.2	274°35.1	16.5'	01°40.5	12.5'	54.3'
	SD.=15.7	d=-0.2	S.D.=14.8				

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 18-20 85-70%
30	03:33	03:39	12:04	02:49	15:10	
01	03:45	03:50	12:04	03:31	15:51	
02	03:56	04:02	12:04	04:11	16:31	

July 03, 04, 05 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	280°54.9	136°25.5	N15°58.3	115°15.0	N07°04.3	277°54.0	S00°06.1	101°08.4	N02°37.1
1	295°57.4	151°25.1	57.3	130°16.1	03.7	292°56.3	06.1	116°10.7	37.0
2	310°59.9	166°24.8	56.3	145°17.3	03.1	307°58.6	06.0	131°13.1	36.9
3	326°02.3	181°24.5	·· 55.3	160°18.5	·· 02.5	323°01.0	·· 06.0	146°15.4	·· 36.9
4	341°04.8	196°24.2	54.3	175°19.6	01.9	338°03.3	05.9	161°17.8	36.8
5	356°07.2	211°23.9	53.3	190°20.8	01.3	353°05.6	05.9	176°20.1	36.7
6	11°09.7	226°23.6	N15°52.4	205°21.9	N07°00.7	8°07.9	S00°05.8	191°22.5	N02°36.7
7	26°12.2	241°23.3	51.4	220°23.1	07°00.2	23°10.2	05.8	206°24.8	36.6
8	41°14.6	256°23.0	50.4	235°24.2	06°59.6	38°12.5	05.7	221°27.1	36.6
9	56°17.1	271°22.7	·· 49.4	250°25.4	·· 59.0	53°14.8	·· 05.7	236°29.5	·· 36.5
10	71°19.6	286°22.4	48.4	265°26.5	58.4	68°17.1	05.6	251°31.8	36.4
11	86°22.0	301°22.1	47.4	280°27.7	57.8	83°19.4	05.6	266°34.2	36.4
12	101°24.5	316°21.8	N15°46.4	295°28.8	N06°57.2	98°21.8	S00°05.5	281°36.5	N02°36.3
13	116°27.0	331°21.5	45.4	310°30.0	56.7	113°24.1	05.5	296°38.8	36.3
14	131°29.4	346°21.2	44.4	325°31.2	56.1	128°26.4	05.4	311°41.2	36.2
15	146°31.9	1°20.8	·· 43.4	340°32.3	·· 55.5	143°28.7	·· 05.4	326°43.5	·· 36.1
16	161°34.4	16°20.5	42.4	355°33.5	54.9	158°31.0	05.3	341°45.9	36.1
17	176°36.8	31°20.2	41.3	10°34.6	54.3	173°33.3	05.3	356°48.2	36.0
18	191°39.3	46°19.9	N15°40.3	25°35.8	N06°53.7	188°35.6	S00°05.2	11°50.6	N02°35.9
19	206°41.7	61°19.6	39.3	40°36.9	53.1	203°38.0	05.2	26°52.9	35.9
20	221°44.2	76°19.3	38.3	55°38.1	52.6	218°40.3	05.1	41°55.2	35.8
21	236°46.7	91°19.0	·· 37.3	70°39.2	·· 52.0	233°42.6	·· 05.1	56°57.6	·· 35.8
22	251°49.1	106°18.8	36.3	85°40.4	51.4	248°44.9	05.0	71°59.9	35.7
23	266°51.6	121°18.5	35.3	100°41.5	50.8	263°47.2	05.0	87°02.3	35.6
Mer.pass.:05:15		v-0.3 d-1.0 m-4.0		v1.2 d-0.6 m1.4		v2.3 d0.1 m-2.3		v2.3 d-0.1 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	281°54.1	136°18.2	N15°34.3	115°42.7	N06°50.2	278°49.5	S00°04.9	102°04.6	N02°35.6
1	296°56.5	151°17.9	33.3	130°43.8	49.6	293°51.9	04.9	117°06.9	35.5
2	311°59.0	166°17.6	32.3	145°45.0	49.0	308°54.2	04.8	132°09.3	35.4
3	327°01.5	181°17.3	·· 31.3	160°46.1	·· 48.5	323°56.5	·· 04.8	147°11.6	·· 35.4
4	342°03.9	196°17.0	30.3	175°47.3	47.9	338°58.8	04.7	162°14.0	35.3
5	357°06.4	211°16.7	29.3	190°48.4	47.3	354°01.1	04.7	177°16.3	35.3
6	12°08.9	226°16.4	N15°28.2	205°49.6	N06°46.7	9°03.5	S00°04.6	192°18.6	N02°35.2
7	27°11.3	241°16.1	27.2	220°50.7	46.1	24°05.8	04.6	207°21.0	35.1
8	42°13.8	256°15.8	26.2	235°51.9	45.5	39°08.1	04.5	222°23.3	35.1
9	57°16.2	271°15.5	·· 25.2	250°53.1	·· 44.9	54°10.4	·· 04.5	237°25.7	·· 35.0
10	72°18.7	286°15.2	24.2	265°54.2	44.3	69°12.7	04.4	252°28.0	34.9
11	87°21.2	301°14.9	23.2	280°55.4	43.8	84°15.0	04.4	267°30.3	34.9
12	102°23.6	316°14.7	N15°22.2	295°56.5	N06°43.2	99°17.4	S00°04.3	282°32.7	N02°34.8
13	117°26.1	331°14.4	21.1	310°57.7	42.6	114°19.7	04.3	297°35.0	34.7
14	132°28.6	346°14.1	20.1	325°58.8	42.0	129°22.0	04.2	312°37.4	34.7
15	147°31.0	1°13.8	·· 19.1	341°00.0	·· 41.4	144°24.3	·· 04.2	327°39.7	·· 34.6
16	162°33.5	16°13.5	18.1	356°01.1	40.8	159°26.7	04.1	342°42.0	34.6
17	177°36.0	31°13.2	17.1	11°02.3	40.2	174°29.0	04.1	357°44.4	34.5
18	192°38.4	46°12.9	N15°16.1	26°03.4	N06°39.6	189°31.3	S00°04.0	12°46.7	N02°34.4
19	207°40.9	61°12.7	15.0	41°04.6	39.0	204°33.6	04.0	27°49.0	34.4
20	222°43.3	76°12.4	14.0	56°05.7	38.5	219°35.9	03.9	42°51.4	34.3
21	237°45.8	91°12.1	·· 13.0	71°06.9	·· 37.9	234°38.3	·· 03.9	57°53.7	·· 34.2
22	252°48.3	106°11.8	12.0	86°08.0	37.3	249°40.6	03.8	72°56.1	34.2
23	267°50.7	121°11.5	11.0	101°09.2	36.7	264°42.9	03.8	87°58.4	34.1
Mer.pass.:05:12		v-0.3 d-1.0 m-4.0		v1.2 d-0.6 m1.4		v2.3 d0.1 m-2.4		v2.3 d-0.1 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	282°53.2	136°11.2	N15°09.9	116°10.3	N06°36.1	279°45.2	S00°03.7	103°00.7	N02°34.0
1	297°55.7	151°11.0	08.9	131°11.5	35.5	294°47.6	03.7	118°03.1	34.0
2	312°58.1	166°10.7	07.9	146°12.6	34.9	309°49.9	03.6	133°05.4	33.9
3	328°00.6	181°10.4	·· 06.9	161°13.8	·· 34.3	324°52.2	·· 03.6	148°07.7	·· 33.9
4	343°03.1	196°10.1	05.8	176°14.9	33.7	339°54.5	03.5	163°10.1	33.8
5	358°05.5	211°09.9	04.8	191°16.1	33.2	354°56.9	03.5	178°12.4	33.7
6	13°08.0	226°09.6	N15°03.8	206°17.2	N06°32.6	9°59.2	S00°03.5	193°14.7	N02°33.7
7	28°10.5	241°09.3	02.8	221°18.4	32.0	25°01.5	03.4	208°17.1	33.6
8	43°12.9	256°09.0	01.7	236°19.5	31.4	40°03.8	03.4	223°19.4	33.5
9	58°15.4	271°08.8	15°00.7	251°20.7	·· 30.8	55°06.2	·· 03.3	238°21.8	·· 33.5
10	73°17.8	286°08.5	14°59.7	266°21.8	30.2	70°08.5	03.3	253°24.1	33.4
11	88°20.3	301°08.2	58.7	281°23.0	29.6	85°10.8	03.2	268°26.4	33.3
12	103°22.8	316°07.9	N14°57.6	296°24.1	N06°29.0	100°13.1	S00°03.2	283°28.8	N02°33.3
13	118°25.2	331°07.7	56.6	311°25.3	28.4	115°15.5	03.1	298°31.1	33.2
14	133°27.7	346°07.4	55.6	326°26.4	27.8	130°17.8	03.1	313°33.4	33.1
15	148°30.2	1°07.1	·· 54.5	341°27.6	·· 27.3	145°20.1	·· 03.0	328°35.8	·· 33.1
16	163°32.6	16°06.9	53.5	356°28.7	26.7	160°22.5	03.0	343°38.1	33.0
17	178°35.1	31°06.6	52.5	11°29.8	26.1	175°24.8	02.9	358°40.4	32.9
18	193°37.6	46°06.3	N14°51.4	26°31.0	N06°25.5	190°27.1	S00°02.9	13°42.8	N02°32.9
19	208°40.0	61°06.1	50.4	41°32.1	24.9	205°29.4	02.9	28°45.1	32.8
20	223°42.5	76°05.8	49.4	56°33.3	24.3	220°31.8	02.8	43°47.4	32.8
21	238°45.0	91°05.5	·· 48.3	71°34.4	·· 23.7	235°34.1	·· 02.8	58°49.8	·· 32.7
22	253°47.4	106°05.3	47.3	86°35.6	23.1	250°36.4	02.7	73°52.1	32.6
23	268°49.9	121°05.0	46.3	101°36.7	22.5	265°38.8	02.7	88°54.4	32.6
Mer.pass.:05:08		v-0.3 d-1.0 m-4.0		v1.1 d-0.6 m1.4		v2.3 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.7	29°08.9
Ankaa	353°17.7	-42°14.6
Schedar	349°43.1	56°35.5
Diphda	348°58.0	-17°55.5
Achernar	335°28.4	-57°10.6
Hamal	328°03.3	23°30.7
Polaris	319°03.6	89°18.4
Acamar	315°20.1	-40°15.5
Menkar	314°17.5	4°07.9
Mirfak	308°43.8	49°53.8
Aldebaran	290°52.1	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.1	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.7	28°36.9
Alnilam	275°48.9	-1°11.7
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.7	-52°42.0
Sirius	258°36.0	-16°43.8
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.9
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.8
Suhail	222°54.5	-43°28.7
Miaplacidus	221°41.1	-69°45.9
Alphard	217°58.5	-8°42.4
Regulus	207°46.0	11°54.9
Dubhe	193°54.4	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.0	-63°09.8
Gacrux	172°03.5	-57°10.7
Alioth	166°22.4	55°54.4
Spica	158°33.5	-11°13.1
Alkaid	153°00.3	49°15.8
Hadar	148°50.8	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.4	-60°53.0
Kochab	137°19.0	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.3
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.7
Nunki	76°00.6	-26°16.9
Altair	62°10.0	8°53.8
Peacock	53°21.9	-56°41.9
Deneb	49°32.6	45°19.1
Enif	33°49.0	9°55.5
Al Na'ir	27°46.0	-46°54.3
Fomalhaut	15°26.1	-29°33.7
Scheat	13°55.3	28°08.4
Markab	13°40.3	15°15.8

Jul 03 Sat	**SHA**	**Mer.pass**
Venus	215°30.5	14:55
Mars	194°20.1	16:18
Jupiter	356°59.1	05:28
Saturn	180°13.5	17:13

Jul 04 Sun	**SHA**	**Mer.pass**
Venus	214°24.1	14:55
Mars	193°48.6	16:16
Jupiter	356°55.5	05:24
Saturn	180°10.5	17:09

Jul 05 Mon	**SHA**	**Mer.pass**
Venus	213°18.0	14:56
Mars	193°17.1	16:14
Jupiter	356°52.0	05:20
Saturn	180°07.5	17:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.1	N22°59.0	289°10.7	16.5'	N01°53.0	12.5'	54.3'
1	193°58.0	58.9	303°46.2	16.5'	02°05.6	12.5'	54.3'
2	208°57.9	58.7	318°21.7	16.5'	02°18.1	12.5'	54.3'
3	223°57.8	·· 58.5	332°57.1	16.5'	02°30.6	12.5'	54.4'
4	238°57.7	58.3	347°32.6	16.4'	02°43.2	12.5'	54.4'
5	253°57.6	58.1	2°08.0	16.4'	02°55.7	12.5'	54.4'
6	268°57.4	N22°57.9	16°43.4	16.4'	N03°08.2	12.5'	54.4'
7	283°57.3	57.7	31°18.8	16.4'	03°20.7	12.5'	54.4'
8	298°57.2	57.5	45°54.2	16.4'	03°33.2	12.5'	54.4'
9	313°57.1	·· 57.3	60°29.6	16.3'	03°45.7	12.5'	54.4'
10	328°57.0	57.0	75°04.9	16.3'	03°58.2	12.5'	54.4'
11	343°56.9	56.8	89°40.2	16.3'	04°10.7	12.5'	54.5'
12	358°56.7	N22°56.6	104°15.5	16.3'	N04°23.2	12.5'	54.5'
13	13°56.6	56.4	118°50.7	16.2'	04°35.6	12.5'	54.5'
14	28°56.5	56.2	133°25.9	16.2'	04°48.1	12.4'	54.5'
15	43°56.4	·· 56.0	148°01.1	16.2'	05°00.5	12.4'	54.5'
16	58°56.3	55.8	162°36.3	16.1'	05°12.9	12.4'	54.5'
17	73°56.2	55.6	177°11.4	16.1'	05°25.3	12.4'	54.5'
18	88°56.1	N22°55.4	191°46.5	16.1'	N05°37.7	12.4'	54.6'
19	103°55.9	55.2	206°21.5	16.0'	05°50.1	12.4'	54.6'
20	118°55.8	55.0	220°56.5	16.0'	06°02.5	12.4'	54.6'
21	133°55.7	·· 54.8	235°31.5	16.0'	06°14.8	12.3'	54.6'
22	148°55.6	54.6	250°06.5	15.9'	06°27.2	12.3'	54.6'
23	163°55.5	54.3	264°41.4	15.9'	06°39.5	12.3'	54.6'
	SD.=15.7	d=-0.2	S.D.=14.8				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.4	N22°54.1	279°16.2	15.8'	N06°51.8	12.3'	54.7'
1	193°55.3	53.9	293°51.1	15.8'	07°04.1	12.3'	54.7'
2	208°55.2	53.7	308°25.9	15.8'	07°16.3	12.3'	54.7'
3	223°55.0	·· 53.5	323°00.6	15.7'	07°28.6	12.2'	54.7'
4	238°54.9	53.3	337°35.3	15.7'	07°40.8	12.2'	54.7'
5	253°54.8	53.1	352°10.0	15.6'	07°53.0	12.2'	54.7'
6	268°54.7	N22°52.8	6°44.6	15.6'	N08°05.2	12.2'	54.8'
7	283°54.6	52.6	21°19.1	15.5'	08°17.3	12.1'	54.8'
8	298°54.5	52.4	35°53.6	15.5'	08°29.4	12.1'	54.8'
9	313°54.4	·· 52.2	50°28.1	15.4'	08°41.5	12.1'	54.8'
10	328°54.3	52.0	65°02.5	15.4'	08°53.6	12.1'	54.8'
11	343°54.1	51.8	79°36.9	15.3'	09°05.7	12.0'	54.9'
12	358°54.0	N22°51.5	94°11.2	15.3'	N09°17.7	12.0'	54.9'
13	13°53.9	51.3	108°45.4	15.2'	09°29.7	12.0'	54.9'
14	28°53.8	51.1	123°19.6	15.2'	09°41.7	12.0'	54.9'
15	43°53.7	·· 50.9	137°53.8	15.1'	09°53.6	11.9'	54.9'
16	58°53.6	50.6	152°27.9	15.1'	10°05.5	11.9'	55.0'
17	73°53.5	50.4	167°01.9	15.0'	10°17.4	11.9'	55.0'
18	88°53.4	N22°50.2	181°35.9	14.9'	N10°29.2	11.8'	55.0'
19	103°53.3	50.0	196°09.8	14.9'	10°41.0	11.8'	55.0'
20	118°53.1	49.7	210°43.7	14.8'	10°52.8	11.8'	55.1'
21	133°53.0	·· 49.5	225°17.4	14.8'	11°04.6	11.7'	55.1'
22	148°52.9	49.3	239°51.2	14.7'	11°16.3	11.7'	55.1'
23	163°52.8	49.1	254°24.8	14.6'	11°27.9	11.7'	55.1'
	SD.=15.7	d=-0.2	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°52.7	N22°48.8	268°58.4	14.6'	N11°39.6	11.6'	55.2'
1	193°52.6	48.6	283°32.0	14.5'	11°51.2	11.6'	55.2'
2	208°52.5	48.4	298°05.4	14.4'	12°02.7	11.5'	55.2'
3	223°52.4	·· 48.1	312°38.8	14.4'	12°14.3	11.5'	55.2'
4	238°52.3	47.9	327°12.2	14.3'	12°25.7	11.5'	55.2'
5	253°52.2	47.7	341°45.4	14.2'	12°37.2	11.4'	55.3'
6	268°52.1	N22°47.4	356°18.6	14.2'	N12°48.6	11.4'	55.3'
7	283°51.9	47.2	10°51.8	14.1'	12°59.9	11.3'	55.3'
8	298°51.8	47.0	25°24.8	14.0'	13°11.2	11.3'	55.4'
9	313°51.7	·· 46.7	39°57.8	13.9'	13°22.5	11.2'	55.4'
10	328°51.6	46.5	54°30.7	13.9'	13°33.7	11.2'	55.4'
11	343°51.5	46.3	69°03.5	13.8'	13°44.9	11.1'	55.4'
12	358°51.4	N22°46.0	83°36.2	13.7'	N13°56.0	11.1'	55.5'
13	13°51.3	45.8	98°08.9	13.6'	14°07.1	11.0'	55.5'
14	28°51.2	45.5	112°41.5	13.6'	14°18.1	11.0'	55.5'
15	43°51.1	·· 45.3	127°14.0	13.5'	14°29.1	10.9'	55.5'
16	58°51.0	45.1	141°46.4	13.4'	14°40.0	10.9'	55.6'
17	73°50.9	44.8	156°18.8	13.3'	14°50.9	10.8'	55.6'
18	88°50.8	N22°44.6	170°51.1	13.2'	N15°01.7	10.8'	55.6'
19	103°50.6	44.3	185°23.2	13.1'	15°12.4	10.7'	55.7'
20	118°50.5	44.1	199°55.3	13.1'	15°23.1	10.7'	55.7'
21	133°50.4	·· 43.9	214°27.3	13.0'	15°33.8	10.6'	55.7'
22	148°50.3	43.6	228°59.3	12.9'	15°44.4	10.6'	55.7'
23	163°50.2	43.4	243°31.1	12.8'	15°54.9	10.5'	55.8'
	SD.=15.7	d=-0.2	S.D.=15.1				

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

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 21-23 61-41%
03	04:07	04:13	12:04	04:51	17:12	
04	04:18	04:24	12:04	05:32	17:53	
05	04:29	04:34	12:05	06:15	18:38	

July 06, 07, 08 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	283°52.3	136°04.7	N14°45.2	116°37.9	N06°21.9	280°41.1	S00°02.6	103°56.8	N02°32.5
1	298°54.8	151°04.5	44.2	131°39.0	21.3	295°43.4	02.6	118°59.1	32.4
2	313°57.3	166°04.2	43.1	146°40.2	20.8	310°45.8	02.5	134°01.4	32.4
3	328°59.7	181°03.9	·· 42.1	161°41.3	·· 20.2	325°48.1	·· 02.5	149°03.8	·· 32.3
4	344°02.2	196°03.7	41.1	176°42.5	19.6	340°50.4	02.5	164°06.1	32.2
5	359°04.7	211°03.4	40.0	191°43.6	19.0	355°52.7	02.4	179°08.4	32.2
6	14°07.1	226°03.2	N14°39.0	206°44.8	N06°18.4	10°55.1	S00°02.4	194°10.8	N02°32.1
7	29°09.6	241°02.9	38.0	221°45.9	17.8	25°57.4	02.3	209°13.1	32.0
8	44°12.1	256°02.6	36.9	236°47.1	17.2	40°59.7	02.3	224°15.4	32.0
9	59°14.5	271°02.4	·· 35.9	251°48.2	·· 16.6	56°02.1	·· 02.2	239°17.8	·· 31.9
10	74°17.0	286°02.1	34.8	266°49.3	16.0	71°04.4	02.2	254°20.1	31.8
11	89°19.4	301°01.9	33.8	281°50.5	15.4	86°06.7	02.2	269°22.4	31.8
12	104°21.9	316°01.6	N14°32.7	296°51.6	N06°14.8	101°09.1	S00°02.1	284°24.8	N02°31.7
13	119°24.4	331°01.4	31.7	311°52.8	14.2	116°11.4	02.1	299°27.1	31.6
14	134°26.8	346°01.1	30.7	326°53.9	13.6	131°13.8	02.0	314°29.4	31.6
15	149°29.3	1°00.9	·· 29.6	341°55.1	·· 13.0	146°16.1	·· 02.0	329°31.8	·· 31.5
16	164°31.8	16°00.6	28.6	356°56.2	12.5	161°18.4	01.9	344°34.1	31.4
17	179°34.2	31°00.3	27.5	11°57.4	11.9	176°20.8	01.9	359°36.4	31.4
18	194°36.7	46°00.1	N14°26.5	26°58.5	N06°11.3	191°23.1	S00°01.9	14°38.8	N02°31.3
19	209°39.2	60°59.8	25.4	41°59.7	10.7	206°25.4	01.8	29°41.1	31.2
20	224°41.6	75°59.6	24.4	57°00.8	10.1	221°27.8	01.8	44°43.4	31.2
21	239°44.1	90°59.3	·· 23.3	72°01.9	·· 09.5	236°30.1	·· 01.7	59°45.7	·· 31.1
22	254°46.6	105°59.1	22.3	87°03.1	08.9	251°32.4	01.7	74°48.1	31.0
23	269°49.0	120°58.8	21.2	102°04.2	08.3	266°34.8	01.7	89°50.4	31.0
Mer.pass.:05:04		v-0.3 d-1.0 m-4.0		v1.1 d-0.6 m1.4		v2.3 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	284°51.5	135°58.6	N14°20.2	117°05.4	N06°07.7	281°37.1	S00°01.6	104°52.7	N02°30.9
1	299°53.9	150°58.4	19.1	132°06.5	07.1	296°39.5	01.6	119°55.1	30.8
2	314°56.4	165°58.1	18.1	147°07.7	06.5	311°41.8	01.5	134°57.4	30.8
3	329°58.9	180°57.9	·· 17.0	162°08.8	·· 05.9	326°44.1	·· 01.5	149°59.7	·· 30.7
4	345°01.3	195°57.6	16.0	177°10.0	05.3	341°46.5	01.4	165°02.1	30.6
5	0°03.8	210°57.4	14.9	192°11.1	04.7	356°48.8	01.4	180°04.4	30.6
6	15°06.3	225°57.1	N14°13.9	207°12.2	N06°04.1	11°51.1	S00°01.4	195°06.7	N02°30.5
7	30°08.7	240°56.9	12.8	222°13.4	03.5	26°53.5	01.3	210°09.0	30.4
8	45°11.2	255°56.6	11.8	237°14.5	02.9	41°55.8	01.3	225°11.4	30.4
9	60°13.7	270°56.4	·· 10.7	252°15.7	·· 02.4	56°58.2	·· 01.2	240°13.7	·· 30.3
10	75°16.1	285°56.2	09.6	267°16.8	01.8	72°00.5	01.2	255°16.0	30.2
11	90°18.6	300°55.9	08.6	282°18.0	01.2	87°02.9	01.2	270°18.4	30.2
12	105°21.1	315°55.7	N14°07.5	297°19.1	N06°00.6	102°05.2	S00°01.1	285°20.7	N02°30.1
13	120°23.5	330°55.4	06.5	312°20.3	06°00.0	117°07.5	01.1	300°23.0	30.0
14	135°26.0	345°55.2	05.4	327°21.4	05°59.4	132°09.9	01.0	315°25.4	30.0
15	150°28.4	0°55.0	·· 04.4	342°22.5	·· 58.8	147°12.2	·· 01.0	330°27.7	·· 29.9
16	165°30.9	15°54.7	03.3	357°23.7	58.2	162°14.6	01.0	345°30.0	29.8
17	180°33.4	30°54.5	02.2	12°24.8	57.6	177°16.9	00.9	0°32.3	29.8
18	195°35.8	45°54.3	N14°01.2	27°26.0	N05°57.0	192°19.2	S00°00.9	15°34.7	N02°29.7
19	210°38.3	60°54.0	14°00.1	42°27.1	56.4	207°21.6	00.9	30°37.0	29.6
20	225°40.8	75°53.8	13°59.1	57°28.3	55.8	222°23.9	00.8	45°39.3	29.6
21	240°43.2	90°53.6	·· 58.0	72°29.4	·· 55.2	237°26.3	·· 00.8	60°41.6	·· 29.5
22	255°45.7	105°53.3	56.9	87°30.5	54.6	252°28.6	00.7	75°44.0	29.4
23	270°48.2	120°53.1	55.9	102°31.7	54.0	267°31.0	00.7	90°46.3	29.3
Mer.pass.:05:00		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.3 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	285°50.6	135°52.9	N13°54.8	117°32.8	N05°53.4	282°33.3	S00°00.7	105°48.6	N02°29.3
1	300°53.1	150°52.6	53.8	132°34.0	52.8	297°35.7	00.6	120°51.0	29.2
2	315°55.6	165°52.4	52.7	147°35.1	52.2	312°38.0	00.6	135°53.3	29.1
3	330°58.0	180°52.2	·· 51.6	162°36.2	·· 51.6	327°40.3	·· 00.5	150°55.6	·· 29.1
4	346°00.5	195°51.9	50.6	177°37.4	51.0	342°42.7	00.5	165°57.9	29.0
5	1°02.9	210°51.7	49.5	192°38.5	50.4	357°45.0	00.5	181°00.3	28.9
6	16°05.4	225°51.5	N13°48.4	207°39.7	N05°49.8	12°47.4	S00°00.4	196°02.6	N02°28.9
7	31°07.9	240°51.3	47.4	222°40.8	49.2	27°49.7	00.4	211°04.9	28.8
8	46°10.3	255°51.0	46.3	237°42.0	48.6	42°52.1	00.4	226°07.2	28.7
9	61°12.8	270°50.8	·· 45.2	252°43.1	·· 48.0	57°54.4	·· 00.3	241°09.6	·· 28.7
10	76°15.3	285°50.6	44.2	267°44.2	47.4	72°56.8	00.3	256°11.9	28.6
11	91°17.7	300°50.4	43.1	282°45.4	46.8	87°59.1	00.2	271°14.2	28.5
12	106°20.2	315°50.1	N13°42.0	297°46.5	N05°46.2	103°01.5	S00°00.2	286°16.5	N02°28.5
13	121°22.7	330°49.9	40.9	312°47.7	45.7	118°03.8	00.2	301°18.9	28.4
14	136°25.1	345°49.7	39.9	327°48.8	45.1	133°06.2	00.1	316°21.2	28.3
15	151°27.6	0°49.5	·· 38.8	342°49.9	·· 44.5	148°08.5	·· 00.1	331°23.5	·· 28.3
16	166°30.0	15°49.2	37.7	357°51.1	43.9	163°10.9	00.1	346°25.8	28.2
17	181°32.5	30°49.0	36.7	12°52.2	43.3	178°13.2	S00°00.0	1°28.2	28.1
18	196°35.0	45°48.8	N13°35.6	27°53.4	N05°42.7	193°15.6	N00°00.0	16°30.5	N02°28.0
19	211°37.4	60°48.6	34.5	42°54.5	42.1	208°17.9	00.0	31°32.8	28.0
20	226°39.9	75°48.4	33.4	57°55.6	41.5	223°20.3	00.1	46°35.1	27.9
21	241°42.4	90°48.1	·· 32.4	72°56.8	·· 40.9	238°22.6	·· 00.1	61°37.5	·· 27.8
22	256°44.8	105°47.9	31.3	87°57.9	40.3	253°25.0	00.1	76°39.8	27.8
23	271°47.3	120°47.7	30.2	102°59.1	39.7	268°27.3	00.2	91°42.1	27.7
Mer.pass.:04:56		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.3 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.7	29°08.9
Ankaa	353°17.6	-42°14.6
Schedar	349°43.1	56°35.5
Diphda	348°58.0	-17°55.5
Achernar	335°28.3	-57°10.6
Hamal	328°03.3	23°30.7
Polaris	319°02.1	89°18.4
Acamar	315°20.1	-40°15.5
Menkar	314°17.5	4°07.9
Mirfak	308°43.8	49°53.8
Aldebaran	290°52.1	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.1	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.7	28°36.9
Alnilam	275°48.8	-1°11.7
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.7	-52°42.0
Sirius	258°35.9	-16°43.8
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.9
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.7
Miaplacidus	221°41.1	-69°45.9
Alphard	217°58.5	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.0	-63°09.8
Gacrux	172°03.5	-57°10.7
Alioth	166°22.4	55°54.4
Spica	158°33.5	-11°13.1
Alkaid	153°00.3	49°15.8
Hadar	148°50.9	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.4	-60°53.0
Kochab	137°19.1	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.8
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°02.9
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.3
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.7
Nunki	76°00.6	-26°16.9
Altair	62°10.0	8°53.9
Peacock	53°21.9	-56°41.9
Deneb	49°32.6	45°19.1
Enif	33°49.0	9°55.5
Al Na'ir	27°46.0	-46°54.3
Fomalhaut	15°26.1	-29°33.7
Scheat	13°55.3	28°08.4
Markab	13°40.3	15°15.8

Jul 06 Tue	**SHA**	**Mer.pass**
Venus	212°12.4	14:56
Mars	192°45.5	16:12
Jupiter	356°48.7	05:16
Saturn	180°04.4	17:02

Jul 07 Wed	**SHA**	**Mer.pass**
Venus	211°07.1	14:56
Mars	192°13.9	16:10
Jupiter	356°45.6	05:13
Saturn	180°01.3	16:58

Jul 08 Thu	**SHA**	**Mer.pass**
Venus	210°02.2	14:57
Mars	191°42.2	16:09
Jupiter	356°42.7	05:09
Saturn	179°58.0	16:54

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°50.1	N22°43.1	258°02.9	12.7'	N16°05.3	10.4'	55.8'
1	193°50.0	42.9	272°34.5	12.6'	16°15.7	10.4'	55.8'
2	208°49.9	42.6	287°06.1	12.5'	16°26.1	10.3'	55.9'
3	223°49.8	·· 42.4	301°37.6	12.4'	16°36.4	10.2'	55.9'
4	238°49.7	42.1	316°09.0	12.4'	16°46.6	10.2'	55.9'
5	253°49.6	41.9	330°40.3	12.3'	16°56.7	10.1'	56.0'
6	268°49.5	N22°41.6	345°11.5	12.2'	N17°06.8	10.0'	56.0'
7	283°49.4	41.4	359°42.6	12.1'	17°16.8	10.0'	56.0'
8	298°49.3	41.1	14°13.7	12.0'	17°26.8	9.9'	56.0'
9	313°49.2	·· 40.9	28°44.6	11.9'	17°36.6	9.8'	56.1'
10	328°49.1	40.6	43°15.4	11.8'	17°46.4	9.8'	56.1'
11	343°49.0	40.4	57°46.2	11.7'	17°56.2	9.7'	56.1'
12	358°48.8	N22°40.1	72°16.8	11.6'	N18°05.8	9.6'	56.2'
13	13°48.7	39.9	86°47.4	11.5'	18°15.4	9.5'	56.2'
14	28°48.6	39.6	101°17.8	11.4'	18°24.9	9.5'	56.2'
15	43°48.5	·· 39.4	115°48.2	11.3'	18°34.3	9.4'	56.3'
16	58°48.4	39.1	130°18.5	11.2'	18°43.6	9.3'	56.3'
17	73°48.3	38.8	144°48.6	11.1'	18°52.9	9.2'	56.3'
18	88°48.2	N22°38.6	159°18.7	11.0'	N19°02.1	9.1'	56.4'
19	103°48.1	38.3	173°48.6	10.9'	19°11.2	9.1'	56.4'
20	118°48.0	38.1	188°18.5	10.8'	19°20.2	9.0'	56.4'
21	133°47.9	·· 37.8	202°48.2	10.7'	19°29.1	8.9'	56.5'
22	148°47.8	37.5	217°17.9	10.6'	19°38.0	8.8'	56.5'
23	163°47.7	37.3	231°47.4	10.5'	19°46.7	8.7'	56.5'
	SD.=15.7	d=-0.2	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°47.6	N22°37.0	246°16.9	10.4'	N19°55.4	8.6'	56.6'
1	193°47.5	36.8	260°46.2	10.3'	20°03.9	8.5'	56.6'
2	208°47.4	36.5	275°15.5	10.2'	20°12.4	8.4'	56.6'
3	223°47.3	·· 36.2	289°44.6	10.1'	20°20.8	8.3'	56.7'
4	238°47.2	36.0	304°13.7	10.0'	20°29.1	8.2'	56.7'
5	253°47.1	35.7	318°42.6	9.9'	20°37.3	8.1'	56.8'
6	268°47.0	N22°35.4	333°11.4	9.8'	N20°45.4	8.0'	56.8'
7	283°46.9	35.2	347°40.2	9.7'	20°53.4	7.9'	56.8'
8	298°46.8	34.9	2°08.8	9.6'	21°01.3	7.8'	56.9'
9	313°46.7	·· 34.6	16°37.3	9.5'	21°09.1	7.7'	56.9'
10	328°46.6	34.4	31°05.7	9.4'	21°16.8	7.6'	56.9'
11	343°46.5	34.1	45°34.0	9.3'	21°24.4	7.5'	57.0'
12	358°46.4	N22°33.8	60°02.2	9.2'	N21°31.8	7.4'	57.0'
13	13°46.3	33.5	74°30.3	9.0'	21°39.2	7.3'	57.0'
14	28°46.2	33.3	88°58.3	8.9'	21°46.5	7.2'	57.1'
15	43°46.1	·· 33.0	103°26.2	8.8'	21°53.6	7.1'	57.1'
16	58°46.0	32.7	117°54.0	8.7'	22°00.7	7.0'	57.1'
17	73°45.9	32.5	132°21.7	8.6'	22°07.6	6.9'	57.2'
18	88°45.8	N22°32.2	146°49.2	8.5'	N22°14.5	6.8'	57.2'
19	103°45.7	31.9	161°16.7	8.4'	22°21.2	6.6'	57.3'
20	118°45.6	31.6	175°44.1	8.3'	22°27.8	6.5'	57.3'
21	133°45.5	·· 31.4	190°11.4	8.2'	22°34.2	6.4'	57.3'
22	148°45.4	31.1	204°38.5	8.1'	22°40.6	6.3'	57.4'
23	163°45.3	30.8	219°05.6	8.0'	22°46.8	6.2'	57.4'
	SD.=15.7	d=-0.3	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°45.2	N22°30.5	233°32.5	7.9'	N22°52.9	6.0'	57.4'
1	193°45.1	30.2	247°59.4	7.8'	22°58.9	5.9'	57.5'
2	208°45.0	30.0	262°26.2	7.7'	23°04.8	5.8'	57.5'
3	223°44.9	·· 29.7	276°52.8	7.6'	23°10.5	5.7'	57.6'
4	238°44.8	29.4	291°19.4	7.5'	23°16.1	5.5'	57.6'
5	253°44.7	29.1	305°45.8	7.4'	23°21.6	5.4'	57.6'
6	268°44.6	N22°28.8	320°12.2	7.3'	N23°26.9	5.3'	57.7'
7	283°44.5	28.6	334°38.5	7.2'	23°32.2	5.2'	57.7'
8	298°44.4	28.3	349°04.6	7.1'	23°37.2	5.0'	57.7'
9	313°44.3	·· 28.0	3°30.7	7.0'	23°42.2	4.9'	57.8'
10	328°44.2	27.7	17°56.7	6.9'	23°47.0	4.7'	57.8'
11	343°44.1	27.4	32°22.6	6.8'	23°51.7	4.6'	57.9'
12	358°44.0	N22°27.1	46°48.3	6.7'	N23°56.2	4.5'	57.9'
13	13°43.9	26.8	61°14.0	6.6'	24°00.6	4.3'	57.9'
14	28°43.8	26.6	75°39.6	6.6'	24°04.9	4.2'	58.0'
15	43°43.7	·· 26.3	90°05.2	6.5'	24°09.0	4.0'	58.0'
16	58°43.6	26.0	104°30.6	6.4'	24°13.0	3.9'	58.0'
17	73°43.5	25.7	118°55.9	6.3'	24°16.8	3.8'	58.1'
18	88°43.4	N22°25.4	133°21.2	6.2'	N24°20.5	3.6'	58.1'
19	103°43.3	25.1	147°46.3	6.1'	24°24.0	3.5'	58.1'
20	118°43.2	24.8	162°11.4	6.0'	24°27.4	3.3'	58.2'
21	133°43.1	·· 24.5	176°36.4	6.0'	24°30.7	3.2'	58.2'
22	148°43.0	24.2	191°01.3	5.9'	24°33.8	3.0'	58.3'
23	163°42.9	23.9	205°26.1	5.8'	24°36.7	2.9'	58.3'
	SD.=15.7	d=-0.3	S.D.=15.8				

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 24-26 32-14%
06	04:40	04:45	12:05	07:01	19:26	
07	04:50	04:54	12:05	07:51	20:18	
08	04:59	05:04	12:05	08:45	21:14	

July 09, 10, 11 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	286°49.8	135°47.5	N13°29.1	118°00.2	N05°39.1	283°29.7	N00°00.2	106°44.4	N02°27.6
1	301°52.2	150°47.3	28.1	133°01.3	38.5	298°32.0	00.3	121°46.8	27.6
2	316°54.7	165°47.1	27.0	148°02.5	37.9	313°34.4	00.3	136°49.1	27.5
3	331°57.2	180°46.8	·· 25.9	163°03.6	·· 37.3	328°36.7	·· 00.3	151°51.4	·· 27.4
4	346°59.6	195°46.6	24.8	178°04.7	36.7	343°39.1	00.4	166°53.7	27.3
5	2°02.1	210°46.4	23.8	193°05.9	36.1	358°41.4	00.4	181°56.1	27.3
6	17°04.5	225°46.2	N13°22.7	208°07.0	N05°35.5	13°43.8	N00°00.4	196°58.4	N02°27.2
7	32°07.0	240°46.0	21.6	223°08.2	34.9	28°46.1	00.5	212°00.7	27.1
8	47°09.5	255°45.8	20.5	238°09.3	34.3	43°48.5	00.5	227°03.0	27.1
9	62°11.9	270°45.6	·· 19.4	253°10.4	·· 33.7	58°50.9	·· 00.5	242°05.3	·· 27.0
10	77°14.4	285°45.4	18.4	268°11.6	33.1	73°53.2	00.6	257°07.7	26.9
11	92°16.9	300°45.2	17.3	283°12.7	32.5	88°55.6	00.6	272°10.0	26.9
12	107°19.3	315°45.0	N13°16.2	298°13.9	N05°31.9	103°57.9	N00°00.6	287°12.3	N02°26.8
13	122°21.8	330°44.7	15.1	313°15.0	31.3	119°00.3	00.7	302°14.6	26.7
14	137°24.3	345°44.5	14.0	328°16.1	30.7	134°02.6	00.7	317°17.0	26.6
15	152°26.7	0°44.3	·· 12.9	343°17.3	·· 30.1	149°05.0	·· 00.7	332°19.3	·· 26.6
16	167°29.2	15°44.1	11.9	358°18.4	29.5	164°07.3	00.8	347°21.6	26.5
17	182°31.7	30°43.9	10.8	13°19.5	28.9	179°09.7	00.8	2°23.9	26.4
18	197°34.1	45°43.7	N13°09.7	28°20.7	N05°28.3	194°12.1	N00°00.8	17°26.2	N02°26.4
19	212°36.6	60°43.5	08.6	43°21.8	27.7	209°14.4	00.9	32°28.6	26.3
20	227°39.0	75°43.3	07.5	58°23.0	27.1	224°16.8	00.9	47°30.9	26.2
21	242°41.5	90°43.1	·· 06.4	73°24.1	·· 26.5	239°19.1	·· 00.9	62°33.2	·· 26.2
22	257°44.0	105°42.9	05.3	88°25.2	25.9	254°21.5	01.0	77°35.5	26.1
23	272°46.4	120°42.7	04.3	103°26.4	25.3	269°23.9	01.0	92°37.8	26.0
Mer.pass.:04:52		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	287°48.9	135°42.5	N13°03.2	118°27.5	N05°24.7	284°26.2	N00°01.0	107°40.2	N02°25.9
1	302°51.4	150°42.3	02.1	133°28.6	24.1	299°28.6	01.0	122°42.5	25.9
2	317°53.8	165°42.1	13°01.0	148°29.8	23.5	314°30.9	01.1	137°44.8	25.8
3	332°56.3	180°41.9	12°59.9	163°30.9	·· 22.9	329°33.3	·· 01.1	152°47.1	·· 25.7
4	347°58.8	195°41.7	58.8	178°32.0	22.3	344°35.7	01.1	167°49.4	25.7
5	3°01.2	210°41.5	57.7	193°33.2	21.7	359°38.0	01.2	182°51.8	25.6
6	18°03.7	225°41.3	N12°56.6	208°34.3	N05°21.0	14°40.4	N00°01.2	197°54.1	N02°25.5
7	33°06.2	240°41.1	55.5	223°35.5	20.4	29°42.7	01.2	212°56.4	25.4
8	48°08.6	255°40.9	54.5	238°36.6	19.8	44°45.1	01.3	227°58.7	25.4
9	63°11.1	270°40.7	·· 53.4	253°37.7	·· 19.2	59°47.5	·· 01.3	243°01.0	·· 25.3
10	78°13.5	285°40.5	52.3	268°38.9	18.6	74°49.8	01.3	258°03.4	25.2
11	93°16.0	300°40.3	51.2	283°40.0	18.0	89°52.2	01.4	273°05.7	25.2
12	108°18.5	315°40.2	N12°50.1	298°41.1	N05°17.4	104°54.5	N00°01.4	288°08.0	N02°25.1
13	123°20.9	330°40.0	49.0	313°42.3	16.8	119°56.9	01.4	303°10.3	25.0
14	138°23.4	345°39.8	47.9	328°43.4	16.2	134°59.3	01.4	318°12.6	24.9
15	153°25.9	0°39.6	·· 46.8	343°44.5	·· 15.6	150°01.6	·· 01.5	333°15.0	·· 24.9
16	168°28.3	15°39.4	45.7	358°45.7	15.0	165°04.0	01.5	348°17.3	24.8
17	183°30.8	30°39.2	44.6	13°46.8	14.4	180°06.4	01.5	3°19.6	24.7
18	198°33.3	45°39.0	N12°43.5	28°47.9	N05°13.8	195°08.7	N00°01.6	18°21.9	N02°24.7
19	213°35.7	60°38.8	42.4	43°49.1	13.2	210°11.1	01.6	33°24.2	24.6
20	228°38.2	75°38.6	41.3	58°50.2	12.6	225°13.5	01.6	48°26.6	24.5
21	243°40.7	90°38.5	·· 40.2	73°51.3	·· 12.0	240°15.8	·· 01.7	63°28.9	·· 24.4
22	258°43.1	105°38.3	39.1	88°52.5	11.4	255°18.2	01.7	78°31.2	24.4
23	273°45.6	120°38.1	38.0	103°53.6	10.8	270°20.6	01.7	93°33.5	24.3
Mer.pass.:04:48		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	288°48.0	135°37.9	N12°36.9	118°54.7	N05°10.2	285°22.9	N00°01.7	108°35.8	N02°24.2
1	303°50.5	150°37.7	35.8	133°55.9	09.6	300°25.3	01.8	123°38.1	24.1
2	318°53.0	165°37.5	34.7	148°57.0	09.0	315°27.7	01.8	138°40.5	24.1
3	333°55.4	180°37.3	·· 33.6	163°58.1	·· 08.4	330°30.0	·· 01.8	153°42.8	·· 24.0
4	348°57.9	195°37.2	32.5	178°59.3	07.8	345°32.4	01.9	168°45.1	23.9
5	4°00.4	210°37.0	31.4	194°00.4	07.2	0°34.8	01.9	183°47.4	23.9
6	19°02.8	225°36.8	N12°30.3	209°01.5	N05°06.6	15°37.1	N00°01.9	198°49.7	N02°23.8
7	34°05.3	240°36.6	29.2	224°02.7	06.0	30°39.5	01.9	213°52.0	23.7
8	49°07.8	255°36.4	28.1	239°03.8	05.4	45°41.9	02.0	228°54.4	23.6
9	64°10.2	270°36.3	·· 27.0	254°04.9	·· 04.8	60°44.2	·· 02.0	243°56.7	·· 23.6
10	79°12.7	285°36.1	25.9	269°06.1	04.2	75°46.6	02.0	258°59.0	23.5
11	94°15.2	300°35.9	24.8	284°07.2	03.5	90°49.0	02.0	274°01.3	23.4
12	109°17.6	315°35.7	N12°23.7	299°08.3	N05°02.9	105°51.3	N00°02.1	289°03.6	N02°23.4
13	124°20.1	330°35.6	22.6	314°09.5	02.3	120°53.7	02.1	304°05.9	23.3
14	139°22.5	345°35.4	21.5	329°10.6	01.7	135°56.1	02.1	319°08.2	23.2
15	154°25.0	0°35.2	·· 20.4	344°11.7	·· 01.1	150°58.5	·· 02.2	334°10.6	·· 23.1
16	169°27.5	15°35.0	19.3	359°12.9	05°00.5	166°00.8	02.2	349°12.9	23.1
17	184°29.9	30°34.9	18.2	14°14.0	04°59.9	181°03.2	02.2	4°15.2	23.0
18	199°32.4	45°34.7	N12°17.1	29°15.1	N04°59.3	196°05.6	N00°02.2	19°17.5	N02°22.9
19	214°34.9	60°34.5	15.9	44°16.3	58.7	211°07.9	02.3	34°19.8	22.8
20	229°37.3	75°34.3	14.8	59°17.4	58.1	226°10.3	02.3	49°22.1	22.8
21	244°39.8	90°34.2	·· 13.7	74°18.5	·· 57.5	241°12.7	·· 02.3	64°24.5	·· 22.7
22	259°42.3	105°34.0	12.6	89°19.7	56.9	256°15.1	02.3	79°26.8	22.6
23	274°44.7	120°33.8	11.5	104°20.8	56.3	271°17.4	02.4	94°29.1	22.5
Mer.pass.:04:44		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.6	29°08.9
Ankaa	353°17.6	-42°14.6
Schedar	349°43.0	56°35.6
Diphda	348°57.9	-17°55.5
Achernar	335°28.3	-57°10.6
Hamal	328°03.3	23°30.7
Polaris	319°00.5	89°18.4
Acamar	315°20.1	-40°15.5
Menkar	314°17.4	4°07.9
Mirfak	308°43.7	49°53.8
Aldebaran	290°52.1	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.0	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.6	28°36.9
Alnilam	275°48.8	-1°11.7
Betelgeuse	271°03.9	7°24.5
Canopus	263°57.6	-52°42.0
Sirius	258°35.9	-16°43.8
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.9
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.7
Miaplacidus	221°41.1	-69°45.9
Alphard	217°58.5	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.0	-63°09.8
Gacrux	172°03.5	-57°10.7
Alioth	166°22.4	55°54.4
Spica	158°33.5	-11°13.1
Alkaid	153°00.4	49°15.8
Hadar	148°50.9	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.4	-60°53.0
Kochab	137°19.2	74°06.9
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.4
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.7
Nunki	76°00.5	-26°16.9
Altair	62°10.0	8°53.9
Peacock	53°21.9	-56°41.9
Deneb	49°32.5	45°19.1
Enif	33°48.9	9°55.5
Al Na'ir	27°45.9	-46°54.3
Fomalhaut	15°26.0	-29°33.7
Scheat	13°55.3	28°08.4
Markab	13°40.3	15°15.8

Jul 09 Fri	**SHA**	**Mer.pass**
Venus	208°57.7	14:57
Mars	191°10.4	16:07
Jupiter	356°39.9	05:05
Saturn	179°54.7	16:50

Jul 10 Sat	**SHA**	**Mer.pass**
Venus	207°53.6	14:57
Mars	190°38.6	16:05
Jupiter	356°37.3	05:01
Saturn	179°51.3	16:47

Jul 11 Sun	**SHA**	**Mer.pass**
Venus	206°49.8	14:58
Mars	190°06.7	16:03
Jupiter	356°34.9	04:58
Saturn	179°47.8	16:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°42.8	N22°23.6	219°50.9	5.7'	N24°39.5	2.7'	58.3'
1	193°42.8	23.3	234°15.6	5.6'	24°42.1	2.6'	58.4'
2	208°42.7	23.0	248°40.2	5.6'	24°44.6	2.4'	58.4'
3	223°42.6	· · 22.7	263°04.7	5.5'	24°46.9	2.2'	58.4'
4	238°42.5	22.5	277°29.2	5.4'	24°49.1	2.1'	58.5'
5	253°42.4	22.2	291°53.5	5.3'	24°51.1	1.9'	58.5'
6	268°42.3	N22°21.9	306°17.8	5.3'	N24°52.9	1.8'	58.6'
7	283°42.2	21.6	320°42.1	5.2'	24°54.6	1.6'	58.6'
8	298°42.1	21.3	335°06.3	5.1'	24°56.2	1.5'	58.6'
9	313°42.0	· · 21.0	349°30.4	5.1'	24°57.5	1.3'	58.7'
10	328°41.9	20.7	3°54.4	5.0'	24°58.7	1.1'	58.7'
11	343°41.8	20.3	18°18.4	5.0'	24°59.8	1.0'	58.7'
12	358°41.7	N22°20.0	32°42.3	4.9'	N25°00.7	0.8'	58.8'
13	13°41.6	19.7	47°06.2	4.8'	25°01.4	0.6'	58.8'
14	28°41.5	19.4	61°30.0	4.8'	25°01.9	0.5'	58.8'
15	43°41.4	· · 19.1	75°53.8	4.7'	25°02.3	0.3'	58.9'
16	58°41.3	18.8	90°17.5	4.7'	25°02.5	0.1'	58.9'
17	73°41.3	18.5	104°41.2	4.6'	25°02.6	-0.0'	58.9'
18	88°41.2	N22°18.2	119°04.8	4.6'	N25°02.5	-0.2'	59.0'
19	103°41.1	17.9	133°28.3	4.5'	25°02.2	-0.4'	59.0'
20	118°41.0	17.6	147°51.9	4.5'	25°01.7	-0.5'	59.0'
21	133°40.9	· · 17.3	162°15.4	4.5'	25°01.1	-0.7'	59.1'
22	148°40.8	17.0	176°38.8	4.4'	25°00.3	-0.9'	59.1'
23	163°40.7	16.7	191°02.2	4.4'	24°59.3	-1.1'	59.1'
	SD.=15.7	d=-0.3	S.D.=16.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°40.6	N22°16.4	205°25.6	4.4'	N24°58.2	-1.2'	59.2'
1	193°40.5	16.1	219°48.9	4.3'	24°56.9	-1.4'	59.2'
2	208°40.4	15.7	234°12.2	4.3'	24°55.4	-1.6'	59.2'
3	223°40.3	· · 15.4	248°35.5	4.3'	24°53.7	-1.7'	59.3'
4	238°40.3	15.1	262°58.7	4.2'	24°51.9	-1.9'	59.3'
5	253°40.2	14.8	277°22.0	4.2'	24°49.9	-2.1'	59.3'
6	268°40.1	N22°14.5	291°45.2	4.2'	N24°47.7	-2.3'	59.4'
7	283°40.0	14.2	306°08.4	4.2'	24°45.4	-2.4'	59.4'
8	298°39.9	13.9	320°31.5	4.2'	24°42.9	-2.6'	59.4'
9	313°39.8	· · 13.5	334°54.7	4.1'	24°40.2	-2.8'	59.5'
10	328°39.7	13.2	349°17.8	4.1'	24°37.3	-3.0'	59.5'
11	343°39.6	12.9	3°41.0	4.1'	24°34.3	-3.1'	59.5'
12	358°39.5	N22°12.6	18°04.1	4.1'	N24°31.1	-3.3'	59.6'
13	13°39.5	12.3	32°27.2	4.1'	24°27.7	-3.5'	59.6'
14	28°39.4	11.9	46°50.3	4.1'	24°24.1	-3.6'	59.6'
15	43°39.3	· · 11.6	61°13.4	4.1'	24°20.4	-3.8'	59.6'
16	58°39.2	11.3	75°36.5	4.1'	24°16.5	-4.0'	59.7'
17	73°39.1	11.0	89°59.6	4.1'	24°12.4	-4.2'	59.7'
18	88°39.0	N22°10.7	104°22.7	4.1'	N24°08.1	-4.3'	59.7'
19	103°38.9	10.3	118°45.8	4.1'	24°03.7	-4.5'	59.8'
20	118°38.8	10.0	133°08.9	4.1'	23°59.1	-4.7'	59.8'
21	133°38.8	· · 09.7	147°32.1	4.1'	23°54.3	-4.9'	59.8'
22	148°38.7	09.4	161°55.2	4.2'	23°49.4	-5.0'	59.8'
23	163°38.6	09.0	176°18.4	4.2'	23°44.3	-5.2'	59.9'
	SD.=15.7	d=-0.3	S.D.=16.2				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°38.5	N22°08.7	190°41.6	4.2'	N23°39.0	-5.4'	59.9'
1	193°38.4	08.4	205°04.8	4.2'	23°33.5	-5.5'	59.9'
2	208°38.3	08.0	219°28.0	4.2'	23°27.9	-5.7'	59.9'
3	223°38.2	· · 07.7	233°51.2	4.2'	23°22.1	-5.9'	60.0'
4	238°38.1	07.4	248°14.5	4.3'	23°16.2	-6.0'	60.0'
5	253°38.1	07.1	262°37.8	4.3'	23°10.1	-6.2'	60.0'
6	268°38.0	N22°06.7	277°01.1	4.3'	N23°03.8	-6.4'	60.0'
7	283°37.9	06.4	291°24.4	4.4'	22°57.3	-6.5'	60.1'
8	298°37.8	06.1	305°47.8	4.4'	22°50.7	-6.7'	60.1'
9	313°37.7	· · 05.7	320°11.2	4.4'	22°43.9	-6.9'	60.1'
10	328°37.6	05.4	334°34.6	4.5'	22°37.0	-7.0'	60.1'
11	343°37.6	05.1	348°58.1	4.5'	22°29.8	-7.2'	60.2'
12	358°37.5	N22°04.7	3°21.6	4.5'	N22°22.6	-7.4'	60.2'
13	13°37.4	04.4	17°45.2	4.6'	22°15.1	-7.5'	60.2'
14	28°37.3	04.1	32°08.8	4.6'	22°07.6	-7.7'	60.2'
15	43°37.2	· · 03.7	46°32.4	4.7'	21°59.8	-7.8'	60.2'
16	58°37.1	03.4	60°56.1	4.7'	21°51.9	-8.0'	60.3'
17	73°37.0	03.1	75°19.9	4.8'	21°43.8	-8.1'	60.3'
18	88°37.0	N22°02.7	89°43.6	4.8'	N21°35.6	-8.3'	60.3'
19	103°36.9	02.4	104°07.5	4.9'	21°27.2	-8.5'	60.3'
20	118°36.8	02.0	118°31.4	4.9'	21°18.7	-8.6'	60.3'
21	133°36.7	· · 01.7	132°55.3	5.0'	21°10.0	-8.8'	60.4'
22	148°36.6	01.4	147°19.3	5.0'	21°01.2	-8.9'	60.4'
23	163°36.6	01.0	161°43.3	5.1'	20°52.2	-9.1'	60.4'
	SD.=15.7	d=-0.3	S.D.=16.4				

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

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

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 27-0 7-0%
09	05:09	05:13	12:05	09:44	22:14	●
10	05:18	05:22	12:05	10:45	23:15	
11	05:26	05:30	12:06	11:46	–:–	

July 12, 13, 14 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	289°47.2	135°33.7	N12°10.4	119°21.9	N04°55.7	286°19.8	N00°02.4	109°31.4	N02°22.5
1	304°49.7	150°33.5	09.3	134°23.0	55.1	301°22.2	02.4	124°33.7	22.4
2	319°52.1	165°33.3	08.2	149°24.2	54.5	316°24.6	02.4	139°36.0	22.3
3	334°54.6	180°33.1	·· 07.1	164°25.3	·· 53.9	331°26.9	·· 02.5	154°38.3	·· 22.3
4	349°57.0	195°33.0	06.0	179°26.4	53.3	346°29.3	02.5	169°40.7	22.2
5	4°59.5	210°32.8	04.8	194°27.6	52.6	1°31.7	02.5	184°43.0	22.1
6	20°02.0	225°32.7	N12°03.7	209°28.7	N04°52.0	16°34.1	N00°02.5	199°45.3	N02°22.0
7	35°04.4	240°32.5	02.6	224°29.8	51.4	31°36.4	02.6	214°47.6	22.0
8	50°06.9	255°32.3	01.5	239°31.0	50.8	46°38.8	02.6	229°49.9	21.9
9	65°09.4	270°32.2	12°00.4	254°32.1	·· 50.2	61°41.2	·· 02.6	244°52.2	·· 21.8
10	80°11.8	285°32.0	11°59.3	269°33.2	49.6	76°43.6	02.6	259°54.5	21.7
11	95°14.3	300°31.8	58.2	284°34.3	49.0	91°45.9	02.7	274°56.8	21.7
12	110°16.8	315°31.7	N11°57.0	299°35.5	N04°48.4	106°48.3	N00°02.7	289°59.2	N02°21.6
13	125°19.2	330°31.5	55.9	314°36.6	47.8	121°50.7	02.7	305°01.5	21.5
14	140°21.7	345°31.4	54.8	329°37.7	47.2	136°53.1	02.7	320°03.8	21.4
15	155°24.1	0°31.2	·· 53.7	344°38.9	·· 46.6	151°55.5	·· 02.8	335°06.1	·· 21.4
16	170°26.6	15°31.0	52.6	359°40.0	46.0	166°57.8	02.8	350°08.4	21.3
17	185°29.1	30°30.9	51.5	14°41.1	45.4	182°00.2	02.8	5°10.7	21.2
18	200°31.5	45°30.7	N11°50.3	29°42.2	N04°44.8	197°02.6	N00°02.8	20°13.0	N02°21.1
19	215°34.0	60°30.6	49.2	44°43.4	44.1	212°05.0	02.8	35°15.3	21.1
20	230°36.5	75°30.4	48.1	59°44.5	43.5	227°07.3	02.9	50°17.7	21.0
21	245°38.9	90°30.2	·· 47.0	74°45.6	·· 42.9	242°09.7	·· 02.9	65°20.0	·· 20.9
22	260°41.4	105°30.1	45.9	89°46.8	42.3	257°12.1	02.9	80°22.3	20.8
23	275°43.9	120°29.9	44.7	104°47.9	41.7	272°14.5	02.9	95°24.6	20.8
Mer.pass.:04:40		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	290°46.3	135°29.8	N11°43.6	119°49.0	N04°41.1	287°16.9	N00°03.0	110°26.9	N02°20.7
1	305°48.8	150°29.6	42.5	134°50.1	40.5	302°19.3	03.0	125°29.2	20.6
2	320°51.3	165°29.5	41.4	149°51.3	39.9	317°21.6	03.0	140°31.5	20.5
3	335°53.7	180°29.3	·· 40.2	164°52.4	·· 39.3	332°24.0	·· 03.0	155°33.8	·· 20.5
4	350°56.2	195°29.2	39.1	179°53.5	38.7	347°26.4	03.0	170°36.1	20.4
5	5°58.6	210°29.0	38.0	194°54.7	38.1	2°28.8	03.1	185°38.5	20.3
6	21°01.1	225°28.9	N11°36.9	209°55.8	N04°37.5	17°31.2	N00°03.1	200°40.8	N02°20.2
7	36°03.6	240°28.7	35.8	224°56.9	36.8	32°33.5	03.1	215°43.1	20.2
8	51°06.0	255°28.6	34.6	239°58.0	36.2	47°35.9	03.1	230°45.4	20.1
9	66°08.5	270°28.4	·· 33.5	254°59.2	·· 35.6	62°38.3	·· 03.2	245°47.7	·· 20.0
10	81°11.0	285°28.3	32.4	270°00.3	35.0	77°40.7	03.2	260°50.0	19.9
11	96°13.4	300°28.1	31.3	285°01.4	34.4	92°43.1	03.2	275°52.3	19.9
12	111°15.9	315°28.0	N11°30.1	300°02.5	N04°33.8	107°45.5	N00°03.2	290°54.6	N02°19.8
13	126°18.4	330°27.8	29.0	315°03.7	33.2	122°47.9	03.2	305°56.9	19.7
14	141°20.8	345°27.7	27.9	330°04.8	32.6	137°50.2	03.3	320°59.2	19.6
15	156°23.3	0°27.5	·· 26.7	345°05.9	·· 32.0	152°52.6	·· 03.3	336°01.6	·· 19.6
16	171°25.8	15°27.4	25.6	0°07.1	31.4	167°55.0	03.3	351°03.9	19.5
17	186°28.2	30°27.3	24.5	15°08.2	30.7	182°57.4	03.3	6°06.2	19.4
18	201°30.7	45°27.1	N11°23.4	30°09.3	N04°30.1	197°59.8	N00°03.3	21°08.5	N02°19.3
19	216°33.1	60°27.0	22.2	45°10.4	29.5	213°02.2	03.4	36°10.8	19.3
20	231°35.6	75°26.8	21.1	60°11.6	28.9	228°04.6	03.4	51°13.1	19.2
21	246°38.1	90°26.7	·· 20.0	75°12.7	·· 28.3	243°06.9	·· 03.4	66°15.4	·· 19.1
22	261°40.5	105°26.6	18.8	90°13.8	27.7	258°09.3	03.4	81°17.7	19.0
23	276°43.0	120°26.4	17.7	105°14.9	27.1	273°11.7	03.4	96°20.0	19.0
Mer.pass.:04:36		v-0.2 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	291°45.5	135°26.3	N11°16.6	120°16.1	N04°26.5	288°14.1	N00°03.5	111°22.3	N02°18.9
1	306°47.9	150°26.1	15.4	135°17.2	25.9	303°16.5	03.5	126°24.6	18.8
2	321°50.4	165°26.0	14.3	150°18.3	25.3	318°18.9	03.5	141°26.9	18.7
3	336°52.9	180°25.9	·· 13.2	165°19.4	·· 24.6	333°21.3	·· 03.5	156°29.2	·· 18.7
4	351°55.3	195°25.7	12.1	180°20.6	24.0	348°23.7	03.5	171°31.6	18.6
5	6°57.8	210°25.6	10.9	195°21.7	23.4	3°26.1	03.6	186°33.9	18.5
6	22°00.3	225°25.5	N11°09.8	210°22.8	N04°22.8	18°28.4	N00°03.6	201°36.2	N02°18.4
7	37°02.7	240°25.3	08.7	225°23.9	22.2	33°30.8	03.6	216°38.5	18.4
8	52°05.2	255°25.2	07.5	240°25.1	21.6	48°33.2	03.6	231°40.8	18.3
9	67°07.6	270°25.1	·· 06.4	255°26.2	·· 21.0	63°35.6	·· 03.6	246°43.1	·· 18.2
10	82°10.1	285°24.9	05.2	270°27.3	20.4	78°38.0	03.6	261°45.4	18.1
11	97°12.6	300°24.8	04.1	285°28.4	19.8	93°40.4	03.7	276°47.7	18.0
12	112°15.0	315°24.7	N11°03.0	300°29.6	N04°19.1	108°42.8	N00°03.7	291°50.0	N02°18.0
13	127°17.5	330°24.5	01.8	315°30.7	18.5	123°45.2	03.7	306°52.3	17.9
14	142°20.0	345°24.4	11°00.7	330°31.8	17.9	138°47.6	03.7	321°54.6	17.8
15	157°22.4	0°24.3	10°59.6	345°32.9	·· 17.3	153°50.0	·· 03.7	336°56.9	·· 17.7
16	172°24.9	15°24.1	58.4	0°34.1	16.7	168°52.4	03.7	351°59.2	17.7
17	187°27.4	30°24.0	57.3	15°35.2	16.1	183°54.8	03.8	7°01.5	17.6
18	202°29.8	45°23.9	N10°56.2	30°36.3	N04°15.5	198°57.2	N00°03.8	22°03.8	N02°17.5
19	217°32.3	60°23.8	55.0	45°37.4	14.9	213°59.5	03.8	37°06.2	17.4
20	232°34.7	75°23.6	53.9	60°38.5	14.3	229°01.9	03.8	52°08.5	17.4
21	247°37.2	90°23.5	·· 52.7	75°39.7	·· 13.6	244°04.3	·· 03.8	67°10.8	·· 17.3
22	262°39.7	105°23.4	51.6	90°40.8	13.0	259°06.7	03.8	82°13.1	17.2
23	277°42.1	120°23.3	50.5	105°41.9	12.4	274°09.1	03.9	97°15.4	17.1
Mer.pass.:04:32		v-0.1 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.6	29°08.9
Ankaa	353°17.6	-42°14.6
Schedar	349°43.0	56°35.6
Diphda	348°57.9	-17°55.5
Achernar	335°28.2	-57°10.6
Hamal	328°03.2	23°30.7
Polaris	318°59.1	89°18.4
Acamar	315°20.1	-40°15.4
Menkar	314°17.4	4°08.0
Mirfak	308°43.7	49°53.8
Aldebaran	290°52.1	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.0	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.6	28°36.9
Alnilam	275°48.8	-1°11.7
Betelgeuse	271°03.9	7°24.6
Canopus	263°57.6	-52°42.0
Sirius	258°35.9	-16°43.8
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.9
Pollux	243°30.7	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.7
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.5	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.0	-63°09.8
Gacrux	172°03.5	-57°10.7
Alioth	166°22.4	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.4	49°15.8
Hadar	148°50.9	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.5	-60°53.0
Kochab	137°19.2	74°07.0
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.5	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.4
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.7
Nunki	76°00.5	-26°16.9
Altair	62°10.0	8°53.9
Peacock	53°21.9	-56°41.9
Deneb	49°32.5	45°19.1
Enif	33°48.9	9°55.5
Al Na'ir	27°45.9	-46°54.3
Fomalhaut	15°26.0	-29°33.7
Scheat	13°55.3	28°08.4
Markab	13°40.3	15°15.8

Jul 12 Mon	**SHA**	**Mer.pass**
Venus	205°46.5	14:58
Mars	189°34.7	16:01
Jupiter	356°32.6	04:54
Saturn	179°44.2	16:39

Jul 13 Tue	**SHA**	**Mer.pass**
Venus	204°43.5	14:58
Mars	189°02.7	16:00
Jupiter	356°30.5	04:50
Saturn	179°40.6	16:36

Jul 14 Wed	**SHA**	**Mer.pass**
Venus	203°40.8	14:58
Mars	188°30.6	15:58
Jupiter	356°28.6	04:46
Saturn	179°36.9	16:32

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°36.5	N22°00.7	176°07.4	5.1'	N20°43.1	-9.2'	60.4'
1	193°36.4	00.3	190°31.6	5.2'	20°33.8	-9.3'	60.4'
2	208°36.3	22°00.0	204°55.8	5.2'	20°24.4	-9.5'	60.4'
3	223°36.2	21°59.6	219°20.0	5.3'	20°14.9	-9.6'	60.5'
4	238°36.1	59.3	233°44.4	5.4'	20°05.1	-9.8'	60.5'
5	253°36.1	58.9	248°08.8	5.4'	19°55.3	-9.9'	60.5'
6	268°36.0	N21°58.6	262°33.2	5.5'	N19°45.3	-10.1'	60.5'
7	283°35.9	58.3	276°57.7	5.5'	19°35.2	-10.2'	60.5'
8	298°35.8	57.9	291°22.3	5.6'	19°24.9	-10.3'	60.5'
9	313°35.7	·· 57.6	305°47.0	5.7'	19°14.6	-10.5'	60.5'
10	328°35.7	57.2	320°11.7	5.7'	19°04.0	-10.6'	60.6'
11	343°35.6	56.9	334°36.4	5.8'	18°53.4	-10.7'	60.6'
12	358°35.5	N21°56.5	349°01.3	5.9'	N18°42.6	-10.9'	60.6'
13	13°35.4	56.2	3°26.2	5.9'	18°31.7	-11.0'	60.6'
14	28°35.3	55.8	17°51.2	6.0'	18°20.6	-11.1'	60.6'
15	43°35.3	·· 55.5	32°16.2	6.1'	18°09.5	-11.2'	60.6'
16	58°35.2	55.1	46°41.3	6.2'	17°58.2	-11.4'	60.6'
17	73°35.1	54.7	61°06.5	6.2'	17°46.8	-11.5'	60.6'
18	88°35.0	N21°54.4	75°31.8	6.3'	N17°35.2	-11.6'	60.6'
19	103°35.0	54.0	89°57.1	6.4'	17°23.6	-11.7'	60.6'
20	118°34.9	53.7	104°22.5	6.4'	17°11.8	-11.8'	60.7'
21	133°34.8	·· 53.3	118°48.0	6.5'	16°59.9	-11.9'	60.7'
22	148°34.7	53.0	133°13.5	6.6'	16°47.9	-12.1'	60.7'
23	163°34.6	52.6	147°39.1	6.6'	16°35.8	-12.2'	60.7'
	SD.=15.7	d=-0.3	S.D.=16.5				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°34.6	N21°52.3	162°04.8	6.7'	N16°23.6	-12.3'	60.7'
1	193°34.5	51.9	176°30.6	6.8'	16°11.3	-12.4'	60.7'
2	208°34.4	51.5	190°56.4	6.9'	15°58.8	-12.5'	60.7'
3	223°34.3	·· 51.2	205°22.3	6.9'	15°46.3	-12.6'	60.7'
4	238°34.3	50.8	219°48.3	7.0'	15°33.7	-12.7'	60.7'
5	253°34.2	50.5	234°14.3	7.1'	15°20.9	-12.8'	60.7'
6	268°34.1	N21°50.1	248°40.4	7.2'	N15°08.1	-12.9'	60.7'
7	283°34.0	49.7	263°06.6	7.2'	14°55.1	-13.0'	60.7'
8	298°34.0	49.4	277°32.9	7.3'	14°42.1	-13.1'	60.7'
9	313°33.9	·· 49.0	291°59.2	7.4'	14°29.0	-13.2'	60.7'
10	328°33.8	48.6	306°25.6	7.4'	14°15.8	-13.3'	60.7'
11	343°33.7	48.3	320°52.1	7.5'	14°02.5	-13.4'	60.7'
12	358°33.7	N21°47.9	335°18.6	7.6'	N13°49.1	-13.4'	60.7'
13	13°33.6	47.5	349°45.2	7.7'	13°35.6	-13.5'	60.7'
14	28°33.5	47.2	4°11.9	7.7'	13°22.0	-13.6'	60.7'
15	43°33.4	·· 46.8	18°38.7	7.8'	13°08.4	-13.7'	60.7'
16	58°33.4	46.4	33°05.5	7.9'	12°54.6	-13.8'	60.7'
17	73°33.3	46.1	47°32.4	7.9'	12°40.8	-13.8'	60.7'
18	88°33.2	N21°45.7	61°59.4	8.0'	N12°27.0	-13.9'	60.7'
19	103°33.1	45.3	76°26.4	8.1'	12°13.0	-14.0'	60.7'
20	118°33.1	45.0	90°53.5	8.1'	11°59.0	-14.1'	60.7'
21	133°33.0	·· 44.6	105°20.7	8.2'	11°44.9	-14.1'	60.7'
22	148°32.9	44.2	119°47.9	8.3'	11°30.7	-14.2'	60.7'
23	163°32.9	43.8	134°15.2	8.3'	11°16.5	-14.3'	60.7'
	SD.=15.7	d=-0.4	S.D.=16.5				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°32.8	N21°43.5	148°42.6	8.4'	N11°02.2	-14.3'	60.7'
1	193°32.7	43.1	163°10.1	8.5'	10°47.8	-14.4'	60.7'
2	208°32.6	42.7	177°37.6	8.5'	10°33.4	-14.5'	60.7'
3	223°32.6	·· 42.3	192°05.1	8.6'	10°18.9	-14.5'	60.7'
4	238°32.5	42.0	206°32.8	8.7'	10°04.3	-14.6'	60.6'
5	253°32.4	41.6	221°00.5	8.7'	09°49.7	-14.6'	60.6'
6	268°32.4	N21°41.2	235°28.2	8.8'	N09°35.1	-14.7'	60.6'
7	283°32.3	40.8	249°56.0	8.9'	09°20.4	-14.7'	60.6'
8	298°32.2	40.4	264°23.9	8.9'	09°05.6	-14.8'	60.6'
9	313°32.1	·· 40.1	278°51.9	9.0'	08°50.8	-14.8'	60.6'
10	328°32.1	39.7	293°19.9	9.0'	08°35.9	-14.9'	60.6'
11	343°32.0	39.3	307°47.9	9.1'	08°21.0	-14.9'	60.6'
12	358°31.9	N21°38.9	322°16.0	9.1'	N08°06.1	-15.0'	60.6'
13	13°31.9	38.5	336°44.2	9.2'	07°51.1	-15.0'	60.6'
14	28°31.8	38.2	351°12.4	9.3'	07°36.1	-15.0'	60.5'
15	43°31.7	·· 37.8	5°40.7	9.3'	07°21.0	-15.1'	60.5'
16	58°31.7	37.4	20°09.1	9.4'	07°05.9	-15.1'	60.5'
17	73°31.6	37.0	34°37.5	9.4'	06°50.8	-15.1'	60.5'
18	88°31.5	N21°36.6	49°05.9	9.5'	N06°35.6	-15.2'	60.5'
19	103°31.5	36.2	63°34.4	9.5'	06°20.4	-15.2'	60.5'
20	118°31.4	35.9	78°03.0	9.6'	06°05.2	-15.2'	60.5'
21	133°31.3	·· 35.5	92°31.6	9.6'	05°50.0	-15.3'	60.5'
22	148°31.3	35.1	107°00.2	9.7'	05°34.7	-15.3'	60.4'
23	163°31.2	34.7	121°28.9	9.7'	05°19.4	-15.3'	60.4'
	SD.=15.7	d=-0.4	S.D.=16.5				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 1-3 1-10%
12	05:34	05:38	12:06	12:46	00:16	●
13	05:42	05:45	12:06	13:43	01:15	
14	05:49	05:52	12:06	14:36	02:10	

July 15, 16, 17 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	292°44.6	135°23.1	N10°49.3	120°43.0	N04°11.8	289°11.5	N00°03.9	112°17.7	N02°17.0
1	307°47.1	150°23.0	48.2	135°44.2	11.2	304°13.9	03.9	127°20.0	17.0
2	322°49.5	165°22.9	47.0	150°45.3	10.6	319°16.3	03.9	142°22.3	16.9
3	337°52.0	180°22.8	·· 45.9	165°46.4	·· 10.0	334°18.7	·· 03.9	157°24.6	·· 16.8
4	352°54.5	195°22.6	44.7	180°47.5	09.4	349°21.1	03.9	172°26.9	16.7
5	7°56.9	210°22.5	43.6	195°48.7	08.7	4°23.5	04.0	187°29.2	16.7
6	22°59.4	225°22.4	N10°42.5	210°49.8	N04°08.1	19°25.9	N00°04.0	202°31.5	N02°16.6
7	38°01.9	240°22.3	41.3	225°50.9	07.5	34°28.3	04.0	217°33.8	16.5
8	53°04.3	255°22.2	40.2	240°52.0	06.9	49°30.7	04.0	232°36.1	16.4
9	68°06.8	270°22.0	·· 39.0	255°53.1	·· 06.3	64°33.1	·· 04.0	247°38.4	·· 16.3
10	83°09.2	285°21.9	37.9	270°54.3	05.7	79°35.5	04.0	262°40.7	16.3
11	98°11.7	300°21.8	36.7	285°55.4	05.1	94°37.9	04.0	277°43.0	16.2
12	113°14.2	315°21.7	N10°35.6	300°56.5	N04°04.4	109°40.3	N00°04.1	292°45.3	N02°16.1
13	128°16.6	330°21.6	34.4	315°57.6	03.8	124°42.7	04.1	307°47.6	16.0
14	143°19.1	345°21.5	33.3	330°58.7	03.2	139°45.1	04.1	322°49.9	16.0
15	158°21.6	0°21.3	·· 32.2	345°59.9	·· 02.6	154°47.5	·· 04.1	337°52.2	·· 15.9
16	173°24.0	15°21.2	31.0	1°01.0	02.0	169°49.9	04.1	352°54.5	15.8
17	188°26.5	30°21.1	29.9	16°02.1	01.4	184°52.3	04.1	7°56.8	15.7
18	203°29.0	45°21.0	N10°28.7	31°03.2	N04°00.8	199°54.7	N00°04.1	22°59.1	N02°15.6
19	218°31.4	60°20.9	27.6	46°04.3	04°00.2	214°57.1	04.2	38°01.4	15.6
20	233°33.9	75°20.8	26.4	61°05.5	03°59.5	229°59.5	04.2	53°03.8	15.5
21	248°36.4	90°20.7	·· 25.3	76°06.6	·· 58.9	245°01.9	·· 04.2	68°06.1	·· 15.4
22	263°38.8	105°20.6	24.1	91°07.7	58.3	260°04.3	04.2	83°08.4	15.3
23	278°41.3	120°20.5	23.0	106°08.8	57.7	275°06.7	04.2	98°10.7	15.3
Mer.pass.:04:28		v-0.1 d-1.1 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	293°43.7	135°20.3	N10°21.8	121°09.9	N03°57.1	290°09.1	N00°04.2	113°13.0	N02°15.2
1	308°46.2	150°20.2	20.7	136°11.1	56.5	305°11.5	04.2	128°15.3	15.1
2	323°48.7	165°20.1	19.5	151°12.2	55.9	320°13.9	04.2	143°17.6	15.0
3	338°51.1	180°20.0	·· 18.4	166°13.3	·· 55.2	335°16.3	·· 04.3	158°19.9	·· 14.9
4	353°53.6	195°19.9	17.2	181°14.4	54.6	350°18.7	04.3	173°22.2	14.9
5	8°56.1	210°19.8	16.1	196°15.5	54.0	5°21.1	04.3	188°24.5	14.8
6	23°58.5	225°19.7	N10°14.9	211°16.7	N03°53.4	20°23.5	N00°04.3	203°26.8	N02°14.7
7	39°01.0	240°19.6	13.8	226°17.8	52.8	35°25.9	04.3	218°29.1	14.6
8	54°03.5	255°19.5	12.6	241°18.9	52.2	50°28.3	04.3	233°31.4	14.5
9	69°05.9	270°19.4	·· 11.5	256°20.0	·· 51.5	65°30.8	·· 04.3	248°33.7	·· 14.5
10	84°08.4	285°19.3	10.3	271°21.1	50.9	80°33.2	04.3	263°36.0	14.4
11	99°10.8	300°19.2	09.2	286°22.3	50.3	95°35.6	04.3	278°38.3	14.3
12	114°13.3	315°19.1	N10°08.0	301°23.4	N03°49.7	110°38.0	N00°04.4	293°40.6	N02°14.2
13	129°15.8	330°19.0	06.8	316°24.5	49.1	125°40.4	04.4	308°42.9	14.2
14	144°18.2	345°18.9	05.7	331°25.6	48.5	140°42.8	04.4	323°45.2	14.1
15	159°20.7	0°18.8	·· 04.5	346°26.7	·· 47.9	155°45.2	·· 04.4	338°47.5	·· 14.0
16	174°23.2	15°18.7	03.4	1°27.9	47.2	170°47.6	04.4	353°49.8	13.9
17	189°25.6	30°18.6	02.2	16°29.0	46.6	185°50.0	04.4	8°52.1	13.8
18	204°28.1	45°18.5	N10°01.1	31°30.1	N03°46.0	200°52.4	N00°04.4	23°54.4	N02°13.8
19	219°30.6	60°18.4	09°59.9	46°31.2	45.4	215°54.8	04.4	38°56.7	13.7
20	234°33.0	75°18.3	58.8	61°32.3	44.8	230°57.2	04.4	53°59.0	13.6
21	249°35.5	90°18.2	·· 57.6	76°33.4	·· 44.2	245°59.6	·· 04.4	69°01.3	·· 13.5
22	264°38.0	105°18.1	56.4	91°34.6	43.5	261°02.1	04.5	84°03.6	13.4
23	279°40.4	120°18.0	55.3	106°35.7	42.9	276°04.5	04.5	99°05.9	13.4
Mer.pass.:04:24		v-0.1 d-1.2 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m1.1	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	294°42.9	135°17.9	N09°54.1	121°36.8	N03°42.3	291°06.9	N00°04.5	114°08.2	N02°13.3
1	309°45.3	150°17.8	53.0	136°37.9	41.7	306°09.3	04.5	129°10.5	13.2
2	324°47.8	165°17.7	51.8	151°39.0	41.1	321°11.7	04.5	144°12.8	13.1
3	339°50.3	180°17.6	·· 50.6	166°40.1	·· 40.5	336°14.1	·· 04.5	159°15.1	·· 13.0
4	354°52.7	195°17.5	49.5	181°41.3	39.8	351°16.5	04.5	174°17.4	13.0
5	9°55.2	210°17.5	48.3	196°42.4	39.2	6°18.9	04.5	189°19.7	12.9
6	24°57.7	225°17.4	N09°47.2	211°43.5	N03°38.6	21°21.4	N00°04.5	204°22.0	N02°12.8
7	40°00.1	240°17.3	46.0	226°44.6	38.0	36°23.8	04.5	219°24.3	12.7
8	55°02.6	255°17.2	44.8	241°45.7	37.4	51°26.2	04.5	234°26.6	12.6
9	70°05.1	270°17.1	·· 43.7	256°46.8	·· 36.8	66°28.6	·· 04.6	249°28.9	·· 12.6
10	85°07.5	285°17.0	42.5	271°48.0	36.1	81°31.0	04.6	264°31.1	12.5
11	100°10.0	300°16.9	41.4	286°49.1	35.5	96°33.4	04.6	279°33.4	12.4
12	115°12.4	315°16.8	N09°40.2	301°50.2	N03°34.9	111°35.8	N00°04.6	294°35.7	N02°12.3
13	130°14.9	330°16.7	39.0	316°51.3	34.3	126°38.2	04.6	309°38.0	12.2
14	145°17.4	345°16.7	37.9	331°52.4	33.7	141°40.7	04.6	324°40.3	12.2
15	160°19.8	0°16.6	·· 36.7	346°53.5	·· 33.1	156°43.1	·· 04.6	339°42.6	·· 12.1
16	175°22.3	15°16.5	35.5	1°54.7	32.4	171°45.5	04.6	354°44.9	12.0
17	190°24.8	30°16.4	34.4	16°55.8	31.8	186°47.9	04.6	9°47.2	11.9
18	205°27.2	45°16.3	N09°33.2	31°56.9	N03°31.2	201°50.3	N00°04.6	24°49.5	N02°11.8
19	220°29.7	60°16.2	32.0	46°58.0	30.6	216°52.7	04.6	39°51.8	11.8
20	235°32.2	75°16.2	30.9	61°59.1	30.0	231°55.2	04.6	54°54.1	11.7
21	250°34.6	90°16.1	·· 29.7	77°00.2	·· 29.3	246°57.6	·· 04.6	69°56.4	·· 11.6
22	265°37.1	105°16.0	28.5	92°01.3	28.7	262°00.0	04.7	84°58.7	11.5
23	280°39.6	120°15.9	27.4	107°02.5	28.1	277°02.4	04.7	100°01.0	11.4
Mer.pass.:04:20		v-0.1 d-1.2 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.5		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.6	29°08.9
Ankaa	353°17.5	-42°14.5
Schedar	349°42.9	56°35.6
Diphda	348°57.9	-17°55.5
Achernar	335°28.2	-57°10.6
Hamal	328°03.2	23°30.7
Polaris	318°57.9	89°18.4
Acamar	315°20.0	-40°15.4
Menkar	314°17.4	4°08.0
Mirfak	308°43.7	49°53.8
Aldebaran	290°52.1	16°31.8
Rigel	281°14.4	-8°11.3
Capella	280°38.0	46°00.4
Bellatrix	278°34.6	6°21.6
Elnath	278°15.6	28°36.9
Alnilam	275°48.8	-1°11.7
Betelgeuse	271°03.9	7°24.6
Canopus	263°57.6	-52°42.0
Sirius	258°35.9	-16°43.8
Adhara	255°14.6	-28°59.2
Procyon	245°02.3	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.7
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.5	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.1	-63°09.8
Gacrux	172°03.6	-57°10.7
Alioth	166°22.5	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.4	49°15.8
Hadar	148°50.9	-60°25.8
Menkent	148°10.0	-36°25.5
Arcturus	145°57.5	19°07.7
Rigil Kent.	139°54.5	-60°53.0
Kochab	137°19.3	74°07.0
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.4
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.7
Nunki	76°00.5	-26°16.9
Altair	62°10.0	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.1
Enif	33°48.9	9°55.5
Al Na'ir	27°45.9	-46°54.3
Fomalhaut	15°26.0	-29°33.7
Scheat	13°55.2	28°08.4
Markab	13°40.2	15°15.8

Jul 15 Thu	**SHA**	**Mer.pass**
Venus	202°38.5	14:59
Mars	187°58.4	15:56
Jupiter	356°26.9	04:42
Saturn	179°33.1	16:28

Jul 16 Fri	**SHA**	**Mer.pass**
Venus	201°36.6	14:59
Mars	187°26.2	15:54
Jupiter	356°25.4	04:39
Saturn	179°29.2	16:25

Jul 17 Sat	**SHA**	**Mer.pass**
Venus	200°35.0	14:59
Mars	186°53.9	15:52
Jupiter	356°24.0	04:35
Saturn	179°25.3	16:21

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°31.1	N21°34.3	135°57.7	9.8'	N05°04.1	-15.3'	60.4'
1	193°31.1	33.9	150°26.5	9.8'	04°48.7	-15.4'	60.4'
2	208°31.0	33.5	164°55.3	9.9'	04°33.4	-15.4'	60.4'
3	223°30.9	·· 33.1	179°24.2	9.9'	04°18.0	-15.4'	60.4'
4	238°30.9	32.7	193°53.1	9.9'	04°02.6	-15.4'	60.3'
5	253°30.8	32.3	208°22.1	10.0'	03°47.2	-15.4'	60.3'
6	268°30.7	N21°32.0	222°51.1	10.0'	N03°31.8	-15.4'	60.3'
7	283°30.7	31.6	237°20.1	10.1'	03°16.4	-15.4'	60.3'
8	298°30.6	31.2	251°49.2	10.1'	03°00.9	-15.4'	60.3'
9	313°30.5	·· 30.8	266°18.3	10.1'	02°45.5	-15.4'	60.3'
10	328°30.5	30.4	280°47.5	10.2'	02°30.0	-15.4'	60.2'
11	343°30.4	30.0	295°16.7	10.2'	02°14.6	-15.5'	60.2'
12	358°30.3	N21°29.6	309°45.9	10.3'	N01°59.1	-15.5'	60.2'
13	13°30.3	29.2	324°15.2	10.3'	01°43.7	-15.5'	60.2'
14	28°30.2	28.8	338°44.5	10.3'	01°28.2	-15.4'	60.2'
15	43°30.2	·· 28.4	353°13.8	10.3'	01°12.8	-15.4'	60.1'
16	58°30.1	28.0	7°43.2	10.4'	00°57.3	-15.4'	60.1'
17	73°30.0	27.6	22°12.6	10.4'	00°41.9	-15.4'	60.1'
18	88°30.0	N21°27.2	36°42.0	10.4'	N00°26.5	-15.4'	60.1'
19	103°29.9	26.8	51°11.4	10.5'	N00°11.1	-15.4'	60.1'
20	118°29.8	26.4	65°40.9	10.5'	S00°04.3	-15.4'	60.0'
21	133°29.8	·· 26.0	80°10.4	10.5'	00°19.7	-15.4'	60.0'
22	148°29.7	25.6	94°39.9	10.5'	00°35.1	-15.4'	60.0'
23	163°29.7	25.2	109°09.5	10.6'	00°50.5	-15.4'	60.0'
	SD.=15.7	d=-0.4	S.D.=16.4				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°29.6	N21°24.8	123°39.1	10.6'	S01°05.8	-15.3'	59.9'
1	193°29.5	24.4	138°08.7	10.6'	01°21.2	-15.3'	59.9'
2	208°29.5	24.0	152°38.3	10.6'	01°36.5	-15.3'	59.9'
3	223°29.4	·· 23.6	167°07.9	10.6'	01°51.8	-15.3'	59.9'
4	238°29.4	23.2	181°37.6	10.7'	02°07.0	-15.3'	59.9'
5	253°29.3	22.7	196°07.2	10.7'	02°22.3	-15.2'	59.8'
6	268°29.2	N21°22.3	210°36.9	10.7'	S02°37.5	-15.2'	59.8'
7	283°29.2	21.9	225°06.6	10.7'	02°52.7	-15.2'	59.8'
8	298°29.1	21.5	239°36.3	10.7'	03°07.8	-15.1'	59.8'
9	313°29.1	·· 21.1	254°06.0	10.7'	03°22.9	-15.1'	59.7'
10	328°29.0	20.7	268°35.8	10.7'	03°38.0	-15.1'	59.7'
11	343°28.9	20.3	283°05.5	10.8'	03°53.1	-15.0'	59.7'
12	358°28.9	N21°19.9	297°35.3	10.8'	S04°08.1	-15.0'	59.7'
13	13°28.8	19.5	312°05.0	10.8'	04°23.1	-15.0'	59.6'
14	28°28.8	19.0	326°34.8	10.8'	04°38.1	-14.9'	59.6'
15	43°28.7	·· 18.6	341°04.6	10.8'	04°53.0	-14.9'	59.6'
16	58°28.7	18.2	355°34.4	10.8'	05°07.9	-14.9'	59.6'
17	73°28.6	17.8	10°04.2	10.8'	05°22.7	-14.8'	59.5'
18	88°28.5	N21°17.4	24°34.0	10.8'	S05°37.5	-14.8'	59.5'
19	103°28.5	17.0	39°03.8	10.8'	05°52.2	-14.7'	59.5'
20	118°28.4	16.6	53°33.6	10.8'	06°06.9	-14.7'	59.5'
21	133°28.4	·· 16.1	68°03.4	10.8'	06°21.6	-14.6'	59.4'
22	148°28.3	15.7	82°33.2	10.8'	06°36.2	-14.6'	59.4'
23	163°28.3	15.3	97°03.0	10.8'	06°50.8	-14.5'	59.4'
	SD.=15.7	d=-0.4	S.D.=16.3				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°28.2	N21°14.9	111°32.8	10.8'	S07°05.3	-14.5'	59.3'
1	193°28.1	14.5	126°02.6	10.8'	07°19.7	-14.4'	59.3'
2	208°28.1	14.0	140°32.4	10.8'	07°34.1	-14.4'	59.3'
3	223°28.0	·· 13.6	155°02.1	10.8'	07°48.5	-14.3'	59.3'
4	238°28.0	13.2	169°31.9	10.8'	08°02.8	-14.3'	59.2'
5	253°27.9	12.8	184°01.7	10.8'	08°17.0	-14.2'	59.2'
6	268°27.9	N21°12.4	198°31.5	10.8'	S08°31.2	-14.1'	59.2'
7	283°27.8	11.9	213°01.2	10.8'	08°45.3	-14.1'	59.2'
8	298°27.8	11.5	227°31.0	10.7'	08°59.3	-14.0'	59.1'
9	313°27.7	·· 11.1	242°00.7	10.7'	09°13.3	-14.0'	59.1'
10	328°27.7	10.7	256°30.4	10.7'	09°27.3	-13.9'	59.1'
11	343°27.6	10.2	271°00.1	10.7'	09°41.1	-13.8'	59.0'
12	358°27.6	N21°09.8	285°29.9	10.7'	S09°54.9	-13.8'	59.0'
13	13°27.5	09.4	299°59.5	10.7'	10°08.7	-13.7'	59.0'
14	28°27.4	08.9	314°29.2	10.7'	10°22.3	-13.6'	59.0'
15	43°27.4	·· 08.5	328°58.9	10.7'	10°35.9	-13.6'	58.9'
16	58°27.3	08.1	343°28.5	10.6'	10°49.5	-13.5'	58.9'
17	73°27.3	07.7	357°58.1	10.6'	11°02.9	-13.4'	58.9'
18	88°27.2	N21°07.2	12°27.8	10.6'	S11°16.3	-13.3'	58.8'
19	103°27.2	06.8	26°57.4	10.6'	11°29.6	-13.3'	58.8'
20	118°27.1	06.4	41°26.9	10.6'	11°42.9	-13.2'	58.8'
21	133°27.1	·· 05.9	55°56.5	10.5'	11°56.0	-13.1'	58.8'
22	148°27.0	05.5	70°26.0	10.5'	12°09.1	-13.0'	58.7'
23	163°27.0	05.1	84°55.5	10.5'	12°22.1	-13.0'	58.7'
	SD.=15.7	d=-0.4	S.D.=16.1				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 4-6 19-40%
15	05:55	05:59	12:06	15:28	03:02	
16	06:02	06:04	12:06	16:18	03:53	
17	06:07	06:10	12:06	17:08	04:43	

July 18, 19, 20 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	295°42.0	135°15.8	N09°26.2	122°03.6	N03°27.5	292°04.8	N00°04.7	115°03.3	N02°11.4
1	310°44.5	150°15.8	25.0	137°04.7	26.9	307°07.2	04.7	130°05.6	11.3
2	325°46.9	165°15.7	23.9	152°05.8	26.3	322°09.7	04.7	145°07.9	11.2
3	340°49.4	180°15.6	· · 22.7	167°06.9	· · 25.6	337°12.1	· · 04.7	160°10.2	· · 11.1
4	355°51.9	195°15.5	21.5	182°08.0	25.0	352°14.5	04.7	175°12.5	11.0
5	10°54.3	210°15.5	20.4	197°09.1	24.4	7°16.9	04.7	190°14.8	10.9
6	25°56.8	225°15.4	N09°19.2	212°10.3	N03°23.8	22°19.3	N00°04.7	205°17.1	N02°10.9
7	40°59.3	240°15.3	18.0	227°11.4	23.2	37°21.8	04.7	220°19.4	10.8
8	56°01.7	255°15.2	16.9	242°12.5	22.5	52°24.2	04.7	235°21.7	10.7
9	71°04.2	270°15.2	· · 15.7	257°13.6	· · 21.9	67°26.6	· · 04.7	250°24.0	· · 10.6
10	86°06.7	285°15.1	14.5	272°14.7	21.3	82°29.0	04.7	265°26.3	10.5
11	101°09.1	300°15.0	13.4	287°15.8	20.7	97°31.4	04.7	280°28.6	10.5
12	116°11.6	315°14.9	N09°12.2	302°16.9	N03°20.1	112°33.9	N00°04.7	295°30.8	N02°10.4
13	131°14.1	330°14.9	11.0	317°18.1	19.4	127°36.3	04.7	310°33.1	10.3
14	146°16.5	345°14.8	09.8	332°19.2	18.8	142°38.7	04.7	325°35.4	10.2
15	161°19.0	0°14.7	· · 08.7	347°20.3	· · 18.2	157°41.1	· · 04.7	340°37.7	· · 10.1
16	176°21.4	15°14.7	07.5	2°21.4	17.6	172°43.6	04.7	355°40.0	10.1
17	191°23.9	30°14.6	06.3	17°22.5	17.0	187°46.0	04.8	10°42.3	10.0
18	206°26.4	45°14.5	N09°05.2	32°23.6	N03°16.4	202°48.4	N00°04.8	25°44.6	N02°09.9
19	221°28.8	60°14.4	04.0	47°24.7	15.7	217°50.8	04.8	40°46.9	09.8
20	236°31.3	75°14.4	02.8	62°25.8	15.1	232°53.3	04.8	55°49.2	09.7
21	251°33.8	90°14.3	· · 01.6	77°27.0	· · 14.5	247°55.7	· · 04.8	70°51.5	· · 09.6
22	266°36.2	105°14.2	09°00.5	92°28.1	13.9	262°58.1	04.8	85°53.8	09.6
23	281°38.7	120°14.2	08°59.3	107°29.2	13.3	278°00.5	04.8	100°56.1	09.5
Mer.pass.:04:16		v-0.1 d-1.2 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.5		v2.3 d-0.1 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	296°41.2	135°14.1	N08°58.1	122°30.3	N03°12.6	293°03.0	N00°04.8	115°58.4	N02°09.4
1	311°43.6	150°14.1	56.9	137°31.4	12.0	308°05.4	04.8	131°00.7	09.3
2	326°46.1	165°14.0	55.8	152°32.5	11.4	323°07.8	04.8	146°03.0	09.2
3	341°48.5	180°13.9	· · 54.6	167°33.6	· · 10.8	338°10.2	· · 04.8	161°05.2	· · 09.2
4	356°51.0	195°13.9	53.4	182°34.7	10.1	353°12.7	04.8	176°07.5	09.1
5	11°53.5	210°13.8	52.2	197°35.8	09.5	8°15.1	04.8	191°09.8	09.0
6	26°55.9	225°13.7	N08°51.1	212°37.0	N03°08.9	23°17.5	N00°04.8	206°12.1	N02°08.9
7	41°58.4	240°13.7	49.9	227°38.1	08.3	38°19.9	04.8	221°14.4	08.8
8	57°00.9	255°13.6	48.7	242°39.2	07.7	53°22.4	04.8	236°16.7	08.7
9	72°03.3	270°13.6	· · 47.5	257°40.3	· · 07.0	68°24.8	· · 04.8	251°19.0	· · 08.7
10	87°05.8	285°13.5	46.4	272°41.4	06.4	83°27.2	04.8	266°21.3	08.6
11	102°08.3	300°13.4	45.2	287°42.5	05.8	98°29.7	04.8	281°23.6	08.5
12	117°10.7	315°13.4	N08°44.0	302°43.6	N03°05.2	113°32.1	N00°04.8	296°25.9	N02°08.4
13	132°13.2	330°13.3	42.8	317°44.7	04.6	128°34.5	04.8	311°28.2	08.3
14	147°15.7	345°13.3	41.7	332°45.8	03.9	143°36.9	04.8	326°30.5	08.2
15	162°18.1	0°13.2	· · 40.5	347°47.0	· · 03.3	158°39.4	· · 04.8	341°32.8	· · 08.2
16	177°20.6	15°13.2	39.3	2°48.1	02.7	173°41.8	04.8	356°35.0	08.1
17	192°23.0	30°13.1	38.1	17°49.2	02.1	188°44.2	04.8	11°37.3	08.0
18	207°25.5	45°13.0	N08°36.9	32°50.3	N03°01.5	203°46.7	N00°04.8	26°39.6	N02°07.9
19	222°28.0	60°13.0	35.8	47°51.4	00.8	218°49.1	04.8	41°41.9	07.8
20	237°30.4	75°12.9	34.6	62°52.5	03°00.2	233°51.5	04.8	56°44.2	07.7
21	252°32.9	90°12.9	· · 33.4	77°53.6	02°59.6	248°54.0	· · 04.8	71°46.5	· · 07.7
22	267°35.4	105°12.8	32.2	92°54.7	59.0	263°56.4	04.8	86°48.8	07.6
23	282°37.8	120°12.8	31.0	107°55.8	58.3	278°58.8	04.8	101°51.1	07.5
Mer.pass.:04:13		v-0.1 d-1.2 m-4.0		v1.1 d-0.6 m1.4		v2.4 d0.0 m-2.5		v2.3 d-0.1 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	297°40.3	135°12.7	N08°29.9	122°56.9	N02°57.7	294°01.3	N00°04.8	116°53.4	N02°07.4
1	312°42.8	150°12.7	28.7	137°58.1	57.1	309°03.7	04.8	131°55.7	07.3
2	327°45.2	165°12.6	27.5	152°59.2	56.5	324°06.1	04.8	146°57.9	07.2
3	342°47.7	180°12.6	· · 26.3	168°00.3	· · 55.9	339°08.6	· · 04.8	162°00.2	· · 07.2
4	357°50.2	195°12.5	25.1	183°01.4	55.2	354°11.0	04.8	177°02.5	07.1
5	12°52.6	210°12.5	23.9	198°02.5	54.6	9°13.4	04.8	192°04.8	07.0
6	27°55.1	225°12.4	N08°22.8	213°03.6	N02°54.0	24°15.9	N00°04.8	207°07.1	N02°06.9
7	42°57.5	240°12.4	21.6	228°04.7	53.4	39°18.3	04.8	222°09.4	06.8
8	58°00.0	255°12.4	20.4	243°05.8	52.7	54°20.7	04.8	237°11.7	06.7
9	73°02.5	270°12.3	· · 19.2	258°06.9	· · 52.1	69°23.2	· · 04.8	252°14.0	· · 06.7
10	88°04.9	285°12.3	18.0	273°08.0	51.5	84°25.6	04.8	267°16.3	06.6
11	103°07.4	300°12.2	16.8	288°09.1	50.9	99°28.0	04.8	282°18.6	06.5
12	118°09.9	315°12.2	N08°15.7	303°10.2	N02°50.3	114°30.5	N00°04.8	297°20.8	N02°06.4
13	133°12.3	330°12.1	14.5	318°11.4	49.6	129°32.9	04.8	312°23.1	06.3
14	148°14.8	345°12.1	13.3	333°12.5	49.0	144°35.3	04.8	327°25.4	06.2
15	163°17.3	0°12.0	· · 12.1	348°13.6	· · 48.4	159°37.8	· · 04.8	342°27.7	· · 06.2
16	178°19.7	15°12.0	10.9	3°14.7	47.8	174°40.2	04.8	357°30.0	06.1
17	193°22.2	30°12.0	09.7	18°15.8	47.1	189°42.7	04.8	12°32.3	06.0
18	208°24.7	45°11.9	N08°08.5	33°16.9	N02°46.5	204°45.1	N00°04.8	27°34.6	N02°05.9
19	223°27.1	60°11.9	07.4	48°18.0	45.9	219°47.5	04.8	42°36.9	05.8
20	238°29.6	75°11.9	06.2	63°19.1	45.3	234°50.0	04.8	57°39.1	05.7
21	253°32.0	90°11.8	· · 05.0	78°20.2	· · 44.6	249°52.4	· · 04.8	72°41.4	· · 05.7
22	268°34.5	105°11.8	03.8	93°21.3	44.0	264°54.9	04.8	87°43.7	05.6
23	283°37.0	120°11.7	02.6	108°22.4	43.4	279°57.3	04.8	102°46.0	05.5
Mer.pass.:04:09		v-0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.4 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.6	29°08.9
Ankaa	353°17.5	-42°14.5
Schedar	349°42.9	56°35.6
Diphda	348°57.9	-17°55.5
Achernar	335°28.2	-57°10.6
Hamal	328°03.2	23°30.7
Polaris	318°56.4	89°18.3
Acamar	315°20.0	-40°15.4
Menkar	314°17.4	4°08.0
Mirfak	308°43.7	49°53.8
Aldebaran	290°52.0	16°31.8
Rigel	281°14.3	-8°11.3
Capella	280°38.0	46°00.4
Bellatrix	278°34.5	6°21.6
Elnath	278°15.6	28°36.9
Alnilam	275°48.8	-1°11.7
Betelgeuse	271°03.9	7°24.6
Canopus	263°57.6	-52°42.0
Sirius	258°35.9	-16°43.8
Adhara	255°14.6	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.5	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.1	-63°09.8
Gacrux	172°03.6	-57°10.7
Alioth	166°22.5	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.4	49°15.8
Hadar	148°50.9	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.5	-60°53.0
Kochab	137°19.3	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.2
Eltanin	90°46.6	51°29.4
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.7
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.1
Enif	33°48.9	9°55.5
Al Na'ir	27°45.9	-46°54.3
Fomalhaut	15°26.0	-29°33.7
Scheat	13°55.2	28°08.4
Markab	13°40.2	15°15.8

Jul 18 Sun	**SHA**	**Mer.pass**
Venus	199°33.8	14:59
Mars	186°21.6	15:51
Jupiter	356°22.8	04:31
Saturn	179°21.3	16:17

Jul 19 Mon	**SHA**	**Mer.pass**
Venus	198°33.0	14:59
Mars	185°49.1	15:49
Jupiter	356°21.8	04:27
Saturn	179°17.2	16:14

Jul 20 Tue	**SHA**	**Mer.pass**
Venus	197°32.4	14:59
Mars	185°16.6	15:47
Jupiter	356°21.0	04:23
Saturn	179°13.1	16:10

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.9	N21°04.6	99°25.0	10.5'	S12°35.0	-12.9'	58.7'
1	193°26.9	04.2	113°54.5	10.5'	12°47.9	-12.8'	58.6'
2	208°26.8	03.8	128°23.9	10.4'	13°00.6	-12.7'	58.6'
3	223°26.8	· · 03.3	142°53.4	10.4'	13°13.3	-12.6'	58.6'
4	238°26.7	02.9	157°22.8	10.4'	13°25.9	-12.6'	58.5'
5	253°26.7	02.5	171°52.1	10.4'	13°38.4	-12.5'	58.5'
6	268°26.6	N21°02.0	186°21.5	10.3'	S13°50.9	-12.4'	58.5'
7	283°26.6	01.6	200°50.8	10.3'	14°03.2	-12.3'	58.5'
8	298°26.5	01.1	215°20.1	10.3'	14°15.5	-12.2'	58.4'
9	313°26.5	· · 00.7	229°49.4	10.3'	14°27.6	-12.1'	58.4'
10	328°26.5	21°00.3	244°18.6	10.2'	14°39.7	-12.0'	58.4'
11	343°26.4	20°59.8	258°47.8	10.2'	14°51.7	-11.9'	58.3'
12	358°26.4	N20°59.4	273°17.0	10.2'	S15°03.6	-11.8'	58.3'
13	13°26.3	58.9	287°46.2	10.1'	15°15.4	-11.8'	58.3'
14	28°26.3	58.5	302°15.3	10.1'	15°27.1	-11.7'	58.3'
15	43°26.2	· · 58.0	316°44.4	10.1'	15°38.7	-11.6'	58.2'
16	58°26.2	57.6	331°13.5	10.1'	15°50.2	-11.5'	58.2'
17	73°26.1	57.2	345°42.5	10.0'	16°01.6	-11.4'	58.2'
18	88°26.1	N20°56.7	0°11.6	10.0'	S16°13.0	-11.3'	58.1'
19	103°26.0	56.3	14°40.5	10.0'	16°24.2	-11.2'	58.1'
20	118°26.0	55.8	29°09.5	9.9'	16°35.3	-11.1'	58.1'
21	133°25.9	· · 55.4	43°38.4	9.9'	16°46.3	-11.0'	58.1'
22	148°25.9	54.9	58°07.3	9.9'	16°57.3	-10.9'	58.0'
23	163°25.9	54.5	72°36.1	9.8'	17°08.1	-10.8'	58.0'
	SD.=15.7	d=-0.4	S.D.=15.9				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.8	N20°54.0	87°05.0	9.8'	S17°18.8	-10.7'	58.0'
1	193°25.8	53.6	101°33.8	9.8'	17°29.4	-10.6'	57.9'
2	208°25.7	53.1	116°02.5	9.7'	17°39.9	-10.5'	57.9'
3	223°25.7	· · 52.7	130°31.2	9.7'	17°50.3	-10.4'	57.9'
4	238°25.6	52.2	144°59.9	9.7'	18°00.6	-10.2'	57.9'
5	253°25.6	51.8	159°28.6	9.6'	18°10.8	-10.1'	57.8'
6	268°25.6	N20°51.3	173°57.2	9.6'	S18°20.9	-10.0'	57.8'
7	283°25.5	50.9	188°25.8	9.6'	18°30.9	-9.9'	57.8'
8	298°25.5	50.4	202°54.4	9.5'	18°40.7	-9.8'	57.7'
9	313°25.4	· · 50.0	217°22.9	9.5'	18°50.5	-9.7'	57.7'
10	328°25.4	49.5	231°51.4	9.5'	19°00.1	-9.6'	57.7'
11	343°25.4	49.1	246°19.9	9.4'	19°09.7	-9.5'	57.7'
12	358°25.3	N20°48.6	260°48.3	9.4'	S19°19.1	-9.4'	57.6'
13	13°25.3	48.1	275°16.7	9.4'	19°28.4	-9.2'	57.6'
14	28°25.2	47.7	289°45.1	9.3'	19°37.5	-9.1'	57.6'
15	43°25.2	· · 47.2	304°13.4	9.3'	19°46.6	-9.0'	57.5'
16	58°25.1	46.8	318°41.7	9.3'	19°55.6	-8.9'	57.5'
17	73°25.1	46.3	333°10.0	9.3'	20°04.4	-8.8'	57.5'
18	88°25.1	N20°45.8	347°38.2	9.2'	S20°13.1	-8.7'	57.5'
19	103°25.0	45.4	2°06.4	9.2'	20°21.7	-8.5'	57.4'
20	118°25.0	44.9	16°34.6	9.2'	20°30.2	-8.4'	57.4'
21	133°25.0	· · 44.5	31°02.7	9.1'	20°38.6	-8.3'	57.4'
22	148°24.9	44.0	45°30.8	9.1'	20°46.8	-8.2'	57.3'
23	163°24.9	43.5	59°58.9	9.1'	20°54.9	-8.1'	57.3'
	SD.=15.7	d=-0.4	S.D.=15.7				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.8	N20°43.1	74°27.0	9.0'	S21°02.9	-7.9'	57.3'
1	193°24.8	42.6	88°55.0	9.0'	21°10.8	-7.8'	57.3'
2	208°24.8	42.1	103°23.0	9.0'	21°18.5	-7.7'	57.2'
3	223°24.7	· · 41.7	117°51.0	8.9'	21°26.1	-7.6'	57.2'
4	238°24.7	41.2	132°18.9	8.9'	21°33.6	-7.4'	57.2'
5	253°24.7	40.7	146°46.8	8.9'	21°41.0	-7.3'	57.2'
6	268°24.6	N20°40.3	161°14.7	8.9'	S21°48.3	-7.2'	57.1'
7	283°24.6	39.8	175°42.5	8.8'	21°55.4	-7.1'	57.1'
8	298°24.5	39.3	190°10.3	8.8'	22°02.4	-6.9'	57.1'
9	313°24.5	· · 38.9	204°38.1	8.8'	22°09.3	-6.8'	57.0'
10	328°24.5	38.4	219°05.9	8.8'	22°16.0	-6.7'	57.0'
11	343°24.4	37.9	233°33.7	8.7'	22°22.6	-6.5'	57.0'
12	358°24.4	N20°37.5	248°01.4	8.7'	S22°29.1	-6.4'	57.0'
13	13°24.4	37.0	262°29.1	8.7'	22°35.4	-6.3'	56.9'
14	28°24.3	36.5	276°56.8	8.7'	22°41.7	-6.2'	56.9'
15	43°24.3	· · 36.1	291°24.4	8.6'	22°47.8	-6.0'	56.9'
16	58°24.3	35.6	305°52.1	8.6'	22°53.7	-5.9'	56.9'
17	73°24.2	35.1	320°19.7	8.6'	22°59.5	-5.8'	56.8'
18	88°24.2	N20°34.6	334°47.3	8.6'	S23°05.2	-5.6'	56.8'
19	103°24.2	34.2	349°14.8	8.6'	23°10.8	-5.5'	56.8'
20	118°24.1	33.7	3°42.4	8.5'	23°16.2	-5.4'	56.8'
21	133°24.1	· · 33.2	18°09.9	8.5'	23°21.5	-5.2'	56.7'
22	148°24.1	32.7	32°37.4	8.5'	23°26.7	-5.1'	56.7'
23	163°24.0	32.2	47°04.9	8.5'	23°31.7	-5.0'	56.7'
	SD.=15.7	d=-0.5	S.D.=15.5				

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 51-72%
18	06:12	06:15	12:06	17:59	05:34	
19	06:17	06:19	12:06	18:51	06:25	
20	06:21	06:22	12:06	19:45	07:18	

July 21, 22, 23 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	298°39.4	135°11.7	N08°01.4	123°23.5	N02°42.8	294°59.7	N00°04.8	117°48.3	N02°05.4
1	313°41.9	150°11.7	08°00.2	138°24.6	42.2	310°02.2	04.8	132°50.6	05.3
2	328°44.4	165°11.6	07°59.0	153°25.7	41.5	325°04.6	04.8	147°52.9	05.2
3	343°46.8	180°11.6	·· 57.9	168°26.8	·· 40.9	340°07.1	·· 04.8	162°55.2	·· 05.2
4	358°49.3	195°11.6	56.7	183°28.0	40.3	355°09.5	04.7	177°57.4	05.1
5	13°51.8	210°11.5	55.5	198°29.1	39.7	10°11.9	04.7	192°59.7	05.0
6	28°54.2	225°11.5	N07°54.3	213°30.2	N02°39.0	25°14.4	N00°04.7	208°02.0	N02°04.9
7	43°56.7	240°11.5	53.1	228°31.3	38.4	40°16.8	04.7	223°04.3	04.8
8	58°59.1	255°11.4	51.9	243°32.4	37.8	55°19.3	04.7	238°06.6	04.7
9	74°01.6	270°11.4	·· 50.7	258°33.5	·· 37.2	70°21.7	·· 04.7	253°08.9	·· 04.6
10	89°04.1	285°11.4	49.5	273°34.6	36.5	85°24.2	04.7	268°11.2	04.6
11	104°06.5	300°11.3	48.3	288°35.7	35.9	100°26.6	04.7	283°13.4	04.5
12	119°09.0	315°11.3	N07°47.1	303°36.8	N02°35.3	115°29.0	N00°04.7	298°15.7	N02°04.4
13	134°11.5	330°11.3	45.9	318°37.9	34.7	130°31.5	04.7	313°18.0	04.3
14	149°13.9	345°11.3	44.8	333°39.0	34.0	145°33.9	04.7	328°20.3	04.2
15	164°16.4	0°11.2	·· 43.6	348°40.1	·· 33.4	160°36.4	·· 04.7	343°22.6	·· 04.1
16	179°18.9	15°11.2	42.4	3°41.2	32.8	175°38.8	04.7	358°24.9	04.0
17	194°21.3	30°11.2	41.2	18°42.3	32.2	190°41.3	04.7	13°27.2	04.0
18	209°23.8	45°11.1	N07°40.0	33°43.4	N02°31.5	205°43.7	N00°04.7	28°29.4	N02°03.9
19	224°26.3	60°11.1	38.8	48°44.5	30.9	220°46.2	04.7	43°31.7	03.8
20	239°28.7	75°11.1	37.6	63°45.6	30.3	235°48.6	04.7	58°34.0	03.7
21	254°31.2	90°11.1	·· 36.4	78°46.7	·· 29.7	250°51.1	·· 04.7	73°36.3	·· 03.6
22	269°33.6	105°11.1	35.2	93°47.8	29.0	265°53.5	04.7	88°38.6	03.5
23	284°36.1	120°11.0	34.0	108°48.9	28.4	280°56.0	04.6	103°40.9	03.5
Mer.pass.:04:05		v-0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.4 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	299°38.6	135°11.0	N07°32.8	123°50.0	N02°27.8	295°58.4	N00°04.6	118°43.2	N02°03.4
1	314°41.0	150°11.0	31.6	138°51.2	27.2	311°00.8	04.6	133°45.4	03.3
2	329°43.5	165°11.0	30.4	153°52.3	26.5	326°03.3	04.6	148°47.7	03.2
3	344°46.0	180°10.9	·· 29.2	168°53.4	·· 25.9	341°05.7	·· 04.6	163°50.0	·· 03.1
4	359°48.4	195°10.9	28.0	183°54.5	25.3	356°08.2	04.6	178°52.3	03.0
5	14°50.9	210°10.9	26.9	198°55.6	24.7	11°10.6	04.6	193°54.6	02.9
6	29°53.4	225°10.9	N07°25.7	213°56.7	N02°24.0	26°13.1	N00°04.6	208°56.9	N02°02.9
7	44°55.8	240°10.9	24.5	228°57.8	23.4	41°15.5	04.6	223°59.1	02.8
8	59°58.3	255°10.8	23.3	243°58.9	22.8	56°18.0	04.6	239°01.4	02.7
9	75°00.8	270°10.8	·· 22.1	259°00.0	·· 22.2	71°20.4	·· 04.6	254°03.7	·· 02.6
10	90°03.2	285°10.8	20.9	274°01.1	21.5	86°22.9	04.6	269°06.0	02.5
11	105°05.7	300°10.8	19.7	289°02.2	20.9	101°25.3	04.6	284°08.3	02.4
12	120°08.1	315°10.8	N07°18.5	304°03.3	N02°20.3	116°27.8	N00°04.6	299°10.6	N02°02.3
13	135°10.6	330°10.8	17.3	319°04.4	19.7	131°30.3	04.5	314°12.8	02.3
14	150°13.1	345°10.8	16.1	334°05.5	19.0	146°32.7	04.5	329°15.1	02.2
15	165°15.5	0°10.7	·· 14.9	349°06.6	·· 18.4	161°35.2	·· 04.5	344°17.4	·· 02.1
16	180°18.0	15°10.7	13.7	4°07.7	17.8	176°37.6	04.5	359°19.7	02.0
17	195°20.5	30°10.7	12.5	19°08.8	17.2	191°40.1	04.5	14°22.0	01.9
18	210°22.9	45°10.7	N07°11.3	34°09.9	N02°16.5	206°42.5	N00°04.5	29°24.3	N02°01.8
19	225°25.4	60°10.7	10.1	49°11.0	15.9	221°45.0	04.5	44°26.5	01.7
20	240°27.9	75°10.7	08.9	64°12.1	15.3	236°47.4	04.5	59°28.8	01.6
21	255°30.3	90°10.7	·· 07.7	79°13.2	·· 14.6	251°49.9	·· 04.5	74°31.1	·· 01.6
22	270°32.8	105°10.7	06.5	94°14.3	14.0	266°52.3	04.5	89°33.4	01.5
23	285°35.3	120°10.7	05.3	109°15.4	13.4	281°54.8	04.5	104°35.7	01.4
Mer.pass.:04:01		v-0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.4 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	300°37.7	135°10.6	N07°04.1	124°16.5	N02°12.8	296°57.2	N00°04.4	119°38.0	N02°01.3
1	315°40.2	150°10.6	02.9	139°17.6	12.1	311°59.7	04.4	134°40.2	01.2
2	330°42.6	165°10.6	01.7	154°18.7	11.5	327°02.2	04.4	149°42.5	01.1
3	345°45.1	180°10.6	07°00.5	169°19.8	·· 10.9	342°04.6	·· 04.4	164°44.8	·· 01.0
4	0°47.6	195°10.6	06°59.3	184°20.9	10.3	357°07.1	04.4	179°47.1	01.0
5	15°50.0	210°10.6	58.1	199°22.0	09.6	12°09.5	04.4	194°49.4	00.9
6	30°52.5	225°10.6	N06°56.9	214°23.1	N02°09.0	27°12.0	N00°04.4	209°51.6	N02°00.8
7	45°55.0	240°10.6	55.7	229°24.2	08.4	42°14.4	04.4	224°53.9	00.7
8	60°57.4	255°10.6	54.5	244°25.3	07.7	57°16.9	04.4	239°56.2	00.6
9	75°59.9	270°10.6	·· 53.3	259°26.4	·· 07.1	72°19.4	·· 04.4	254°58.5	·· 00.5
10	91°02.4	285°10.6	52.1	274°27.5	06.5	87°21.8	04.3	270°00.8	00.4
11	106°04.8	300°10.6	50.9	289°28.6	05.9	102°24.3	04.3	285°03.0	00.3
12	121°07.3	315°10.6	N06°49.7	304°29.7	N02°05.2	117°26.7	N00°04.3	300°05.3	N02°00.3
13	136°09.8	330°10.6	48.5	319°30.8	04.6	132°29.2	04.3	315°07.6	00.2
14	151°12.2	345°10.6	47.3	334°31.9	04.0	147°31.6	04.3	330°09.9	00.1
15	166°14.7	0°10.6	·· 46.1	349°33.0	·· 03.4	162°34.1	·· 04.3	345°12.2	02°00.0
16	181°17.1	15°10.6	44.9	4°34.1	02.7	177°36.6	04.3	0°14.4	01°59.9
17	196°19.6	30°10.6	43.7	19°35.2	02.1	192°39.0	04.3	15°16.7	59.8
18	211°22.1	45°10.6	N06°42.5	34°36.3	N02°01.5	207°41.5	N00°04.2	30°19.0	N01°59.7
19	226°24.5	60°10.6	41.2	49°37.4	00.8	222°44.0	04.2	45°21.3	59.6
20	241°27.0	75°10.6	40.0	64°38.5	02°00.2	237°46.4	04.2	60°23.6	59.6
21	256°29.5	90°10.6	·· 38.8	79°39.6	01°59.6	252°48.9	·· 04.2	75°25.8	·· 59.5
22	271°31.9	105°10.6	37.6	94°40.7	59.0	267°51.3	04.2	90°28.1	59.4
23	286°34.4	120°10.6	36.4	109°41.8	58.3	282°53.8	04.2	105°30.4	59.3
Mer.pass.:03:57		v-0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.5	29°09.0
Ankaa	353°17.5	-42°14.5
Schedar	349°42.9	56°35.6
Diphda	348°57.8	-17°55.4
Achernar	335°28.1	-57°10.6
Hamal	328°03.2	23°30.8
Polaris	318°54.8	89°18.3
Acamar	315°20.0	-40°15.4
Menkar	314°17.3	4°08.0
Mirfak	308°43.6	49°53.8
Aldebaran	290°52.0	16°31.8
Rigel	281°14.3	-8°11.3
Capella	280°37.9	46°00.4
Bellatrix	278°34.5	6°21.6
Elnath	278°15.6	28°36.9
Alnilam	275°48.8	-1°11.6
Betelgeuse	271°03.8	7°24.6
Canopus	263°57.6	-52°42.0
Sirius	258°35.9	-16°43.8
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.5	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.1	-63°09.8
Gacrux	172°03.6	-57°10.7
Alioth	166°22.5	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.4	49°15.8
Hadar	148°51.0	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.5	-60°53.0
Kochab	137°19.4	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°31.9	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.6	51°29.4
Kaus Aust.	83°46.2	-34°22.7
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.2
Enif	33°48.9	9°55.6
Al Na'ir	27°45.8	-46°54.3
Fomalhaut	15°26.0	-29°33.7
Scheat	13°55.2	28°08.5
Markab	13°40.2	15°15.8

Jul 21 Wed	**SHA**	**Mer.pass**
Venus	196°32.3	14:59
Mars	184°44.1	15:45
Jupiter	356°20.3	04:19
Saturn	179°08.9	16:06

Jul 22 Thu	**SHA**	**Mer.pass**
Venus	195°32.4	14:59
Mars	184°11.5	15:44
Jupiter	356°19.8	04:15
Saturn	179°04.6	16:03

Jul 23 Fri	**SHA**	**Mer.pass**
Venus	194°32.9	14:59
Mars	183°38.8	15:42
Jupiter	356°19.5	04:11
Saturn	179°00.2	15:59

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°24.0	N20°31.8	61°32.4	8.5'	S23°36.6	-4.8'	56.7'
1	193°24.0	31.3	75°59.9	8.5'	23°41.4	-4.7'	56.6'
2	208°23.9	30.8	90°27.4	8.5'	23°46.0	-4.6'	56.6'
3	223°23.9	· · 30.3	104°54.8	8.4'	23°50.5	-4.4'	56.6'
4	238°23.9	29.9	119°22.3	8.4'	23°54.9	-4.3'	56.6'
5	253°23.8	29.4	133°49.7	8.4'	23°59.1	-4.2'	56.5'
6	268°23.8	N20°28.9	148°17.1	8.4'	S24°03.2	-4.0'	56.5'
7	283°23.8	28.4	162°44.5	8.4'	24°07.1	-3.9'	56.5'
8	298°23.8	27.9	177°11.9	8.4'	24°10.9	-3.7'	56.5'
9	313°23.7	· · 27.4	191°39.3	8.4'	24°14.6	-3.6'	56.4'
10	328°23.7	27.0	206°06.7	8.4'	24°18.2	-3.5'	56.4'
11	343°23.7	26.5	220°34.1	8.4'	24°21.6	-3.3'	56.4'
12	358°23.6	N20°26.0	235°01.4	8.4'	S24°24.8	-3.2'	56.4'
13	13°23.6	25.5	249°28.8	8.4'	24°28.0	-3.1'	56.3'
14	28°23.6	25.0	263°56.2	8.4'	24°30.9	-2.9'	56.3'
15	43°23.6	· · 24.5	278°23.6	8.4'	24°33.8	-2.8'	56.3'
16	58°23.5	24.0	292°50.9	8.4'	24°36.5	-2.6'	56.3'
17	73°23.5	23.6	307°18.3	8.4'	24°39.1	-2.5'	56.2'
18	88°23.5	N20°23.1	321°45.7	8.4'	S24°41.5	-2.4'	56.2'
19	103°23.4	22.6	336°13.1	8.4'	24°43.8	-2.2'	56.2'
20	118°23.4	22.1	350°40.5	8.4'	24°46.0	-2.1'	56.2'
21	133°23.4	· · 21.6	5°07.9	8.4'	24°48.0	-2.0'	56.2'
22	148°23.4	21.1	19°35.3	8.4'	24°49.9	-1.8'	56.1'
23	163°23.3	20.6	34°02.7	8.4'	24°51.7	-1.7'	56.1'
	SD.=15.7	d=-0.5	S.D.=15.4				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°23.3	N20°20.1	48°30.1	8.4'	S24°53.3	-1.5'	56.1'
1	193°23.3	19.6	62°57.5	8.4'	24°54.8	-1.4'	56.1'
2	208°23.3	19.1	77°25.0	8.4'	24°56.1	-1.3'	56.0'
3	223°23.2	· · 18.6	91°52.4	8.5'	24°57.3	-1.1'	56.0'
4	238°23.2	18.2	106°19.9	8.5'	24°58.4	-1.0'	56.0'
5	253°23.2	17.7	120°47.4	8.5'	24°59.3	-0.9'	56.0'
6	268°23.2	N20°17.2	135°14.9	8.5'	S25°00.1	-0.7'	56.0'
7	283°23.1	16.7	149°42.4	8.5'	25°00.8	-0.6'	55.9'
8	298°23.1	16.2	164°09.9	8.5'	25°01.3	-0.5'	55.9'
9	313°23.1	· · 15.7	178°37.5	8.6'	25°01.7	-0.3'	55.9'
10	328°23.1	15.2	193°05.1	8.6'	25°01.9	-0.2'	55.9'
11	343°23.0	14.7	207°32.7	8.6'	25°02.0	-0.0'	55.8'
12	358°23.0	N20°14.2	222°00.3	8.6'	S25°02.0	0.1'	55.8'
13	13°23.0	13.7	236°28.0	8.7'	25°01.9	0.2'	55.8'
14	28°23.0	13.2	250°55.6	8.7'	25°01.6	0.4'	55.8'
15	43°22.9	· · 12.7	265°23.3	8.7'	25°01.2	0.5'	55.8'
16	58°22.9	12.2	279°51.1	8.7'	25°00.6	0.6'	55.7'
17	73°22.9	11.7	294°18.8	8.8'	24°59.9	0.8'	55.7'
18	88°22.9	N20°11.2	308°46.6	8.8'	S24°59.1	0.9'	55.7'
19	103°22.9	10.7	323°14.4	8.8'	24°58.1	1.0'	55.7'
20	118°22.8	10.2	337°42.3	8.9'	24°57.0	1.2'	55.7'
21	133°22.8	· · 09.7	352°10.2	8.9'	24°55.8	1.3'	55.6'
22	148°22.8	09.2	6°38.1	8.9'	24°54.4	1.4'	55.6'
23	163°22.8	08.6	21°06.1	9.0'	24°52.9	1.6'	55.6'
	SD.=15.7	d=-0.5	S.D.=15.2				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.8	N20°08.1	35°34.0	9.0'	S24°51.3	1.7'	55.6'
1	193°22.7	07.6	50°02.1	9.1'	24°49.6	1.8'	55.6'
2	208°22.7	07.1	64°30.1	9.1'	24°47.7	1.9'	55.5'
3	223°22.7	· · 06.6	78°58.3	9.1'	24°45.7	2.1'	55.5'
4	238°22.7	06.1	93°26.4	9.2'	24°43.5	2.2'	55.5'
5	253°22.7	05.6	107°54.6	9.2'	24°41.3	2.3'	55.5'
6	268°22.6	N20°05.1	122°22.8	9.3'	S24°38.9	2.5'	55.5'
7	283°22.6	04.6	136°51.1	9.3'	24°36.4	2.6'	55.4'
8	298°22.6	04.1	151°19.4	9.3'	24°33.7	2.7'	55.4'
9	313°22.6	· · 03.6	165°47.8	9.4'	24°30.9	2.8'	55.4'
10	328°22.6	03.0	180°16.2	9.4'	24°28.0	3.0'	55.4'
11	343°22.6	02.5	194°44.7	9.5'	24°25.0	3.1'	55.4'
12	358°22.5	N20°02.0	209°13.2	9.5'	S24°21.9	3.2'	55.3'
13	13°22.5	01.5	223°41.7	9.6'	24°18.6	3.3'	55.3'
14	28°22.5	01.0	238°10.4	9.6'	24°15.2	3.5'	55.3'
15	43°22.5	· · 00.5	252°39.0	9.7'	24°11.7	3.6'	55.3'
16	58°22.5	20°00.0	267°07.7	9.7'	24°08.0	3.7'	55.3'
17	73°22.5	19°59.4	281°36.5	9.8'	24°04.3	3.8'	55.3'
18	88°22.4	N19°58.9	296°05.3	9.8'	S24°00.4	3.9'	55.2'
19	103°22.4	58.4	310°34.2	9.9'	23°56.4	4.1'	55.2'
20	118°22.4	57.9	325°03.1	10.0'	23°52.2	4.2'	55.2'
21	133°22.4	· · 57.4	339°32.1	10.0'	23°48.0	4.3'	55.2'
22	148°22.4	56.9	354°01.1	10.1'	23°43.6	4.4'	55.2'
23	163°22.4	56.3	8°30.2	10.1'	23°39.2	4.5'	55.2'
	SD.=15.7	d=-0.5	S.D.=15.1				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 10-12 81-94%
21	06:24	06:25	12:06	20:39	08:12	
22	06:27	06:28	12:06	21:32	09:06	
23	06:29	06:30	12:06	22:25	09:59	

July 24, 25, 26 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	301°36.9	135°10.6	N06°35.2	124°42.9	N01°57.7	297°56.3	N00°04.2	120°32.7	N01°59.2
1	316°39.3	150°10.6	34.0	139°44.0	57.1	312°58.7	04.2	135°35.0	59.1
2	331°41.8	165°10.6	32.8	154°45.1	56.4	328°01.2	04.1	150°37.2	59.0
3	346°44.2	180°10.6	·· 31.6	169°46.2	·· 55.8	343°03.7	·· 04.1	165°39.5	·· 58.9
4	1°46.7	195°10.6	30.4	184°47.3	55.2	358°06.1	04.1	180°41.8	58.9
5	16°49.2	210°10.7	29.2	199°48.4	54.6	13°08.6	04.1	195°44.1	58.8
6	31°51.6	225°10.7	N06°28.0	214°49.5	N01°53.9	28°11.0	N00°04.1	210°46.4	N01°58.7
7	46°54.1	240°10.7	26.8	229°50.6	53.3	43°13.5	04.1	225°48.6	58.6
8	61°56.6	255°10.7	25.6	244°51.7	52.7	58°16.0	04.1	240°50.9	58.5
9	76°59.0	270°10.7	·· 24.4	259°52.8	·· 52.0	73°18.4	·· 04.0	255°53.2	·· 58.4
10	92°01.5	285°10.7	23.2	274°53.9	51.4	88°20.9	04.0	270°55.5	58.3
11	107°04.0	300°10.7	22.0	289°55.0	50.8	103°23.4	04.0	285°57.7	58.2
12	122°06.4	315°10.7	N06°20.7	304°56.1	N01°50.2	118°25.8	N00°04.0	301°00.0	N01°58.2
13	137°08.9	330°10.7	19.5	319°57.2	49.5	133°28.3	04.0	316°02.3	58.1
14	152°11.4	345°10.7	18.3	334°58.3	48.9	148°30.8	04.0	331°04.6	58.0
15	167°13.8	0°10.8	·· 17.1	349°59.4	·· 48.3	163°33.2	·· 04.0	346°06.9	·· 57.9
16	182°16.3	15°10.8	15.9	5°00.4	47.6	178°35.7	03.9	1°09.1	57.8
17	197°18.7	30°10.8	14.7	20°01.5	47.0	193°38.2	03.9	16°11.4	57.7
18	212°21.2	45°10.8	N06°13.5	35°02.6	N01°46.4	208°40.6	N00°03.9	31°13.7	N01°57.6
19	227°23.7	60°10.8	12.3	50°03.7	45.8	223°43.1	03.9	46°16.0	57.5
20	242°26.1	75°10.8	11.1	65°04.8	45.1	238°45.6	03.9	61°18.2	57.4
21	257°28.6	90°10.9	·· 09.9	80°05.9	·· 44.5	253°48.1	·· 03.9	76°20.5	·· 57.4
22	272°31.1	105°10.9	08.7	95°07.0	43.9	268°50.5	03.9	91°22.8	57.3
23	287°33.5	120°10.9	07.4	110°08.1	43.2	283°53.0	03.8	106°25.1	57.2
Mer.pass.:03:53		v0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	302°36.0	135°10.9	N06°06.2	125°09.2	N01°42.6	298°55.5	N00°03.8	121°27.3	N01°57.1
1	317°38.5	150°10.9	05.0	140°10.3	42.0	313°57.9	03.8	136°29.6	57.0
2	332°40.9	165°11.0	03.8	155°11.4	41.3	329°00.4	03.8	151°31.9	56.9
3	347°43.4	180°11.0	·· 02.6	170°12.5	·· 40.7	344°02.9	·· 03.8	166°34.2	·· 56.8
4	2°45.9	195°11.0	01.4	185°13.6	40.1	359°05.3	03.8	181°36.4	56.7
5	17°48.3	210°11.0	06°00.2	200°14.7	39.5	14°07.8	03.7	196°38.7	56.7
6	32°50.8	225°11.0	N05°59.0	215°15.8	N01°38.8	29°10.3	N00°03.7	211°41.0	N01°56.6
7	47°53.2	240°11.1	57.8	230°16.9	38.2	44°12.8	03.7	226°43.3	56.5
8	62°55.7	255°11.1	56.5	245°18.0	37.6	59°15.2	03.7	241°45.6	56.4
9	77°58.2	270°11.1	·· 55.3	260°19.1	·· 36.9	74°17.7	·· 03.7	256°47.8	·· 56.3
10	93°00.6	285°11.1	54.1	275°20.2	36.3	89°20.2	03.6	271°50.1	56.2
11	108°03.1	300°11.2	52.9	290°21.3	35.7	104°22.7	03.6	286°52.4	56.1
12	123°05.6	315°11.2	N05°51.7	305°22.3	N01°35.0	119°25.1	N00°03.6	301°54.7	N01°56.0
13	138°08.0	330°11.2	50.5	320°23.4	34.4	134°27.6	03.6	316°56.9	55.9
14	153°10.5	345°11.2	49.3	335°24.5	33.8	149°30.1	03.6	331°59.2	55.8
15	168°13.0	0°11.3	·· 48.1	350°25.6	·· 33.2	164°32.6	·· 03.6	347°01.5	·· 55.8
16	183°15.4	15°11.3	46.8	5°26.7	32.5	179°35.0	03.5	2°03.8	55.7
17	198°17.9	30°11.3	45.6	20°27.8	31.9	194°37.5	03.5	17°06.0	55.6
18	213°20.4	45°11.3	N05°44.4	35°28.9	N01°31.3	209°40.0	N00°03.5	32°08.3	N01°55.5
19	228°22.8	60°11.4	43.2	50°30.0	30.6	224°42.5	03.5	47°10.6	55.4
20	243°25.3	75°11.4	42.0	65°31.1	30.0	239°44.9	03.5	62°12.8	55.3
21	258°27.7	90°11.4	·· 40.8	80°32.2	·· 29.4	254°47.4	·· 03.4	77°15.1	·· 55.2
22	273°30.2	105°11.5	39.6	95°33.3	28.7	269°49.9	03.4	92°17.4	55.1
23	288°32.7	120°11.5	38.4	110°34.4	28.1	284°52.4	03.4	107°19.7	55.0
Mer.pass.:03:49		v0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	303°35.1	135°11.5	N05°37.1	125°35.5	N01°27.5	299°54.8	N00°03.4	122°21.9	N01°55.0
1	318°37.6	150°11.6	35.9	140°36.6	26.8	314°57.3	03.4	137°24.2	54.9
2	333°40.1	165°11.6	34.7	155°37.6	26.2	329°59.8	03.3	152°26.5	54.8
3	348°42.5	180°11.6	·· 33.5	170°38.7	·· 25.6	345°02.3	·· 03.3	167°28.8	·· 54.7
4	3°45.0	195°11.7	32.3	185°39.8	24.9	0°04.8	03.3	182°31.0	54.6
5	18°47.5	210°11.7	31.1	200°40.9	24.3	15°07.2	03.3	197°33.3	54.5
6	33°49.9	225°11.7	N05°29.8	215°42.0	N01°23.7	30°09.7	N00°03.3	212°35.6	N01°54.4
7	48°52.4	240°11.8	28.6	230°43.1	23.1	45°12.2	03.2	227°37.9	54.3
8	63°54.9	255°11.8	27.4	245°44.2	22.4	60°14.7	03.2	242°40.1	54.2
9	78°57.3	270°11.8	·· 26.2	260°45.3	·· 21.8	75°17.2	·· 03.2	257°42.4	·· 54.1
10	93°59.8	285°11.9	25.0	275°46.4	21.2	90°19.6	03.2	272°44.7	54.1
11	109°02.2	300°11.9	23.8	290°47.5	20.5	105°22.1	03.2	287°46.9	54.0
12	124°04.7	315°12.0	N05°22.5	305°48.6	N01°19.9	120°24.6	N00°03.1	302°49.2	N01°53.9
13	139°07.2	330°12.0	21.3	320°49.7	19.3	135°27.1	03.1	317°51.5	53.8
14	154°09.6	345°12.0	20.1	335°50.7	18.6	150°29.6	03.1	332°53.8	53.7
15	169°12.1	0°12.1	·· 18.9	350°51.8	·· 18.0	165°32.1	·· 03.1	347°56.0	·· 53.6
16	184°14.6	15°12.1	17.7	5°52.9	17.4	180°34.5	03.1	2°58.3	53.5
17	199°17.0	30°12.2	16.5	20°54.0	16.7	195°37.0	03.0	18°00.6	53.4
18	214°19.5	45°12.2	N05°15.2	35°55.1	N01°16.1	210°39.5	N00°03.0	33°02.9	N01°53.3
19	229°22.0	60°12.3	14.0	50°56.2	15.5	225°42.0	03.0	48°05.1	53.2
20	244°24.4	75°12.3	12.8	65°57.3	14.8	240°44.5	03.0	63°07.4	53.2
21	259°26.9	90°12.3	·· 11.6	80°58.4	·· 14.2	255°47.0	·· 02.9	78°09.7	·· 53.1
22	274°29.3	105°12.4	10.4	95°59.5	13.6	270°49.4	02.9	93°11.9	53.0
23	289°31.8	120°12.4	09.2	111°00.6	12.9	285°51.9	02.9	108°14.2	52.9
Mer.pass.:03:45		v0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.5	29°09.0
Ankaa	353°17.5	-42°14.5
Schedar	349°42.8	56°35.6
Diphda	348°57.8	-17°55.4
Achernar	335°28.1	-57°10.6
Hamal	328°03.1	23°30.8
Polaris	318°53.3	89°18.4
Acamar	315°20.0	-40°15.4
Menkar	314°17.3	4°08.0
Mirfak	308°43.6	49°53.8
Aldebaran	290°52.0	16°31.8
Rigel	281°14.3	-8°11.3
Capella	280°37.9	46°00.4
Bellatrix	278°34.5	6°21.6
Elnath	278°15.5	28°36.9
Alnilam	275°48.7	-1°11.6
Betelgeuse	271°03.8	7°24.6
Canopus	263°57.6	-52°41.9
Sirius	258°35.9	-16°43.8
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.7
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.1	-63°09.8
Gacrux	172°03.6	-57°10.7
Alioth	166°22.5	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.5	49°15.8
Hadar	148°51.0	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.5	-60°53.0
Kochab	137°19.4	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°32.0	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.6	51°29.4
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.2
Enif	33°48.9	9°55.6
Al Na'ir	27°45.8	-46°54.3
Fomalhaut	15°25.9	-29°33.7
Scheat	13°55.2	28°08.5
Markab	13°40.2	15°15.9

Jul 24 Sat	**SHA**	**Mer.pass**
Venus	193°33.8	14:59
Mars	183°06.0	15:40
Jupiter	356°19.4	04:08
Saturn	178°55.8	15:55

Jul 25 Sun	**SHA**	**Mer.pass**
Venus	192°34.9	14:59
Mars	182°33.2	15:38
Jupiter	356°19.5	04:04
Saturn	178°51.3	15:52

Jul 26 Mon	**SHA**	**Mer.pass**
Venus	191°36.4	14:59
Mars	182°00.3	15:37
Jupiter	356°19.7	04:00
Saturn	178°46.8	15:48

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0514 sec ΔT = TT-UT1 = +66.2354 sec

2010 July 24 to Jul. 26 UT

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.4	N19°55.8	22°59.4	10.2'	S23°34.6	4.6'	55.1'
1	193°22.4	55.3	37°28.6	10.2'	23°29.9	4.8'	55.1'
2	208°22.3	54.8	51°57.8	10.3'	23°25.1	4.9'	55.1'
3	223°22.3	· · 54.3	66°27.2	10.4'	23°20.1	5.0'	55.1'
4	238°22.3	53.7	80°56.6	10.4'	23°15.1	5.1'	55.1'
5	253°22.3	53.2	95°26.0	10.5'	23°09.9	5.2'	55.1'
6	268°22.3	N19°52.7	109°55.5	10.5'	S23°04.6	5.3'	55.0'
7	283°22.3	52.2	124°25.1	10.6'	22°59.3	5.4'	55.0'
8	298°22.3	51.6	138°54.7	10.7'	22°53.8	5.5'	55.0'
9	313°22.3	· · 51.1	153°24.4	10.7'	22°48.2	5.7'	55.0'
10	328°22.2	50.6	167°54.2	10.8'	22°42.4	5.8'	55.0'
11	343°22.2	50.1	182°24.0	10.9'	22°36.6	5.9'	55.0'
12	358°22.2	N19°49.5	196°53.9	10.9'	S22°30.7	6.0'	54.9'
13	13°22.2	49.0	211°23.8	11.0'	22°24.7	6.1'	54.9'
14	28°22.2	48.5	225°53.8	11.0'	22°18.5	6.2'	54.9'
15	43°22.2	· · 48.0	240°23.9	11.1'	22°12.3	6.3'	54.9'
16	58°22.2	47.4	254°54.0	11.2'	22°06.0	6.4'	54.9'
17	73°22.2	46.9	269°24.2	11.2'	21°59.5	6.5'	54.9'
18	88°22.2	N19°46.4	283°54.5	11.3'	S21°53.0	6.6'	54.8'
19	103°22.2	45.8	298°24.9	11.4'	21°46.3	6.7'	54.8'
20	118°22.1	45.3	312°55.3	11.4'	21°39.6	6.8'	54.8'
21	133°22.1	· · 44.8	327°25.7	11.5'	21°32.7	6.9'	54.8'
22	148°22.1	44.2	341°56.3	11.6'	21°25.8	7.0'	54.8'
23	163°22.1	43.7	356°26.9	11.6'	21°18.8	7.1'	54.8'
	SD.=15.7	d=-0.5	S.D.=15.0				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.1	N19°43.2	10°57.5	11.7'	S21°11.6	7.2'	54.8'
1	193°22.1	42.6	25°28.3	11.8'	21°04.4	7.3'	54.7'
2	208°22.1	42.1	39°59.1	11.8'	20°57.1	7.4'	54.7'
3	223°22.1	· · 41.6	54°30.0	11.9'	20°49.6	7.5'	54.7'
4	238°22.1	41.0	69°00.9	12.0'	20°42.1	7.6'	54.7'
5	253°22.1	40.5	83°31.9	12.0'	20°34.5	7.6'	54.7'
6	268°22.1	N19°40.0	98°03.0	12.1'	S20°26.8	7.7'	54.7'
7	283°22.1	39.4	112°34.1	12.2'	20°19.1	7.8'	54.7'
8	298°22.1	38.9	127°05.3	12.2'	20°11.2	7.9'	54.6'
9	313°22.1	· · 38.3	141°36.6	12.3'	20°03.2	8.0'	54.6'
10	328°22.1	37.8	156°08.0	12.4'	19°55.2	8.1'	54.6'
11	343°22.0	37.3	170°39.4	12.4'	19°47.1	8.2'	54.6'
12	358°22.0	N19°36.7	185°10.9	12.5'	S19°38.8	8.3'	54.6'
13	13°22.0	36.2	199°42.4	12.6'	19°30.5	8.3'	54.6'
14	28°22.0	35.6	214°14.0	12.6'	19°22.1	8.4'	54.6'
15	43°22.0	· · 35.1	228°45.7	12.7'	19°13.7	8.5'	54.6'
16	58°22.0	34.6	243°17.4	12.8'	19°05.1	8.6'	54.5'
17	73°22.0	34.0	257°49.3	12.8'	18°56.5	8.7'	54.5'
18	88°22.0	N19°33.5	272°21.1	12.9'	S18°47.8	8.7'	54.5'
19	103°22.0	32.9	286°53.1	13.0'	18°39.0	8.8'	54.5'
20	118°22.0	32.4	301°25.1	13.0'	18°30.1	8.9'	54.5'
21	133°22.0	· · 31.8	315°57.2	13.1'	18°21.2	9.0'	54.5'
22	148°22.0	31.3	330°29.3	13.2'	18°12.2	9.1'	54.5'
23	163°22.0	30.7	345°01.5	13.2'	18°03.1	9.1'	54.5'
	SD.=15.7	d=-0.5	S.D.=14.9				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.0	N19°30.2	359°33.8	13.3'	S17°53.9	9.2'	54.4'
1	193°22.0	29.6	14°06.1	13.4'	17°44.7	9.3'	54.4'
2	208°22.0	29.1	28°38.5	13.4'	17°35.3	9.4'	54.4'
3	223°22.0	· · 28.5	43°11.0	13.5'	17°26.0	9.4'	54.4'
4	238°22.0	28.0	57°43.5	13.6'	17°16.5	9.5'	54.4'
5	253°22.0	27.4	72°16.1	13.6'	17°07.0	9.6'	54.4'
6	268°22.0	N19°26.9	86°48.8	13.7'	S16°57.4	9.6'	54.4'
7	283°22.0	26.3	101°21.5	13.8'	16°47.7	9.7'	54.4'
8	298°22.0	25.8	115°54.3	13.8'	16°38.0	9.8'	54.4'
9	313°22.0	· · 25.2	130°27.2	13.9'	16°28.2	9.8'	54.4'
10	328°22.0	24.7	145°00.1	13.9'	16°18.3	9.9'	54.3'
11	343°22.0	24.1	159°33.0	14.0'	16°08.4	10.0'	54.3'
12	358°22.0	N19°23.6	174°06.1	14.1'	S15°58.4	10.0'	54.3'
13	13°22.0	23.0	188°39.1	14.1'	15°48.4	10.1'	54.3'
14	28°22.0	22.5	203°12.3	14.2'	15°38.2	10.1'	54.3'
15	43°22.0	· · 21.9	217°45.5	14.2'	15°28.1	10.2'	54.3'
16	58°22.0	21.4	232°18.8	14.3'	15°17.8	10.3'	54.3'
17	73°22.0	20.8	246°52.1	14.4'	15°07.5	10.3'	54.3'
18	88°22.0	N19°20.2	261°25.5	14.4'	S14°57.2	10.4'	54.3'
19	103°22.0	19.7	275°58.9	14.5'	14°46.8	10.4'	54.3'
20	118°22.0	19.1	290°32.4	14.5'	14°36.3	10.5'	54.2'
21	133°22.0	· · 18.6	305°06.0	14.6'	14°25.8	10.5'	54.2'
22	148°22.0	18.0	319°39.6	14.6'	14°15.2	10.6'	54.2'
23	163°22.1	17.4	334°13.2	14.7'	14°04.6	10.7'	54.2'
	SD.=15.7	d=-0.5	S.D.=14.8				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 13-15 98-100%
24	06:31	06:31	12:07	23:15	10:50	○
25	06:32	06:32	12:07	–:–	11:39	
26	06:32	06:32	12:07	00:02	12:24	

July 27, 28, 29 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	304°34.3	135°12.5	N05°07.9	126°01.6	N01°12.3	300°54.4	N00°02.9	123°16.5	N01°52.8
1	319°36.7	150°12.5	06.7	141°02.7	11.7	315°56.9	02.9	138°18.8	52.7
2	334°39.2	165°12.6	05.5	156°03.8	11.0	330°59.4	02.8	153°21.0	52.6
3	349°41.7	180°12.6	·· 04.3	171°04.9	·· 10.4	346°01.9	·· 02.8	168°23.3	·· 52.5
4	4°44.1	195°12.7	03.1	186°06.0	09.8	1°04.4	02.8	183°25.6	52.4
5	19°46.6	210°12.7	01.8	201°07.1	09.1	16°06.8	02.8	198°27.8	52.3
6	34°49.1	225°12.8	N05°00.6	216°08.2	N01°08.5	31°09.3	N00°02.7	213°30.1	N01°52.2
7	49°51.5	240°12.8	04°59.4	231°09.3	07.9	46°11.8	02.7	228°32.4	52.2
8	64°54.0	255°12.9	58.2	246°10.4	07.2	61°14.3	02.7	243°34.6	52.1
9	79°56.5	270°12.9	·· 57.0	261°11.4	·· 06.6	76°16.8	·· 02.7	258°36.9	·· 52.0
10	94°58.9	285°13.0	55.7	276°12.5	06.0	91°19.3	02.6	273°39.2	51.9
11	110°01.4	300°13.0	54.5	291°13.6	05.3	106°21.8	02.6	288°41.5	51.8
12	125°03.8	315°13.1	N04°53.3	306°14.7	N01°04.7	121°24.3	N00°02.6	303°43.7	N01°51.7
13	140°06.3	330°13.1	52.1	321°15.8	04.1	136°26.7	02.6	318°46.0	51.6
14	155°08.8	345°13.2	50.9	336°16.9	03.4	151°29.2	02.6	333°48.3	51.5
15	170°11.2	0°13.2	·· 49.6	351°18.0	·· 02.8	166°31.7	·· 02.5	348°50.5	·· 51.4
16	185°13.7	15°13.3	48.4	6°19.1	02.2	181°34.2	02.5	3°52.8	51.3
17	200°16.2	30°13.3	47.2	21°20.2	01.5	196°36.7	02.5	18°55.1	51.2
18	215°18.6	45°13.4	N04°46.0	36°21.2	N01°00.9	211°39.2	N00°02.5	33°57.3	N01°51.1
19	230°21.1	60°13.4	44.8	51°22.3	01°00.3	226°41.7	02.4	48°59.6	51.1
20	245°23.6	75°13.5	43.5	66°23.4	00°59.6	241°44.2	02.4	64°01.9	51.0
21	260°26.0	90°13.6	·· 42.3	81°24.5	·· 59.0	256°46.7	·· 02.4	79°04.1	·· 50.9
22	275°28.5	105°13.6	41.1	96°25.6	58.4	271°49.2	02.3	94°06.4	50.8
23	290°31.0	120°13.7	39.9	111°26.7	57.7	286°51.7	02.3	109°08.7	50.7
Mer.pass.:03:41		v0.0 d-1.2 m-4.1		v1.1 d-0.6 m1.4		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	305°33.4	135°13.7	N04°38.6	126°27.8	N00°57.1	301°54.1	N00°02.3	124°11.0	N01°50.6
1	320°35.9	150°13.8	37.4	141°28.8	56.5	316°56.6	02.3	139°13.2	50.5
2	335°38.3	165°13.8	36.2	156°29.9	55.8	331°59.1	02.2	154°15.5	50.4
3	350°40.8	180°13.9	·· 35.0	171°31.0	·· 55.2	347°01.6	·· 02.2	169°17.8	·· 50.3
4	5°43.3	195°14.0	33.8	186°32.1	54.6	2°04.1	02.2	184°20.0	50.2
5	20°45.7	210°14.0	32.5	201°33.2	53.9	17°06.6	02.2	199°22.3	50.1
6	35°48.2	225°14.1	N04°31.3	216°34.3	N00°53.3	32°09.1	N00°02.1	214°24.6	N01°50.0
7	50°50.7	240°14.2	30.1	231°35.4	52.7	47°11.6	02.1	229°26.8	50.0
8	65°53.1	255°14.2	28.9	246°36.4	52.0	62°14.1	02.1	244°29.1	49.9
9	80°55.6	270°14.3	·· 27.6	261°37.5	·· 51.4	77°16.6	·· 02.1	259°31.4	·· 49.8
10	95°58.1	285°14.3	26.4	276°38.6	50.8	92°19.1	02.0	274°33.6	49.7
11	111°00.5	300°14.4	25.2	291°39.7	50.1	107°21.6	02.0	289°35.9	49.6
12	126°03.0	315°14.5	N04°24.0	306°40.8	N00°49.5	122°24.1	N00°02.0	304°38.2	N01°49.5
13	141°05.4	330°14.5	22.7	321°41.9	48.9	137°26.6	01.9	319°40.4	49.4
14	156°07.9	345°14.6	21.5	336°43.0	48.2	152°29.1	01.9	334°42.7	49.3
15	171°10.4	0°14.7	·· 20.3	351°44.0	·· 47.6	167°31.6	·· 01.9	349°45.0	·· 49.2
16	186°12.8	15°14.7	19.1	6°45.1	47.0	182°34.1	01.9	4°47.2	49.1
17	201°15.3	30°14.8	17.8	21°46.2	46.3	197°36.6	01.8	19°49.5	49.0
18	216°17.8	45°14.9	N04°16.6	36°47.3	N00°45.7	212°39.1	N00°01.8	34°51.8	N01°48.9
19	231°20.2	60°14.9	15.4	51°48.4	45.1	227°41.6	01.8	49°54.0	48.8
20	246°22.7	75°15.0	14.2	66°49.5	44.4	242°44.1	01.8	64°56.3	48.8
21	261°25.2	90°15.1	·· 12.9	81°50.6	·· 43.8	257°46.6	·· 01.7	79°58.6	·· 48.7
22	276°27.6	105°15.2	11.7	96°51.6	43.1	272°49.1	01.7	95°00.8	48.6
23	291°30.1	120°15.2	10.5	111°52.7	42.5	287°51.6	01.7	110°03.1	48.5
Mer.pass.:03:37		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	306°32.6	135°15.3	N04°09.3	126°53.8	N00°41.9	302°54.1	N00°01.6	125°05.4	N01°48.4
1	321°35.0	150°15.4	08.0	141°54.9	41.2	317°56.6	01.6	140°07.6	48.3
2	336°37.5	165°15.4	06.8	156°56.0	40.6	332°59.1	01.6	155°09.9	48.2
3	351°39.9	180°15.5	·· 05.6	171°57.1	·· 40.0	348°01.6	·· 01.5	170°12.2	·· 48.1
4	6°42.4	195°15.6	04.4	186°58.1	39.3	3°04.1	01.5	185°14.4	48.0
5	21°44.9	210°15.7	03.1	201°59.2	38.7	18°06.6	01.5	200°16.7	47.9
6	36°47.3	225°15.7	N04°01.9	217°00.3	N00°38.1	33°09.1	N00°01.5	215°19.0	N01°47.8
7	51°49.8	240°15.8	04°00.7	232°01.4	37.4	48°11.6	01.4	230°21.2	47.7
8	66°52.3	255°15.9	03°59.5	247°02.5	36.8	63°14.1	01.4	245°23.5	47.6
9	81°54.7	270°16.0	·· 58.2	262°03.5	·· 36.2	78°16.6	·· 01.4	260°25.8	·· 47.5
10	96°57.2	285°16.0	57.0	277°04.6	35.5	93°19.1	01.3	275°28.0	47.5
11	111°59.7	300°16.1	55.8	292°05.7	34.9	108°21.6	01.3	290°30.3	47.4
12	127°02.1	315°16.2	N03°54.6	307°06.8	N00°34.2	123°24.1	N00°01.3	305°32.5	N01°47.3
13	142°04.6	330°16.3	53.3	322°07.9	33.6	138°26.6	01.2	320°34.8	47.2
14	157°07.0	345°16.4	52.1	337°09.0	33.0	153°29.1	01.2	335°37.1	47.1
15	172°09.5	0°16.4	·· 50.9	352°10.0	·· 32.3	168°31.6	·· 01.2	350°39.3	·· 47.0
16	187°12.0	15°16.5	49.7	7°11.1	31.7	183°34.1	01.2	5°41.6	46.9
17	202°14.4	30°16.6	48.4	22°12.2	31.1	198°36.6	01.1	20°43.9	46.8
18	217°16.9	45°16.7	N03°47.2	37°13.3	N00°30.4	213°39.1	N00°01.1	35°46.1	N01°46.7
19	232°19.4	60°16.8	46.0	52°14.4	29.8	228°41.6	01.1	50°48.4	46.6
20	247°21.8	75°16.8	44.7	67°15.4	29.2	243°44.1	01.0	65°50.7	46.5
21	262°24.3	90°16.9	·· 43.5	82°16.5	·· 28.5	258°46.7	·· 01.0	80°52.9	·· 46.4
22	277°26.8	105°17.0	42.3	97°17.6	27.9	273°49.2	01.0	95°55.2	46.3
23	292°29.2	120°17.1	41.1	112°18.7	27.3	288°51.7	00.9	110°57.5	46.2
Mer.pass.:03:33		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.5	29°09.0
Ankaa	353°17.4	-42°14.5
Schedar	349°42.8	56°35.6
Diphda	348°57.8	-17°55.4
Achernar	335°28.1	-57°10.6
Hamal	328°03.1	23°30.8
Polaris	318°52.0	89°18.4
Acamar	315°19.9	-40°15.4
Menkar	314°17.3	4°08.0
Mirfak	308°43.5	49°53.8
Aldebaran	290°52.0	16°31.9
Rigel	281°14.3	-8°11.2
Capella	280°37.9	46°00.4
Bellatrix	278°34.5	6°21.6
Elnath	278°15.5	28°36.9
Alnilam	275°48.7	-1°11.6
Betelgeuse	271°03.8	7°24.6
Canopus	263°57.6	-52°41.9
Sirius	258°35.9	-16°43.8
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.5	61°41.8
Denebola	182°35.9	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.2	-63°09.8
Gacrux	172°03.6	-57°10.7
Alioth	166°22.5	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.5	49°15.8
Hadar	148°51.0	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.6	-60°53.0
Kochab	137°19.5	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°32.0	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.7	51°29.4
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.2
Enif	33°48.9	9°55.6
Al Na'ir	27°45.8	-46°54.3
Fomalhaut	15°25.9	-29°33.7
Scheat	13°55.2	28°08.5
Markab	13°40.2	15°15.9

Jul 27 Tue	**SHA**	**Mer.pass**
Venus	190°38.2	14:59
Mars	181°27.4	15:35
Jupiter	356°20.1	03:56
Saturn	178°42.2	15:45

Jul 28 Wed	**SHA**	**Mer.pass**
Venus	189°40.3	14:59
Mars	180°54.3	15:33
Jupiter	356°20.7	03:52
Saturn	178°37.5	15:41

Jul 29 Thu	**SHA**	**Mer.pass**
Venus	188°42.7	14:59
Mars	180°21.3	15:31
Jupiter	356°21.5	03:48
Saturn	178°32.8	15:37

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°22.1	N19°16.9	348°46.9	14.7'	S13°53.9	10.7'	54.2'
1	193°22.1	16.3	3°20.7	14.8'	13°43.2	10.8'	54.2'
2	208°22.1	15.8	17°54.5	14.8'	13°32.4	10.8'	54.2'
3	223°22.1	· · 15.2	32°28.4	14.9'	13°21.5	10.9'	54.2'
4	238°22.1	14.6	47°02.3	15.0'	13°10.6	10.9'	54.2'
5	253°22.1	14.1	61°36.3	15.0'	12°59.7	11.0'	54.2'
6	268°22.1	N19°13.5	76°10.3	15.1'	S12°48.7	11.0'	54.2'
7	283°22.1	12.9	90°44.4	15.1'	12°37.7	11.1'	54.2'
8	298°22.1	12.4	105°18.6	15.2'	12°26.6	11.1'	54.2'
9	313°22.1	· · 11.8	119°52.7	15.2'	12°15.5	11.1'	54.1'
10	328°22.1	11.2	134°27.0	15.2'	12°04.3	11.2'	54.1'
11	343°22.1	10.7	149°01.2	15.3'	11°53.1	11.2'	54.1'
12	358°22.1	N19°10.1	163°35.6	15.3'	S11°41.9	11.3'	54.1'
13	13°22.1	09.5	178°09.9	15.4'	11°30.6	11.3'	54.1'
14	28°22.2	09.0	192°44.3	15.4'	11°19.2	11.4'	54.1'
15	43°22.2	· · 08.4	207°18.8	15.5'	11°07.8	11.4'	54.1'
16	58°22.2	07.8	221°53.3	15.5'	10°56.4	11.4'	54.1'
17	73°22.2	07.3	236°27.8	15.6'	10°45.0	11.5'	54.1'
18	88°22.2	N19°06.7	251°02.4	15.6'	S10°33.5	11.5'	54.1'
19	103°22.2	06.1	265°37.0	15.6'	10°21.9	11.6'	54.1'
20	118°22.2	05.6	280°11.7	15.7'	10°10.3	11.6'	54.1'
21	133°22.2	· · 05.0	294°46.4	15.7'	09°58.7	11.6'	54.1'
22	148°22.2	04.4	309°21.2	15.8'	09°47.1	11.7'	54.1'
23	163°22.2	03.8	323°55.9	15.8'	09°35.4	11.7'	54.1'
	SD.=15.7	d=-0.6	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°22.3	N19°03.3	338°30.8	15.8'	S09°23.7	11.7'	54.1'
1	193°22.3	02.7	353°05.6	15.9'	09°12.0	11.8'	54.1'
2	208°22.3	02.1	7°40.5	15.9'	09°00.2	11.8'	54.1'
3	223°22.3	· · 01.5	22°15.5	16.0'	08°48.4	11.8'	54.0'
4	238°22.3	01.0	36°50.4	16.0'	08°36.5	11.9'	54.0'
5	253°22.3	19°00.4	51°25.4	16.0'	08°24.7	11.9'	54.0'
6	268°22.3	N18°59.8	66°00.5	16.1'	S08°12.8	11.9'	54.0'
7	283°22.3	59.2	80°35.5	16.1'	08°00.8	11.9'	54.0'
8	298°22.4	58.7	95°10.6	16.1'	07°48.9	12.0'	54.0'
9	313°22.4	· · 58.1	109°45.8	16.1'	07°36.9	12.0'	54.0'
10	328°22.4	57.5	124°20.9	16.2'	07°24.9	12.0'	54.0'
11	343°22.4	56.9	138°56.1	16.2'	07°12.9	12.0'	54.0'
12	358°22.4	N18°56.3	153°31.3	16.2'	S07°00.8	12.1'	54.0'
13	13°22.4	55.8	168°06.6	16.3'	06°48.7	12.1'	54.0'
14	28°22.4	55.2	182°41.9	16.3'	06°36.6	12.1'	54.0'
15	43°22.5	· · 54.6	197°17.2	16.3'	06°24.5	12.1'	54.0'
16	58°22.5	54.0	211°52.5	16.3'	06°12.3	12.2'	54.0'
17	73°22.5	53.4	226°27.8	16.4'	06°00.1	12.2'	54.0'
18	88°22.5	N18°52.8	241°03.2	16.4'	S05°48.0	12.2'	54.0'
19	103°22.5	52.3	255°38.6	16.4'	05°35.7	12.2'	54.0'
20	118°22.5	51.7	270°14.0	16.4'	05°23.5	12.2'	54.0'
21	133°22.6	· · 51.1	284°49.4	16.4'	05°11.3	12.3'	54.0'
22	148°22.6	50.5	299°24.9	16.5'	04°59.0	12.3'	54.0'
23	163°22.6	49.9	314°00.4	16.5'	04°46.7	12.3'	54.0'
	SD.=15.7	d=-0.6	S.D.=14.7				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°22.6	N18°49.3	328°35.9	16.5'	S04°34.4	12.3'	54.0'
1	193°22.6	48.7	343°11.4	16.5'	04°22.1	12.3'	54.0'
2	208°22.6	48.2	357°46.9	16.5'	04°09.7	12.3'	54.0'
3	223°22.7	· · 47.6	12°22.5	16.6'	03°57.4	12.4'	54.0'
4	238°22.7	47.0	26°58.0	16.6'	03°45.0	12.4'	54.0'
5	253°22.7	46.4	41°33.6	16.6'	03°32.7	12.4'	54.0'
6	268°22.7	N18°45.8	56°09.2	16.6'	S03°20.3	12.4'	54.0'
7	283°22.7	45.2	70°44.8	16.6'	03°07.9	12.4'	54.0'
8	298°22.8	44.6	85°20.4	16.6'	02°55.5	12.4'	54.0'
9	313°22.8	· · 44.0	99°56.0	16.6'	02°43.0	12.4'	54.0'
10	328°22.8	43.4	114°31.6	16.6'	02°30.6	12.4'	54.0'
11	343°22.8	42.8	129°07.3	16.6'	02°18.2	12.4'	54.0'
12	358°22.8	N18°42.2	143°42.9	16.6'	S02°05.7	12.5'	54.0'
13	13°22.9	41.7	158°18.6	16.7'	01°53.3	12.5'	54.0'
14	28°22.9	41.1	172°54.2	16.7'	01°40.8	12.5'	54.0'
15	43°22.9	· · 40.5	187°29.9	16.7'	01°28.4	12.5'	54.0'
16	58°22.9	39.9	202°05.5	16.7'	01°15.9	12.5'	54.0'
17	73°22.9	39.3	216°41.2	16.7'	01°03.4	12.5'	54.0'
18	88°23.0	N18°38.7	231°16.9	16.7'	S00°50.9	12.5'	54.0'
19	103°23.0	38.1	245°52.6	16.7'	00°38.4	12.5'	54.0'
20	118°23.0	37.5	260°28.2	16.7'	00°25.9	12.5'	54.1'
21	133°23.0	· · 36.9	275°03.9	16.7'	00°13.5	12.5'	54.1'
22	148°23.0	36.3	289°39.6	16.7'	S00°01.0	12.5'	54.1'
23	163°23.1	35.7	304°15.2	16.7'	00°11.5	12.5'	54.1'
	SD.=15.7	d=-0.6	S.D.=14.7				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 16-18 98-90%
27	06:32	06:31	12:07	00:46	13:08	
28	06:31	06:30	12:07	01:28	13:49	
29	06:30	06:29	12:06	02:09	14:29	

July 30, 31, 01 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	307°31.7	135°17.2	N03°39.8	127°19.8	N00°26.6	303°54.2	N00°00.9	125°59.7	N01°46.1
1	322°34.2	150°17.3	38.6	142°20.9	26.0	318°56.7	00.9	141°02.0	46.1
2	337°36.6	165°17.3	37.4	157°21.9	25.3	333°59.2	00.8	156°04.2	46.0
3	352°39.1	180°17.4	·· 36.2	172°23.0	·· 24.7	349°01.7	·· 00.8	171°06.5	·· 45.9
4	7°41.5	195°17.5	34.9	187°24.1	24.1	4°04.2	00.8	186°08.8	45.8
5	22°44.0	210°17.6	33.7	202°25.2	23.4	19°06.7	00.7	201°11.0	45.7
6	37°46.5	225°17.7	N03°32.5	217°26.3	N00°22.8	34°09.2	N00°00.7	216°13.3	N01°45.6
7	52°48.9	240°17.8	31.2	232°27.3	22.2	49°11.7	00.7	231°15.6	45.5
8	67°51.4	255°17.9	30.0	247°28.4	21.5	64°14.2	00.6	246°17.8	45.4
9	82°53.9	270°18.0	·· 28.8	262°29.5	·· 20.9	79°16.8	·· 00.6	261°20.1	·· 45.3
10	97°56.3	285°18.0	27.5	277°30.6	20.2	94°19.3	00.6	276°22.3	45.2
11	112°58.8	300°18.1	26.3	292°31.6	19.6	109°21.8	00.5	291°24.6	45.1
12	128°01.3	315°18.2	N03°25.1	307°32.7	N00°19.0	124°24.3	N00°00.5	306°26.9	N01°45.0
13	143°03.7	330°18.3	23.9	322°33.8	18.3	139°26.8	00.5	321°29.1	44.9
14	158°06.2	345°18.4	22.6	337°34.9	17.7	154°29.3	00.4	336°31.4	44.8
15	173°08.7	0°18.5	·· 21.4	352°36.0	·· 17.1	169°31.8	·· 00.4	351°33.7	·· 44.7
16	188°11.1	15°18.6	20.2	7°37.0	16.4	184°34.3	00.4	6°35.9	44.6
17	203°13.6	30°18.7	18.9	22°38.1	15.8	199°36.9	00.3	21°38.2	44.5
18	218°16.0	45°18.8	N03°17.7	37°39.2	N00°15.2	214°39.4	N00°00.3	36°40.4	N01°44.5
19	233°18.5	60°18.9	16.5	52°40.3	14.5	229°41.9	00.3	51°42.7	44.4
20	248°21.0	75°19.0	15.3	67°41.4	13.9	244°44.4	00.2	66°45.0	44.3
21	263°23.4	90°19.1	·· 14.0	82°42.4	·· 13.2	259°46.9	·· 00.2	81°47.2	·· 44.2
22	278°25.9	105°19.2	12.8	97°43.5	12.6	274°49.4	00.2	96°49.5	44.1
23	293°28.4	120°19.3	11.6	112°44.6	12.0	289°51.9	00.1	111°51.7	44.0
Mer.pass.:03:29		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	308°30.8	135°19.3	N03°10.3	127°45.7	N00°11.3	304°54.5	N00°00.1	126°54.0	N01°43.9
1	323°33.3	150°19.4	09.1	142°46.7	10.7	319°57.0	00.0	141°56.3	43.8
2	338°35.8	165°19.5	07.9	157°47.8	10.1	334°59.5	N00°00.0	156°58.5	43.7
3	353°38.2	180°19.6	·· 06.6	172°48.9	·· 09.4	350°02.0	S00°00.0	172°00.8	·· 43.6
4	8°40.7	195°19.7	05.4	187°50.0	08.8	5°04.5	00.1	187°03.1	43.5
5	23°43.1	210°19.8	04.2	202°51.1	08.1	20°07.0	00.1	202°05.3	43.4
6	38°45.6	225°19.9	N03°03.0	217°52.1	N00°07.5	35°09.6	S00°00.1	217°07.6	N01°43.3
7	53°48.1	240°20.0	01.7	232°53.2	06.9	50°12.1	00.2	232°09.8	43.2
8	68°50.5	255°20.1	03°00.5	247°54.3	06.2	65°14.6	00.2	247°12.1	43.1
9	83°53.0	270°20.2	02°59.3	262°55.4	·· 05.6	80°17.1	·· 00.2	262°14.4	·· 43.0
10	98°55.5	285°20.3	58.0	277°56.4	04.9	95°19.6	00.3	277°16.6	42.9
11	113°57.9	300°20.4	56.8	292°57.5	04.3	110°22.1	00.3	292°18.9	42.8
12	129°00.4	315°20.6	N02°55.6	307°58.6	N00°03.7	125°24.7	S00°00.4	307°21.1	N01°42.7
13	144°02.9	330°20.7	54.3	322°59.7	03.0	140°27.2	00.4	322°23.4	42.6
14	159°05.3	345°20.8	53.1	338°00.7	02.4	155°29.7	00.4	337°25.6	42.6
15	174°07.8	0°20.9	·· 51.9	353°01.8	·· 01.8	170°32.2	·· 00.5	352°27.9	·· 42.5
16	189°10.3	15°21.0	50.6	8°02.9	01.1	185°34.7	00.5	7°30.2	42.4
17	204°12.7	30°21.1	49.4	23°04.0	N00°00.5	200°37.3	00.5	22°32.4	42.3
18	219°15.2	45°21.2	N02°48.2	38°05.0	S00°00.2	215°39.8	S00°00.6	37°34.7	N01°42.2
19	234°17.6	60°21.3	46.9	53°06.1	00.8	230°42.3	00.6	52°36.9	42.1
20	249°20.1	75°21.4	45.7	68°07.2	01.4	245°44.8	00.7	67°39.2	42.0
21	264°22.6	90°21.5	·· 44.5	83°08.3	·· 02.1	260°47.4	·· 00.7	82°41.5	·· 41.9
22	279°25.0	105°21.6	43.2	98°09.3	02.7	275°49.9	00.7	97°43.7	41.8
23	294°27.5	120°21.7	42.0	113°10.4	03.3	290°52.4	00.8	112°46.0	41.7
Mer.pass.:03:25		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	309°30.0	135°21.8	N02°40.8	128°11.5	S00°04.0	305°54.9	S00°00.8	127°48.2	N01°41.6
1	324°32.4	150°21.9	39.6	143°12.6	04.6	320°57.4	00.8	142°50.5	41.5
2	339°34.9	165°22.0	38.3	158°13.6	05.3	336°00.0	00.9	157°52.8	41.4
3	354°37.4	180°22.2	·· 37.1	173°14.7	·· 05.9	351°02.5	·· 00.9	172°55.0	·· 41.3
4	9°39.8	195°22.3	35.9	188°15.8	06.5	6°05.0	01.0	187°57.3	41.2
5	24°42.3	210°22.4	34.6	203°16.9	07.2	21°07.5	01.0	202°59.5	41.1
6	39°44.7	225°22.5	N02°33.4	218°17.9	S00°07.8	36°10.1	S00°01.0	218°01.8	N01°41.0
7	54°47.2	240°22.6	32.2	233°19.0	08.5	51°12.6	01.1	233°04.0	40.9
8	69°49.7	255°22.7	30.9	248°20.1	09.1	66°15.1	01.1	248°06.3	40.8
9	84°52.1	270°22.8	·· 29.7	263°21.1	·· 09.7	81°17.6	·· 01.2	263°08.6	·· 40.7
10	99°54.6	285°22.9	28.5	278°22.2	10.4	96°20.2	01.2	278°10.8	40.6
11	114°57.1	300°23.1	27.2	293°23.3	11.0	111°22.7	01.2	293°13.1	40.5
12	129°59.5	315°23.2	N02°26.0	308°24.4	S00°11.7	126°25.2	S00°01.3	308°15.3	N01°40.4
13	145°02.0	330°23.3	24.8	323°25.4	12.3	141°27.7	01.3	323°17.6	40.3
14	160°04.5	345°23.4	23.5	338°26.5	12.9	156°30.3	01.4	338°19.8	40.3
15	175°06.9	0°23.5	·· 22.3	353°27.6	·· 13.6	171°32.8	·· 01.4	353°22.1	·· 40.2
16	190°09.4	15°23.6	21.1	8°28.7	14.2	186°35.3	01.4	8°24.4	40.1
17	205°11.9	30°23.8	19.8	23°29.7	14.9	201°37.9	01.5	23°26.6	40.0
18	220°14.3	45°23.9	N02°18.6	38°30.8	S00°15.5	216°40.4	S00°01.5	38°28.9	N01°39.9
19	235°16.8	60°24.0	17.4	53°31.9	16.1	231°42.9	01.6	53°31.1	39.8
20	250°19.2	75°24.1	16.1	68°32.9	16.8	246°45.4	01.6	68°33.4	39.7
21	265°21.7	90°24.2	·· 14.9	83°34.0	·· 17.4	261°48.0	·· 01.6	83°35.6	·· 39.6
22	280°24.2	105°24.4	13.7	98°35.1	18.0	276°50.5	01.7	98°37.9	39.5
23	295°26.6	120°24.5	12.4	113°36.2	18.7	291°53.0	01.7	113°40.2	39.4
Mer.pass.:03:21		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.5		v2.3 d-0.1 m1.1	

Stars	SHA	Dec
Alpheratz	357°45.5	29°09.0
Ankaa	353°17.4	-42°14.5
Schedar	349°42.8	56°35.6
Diphda	348°57.8	-17°55.4
Achernar	335°28.0	-57°10.6
Hamal	328°03.1	23°30.8
Polaris	318°50.6	89°18.4
Acamar	315°19.9	-40°15.4
Menkar	314°17.3	4°08.0
Mirfak	308°43.5	49°53.8
Aldebaran	290°51.9	16°31.9
Rigel	281°14.3	-8°11.2
Capella	280°37.8	46°00.4
Bellatrix	278°34.5	6°21.6
Elnath	278°15.5	28°36.9
Alnilam	275°48.7	-1°11.6
Betelgeuse	271°03.8	7°24.6
Canopus	263°57.5	-52°41.9
Sirius	258°35.8	-16°43.8
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.8
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.2	-63°09.8
Gacrux	172°03.6	-57°10.7
Alioth	166°22.6	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.5	49°15.8
Hadar	148°51.0	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.6	-60°53.0
Kochab	137°19.5	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°32.0	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.7	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.2
Enif	33°48.8	9°55.6
Al Na'ir	27°45.8	-46°54.3
Fomalhaut	15°25.9	-29°33.7
Scheat	13°55.1	28°08.5
Markab	13°40.2	15°15.9

Jul 30 Fri	SHA	Mer.pass
Venus	187°45.5	14:59
Mars	179°48.1	15:30
Jupiter	356°22.5	03:44
Saturn	178°28.0	15:34

Jul 31 Sat	SHA	Mer.pass
Venus	186°48.5	14:59
Mars	179°14.8	15:28
Jupiter	356°23.6	03:40
Saturn	178°23.2	15:30

Aug 01 Sun	SHA	Mer.pass
Venus	185°51.9	14:58
Mars	178°41.5	15:26
Jupiter	356°25.0	03:36
Saturn	178°18.3	15:26

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0500 sec ΔT = TT-UT1 = +66.2340 sec

2010 July 30 to Aug. 01 UT

h — Sun — Moon

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.1	N18°35.1	318°50.9	16.7'	N00°24.0	12.5'	54.1'
1	193°23.1	34.5	333°26.6	16.7'	00°36.5	12.5'	54.1'
2	208°23.1	33.9	348°02.2	16.7'	00°49.0	12.5'	54.1'
3	223°23.2	·· 33.3	2°37.9	16.6'	01°01.5	12.5'	54.1'
4	238°23.2	32.7	17°13.5	16.6'	01°14.0	12.5'	54.1'
5	253°23.2	32.1	31°49.2	16.6'	01°26.5	12.5'	54.1'
6	268°23.2	N18°31.5	46°24.8	16.6'	N01°39.0	12.5'	54.1'
7	283°23.3	30.9	61°00.4	16.6'	01°51.4	12.5'	54.1'
8	298°23.3	30.3	75°36.0	16.6'	02°03.9	12.5'	54.1'
9	313°23.3	·· 29.7	90°11.6	16.6'	02°16.4	12.5'	54.1'
10	328°23.3	29.1	104°47.2	16.6'	02°28.9	12.5'	54.1'
11	343°23.4	28.5	119°22.8	16.6'	02°41.3	12.5'	54.1'
12	358°23.4	N18°27.8	133°58.3	16.5'	N02°53.8	12.4'	54.1'
13	13°23.4	27.2	148°33.8	16.5'	03°06.2	12.4'	54.2'
14	28°23.5	26.6	163°09.4	16.5'	03°18.6	12.4'	54.2'
15	43°23.5	·· 26.0	177°44.9	16.5'	03°31.0	12.4'	54.2'
16	58°23.5	25.4	192°20.4	16.5'	03°43.5	12.4'	54.2'
17	73°23.5	24.8	206°55.8	16.5'	03°55.9	12.4'	54.2'
18	88°23.6	N18°24.2	221°31.3	16.4'	N04°08.2	12.4'	54.2'
19	103°23.6	23.6	236°06.7	16.4'	04°20.6	12.4'	54.2'
20	118°23.6	23.0	250°42.1	16.4'	04°33.0	12.4'	54.2'
21	133°23.7	·· 22.4	265°17.5	16.4'	04°45.3	12.3'	54.2'
22	148°23.7	21.8	279°52.8	16.3'	04°57.7	12.3'	54.2'
23	163°23.7	21.1	294°28.2	16.3'	05°10.0	12.3'	54.3'
	SD.=15.7	d=-0.6			S.D.=14.8		

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.7	N18°20.5	309°03.5	16.3'	N05°22.3	12.3'	54.3'
1	193°23.8	19.9	323°38.7	16.3'	05°34.6	12.3'	54.3'
2	208°23.8	19.3	338°14.0	16.2'	05°46.9	12.3'	54.3'
3	223°23.8	·· 18.7	352°49.2	16.2'	05°59.1	12.2'	54.3'
4	238°23.9	18.1	7°24.4	16.2'	06°11.4	12.2'	54.3'
5	253°23.9	17.5	21°59.6	16.1'	06°23.6	12.2'	54.3'
6	268°23.9	N18°16.8	36°34.7	16.1'	N06°35.8	12.2'	54.3'
7	283°24.0	16.2	51°09.8	16.1'	06°47.9	12.2'	54.3'
8	298°24.0	15.6	65°44.8	16.0'	07°00.1	12.1'	54.4'
9	313°24.0	·· 15.0	80°19.9	16.0'	07°12.2	12.1'	54.4'
10	328°24.1	14.4	94°54.9	16.0'	07°24.4	12.1'	54.4'
11	343°24.1	13.8	109°29.8	15.9'	07°36.4	12.1'	54.4'
12	358°24.1	N18°13.1	124°04.7	15.9'	N07°48.5	12.1'	54.4'
13	13°24.2	12.5	138°39.6	15.9'	08°00.5	12.0'	54.4'
14	28°24.2	11.9	153°14.5	15.8'	08°12.6	12.0'	54.4'
15	43°24.2	·· 11.3	167°49.2	15.8'	08°24.6	12.0'	54.5'
16	58°24.3	10.7	182°24.0	15.7'	08°36.5	11.9'	54.5'
17	73°24.3	10.0	196°58.7	15.7'	08°48.5	11.9'	54.5'
18	88°24.3	N18°09.4	211°33.4	15.6'	N09°00.4	11.9'	54.5'
19	103°24.4	08.8	226°08.0	15.6'	09°12.2	11.9'	54.5'
20	118°24.4	08.2	240°42.6	15.6'	09°24.1	11.8'	54.5'
21	133°24.4	·· 07.6	255°17.1	15.5'	09°35.9	11.8'	54.5'
22	148°24.5	06.9	269°51.6	15.5'	09°47.7	11.8'	54.6'
23	163°24.5	06.3	284°26.1	15.4'	09°59.4	11.7'	54.6'
	SD.=15.7	d=-0.6			S.D.=14.8		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.5	N18°05.7	299°00.4	15.4'	N10°11.2	11.7'	54.6'
1	193°24.6	05.1	313°34.8	15.3'	10°22.9	11.7'	54.6'
2	208°24.6	04.4	328°09.1	15.3'	10°34.5	11.6'	54.6'
3	223°24.6	·· 03.8	342°43.3	15.2'	10°46.1	11.6'	54.6'
4	238°24.7	03.2	357°17.5	15.2'	10°57.7	11.6'	54.7'
5	253°24.7	02.5	11°51.6	15.1'	11°09.3	11.5'	54.7'
6	268°24.8	N18°01.9	26°25.7	15.0'	N11°20.8	11.5'	54.7'
7	283°24.8	01.3	40°59.7	15.0'	11°32.2	11.5'	54.7'
8	298°24.8	00.7	55°33.7	14.9'	11°43.7	11.4'	54.7'
9	313°24.9	18°00.0	70°07.6	14.9'	11°55.1	11.4'	54.8'
10	328°24.9	17°59.4	84°41.4	14.8'	12°06.4	11.3'	54.8'
11	343°24.9	58.8	99°15.2	14.8'	12°17.7	11.3'	54.8'
12	358°25.0	N17°58.1	113°48.9	14.7'	N12°29.0	11.2'	54.8'
13	13°25.0	57.5	128°22.6	14.6'	12°40.2	11.2'	54.8'
14	28°25.1	56.9	142°56.2	14.6'	12°51.4	11.2'	54.9'
15	43°25.1	·· 56.2	157°29.8	14.5'	13°02.5	11.1'	54.9'
16	58°25.1	55.6	172°03.2	14.4'	13°13.6	11.1'	54.9'
17	73°25.2	55.0	186°36.6	14.4'	13°24.7	11.0'	54.9'
18	88°25.2	N17°54.3	201°10.0	14.3'	N13°35.7	11.0'	54.9'
19	103°25.3	53.7	215°43.3	14.2'	13°46.6	10.9'	55.0'
20	118°25.3	53.1	230°16.5	14.2'	13°57.5	10.9'	55.0'
21	133°25.3	·· 52.4	244°49.6	14.1'	14°08.4	10.8'	55.0'
22	148°25.4	51.8	259°22.7	14.0'	14°19.2	10.8'	55.0'
23	163°25.4	51.2	273°55.7	14.0'	14°29.9	10.7'	55.1'
	SD.=15.7	d=-0.6			S.D.=14.9		

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

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

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 83-67%
30	06:28	06:26	12:06	02:49	15:09	◑
31	06:25	06:24	12:06	03:30	15:50	
01	06:22	06:20	12:06	04:11	16:33	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	310°29.1	135°24.6	N02°11.2	128°37.2	S00°19.3	306°55.6	S00°01.8	128°42.4	N01°39.3
1	325°31.6	150°24.7	10.0	143°38.3	20.0	321°58.1	01.8	143°44.7	39.2
2	340°34.0	165°24.8	08.7	158°39.4	20.6	337°00.6	01.9	158°46.9	39.1
3	355°36.5	180°25.0	· · 07.5	173°40.4	· · 21.2	352°03.2	· · 01.9	173°49.2	· · 39.0
4	10°39.0	195°25.1	06.3	188°41.5	21.9	7°05.7	01.9	188°51.4	38.9
5	25°41.4	210°25.2	05.0	203°42.6	22.5	22°08.2	02.0	203°53.7	38.8
6	40°43.9	225°25.3	N02°03.8	218°43.7	S00°23.2	37°10.8	S00°02.0	218°55.9	N01°38.7
7	55°46.4	240°25.5	02.6	233°44.7	23.8	52°13.3	02.1	233°58.2	38.6
8	70°48.8	255°25.6	01.3	248°45.8	24.4	67°15.8	02.1	249°00.5	38.5
9	85°51.3	270°25.7	02°00.1	263°46.9	· · 25.1	82°18.4	· · 02.2	264°02.7	· · 38.4
10	100°53.7	285°25.8	01°58.9	278°47.9	25.7	97°20.9	02.2	279°05.0	38.3
11	115°56.2	300°26.0	57.6	293°49.0	26.4	112°23.4	02.2	294°07.2	38.2
12	130°58.7	315°26.1	N01°56.4	308°50.1	S00°27.0	127°26.0	S00°02.3	309°09.5	N01°38.1
13	146°01.1	330°26.2	55.2	323°51.1	27.6	142°28.5	02.3	324°11.7	38.0
14	161°03.6	345°26.4	53.9	338°52.2	28.3	157°31.0	02.4	339°14.0	37.9
15	176°06.1	0°26.5	· · 52.7	353°53.3	· · 28.9	172°33.6	· · 02.4	354°16.2	· · 37.8
16	191°08.5	15°26.6	51.5	8°54.3	29.6	187°36.1	02.5	9°18.5	37.7
17	206°11.0	30°26.7	50.2	23°55.4	30.2	202°38.6	02.5	24°20.7	37.6
18	221°13.5	45°26.9	N01°49.0	38°56.5	S00°30.9	217°41.2	S00°02.6	39°23.0	N01°37.5
19	236°15.9	60°27.0	47.8	53°57.6	31.5	232°43.7	02.6	54°25.3	37.4
20	251°18.4	75°27.1	46.5	68°58.6	32.1	247°46.2	02.6	69°27.5	37.3
21	266°20.8	90°27.3	· · 45.3	83°59.7	· · 32.8	262°48.8	· · 02.7	84°29.8	· · 37.3
22	281°23.3	105°27.4	44.0	99°00.8	33.4	277°51.3	02.7	99°32.0	37.2
23	296°25.8	120°27.5	42.8	114°01.8	34.1	292°53.8	02.8	114°34.3	37.1
Mer.pass.:03:18		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.6		v2.3 d-0.1 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	311°28.2	135°27.7	N01°41.6	129°02.9	S00°34.7	307°56.4	S00°02.8	129°36.5	N01°37.0
1	326°30.7	150°27.8	40.3	144°04.0	35.3	322°58.9	02.9	144°38.8	36.9
2	341°33.2	165°27.9	39.1	159°05.0	36.0	338°01.5	02.9	159°41.0	36.8
3	356°35.6	180°28.1	· · 37.9	174°06.1	· · 36.6	353°04.0	· · 03.0	174°43.3	· · 36.7
4	11°38.1	195°28.2	36.6	189°07.2	37.3	8°06.5	03.0	189°45.5	36.6
5	26°40.6	210°28.3	35.4	204°08.2	37.9	23°09.1	03.0	204°47.8	36.5
6	41°43.0	225°28.5	N01°34.2	219°09.3	S00°38.5	38°11.6	S00°03.1	219°50.0	N01°36.4
7	56°45.5	240°28.6	32.9	234°10.4	39.2	53°14.2	03.1	234°52.3	36.3
8	71°48.0	255°28.8	31.7	249°11.4	39.8	68°16.7	03.2	249°54.6	36.2
9	86°50.4	270°28.9	· · 30.5	264°12.5	· · 40.5	83°19.2	· · 03.2	264°56.8	· · 36.1
10	101°52.9	285°29.0	29.2	279°13.6	41.1	98°21.8	03.3	279°59.1	36.0
11	116°55.3	300°29.2	28.0	294°14.6	41.7	113°24.3	03.3	295°01.3	35.9
12	131°57.8	315°29.3	N01°26.8	309°15.7	S00°42.4	128°26.9	S00°03.4	310°03.6	N01°35.8
13	147°00.3	330°29.5	25.5	324°16.8	43.0	143°29.4	03.4	325°05.8	35.7
14	162°02.7	345°29.6	24.3	339°17.8	43.7	158°31.9	03.5	340°08.1	35.6
15	177°05.2	0°29.7	· · 23.1	354°18.9	· · 44.3	173°34.5	· · 03.5	355°10.3	· · 35.5
16	192°07.7	15°29.9	21.8	9°20.0	45.0	188°37.0	03.6	10°12.6	35.4
17	207°10.1	30°30.0	20.6	24°21.0	45.6	203°39.6	03.6	25°14.8	35.3
18	222°12.6	45°30.2	N01°19.4	39°22.1	S00°46.2	218°42.1	S00°03.6	40°17.1	N01°35.2
19	237°15.1	60°30.3	18.1	54°23.2	46.9	233°44.7	03.7	55°19.3	35.1
20	252°17.5	75°30.5	16.9	69°24.2	47.5	248°47.2	03.7	70°21.6	35.0
21	267°20.0	90°30.6	· · 15.6	84°25.3	· · 48.2	263°49.8	· · 03.8	85°23.8	· · 34.9
22	282°22.5	105°30.7	14.4	99°26.3	48.8	278°52.3	03.8	100°26.1	34.8
23	297°24.9	120°30.9	13.2	114°27.4	49.4	293°54.8	03.9	115°28.3	34.7
Mer.pass.:03:14		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.6		v2.3 d-0.1 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	312°27.4	135°31.0	N01°11.9	129°28.5	S00°50.1	308°57.4	S00°03.9	130°30.6	N01°34.6
1	327°29.8	150°31.2	10.7	144°29.5	50.7	323°59.9	04.0	145°32.8	34.5
2	342°32.3	165°31.3	09.5	159°30.6	51.4	339°02.5	04.0	160°35.1	34.4
3	357°34.8	180°31.5	· · 08.2	174°31.7	· · 52.0	354°05.0	· · 04.1	175°37.3	· · 34.3
4	12°37.2	195°31.6	07.0	189°32.7	52.7	9°07.6	04.1	190°39.6	34.2
5	27°39.7	210°31.8	05.8	204°33.8	53.3	24°10.1	04.2	205°41.8	34.1
6	42°42.2	225°31.9	N01°04.5	219°34.9	S00°53.9	39°12.7	S00°04.2	220°44.1	N01°34.0
7	57°44.6	240°32.1	03.3	234°35.9	54.6	54°15.2	04.3	235°46.3	33.9
8	72°47.1	255°32.2	02.1	249°37.0	55.2	69°17.8	04.3	250°48.6	33.8
9	87°49.6	270°32.4	01°00.8	264°38.1	· · 55.9	84°20.3	· · 04.4	265°50.8	· · 33.7
10	102°52.0	285°32.5	00°59.6	279°39.1	56.5	99°22.9	04.4	280°53.1	33.6
11	117°54.5	300°32.7	58.4	294°40.2	57.1	114°25.4	04.5	295°55.3	33.5
12	132°56.9	315°32.8	N00°57.1	309°41.2	S00°57.8	129°28.0	S00°04.5	310°57.6	N01°33.4
13	147°59.4	330°33.0	55.9	324°42.3	58.4	144°30.5	04.6	325°59.8	33.3
14	163°01.9	345°33.1	54.6	339°43.4	59.1	159°33.1	04.6	341°02.1	33.2
15	178°04.3	0°33.3	· · 53.4	354°44.4	00°59.7	174°35.6	· · 04.7	356°04.3	· · 33.1
16	193°06.8	15°33.4	52.2	9°45.5	01°00.4	189°38.2	04.7	11°06.6	33.0
17	208°09.3	30°33.6	50.9	24°46.6	01.0	204°40.7	04.8	26°08.8	32.9
18	223°11.7	45°33.7	N00°49.7	39°47.6	S01°01.6	219°43.3	S00°04.8	41°11.1	N01°32.8
19	238°14.2	60°33.9	48.5	54°48.7	02.3	234°45.8	04.9	56°13.3	32.7
20	253°16.7	75°34.1	47.2	69°49.7	02.9	249°48.4	04.9	71°15.6	32.6
21	268°19.1	90°34.2	· · 46.0	84°50.8	· · 03.6	264°50.9	· · 05.0	86°17.8	· · 32.5
22	283°21.6	105°34.4	44.8	99°51.9	04.2	279°53.5	05.0	101°20.1	32.4
23	298°24.1	120°34.5	43.5	114°52.9	04.9	294°56.0	05.1	116°22.3	32.3
Mer.pass.:03:10		v0.1 d-1.2 m-4.1		v1.1 d-0.6 m1.5		v2.5 d-0.0 m-2.6		v2.3 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.5	29°09.0
Ankaa	353°17.4	-42°14.5
Schedar	349°42.7	56°35.6
Diphda	348°57.8	-17°55.4
Achernar	335°28.0	-57°10.6
Hamal	328°03.1	23°30.8
Polaris	318°49.1	89°18.4
Acamar	315°19.9	-40°15.4
Menkar	314°17.3	4°08.0
Mirfak	308°43.5	49°53.8
Aldebaran	290°51.9	16°31.9
Rigel	281°14.2	-8°11.2
Capella	280°37.8	46°00.4
Bellatrix	278°34.4	6°21.6
Elnath	278°15.5	28°36.9
Alnilam	275°48.7	-1°11.6
Betelgeuse	271°03.8	7°24.6
Canopus	263°57.5	-52°41.9
Sirius	258°35.8	-16°43.7
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.6	-17°36.2
Acrux	173°12.2	-63°09.8
Gacrux	172°03.7	-57°10.6
Alioth	166°22.6	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.5	49°15.8
Hadar	148°51.1	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.6	-60°53.0
Kochab	137°19.6	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°32.0	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.7	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°53.9
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.2
Enif	33°48.8	9°55.6
Al Na'ir	27°45.8	-46°54.3
Fomalhaut	15°25.9	-29°33.7
Scheat	13°55.1	28°08.5
Markab	13°40.1	15°15.9

Aug 02 Mon	**SHA**	**Mer.pass**
Venus	184°55.5	14:58
Mars	178°08.1	15:24
Jupiter	356°26.5	03:32
Saturn	178°13.3	15:23

Aug 03 Tue	**SHA**	**Mer.pass**
Venus	183°59.4	14:58
Mars	177°34.7	15:23
Jupiter	356°28.1	03:28
Saturn	178°08.3	15:19

Aug 04 Wed	**SHA**	**Mer.pass**
Venus	183°03.7	14:58
Mars	177°01.1	15:21
Jupiter	356°30.0	03:24
Saturn	178°03.2	15:16

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.5	N17°50.5	288°28.6	13.9'	N14°40.6	10.7'	55.1'
1	193°25.5	49.9	303°01.5	13.8'	14°51.2	10.6'	55.1'
2	208°25.6	49.3	317°34.3	13.7'	15°01.8	10.6'	55.1'
3	223°25.6	· · 48.6	332°07.0	13.7'	15°12.3	10.5'	55.2'
4	238°25.6	48.0	346°39.6	13.6'	15°22.8	10.4'	55.2'
5	253°25.7	47.3	1°12.2	13.5'	15°33.2	10.4'	55.2'
6	268°25.7	N17°46.7	15°44.6	13.4'	N15°43.6	10.3'	55.2'
7	283°25.8	46.1	30°17.0	13.4'	15°53.9	10.3'	55.3'
8	298°25.8	45.4	44°49.4	13.3'	16°04.1	10.2'	55.3'
9	313°25.9	· · 44.8	59°21.6	13.2'	16°14.3	10.1'	55.3'
10	328°25.9	44.1	73°53.8	13.1'	16°24.4	10.1'	55.3'
11	343°26.0	43.5	88°25.9	13.1'	16°34.5	10.0'	55.4'
12	358°26.0	N17°42.8	102°57.9	13.0'	N16°44.4	10.0'	55.4'
13	13°26.0	42.2	117°29.8	12.9'	16°54.4	9.9'	55.4'
14	28°26.1	41.6	132°01.7	12.8'	17°04.2	9.8'	55.4'
15	43°26.1	· · 40.9	146°33.4	12.7'	17°14.0	9.8'	55.5'
16	58°26.2	40.3	161°05.1	12.6'	17°23.7	9.7'	55.5'
17	73°26.2	39.6	175°36.7	12.6'	17°33.4	9.6'	55.5'
18	88°26.3	N17°39.0	190°08.2	12.5'	N17°42.9	9.5'	55.5'
19	103°26.3	38.3	204°39.7	12.4'	17°52.5	9.5'	55.6'
20	118°26.4	37.7	219°11.0	12.3'	18°01.9	9.4'	55.6'
21	133°26.4	· · 37.0	233°42.2	12.2'	18°11.2	9.3'	55.6'
22	148°26.5	36.4	248°13.4	12.1'	18°20.5	9.2'	55.7'
23	163°26.5	35.7	262°44.5	12.0'	18°29.7	9.2'	55.7'
	SD.=15.7	d=-0.6	S.D.=15.1				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.6	N17°35.1	277°15.5	11.9'	N18°38.9	9.1'	55.7'
1	193°26.6	34.4	291°46.4	11.9'	18°47.9	9.0'	55.7'
2	208°26.7	33.8	306°17.2	11.8'	18°56.9	8.9'	55.8'
3	223°26.7	· · 33.1	320°47.9	11.7'	19°05.8	8.9'	55.8'
4	238°26.8	32.5	335°18.5	11.6'	19°14.6	8.8'	55.8'
5	253°26.8	31.8	349°49.0	11.5'	19°23.3	8.7'	55.9'
6	268°26.9	N17°31.2	4°19.5	11.4'	N19°32.0	8.6'	55.9'
7	283°26.9	30.5	18°49.8	11.3'	19°40.6	8.5'	55.9'
8	298°27.0	29.9	33°20.1	11.2'	19°49.0	8.4'	56.0'
9	313°27.0	· · 29.2	47°50.2	11.1'	19°57.4	8.3'	56.0'
10	328°27.1	28.6	62°20.3	11.0'	20°05.7	8.3'	56.0'
11	343°27.1	27.9	76°50.3	10.9'	20°13.9	8.2'	56.1'
12	358°27.2	N17°27.3	91°20.2	10.8'	N20°22.1	8.1'	56.1'
13	13°27.2	26.6	105°49.9	10.7'	20°30.1	8.0'	56.1'
14	28°27.3	25.9	120°19.6	10.6'	20°38.0	7.9'	56.2'
15	43°27.3	· · 25.3	134°49.2	10.5'	20°45.9	7.8'	56.2'
16	58°27.4	24.6	149°18.7	10.4'	20°53.6	7.7'	56.2'
17	73°27.4	24.0	163°48.1	10.4'	21°01.3	7.6'	56.3'
18	88°27.5	N17°23.3	178°17.4	10.3'	N21°08.8	7.5'	56.3'
19	103°27.5	22.7	192°46.6	10.2'	21°16.3	7.4'	56.3'
20	118°27.6	22.0	207°15.7	10.1'	21°23.6	7.3'	56.4'
21	133°27.6	· · 21.3	221°44.8	10.0'	21°30.9	7.2'	56.4'
22	148°27.7	20.7	236°13.7	9.9'	21°38.0	7.1'	56.4'
23	163°27.7	20.0	250°42.5	9.8'	21°45.1	7.0'	56.5'
	SD.=15.8	d=-0.6	S.D.=15.3				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.8	N17°19.4	265°11.2	9.7'	N21°52.0	6.9'	56.5'
1	193°27.8	18.7	279°39.9	9.6'	21°58.9	6.8'	56.5'
2	208°27.9	18.0	294°08.4	9.5'	22°05.6	6.7'	56.6'
3	223°28.0	· · 17.4	308°36.8	9.4'	22°12.2	6.6'	56.6'
4	238°28.0	16.7	323°05.2	9.3'	22°18.7	6.5'	56.6'
5	253°28.1	16.0	337°33.4	9.2'	22°25.1	6.3'	56.7'
6	268°28.1	N17°15.4	352°01.5	9.1'	N22°31.4	6.2'	56.7'
7	283°28.2	14.7	6°29.6	9.0'	22°37.6	6.1'	56.7'
8	298°28.2	14.1	20°57.5	8.9'	22°43.7	6.0'	56.8'
9	313°28.3	· · 13.4	35°25.4	8.8'	22°49.6	5.9'	56.8'
10	328°28.4	12.7	49°53.2	8.7'	22°55.4	5.8'	56.9'
11	343°28.4	12.1	64°20.8	8.6'	23°01.2	5.7'	56.9'
12	358°28.5	N17°11.4	78°48.4	8.5'	N23°06.7	5.5'	56.9'
13	13°28.5	10.7	93°15.9	8.4'	23°12.2	5.4'	57.0'
14	28°28.6	10.1	107°43.2	8.3'	23°17.6	5.3'	57.0'
15	43°28.6	· · 09.4	122°10.5	8.2'	23°22.8	5.2'	57.0'
16	58°28.7	08.7	136°37.7	8.1'	23°27.9	5.0'	57.1'
17	73°28.8	08.0	151°04.8	8.1'	23°32.9	4.9'	57.1'
18	88°28.8	N17°07.4	165°31.8	8.0'	N23°37.7	4.8'	57.2'
19	103°28.9	06.7	179°58.7	7.9'	23°42.4	4.7'	57.2'
20	118°28.9	06.0	194°25.6	7.8'	23°47.0	4.5'	57.2'
21	133°29.0	· · 05.4	208°52.3	7.7'	23°51.5	4.4'	57.3'
22	148°29.1	04.7	223°18.9	7.6'	23°55.8	4.3'	57.3'
23	163°29.1	04.0	237°45.5	7.5'	24°00.0	4.1'	57.3'
	SD.=15.8	d=-0.7	S.D.=15.5				

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 57-37%
02	06:18	06:16	12:06	04:55	17:18	
03	06:14	06:11	12:06	05:42	18:07	
04	06:09	06:06	12:06	06:33	19:00	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	313°26.5	135°34.7	N00°42.3	129°54.0	S01°05.5	309°58.6	S00°05.1	131°24.6	N01°32.2
1	328°29.0	150°34.8	41.1	144°55.0	06.1	325°01.1	05.2	146°26.8	32.1
2	343°31.4	165°35.0	39.8	159°56.1	06.8	340°03.7	05.2	161°29.1	32.0
3	358°33.9	180°35.2	·· 38.6	174°57.2	·· 07.4	355°06.2	·· 05.3	176°31.3	·· 31.9
4	13°36.4	195°35.3	37.4	189°58.2	08.1	10°08.8	05.3	191°33.6	31.8
5	28°38.8	210°35.5	36.1	204°59.3	08.7	25°11.3	05.4	206°35.8	31.7
6	43°41.3	225°35.6	N00°34.9	220°00.3	S01°09.4	40°13.9	S00°05.4	221°38.1	N01°31.6
7	58°43.8	240°35.8	33.6	235°01.4	10.0	55°16.4	05.5	236°40.3	31.5
8	73°46.2	255°36.0	32.4	250°02.5	10.6	70°19.0	05.5	251°42.6	31.4
9	88°48.7	270°36.1	·· 31.2	265°03.5	·· 11.3	85°21.6	·· 05.6	266°44.8	·· 31.3
10	103°51.2	285°36.3	29.9	280°04.6	11.9	100°24.1	05.6	281°47.1	31.2
11	118°53.6	300°36.5	28.7	295°05.6	12.6	115°26.7	05.7	296°49.3	31.1
12	133°56.1	315°36.6	N00°27.5	310°06.7	S01°13.2	130°29.2	S00°05.8	311°51.6	N01°31.0
13	148°58.6	330°36.8	26.2	325°07.8	13.9	145°31.8	05.8	326°53.8	30.9
14	164°01.0	345°36.9	25.0	340°08.8	14.5	160°34.3	05.9	341°56.1	30.8
15	179°03.5	0°37.1	·· 23.8	355°09.9	·· 15.1	175°36.9	·· 05.9	356°58.3	·· 30.7
16	194°05.9	15°37.3	22.5	10°10.9	15.8	190°39.5	06.0	12°00.6	30.6
17	209°08.4	30°37.4	21.3	25°12.0	16.4	205°42.0	06.0	27°02.8	30.5
18	224°10.9	45°37.6	N00°20.1	40°13.1	S01°17.1	220°44.6	S00°06.1	42°05.0	N01°30.4
19	239°13.3	60°37.8	18.8	55°14.1	17.7	235°47.1	06.1	57°07.3	30.3
20	254°15.8	75°37.9	17.6	70°15.2	18.4	250°49.7	06.2	72°09.5	30.2
21	269°18.3	90°38.1	·· 16.4	85°16.2	·· 19.0	265°52.2	·· 06.2	87°11.8	·· 30.1
22	284°20.7	105°38.3	15.1	100°17.3	19.6	280°54.8	06.3	102°14.0	30.0
23	299°23.2	120°38.5	13.9	115°18.3	20.3	295°57.4	06.3	117°16.3	29.9
Mer.pass.:03:06		v0.2 d-1.2 m-4.2		v1.1 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	314°25.7	135°38.6	N00°12.6	130°19.4	S01°20.9	310°59.9	S00°06.4	132°18.5	N01°29.8
1	329°28.1	150°38.8	11.4	145°20.5	21.6	326°02.5	06.5	147°20.8	29.7
2	344°30.6	165°39.0	10.2	160°21.5	22.2	341°05.0	06.5	162°23.0	29.6
3	359°33.1	180°39.1	·· 08.9	175°22.6	·· 22.9	356°07.6	·· 06.6	177°25.3	·· 29.5
4	14°35.5	195°39.3	07.7	190°23.6	23.5	11°10.2	06.6	192°27.5	29.4
5	29°38.0	210°39.5	06.5	205°24.7	24.1	26°12.7	06.7	207°29.8	29.3
6	44°40.4	225°39.6	N00°05.2	220°25.7	S01°24.8	41°15.3	S00°06.7	222°32.0	N01°29.2
7	59°42.9	240°39.8	04.0	235°26.8	25.4	56°17.9	06.8	237°34.3	29.1
8	74°45.4	255°40.0	02.8	250°27.9	26.1	71°20.4	06.8	252°36.5	29.0
9	89°47.8	270°40.2	·· 01.5	265°28.9	·· 26.7	86°23.0	·· 06.9	267°38.7	·· 28.9
10	104°50.3	285°40.3	N00°00.3	280°30.0	27.4	101°25.5	06.9	282°41.0	28.8
11	119°52.8	300°40.5	S00°00.9	295°31.0	28.0	116°28.1	07.0	297°43.2	28.7
12	134°55.2	315°40.7	S00°02.2	310°32.1	S01°28.7	131°30.7	S00°07.1	312°45.5	N01°28.6
13	149°57.7	330°40.9	03.4	325°33.1	29.3	146°33.2	07.1	327°47.7	28.5
14	165°00.2	345°41.0	04.6	340°34.2	29.9	161°35.8	07.2	342°50.0	28.4
15	180°02.6	0°41.2	·· 05.9	355°35.3	·· 30.6	176°38.4	·· 07.2	357°52.2	·· 28.3
16	195°05.1	15°41.4	07.1	10°36.3	31.2	191°40.9	07.3	12°54.5	28.2
17	210°07.6	30°41.6	08.3	25°37.4	31.9	206°43.5	07.3	27°56.7	28.1
18	225°10.0	45°41.8	S00°09.6	40°38.4	S01°32.5	221°46.1	S00°07.4	42°59.0	N01°28.0
19	240°12.5	60°41.9	10.8	55°39.5	33.2	236°48.6	07.5	58°01.2	27.9
20	255°14.9	75°42.1	12.0	70°40.5	33.8	251°51.2	07.5	73°03.4	27.8
21	270°17.4	90°42.3	·· 13.3	85°41.6	·· 34.4	266°53.8	·· 07.6	88°05.7	·· 27.7
22	285°19.9	105°42.5	14.5	100°42.6	35.1	281°56.3	07.6	103°07.9	27.6
23	300°22.3	120°42.7	15.8	115°43.7	35.7	296°58.9	07.7	118°10.2	27.5
Mer.pass.:03:02		v0.2 d-1.2 m-4.2		v1.1 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	315°24.8	135°42.8	S00°17.0	130°44.7	S01°36.4	312°01.5	S00°07.7	133°12.4	N01°27.4
1	330°27.3	150°43.0	18.2	145°45.8	37.0	327°04.0	07.8	148°14.7	27.3
2	345°29.7	165°43.2	19.5	160°46.9	37.7	342°06.6	07.9	163°16.9	27.2
3	0°32.2	180°43.4	·· 20.7	175°47.9	·· 38.3	357°09.2	·· 07.9	178°19.2	·· 27.1
4	15°34.7	195°43.6	21.9	190°49.0	39.0	12°11.7	08.0	193°21.4	27.0
5	30°37.1	210°43.8	23.2	205°50.0	39.6	27°14.3	08.0	208°23.6	26.9
6	45°39.6	225°43.9	S00°24.4	220°51.1	S01°40.2	42°16.9	S00°08.1	223°25.9	N01°26.8
7	60°42.1	240°44.1	25.6	235°52.1	40.9	57°19.4	08.1	238°28.1	26.7
8	75°44.5	255°44.3	26.9	250°53.2	41.5	72°22.0	08.2	253°30.4	26.6
9	90°47.0	270°44.5	·· 28.1	265°54.2	·· 42.2	87°24.6	·· 08.3	268°32.6	·· 26.5
10	105°49.4	285°44.7	29.3	280°55.3	42.8	102°27.2	08.3	283°34.9	26.4
11	120°51.9	300°44.9	30.6	295°56.3	43.5	117°29.7	08.4	298°37.1	26.3
12	135°54.4	315°45.1	S00°31.8	310°57.4	S01°44.1	132°32.3	S00°08.4	313°39.3	N01°26.2
13	150°56.8	330°45.2	33.0	325°58.4	44.8	147°34.9	08.5	328°41.6	26.1
14	165°59.3	345°45.4	34.3	340°59.5	45.4	162°37.4	08.6	343°43.8	26.0
15	181°01.8	0°45.6	·· 35.5	356°00.5	·· 46.0	177°40.0	·· 08.6	358°46.1	·· 25.9
16	196°04.2	15°45.8	36.7	11°01.6	46.7	192°42.6	08.7	13°48.3	25.8
17	211°06.7	30°46.0	38.0	26°02.6	47.3	207°45.2	08.7	28°50.6	25.7
18	226°09.2	45°46.2	S00°39.2	41°03.7	S01°48.0	222°47.7	S00°08.8	43°52.8	N01°25.6
19	241°11.6	60°46.4	40.4	56°04.7	48.6	237°50.3	08.9	58°55.0	25.5
20	256°14.1	75°46.6	41.7	71°05.8	49.3	252°52.9	08.9	73°57.3	25.4
21	271°16.5	90°46.8	·· 42.9	86°06.8	·· 49.9	267°55.4	·· 09.0	88°59.5	·· 25.3
22	286°19.0	105°47.0	44.1	101°07.9	50.6	282°58.0	09.0	104°01.8	25.2
23	301°21.5	120°47.2	45.4	116°09.0	51.2	298°00.6	09.1	119°04.0	25.1
Mer.pass.:02:58		v0.2 d-1.2 m-4.2		v1.1 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.0
Ankaa	353°17.4	-42°14.5
Schedar	349°42.7	56°35.7
Diphda	348°57.7	-17°55.4
Achernar	335°28.0	-57°10.6
Hamal	328°03.0	23°30.8
Polaris	318°47.4	89°18.4
Acamar	315°19.9	-40°15.4
Menkar	314°17.2	4°08.0
Mirfak	308°43.4	49°53.8
Aldebaran	290°51.9	16°31.9
Rigel	281°14.2	-8°11.2
Capella	280°37.8	46°00.4
Bellatrix	278°34.4	6°21.6
Elnath	278°15.5	28°36.9
Alnilam	275°48.7	-1°11.6
Betelgeuse	271°03.8	7°24.6
Canopus	263°57.5	-52°41.9
Sirius	258°35.8	-16°43.7
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.2
Acrux	173°12.2	-63°09.8
Gacrux	172°03.7	-57°10.6
Alioth	166°22.6	55°54.3
Spica	158°33.5	-11°13.1
Alkaid	153°00.5	49°15.8
Hadar	148°51.1	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.7	-60°53.0
Kochab	137°19.7	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°32.1	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.7
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.7	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.2
Enif	33°48.8	9°55.6
Al Na'ir	27°45.8	-46°54.3
Fomalhaut	15°25.9	-29°33.7
Scheat	13°55.1	28°08.5
Markab	13°40.1	15°15.9

Aug 05 Thu	**SHA**	**Mer.pass**
Venus	182°08.2	14:58
Mars	176°27.5	15:19
Jupiter	356°32.0	03:20
Saturn	177°58.1	15:12

Aug 06 Fri	**SHA**	**Mer.pass**
Venus	181°13.0	14:57
Mars	175°53.7	15:18
Jupiter	356°34.3	03:15
Saturn	177°52.9	15:08

Aug 07 Sat	**SHA**	**Mer.pass**
Venus	180°18.0	14:57
Mars	175°19.9	15:16
Jupiter	356°36.7	03:11
Saturn	177°47.6	15:05

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0497 sec ΔT = TT-UT1 = +66.2337 sec

2010 August 05 to Aug. 07 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°29.2	N17°03.3	252°12.0	7.4′	N24°04.1	4.0′	57.4′
1	193°29.2	02.7	266°38.3	7.3′	24°08.0	3.9′	57.4′
2	208°29.3	02.0	281°04.6	7.2′	24°11.8	3.7′	57.5′
3	223°29.4	· · 01.3	295°30.8	7.2′	24°15.4	3.6′	57.5′
4	238°29.4	00.6	309°56.9	7.1′	24°18.9	3.4′	57.5′
5	253°29.5	17°00.0	324°23.0	7.0′	24°22.3	3.3′	57.6′
6	268°29.5	N16°59.3	338°48.9	6.9′	N24°25.6	3.2′	57.6′
7	283°29.6	58.6	353°14.8	6.8′	24°28.6	3.0′	57.7′
8	298°29.7	57.9	7°40.6	6.7′	24°31.6	2.9′	57.7′
9	313°29.7	· · 57.3	22°06.3	6.7′	24°34.4	2.7′	57.7′
10	328°29.8	56.6	36°31.9	6.6′	24°37.1	2.6′	57.8′
11	343°29.9	55.9	50°57.5	6.5′	24°39.6	2.4′	57.8′
12	358°29.9	N16°55.2	65°22.9	6.4′	N24°41.9	2.3′	57.9′
13	13°30.0	54.6	79°48.3	6.4′	24°44.2	2.1′	57.9′
14	28°30.0	53.9	94°13.6	6.3′	24°46.2	2.0′	57.9′
15	43°30.1	· · 53.2	108°38.9	6.2′	24°48.2	1.8′	58.0′
16	58°30.2	52.5	123°04.1	6.1′	24°49.9	1.7′	58.0′
17	73°30.2	51.8	137°29.2	6.1′	24°51.5	1.5′	58.0′
18	88°30.3	N16°51.2	151°54.2	6.0′	N24°53.0	1.4′	58.1′
19	103°30.4	50.5	166°19.2	5.9′	24°54.3	1.2′	58.1′
20	118°30.4	49.8	180°44.1	5.9′	24°55.5	1.1′	58.2′
21	133°30.5	· · 49.1	195°08.9	5.8′	24°56.5	0.9′	58.2′
22	148°30.6	48.4	209°33.7	5.7′	24°57.3	0.8′	58.2′
23	163°30.6	47.7	223°58.4	5.7′	24°58.0	0.6′	58.3′
	SD.=15.8	d=-0.7	S.D.=15.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°30.7	N16°47.1	238°23.1	5.6′	N24°58.5	0.5′	58.3′
1	193°30.8	46.4	252°47.6	5.6′	24°58.9	0.3′	58.4′
2	208°30.8	45.7	267°12.2	5.5′	24°59.1	0.1′	58.4′
3	223°30.9	· · 45.0	281°36.7	5.5′	24°59.2	-0.0′	58.4′
4	238°31.0	44.3	296°01.1	5.4′	24°59.1	-0.2′	58.5′
5	253°31.0	43.6	310°25.5	5.3′	24°58.8	-0.4′	58.5′
6	268°31.1	N16°42.9	324°49.8	5.3′	N24°58.4	-0.5′	58.6′
7	283°31.2	42.3	339°14.0	5.2′	24°57.8	-0.7′	58.6′
8	298°31.2	41.6	353°38.3	5.2′	24°57.0	-0.8′	58.6′
9	313°31.3	· · 40.9	8°02.4	5.2′	24°56.1	-1.0′	58.7′
10	328°31.4	40.2	22°26.6	5.1′	24°55.0	-1.2′	58.7′
11	343°31.5	39.5	36°50.7	5.1′	24°53.8	-1.3′	58.8′
12	358°31.5	N16°38.8	51°14.7	5.0′	N24°52.3	-1.5′	58.8′
13	13°31.6	38.1	65°38.7	5.0′	24°50.8	-1.7′	58.8′
14	28°31.7	37.4	80°02.7	5.0′	24°49.0	-1.8′	58.9′
15	43°31.7	· · 36.7	94°26.7	4.9′	24°47.1	-2.0′	58.9′
16	58°31.8	36.0	108°50.6	4.9′	24°45.0	-2.2′	59.0′
17	73°31.9	35.3	123°14.4	4.9′	24°42.8	-2.3′	59.0′
18	88°31.9	N16°34.7	137°38.3	4.8′	N24°40.3	-2.5′	59.0′
19	103°32.0	34.0	152°02.1	4.8′	24°37.7	-2.7′	59.1′
20	118°32.1	33.3	166°25.9	4.8′	24°35.0	-2.8′	59.1′
21	133°32.2	· · 32.6	180°49.7	4.8′	24°32.1	-3.0′	59.2′
22	148°32.2	31.9	195°13.4	4.7′	24°29.0	-3.2′	59.2′
23	163°32.3	31.2	209°37.1	4.7′	24°25.7	-3.3′	59.2′
	SD.=15.8	d=-0.7	S.D.=16.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°32.4	N16°30.5	224°00.8	4.7′	N24°22.3	-3.5′	59.3′
1	193°32.4	29.8	238°24.5	4.7′	24°18.7	-3.7′	59.3′
2	208°32.5	29.1	252°48.2	4.7′	24°14.9	-3.9′	59.3′
3	223°32.6	· · 28.4	267°11.9	4.7′	24°11.0	-4.0′	59.4′
4	238°32.7	27.7	281°35.5	4.6′	24°06.9	-4.2′	59.4′
5	253°32.7	27.0	295°59.2	4.6′	24°02.6	-4.4′	59.5′
6	268°32.8	N16°26.3	310°22.8	4.6′	N23°58.2	-4.5′	59.5′
7	283°32.9	25.6	324°46.4	4.6′	23°53.6	-4.7′	59.5′
8	298°33.0	24.9	339°10.1	4.6′	23°48.8	-4.9′	59.6′
9	313°33.0	· · 24.2	353°33.7	4.6′	23°43.8	-5.0′	59.6′
10	328°33.1	23.5	7°57.3	4.6′	23°38.7	-5.2′	59.6′
11	343°33.2	22.8	22°20.9	4.6′	23°33.4	-5.4′	59.7′
12	358°33.3	N16°22.1	36°44.6	4.6′	N23°28.0	-5.5′	59.7′
13	13°33.3	21.4	51°08.2	4.6′	23°22.4	-5.7′	59.7′
14	28°33.4	20.7	65°31.9	4.6′	23°16.6	-5.9′	59.8′
15	43°33.5	· · 20.0	79°55.5	4.7′	23°10.6	-6.0′	59.8′
16	58°33.6	19.3	94°19.2	4.7′	23°04.5	-6.2′	59.9′
17	73°33.6	18.6	108°42.8	4.7′	22°58.2	-6.4′	59.9′
18	88°33.7	N16°17.9	123°06.5	4.7′	N22°51.8	-6.5′	59.9′
19	103°33.8	17.2	137°30.2	4.7′	22°45.2	-6.7′	60.0′
20	118°33.9	16.5	151°54.0	4.7′	22°38.4	-6.9′	60.0′
21	133°34.0	· · 15.8	166°17.7	4.8′	22°31.5	-7.0′	60.0′
22	148°34.0	15.1	180°41.5	4.8′	22°24.4	-7.2′	60.1′
23	163°34.1	14.4	195°05.3	4.8′	22°17.1	-7.3′	60.1′
	SD.=15.8	d=-0.7	S.D.=16.3				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 25-27 27-10%
05	06:03	06:00	12:06	07:28	19:57	
06	05:57	05:54	12:06	08:27	20:57	
07	05:51	05:47	12:06	09:27	21:57	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	316°23.9	135°47.3	S00°46.6	131°10.0	S01°51.8	313°03.2	S00°09.2	134°06.3	N01°25.0
1	331°26.4	150°47.5	47.8	146°11.1	52.5	328°05.7	09.2	149°08.5	24.9
2	346°28.9	165°47.7	49.1	161°12.1	53.1	343°08.3	09.3	164°10.7	24.8
3	1°31.3	180°47.9	·· 50.3	176°13.2	·· 53.8	358°10.9	·· 09.3	179°13.0	·· 24.7
4	16°33.8	195°48.1	51.5	191°14.2	54.4	13°13.5	09.4	194°15.2	24.6
5	31°36.3	210°48.3	52.8	206°15.3	55.1	28°16.0	09.5	209°17.5	24.5
6	46°38.7	225°48.5	S00°54.0	221°16.3	S01°55.7	43°18.6	S00°09.5	224°19.7	N01°24.4
7	61°41.2	240°48.7	55.2	236°17.4	56.4	58°21.2	09.6	239°22.0	24.3
8	76°43.7	255°48.9	56.5	251°18.4	57.0	73°23.8	09.6	254°24.2	24.2
9	91°46.1	270°49.1	·· 57.7	266°19.4	·· 57.7	88°26.4	·· 09.7	269°26.4	·· 24.1
10	106°48.6	285°49.3	00°58.9	281°20.5	58.3	103°28.9	09.8	284°28.7	24.0
11	121°51.0	300°49.5	01°00.2	296°21.5	58.9	118°31.5	09.8	299°30.9	23.9
12	136°53.5	315°49.7	S01°01.4	311°22.6	S01°59.6	133°34.1	S00°09.9	314°33.2	N01°23.7
13	151°56.0	330°49.9	02.6	326°23.6	02°00.2	148°36.7	10.0	329°35.4	23.6
14	166°58.4	345°50.1	03.9	341°24.7	00.9	163°39.2	10.0	344°37.6	23.5
15	182°00.9	0°50.3	·· 05.1	356°25.7	·· 01.5	178°41.8	·· 10.1	359°39.9	·· 23.4
16	197°03.4	15°50.5	06.3	11°26.8	02.2	193°44.4	10.1	14°42.1	23.3
17	212°05.8	30°50.7	07.6	26°27.8	02.8	208°47.0	10.2	29°44.4	23.2
18	227°08.3	45°50.9	S01°08.8	41°28.9	S02°03.5	223°49.6	S00°10.3	44°46.6	N01°23.1
19	242°10.8	60°51.1	10.0	56°29.9	04.1	238°52.1	10.3	59°48.8	23.0
20	257°13.2	75°51.3	11.3	71°31.0	04.8	253°54.7	10.4	74°51.1	22.9
21	272°15.7	90°51.5	·· 12.5	86°32.0	·· 05.4	268°57.3	·· 10.5	89°53.3	·· 22.8
22	287°18.2	105°51.7	13.7	101°33.1	06.0	283°59.9	10.5	104°55.6	22.7
23	302°20.6	120°51.9	14.9	116°34.1	06.7	299°02.5	10.6	119°57.8	22.6
Mer.pass.:02:54		v0.2 d-1.2 m-4.2		v1.1 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	317°23.1	135°52.1	S01°16.2	131°35.2	S02°07.3	314°05.1	S00°10.6	135°00.0	N01°22.5
1	332°25.5	150°52.3	17.4	146°36.2	08.0	329°07.6	10.7	150°02.3	22.4
2	347°28.0	165°52.6	18.6	161°37.3	08.6	344°10.2	10.8	165°04.5	22.3
3	2°30.5	180°52.8	·· 19.9	176°38.3	·· 09.3	359°12.8	·· 10.8	180°06.8	·· 22.2
4	17°32.9	195°53.0	21.1	191°39.4	09.9	14°15.4	10.9	195°09.0	22.1
5	32°35.4	210°53.2	22.3	206°40.4	10.6	29°18.0	11.0	210°11.2	22.0
6	47°37.9	225°53.4	S01°23.6	221°41.4	S02°11.2	44°20.6	S00°11.0	225°13.5	N01°21.9
7	62°40.3	240°53.6	24.8	236°42.5	11.9	59°23.1	11.1	240°15.7	21.8
8	77°42.8	255°53.8	26.0	251°43.5	12.5	74°25.7	11.2	255°18.0	21.7
9	92°45.3	270°54.0	·· 27.3	266°44.6	·· 13.1	89°28.3	·· 11.2	270°20.2	·· 21.6
10	107°47.7	285°54.2	28.5	281°45.6	13.8	104°30.9	11.3	285°22.4	21.5
11	122°50.2	300°54.4	29.7	296°46.7	14.4	119°33.5	11.3	300°24.7	21.4
12	137°52.7	315°54.6	S01°31.0	311°47.7	S02°15.1	134°36.1	S00°11.4	315°26.9	N01°21.3
13	152°55.1	330°54.9	32.2	326°48.8	15.7	149°38.7	11.5	330°29.2	21.2
14	167°57.6	345°55.1	33.4	341°49.8	16.4	164°41.2	11.5	345°31.4	21.1
15	183°00.0	0°55.3	·· 34.6	356°50.9	·· 17.0	179°43.8	·· 11.6	0°33.6	·· 21.0
16	198°02.5	15°55.5	35.9	11°51.9	17.7	194°46.4	11.7	15°35.9	20.9
17	213°05.0	30°55.7	37.1	26°52.9	18.3	209°49.0	11.7	30°38.1	20.8
18	228°07.4	45°55.9	S01°38.3	41°54.0	S02°19.0	224°51.6	S00°11.8	45°40.3	N01°20.7
19	243°09.9	60°56.1	39.6	56°55.0	19.6	239°54.2	11.9	60°42.6	20.6
20	258°12.4	75°56.4	40.8	71°56.1	20.2	254°56.8	11.9	75°44.8	20.5
21	273°14.8	90°56.6	·· 42.0	86°57.1	·· 20.9	269°59.3	·· 12.0	90°47.1	·· 20.3
22	288°17.3	105°56.8	43.3	101°58.2	21.5	285°01.9	12.1	105°49.3	20.2
23	303°19.8	120°57.0	44.5	116°59.2	22.2	300°04.5	12.1	120°51.5	20.1
Mer.pass.:02:50		v0.2 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	318°22.2	135°57.2	S01°45.7	132°00.3	S02°22.8	315°07.1	S00°12.2	135°53.8	N01°20.0
1	333°24.7	150°57.4	46.9	147°01.3	23.5	330°09.7	12.3	150°56.0	19.9
2	348°27.1	165°57.7	48.2	162°02.3	24.1	345°12.3	12.3	165°58.3	19.8
3	3°29.6	180°57.9	·· 49.4	177°03.4	·· 24.8	0°14.9	·· 12.4	181°00.5	·· 19.7
4	18°32.1	195°58.1	50.6	192°04.4	25.4	15°17.5	12.5	196°02.7	19.6
5	33°34.5	210°58.3	51.9	207°05.5	26.1	30°20.1	12.5	211°05.0	19.5
6	48°37.0	225°58.5	S01°53.1	222°06.5	S02°26.7	45°22.7	S00°12.6	226°07.2	N01°19.4
7	63°39.5	240°58.8	54.3	237°07.6	27.4	60°25.2	12.7	241°09.4	19.3
8	78°41.9	255°59.0	55.6	252°08.6	28.0	75°27.8	12.7	256°11.7	19.2
9	93°44.4	270°59.2	·· 56.8	267°09.6	·· 28.6	90°30.4	·· 12.8	271°13.9	·· 19.1
10	108°46.9	285°59.4	58.0	282°10.7	29.3	105°33.0	12.9	286°16.1	19.0
11	123°49.3	300°59.6	01°59.2	297°11.7	29.9	120°35.6	12.9	301°18.4	18.9
12	138°51.8	315°59.9	S02°00.5	312°12.8	S02°30.6	135°38.2	S00°13.0	316°20.6	N01°18.8
13	153°54.3	331°00.1	01.7	327°13.8	31.2	150°40.8	13.1	331°22.9	18.7
14	168°56.7	346°00.3	02.9	342°14.8	31.9	165°43.4	13.1	346°25.1	18.6
15	183°59.2	1°00.5	·· 04.2	357°15.9	·· 32.5	180°46.0	·· 13.2	1°27.3	·· 18.5
16	199°01.6	16°00.8	05.4	12°16.9	33.2	195°48.6	13.3	16°29.6	18.4
17	214°04.1	31°01.0	06.6	27°18.0	33.8	210°51.2	13.4	31°31.8	18.3
18	229°06.6	46°01.2	S02°07.8	42°19.0	S02°34.5	225°53.8	S00°13.4	46°34.0	N01°18.2
19	244°09.0	61°01.4	09.1	57°20.0	35.1	240°56.4	13.5	61°36.3	18.1
20	259°11.5	76°01.7	10.3	72°21.1	35.8	255°59.0	13.6	76°38.5	18.0
21	274°14.0	91°01.9	·· 11.5	87°22.1	·· 36.4	271°01.6	·· 13.6	91°40.7	·· 17.9
22	289°16.4	106°02.1	12.7	102°23.2	37.0	286°04.2	13.7	106°43.0	17.8
23	304°18.9	121°02.3	14.0	117°24.2	37.7	301°06.7	13.8	121°45.2	17.6
Mer.pass.:02:46		v0.2 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.0
Ankaa	353°17.3	-42°14.5
Schedar	349°42.7	56°35.7
Diphda	348°57.7	-17°55.4
Achernar	335°27.9	-57°10.6
Hamal	328°03.0	23°30.8
Polaris	318°45.9	89°18.4
Acamar	315°19.8	-40°15.4
Menkar	314°17.2	4°08.0
Mirfak	308°43.4	49°53.8
Aldebaran	290°51.9	16°31.9
Rigel	281°14.2	-8°11.2
Capella	280°37.7	46°00.4
Bellatrix	278°34.4	6°21.6
Elnath	278°15.4	28°36.9
Alnilam	275°48.6	-1°11.6
Betelgeuse	271°03.7	7°24.6
Canopus	263°57.5	-52°41.9
Sirius	258°35.8	-16°43.7
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.6	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.6
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.3	-63°09.8
Gacrux	172°03.7	-57°10.6
Alioth	166°22.6	55°54.3
Spica	158°33.6	-11°13.1
Alkaid	153°00.5	49°15.8
Hadar	148°51.1	-60°25.8
Menkent	148°10.1	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.7	-60°53.0
Kochab	137°19.7	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.6	26°40.9
Antares	112°28.6	-26°27.4
Atria	107°32.1	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.8
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.7	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°41.9
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.6
Al Na'ir	27°45.7	-46°54.3
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.1	28°08.5
Markab	13°40.1	15°15.9

Aug 08 Sun	**SHA**	**Mer.pass**
Venus	179°23.4	14:57
Mars	174°46.1	15:14
Jupiter	356°39.2	03:07
Saturn	177°42.3	15:01

Aug 09 Mon	**SHA**	**Mer.pass**
Venus	178°29.1	14:56
Mars	174°12.1	15:13
Jupiter	356°42.0	03:03
Saturn	177°37.0	14:58

Aug 10 Tue	**SHA**	**Mer.pass**
Venus	177°35.0	14:56
Mars	173°38.0	15:11
Jupiter	356°44.9	02:59
Saturn	177°31.6	14:54

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0498 sec ΔT = TT-UT1 = +66.2338 sec

2010 August 08 to Aug. 10 UT

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°34.2	N16°13.7	209°29.1	4.8'	N22°09.7	-7.5'	60.1'
1	193°34.3	13.0	223°52.9	4.8'	22°02.1	-7.7'	60.1'
2	208°34.3	12.2	238°16.8	4.9'	21°54.4	-7.8'	60.2'
3	223°34.4	· · 11.5	252°40.6	4.9'	21°46.5	-8.0'	60.2'
4	238°34.5	10.8	267°04.6	4.9'	21°38.4	-8.1'	60.2'
5	253°34.6	10.1	281°28.5	5.0'	21°30.2	-8.3'	60.3'
6	268°34.7	N16°09.4	295°52.5	5.0'	N21°21.8	-8.4'	60.3'
7	283°34.7	08.7	310°16.5	5.0'	21°13.3	-8.6'	60.3'
8	298°34.8	08.0	324°40.5	5.1'	21°04.6	-8.8'	60.4'
9	313°34.9	· · 07.3	339°04.6	5.1'	20°55.8	-8.9'	60.4'
10	328°35.0	06.6	353°28.7	5.1'	20°46.8	-9.1'	60.4'
11	343°35.1	05.9	7°52.9	5.2'	20°37.7	-9.2'	60.4'
12	358°35.2	N16°05.1	22°17.1	5.2'	N20°28.4	-9.4'	60.5'
13	13°35.2	04.4	36°41.3	5.3'	20°19.0	-9.5'	60.5'
14	28°35.3	03.7	51°05.6	5.3'	20°09.4	-9.6'	60.5'
15	43°35.4	· · 03.0	65°30.0	5.3'	19°59.7	-9.8'	60.6'
16	58°35.5	02.3	79°54.3	5.4'	19°49.8	-9.9'	60.6'
17	73°35.6	01.6	94°18.7	5.4'	19°39.8	-10.1'	60.6'
18	88°35.6	N16°00.9	108°43.2	5.5'	N19°29.7	-10.2'	60.6'
19	103°35.7	16°00.2	123°07.7	5.5'	19°19.4	-10.4'	60.7'
20	118°35.8	15°59.4	137°32.2	5.6'	19°08.9	-10.5'	60.7'
21	133°35.9	· · 58.7	151°56.8	5.6'	18°58.4	-10.6'	60.7'
22	148°36.0	58.0	166°21.5	5.7'	18°47.7	-10.8'	60.7'
23	163°36.1	57.3	180°46.2	5.7'	18°36.8	-10.9'	60.8'
	SD.=15.8	d=-0.7	S.D.=16.5				

Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°36.2	N15°56.6	195°10.9	5.8'	N18°25.9	-11.0'	60.8'
1	193°36.2	55.9	209°35.7	5.8'	18°14.7	-11.2'	60.8'
2	208°36.3	55.1	224°00.6	5.9'	18°03.5	-11.3'	60.8'
3	223°36.4	· · 54.4	238°25.5	5.9'	17°52.1	-11.4'	60.8'
4	238°36.5	53.7	252°50.5	6.0'	17°40.6	-11.6'	60.9'
5	253°36.6	53.0	267°15.5	6.0'	17°29.0	-11.7'	60.9'
6	268°36.7	N15°52.3	281°40.5	6.1'	N17°17.3	-11.8'	60.9'
7	283°36.7	51.5	296°05.7	6.1'	17°05.4	-11.9'	60.9'
8	298°36.8	50.8	310°30.8	6.2'	16°53.4	-12.1'	60.9'
9	313°36.9	· · 50.1	324°56.1	6.3'	16°41.3	-12.2'	61.0'
10	328°37.0	49.4	339°21.4	6.3'	16°29.1	-12.3'	61.0'
11	343°37.1	48.7	353°46.7	6.4'	16°16.7	-12.4'	61.0'
12	358°37.2	N15°47.9	8°12.1	6.4'	N16°04.3	-12.5'	61.0'
13	13°37.3	47.2	22°37.6	6.5'	15°51.7	-12.6'	61.0'
14	28°37.4	46.5	37°03.1	6.5'	15°39.0	-12.7'	61.0'
15	43°37.4	· · 45.8	51°28.7	6.6'	15°26.2	-12.8'	61.1'
16	58°37.5	45.0	65°54.3	6.7'	15°13.3	-13.0'	61.1'
17	73°37.6	44.3	80°20.0	6.7'	15°00.3	-13.1'	61.1'
18	88°37.7	N15°43.6	94°45.7	6.8'	N14°47.2	-13.2'	61.1'
19	103°37.8	42.9	109°11.5	6.8'	14°34.0	-13.3'	61.1'
20	118°37.9	42.1	123°37.4	6.9'	14°20.7	-13.4'	61.1'
21	133°38.0	· · 41.4	138°03.3	6.9'	14°07.3	-13.5'	61.1'
22	148°38.1	40.7	152°29.3	7.0'	13°53.8	-13.6'	61.2'
23	163°38.2	40.0	166°55.3	7.1'	13°40.2	-13.7'	61.2'
	SD.=15.8	d=-0.7	S.D.=16.6				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°38.3	N15°39.2	181°21.4	7.1'	N13°26.5	-13.7'	61.2'
1	193°38.3	38.5	195°47.5	7.2'	13°12.7	-13.8'	61.2'
2	208°38.4	37.8	210°13.7	7.2'	12°58.8	-13.9'	61.2'
3	223°38.5	· · 37.0	224°40.0	7.3'	12°44.8	-14.0'	61.2'
4	238°38.6	36.3	239°06.3	7.3'	12°30.8	-14.1'	61.2'
5	253°38.7	35.6	253°32.7	7.4'	12°16.7	-14.2'	61.2'
6	268°38.8	N15°34.8	267°59.1	7.5'	N12°02.4	-14.3'	61.2'
7	283°38.9	34.1	282°25.6	7.5'	11°48.1	-14.3'	61.2'
8	298°39.0	33.4	296°52.1	7.6'	11°33.8	-14.4'	61.2'
9	313°39.1	· · 32.7	311°18.7	7.6'	11°19.3	-14.5'	61.2'
10	328°39.2	31.9	325°45.4	7.7'	11°04.8	-14.6'	61.2'
11	343°39.3	31.2	340°12.1	7.7'	10°50.2	-14.6'	61.2'
12	358°39.4	N15°30.5	354°38.8	7.8'	N10°35.5	-14.7'	61.3'
13	13°39.5	29.7	9°05.7	7.8'	10°20.8	-14.8'	61.3'
14	28°39.5	29.0	23°32.5	7.9'	10°06.0	-14.8'	61.3'
15	43°39.6	· · 28.3	37°59.4	7.9'	09°51.1	-14.9'	61.3'
16	58°39.7	27.5	52°26.4	8.0'	09°36.2	-15.0'	61.3'
17	73°39.8	26.8	66°53.4	8.0'	09°21.2	-15.0'	61.3'
18	88°39.9	N15°26.1	81°20.5	8.1'	N09°06.2	-15.1'	61.3'
19	103°40.0	25.3	95°47.6	8.1'	08°51.1	-15.1'	61.3'
20	118°40.1	24.6	110°14.8	8.2'	08°35.9	-15.2'	61.3'
21	133°40.2	· · 23.8	124°42.0	8.2'	08°20.7	-15.2'	61.3'
22	148°40.3	23.1	139°09.3	8.3'	08°05.5	-15.3'	61.3'
23	163°40.4	22.4	153°36.6	8.3'	07°50.2	-15.3'	61.3'
	SD.=15.8	d=-0.7	S.D.=16.7				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 28-0 4-0%
08	05:43	05:39	12:06	10:27	22:57	●
09	05:35	05:31	12:06	11:26	23:54	
10	05:27	05:23	12:05	12:22	–:–	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	319°21.4	136°02.6	S02°15.2	132°25.2	S02°38.3	316°09.3	S00°13.8	136°47.5	N01°17.5
1	334°23.8	151°02.8	16.4	147°26.3	39.0	331°11.9	13.9	151°49.7	17.4
2	349°26.3	166°03.0	17.7	162°27.3	39.6	346°14.5	14.0	166°51.9	17.3
3	4°28.8	181°03.3	·· 18.9	177°28.4	·· 40.3	1°17.1	·· 14.0	181°54.2	·· 17.2
4	19°31.2	196°03.5	20.1	192°29.4	40.9	16°19.7	14.1	196°56.4	17.1
5	34°33.7	211°03.7	21.3	207°30.4	41.6	31°22.3	14.2	211°58.6	17.0
6	49°36.1	226°04.0	S02°22.6	222°31.5	S02°42.2	46°24.9	S00°14.3	227°00.9	N01°16.9
7	64°38.6	241°04.2	23.8	237°32.5	42.9	61°27.5	14.3	242°03.1	16.8
8	79°41.1	256°04.4	25.0	252°33.6	43.5	76°30.1	14.4	257°05.3	16.7
9	94°43.5	271°04.7	·· 26.2	267°34.6	·· 44.2	91°32.7	·· 14.5	272°07.6	·· 16.6
10	109°46.0	286°04.9	27.5	282°35.6	44.8	106°35.3	14.5	287°09.8	16.5
11	124°48.5	301°05.1	28.7	297°36.7	45.5	121°37.9	14.6	302°12.0	16.4
12	139°50.9	316°05.4	S02°29.9	312°37.7	S02°46.1	136°40.5	S00°14.7	317°14.3	N01°16.3
13	154°53.4	331°05.6	31.1	327°38.7	46.7	151°43.1	14.8	332°16.5	16.2
14	169°55.9	346°05.8	32.4	342°39.8	47.4	166°45.7	14.8	347°18.7	16.1
15	184°58.3	1°06.1	·· 33.6	357°40.8	·· 48.0	181°48.3	·· 14.9	2°21.0	·· 16.0
16	200°00.8	16°06.3	34.8	12°41.9	48.7	196°50.9	15.0	17°23.2	15.9
17	215°03.2	31°06.6	36.1	27°42.9	49.3	211°53.5	15.0	32°25.4	15.8
18	230°05.7	46°06.8	S02°37.3	42°43.9	S02°50.0	226°56.1	S00°15.1	47°27.7	N01°15.7
19	245°08.2	61°07.0	38.5	57°45.0	50.6	241°58.7	15.2	62°29.9	15.6
20	260°10.6	76°07.3	39.7	72°46.0	51.3	257°01.3	15.3	77°32.2	15.4
21	275°13.1	91°07.5	·· 41.0	87°47.0	·· 51.9	272°03.9	·· 15.3	92°34.4	·· 15.3
22	290°15.6	106°07.7	42.2	102°48.1	52.6	287°06.5	15.4	107°36.6	15.2
23	305°18.0	121°08.0	43.4	117°49.1	53.2	302°09.1	15.5	122°38.9	15.1
Mer.pass.:02:42		v0.2 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	320°20.5	136°08.2	S02°44.6	132°50.2	S02°53.9	317°11.7	S00°15.5	137°41.1	N01°15.0
1	335°23.0	151°08.5	45.8	147°51.2	54.5	332°14.4	15.6	152°43.3	14.9
2	350°25.4	166°08.7	47.1	162°52.2	55.2	347°17.0	15.7	167°45.6	14.8
3	5°27.9	181°09.0	·· 48.3	177°53.3	·· 55.8	2°19.6	·· 15.8	182°47.8	·· 14.7
4	20°30.4	196°09.2	49.5	192°54.3	56.4	17°22.2	15.8	197°50.0	14.6
5	35°32.8	211°09.4	50.7	207°55.3	57.1	32°24.8	15.9	212°52.3	14.5
6	50°35.3	226°09.7	S02°52.0	222°56.4	S02°57.7	47°27.4	S00°16.0	227°54.5	N01°14.4
7	65°37.7	241°09.9	53.2	237°57.4	58.4	62°30.0	16.1	242°56.7	14.3
8	80°40.2	256°10.2	54.4	252°58.4	59.0	77°32.6	16.1	257°59.0	14.2
9	95°42.7	271°10.4	·· 55.6	267°59.5	02°59.7	92°35.2	·· 16.2	273°01.2	·· 14.1
10	110°45.1	286°10.7	56.9	283°00.5	03°00.3	107°37.8	16.3	288°03.4	14.0
11	125°47.6	301°10.9	58.1	298°01.5	01.0	122°40.4	16.3	303°05.7	13.9
12	140°50.1	316°11.2	S02°59.3	313°02.6	S03°01.6	137°43.0	S00°16.4	318°07.9	N01°13.8
13	155°52.5	331°11.4	03°00.5	328°03.6	02.3	152°45.6	16.5	333°10.1	13.7
14	170°55.0	346°11.7	01.8	343°04.6	02.9	167°48.2	16.6	348°12.3	13.6
15	185°57.5	1°11.9	·· 03.0	358°05.7	·· 03.6	182°50.8	·· 16.6	3°14.6	·· 13.4
16	200°59.9	16°12.2	04.2	13°06.7	04.2	197°53.4	16.7	18°16.8	13.3
17	216°02.4	31°12.4	05.4	28°07.7	04.9	212°56.0	16.8	33°19.0	13.2
18	231°04.9	46°12.7	S03°06.6	43°08.8	S03°05.5	227°58.7	S00°16.9	48°21.3	N01°13.1
19	246°07.3	61°12.9	07.9	58°09.8	06.2	243°01.3	16.9	63°23.5	13.0
20	261°09.8	76°13.2	09.1	73°10.8	06.8	258°03.9	17.0	78°25.7	12.9
21	276°12.2	91°13.4	·· 10.3	88°11.9	·· 07.4	273°06.5	·· 17.1	93°28.0	·· 12.8
22	291°14.7	106°13.7	11.5	103°12.9	08.1	288°09.1	17.2	108°30.2	12.7
23	306°17.2	121°13.9	12.7	118°13.9	08.7	303°11.7	17.2	123°32.4	12.6
Mer.pass.:02:38		v0.2 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	321°19.6	136°14.2	S03°14.0	133°15.0	S03°09.4	318°14.3	S00°17.3	138°34.7	N01°12.5
1	336°22.1	151°14.4	15.2	148°16.0	10.0	333°16.9	17.4	153°36.9	12.4
2	351°24.6	166°14.7	16.4	163°17.0	10.7	348°19.5	17.5	168°39.1	12.3
3	6°27.0	181°14.9	·· 17.6	178°18.1	·· 11.3	3°22.1	·· 17.5	183°41.4	·· 12.2
4	21°29.5	196°15.2	18.9	193°19.1	12.0	18°24.8	17.6	198°43.6	12.1
5	36°32.0	211°15.5	20.1	208°20.1	12.6	33°27.4	17.7	213°45.8	12.0
6	51°34.4	226°15.7	S03°21.3	223°21.2	S03°13.3	48°30.0	S00°17.8	228°48.1	N01°11.9
7	66°36.9	241°16.0	22.5	238°22.2	13.9	63°32.6	17.8	243°50.3	11.8
8	81°39.3	256°16.2	23.7	253°23.2	14.6	78°35.2	17.9	258°52.5	11.6
9	96°41.8	271°16.5	·· 25.0	268°24.3	·· 15.2	93°37.8	·· 18.0	273°54.7	·· 11.5
10	111°44.3	286°16.7	26.2	283°25.3	15.9	108°40.4	18.1	288°57.0	11.4
11	126°46.7	301°17.0	27.4	298°26.3	16.5	123°43.0	18.1	303°59.2	11.3
12	141°49.2	316°17.3	S03°28.6	313°27.3	S03°17.2	138°45.7	S00°18.2	319°01.4	N01°11.2
13	156°51.7	331°17.5	29.8	328°28.4	17.8	153°48.3	18.3	334°03.7	11.1
14	171°54.1	346°17.8	31.0	343°29.4	18.4	168°50.9	18.4	349°05.9	11.0
15	186°56.6	1°18.0	·· 32.3	358°30.4	·· 19.1	183°53.5	·· 18.5	4°08.1	·· 10.9
16	201°59.1	16°18.3	33.5	13°31.5	19.7	198°56.1	18.5	19°10.4	10.8
17	217°01.5	31°18.6	34.7	28°32.5	20.4	213°58.7	18.6	34°12.6	10.7
18	232°04.0	46°18.8	S03°35.9	43°33.5	S03°21.0	229°01.4	S00°18.7	49°14.8	N01°10.6
19	247°06.5	61°19.1	37.1	58°34.6	21.7	244°04.0	18.8	64°17.1	10.5
20	262°08.9	76°19.4	38.4	73°35.6	22.3	259°06.6	18.8	79°19.3	10.4
21	277°11.4	91°19.6	·· 39.6	88°36.6	·· 23.0	274°09.2	·· 18.9	94°21.5	·· 10.3
22	292°13.8	106°19.9	40.8	103°37.6	23.6	289°11.8	19.0	109°23.7	10.2
23	307°16.3	121°20.1	42.0	118°38.7	24.3	304°14.4	19.1	124°26.0	10.1
Mer.pass.:02:34		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.0
Ankaa	353°17.3	-42°14.5
Schedar	349°42.6	56°35.7
Diphda	348°57.7	-17°55.4
Achernar	335°27.9	-57°10.6
Hamal	328°03.0	23°30.8
Polaris	318°44.7	89°18.4
Acamar	315°19.8	-40°15.4
Menkar	314°17.2	4°08.0
Mirfak	308°43.4	49°53.8
Aldebaran	290°51.9	16°31.9
Rigel	281°14.2	-8°11.2
Capella	280°37.7	46°00.4
Bellatrix	278°34.4	6°21.6
Elnath	278°15.4	28°36.9
Alnilam	275°48.6	-1°11.6
Betelgeuse	271°03.7	7°24.6
Canopus	263°57.5	-52°41.9
Sirius	258°35.8	-16°43.7
Adhara	255°14.5	-28°59.1
Procyon	245°02.2	5°11.9
Pollux	243°30.5	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.5
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.3	-63°09.8
Gacrux	172°03.7	-57°10.6
Alioth	166°22.6	55°54.3
Spica	158°33.6	-11°13.1
Alkaid	153°00.6	49°15.8
Hadar	148°51.1	-60°25.8
Menkent	148°10.2	-36°25.5
Arcturus	145°57.6	19°07.7
Rigil Kent.	139°54.7	-60°53.0
Kochab	137°19.8	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.7	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.1	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.4	-37°06.8
Rasalhague	96°08.1	12°33.3
Eltanin	90°46.7	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.8
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.6
Al Na'ir	27°45.7	-46°54.3
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.1	28°08.6
Markab	13°40.1	15°15.9

Aug 11 Wed	**SHA**	**Mer.pass**
Venus	176°41.2	14:56
Mars	173°03.9	15:09
Jupiter	356°48.0	02:55
Saturn	177°26.1	14:51

Aug 12 Thu	**SHA**	**Mer.pass**
Venus	175°47.7	14:55
Mars	172°29.7	15:08
Jupiter	356°51.2	02:51
Saturn	177°20.6	14:47

Aug 13 Fri	**SHA**	**Mer.pass**
Venus	174°54.5	14:55
Mars	171°55.3	15:06
Jupiter	356°54.7	02:47
Saturn	177°15.0	14:43

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0500 sec ΔT = TT-UT1 = +66.2340 sec

2010 August 11 to Aug. 13 UT

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°40.5	N15°21.6	168°04.0	8.4'	N07°34.8	-15.4'	61.3'
1	193°40.6	20.9	182°31.4	8.4'	07°19.4	-15.4'	61.2'
2	208°40.7	20.2	196°58.8	8.5'	07°04.0	-15.5'	61.2'
3	223°40.8	· · 19.4	211°26.3	8.5'	06°48.5	-15.5'	61.2'
4	238°40.9	18.7	225°53.9	8.6'	06°33.0	-15.5'	61.2'
5	253°41.0	17.9	240°21.5	8.6'	06°17.4	-15.6'	61.2'
6	268°41.1	N15°17.2	254°49.1	8.7'	N06°01.8	-15.6'	61.2'
7	283°41.2	16.4	269°16.8	8.7'	05°46.2	-15.6'	61.2'
8	298°41.3	15.7	283°44.5	8.7'	05°30.6	-15.7'	61.2'
9	313°41.4	· · 15.0	298°12.2	8.8'	05°14.9	-15.7'	61.2'
10	328°41.5	14.2	312°40.0	8.8'	04°59.2	-15.7'	61.2'
11	343°41.6	13.5	327°07.9	8.9'	04°43.4	-15.7'	61.2'
12	358°41.7	N15°12.7	341°35.7	8.9'	N04°27.7	-15.8'	61.2'
13	13°41.8	12.0	356°03.7	8.9'	04°11.9	-15.8'	61.2'
14	28°41.9	11.2	10°31.6	9.0'	03°56.1	-15.8'	61.1'
15	43°42.0	· · 10.5	24°59.6	9.0'	03°40.3	-15.8'	61.1'
16	58°42.1	09.8	39°27.6	9.0'	03°24.5	-15.8'	61.1'
17	73°42.2	09.0	53°55.7	9.1'	03°08.6	-15.8'	61.1'
18	88°42.3	N15°08.3	68°23.7	9.1'	N02°52.8	-15.9'	61.1'
19	103°42.4	07.5	82°51.9	9.1'	02°36.9	-15.9'	61.1'
20	118°42.5	06.8	97°20.0	9.2'	02°21.0	-15.9'	61.1'
21	133°42.6	· · 06.0	111°48.2	9.2'	02°05.2	-15.9'	61.1'
22	148°42.7	05.3	126°16.4	9.2'	01°49.3	-15.9'	61.0'
23	163°42.8	04.5	140°44.6	9.3'	01°33.4	-15.9'	61.0'
	SD.=15.8	d=-0.7	S.D.=16.7				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°42.9	N15°03.8	155°12.9	9.3'	N01°17.5	-15.9'	61.0'
1	193°43.0	03.0	169°41.2	9.3'	01°01.7	-15.9'	61.0'
2	208°43.1	02.3	184°09.5	9.3'	00°45.8	-15.9'	61.0'
3	223°43.2	· · 01.5	198°37.9	9.4'	00°29.9	-15.9'	61.0'
4	238°43.3	00.8	213°06.2	9.4'	N00°14.1	-15.9'	60.9'
5	253°43.4	15°00.0	227°34.6	9.4'	S00°01.8	-15.8'	60.9'
6	268°43.5	N14°59.3	242°03.0	9.4'	S00°17.6	-15.8'	60.9'
7	283°43.6	58.5	256°31.5	9.4'	00°33.5	-15.8'	60.9'
8	298°43.7	57.8	270°59.9	9.5'	00°49.3	-15.8'	60.9'
9	313°43.8	· · 57.0	285°28.4	9.5'	01°05.1	-15.8'	60.8'
10	328°43.9	56.3	299°56.9	9.5'	01°20.9	-15.8'	60.8'
11	343°44.0	55.5	314°25.4	9.5'	01°36.6	-15.7'	60.8'
12	358°44.1	N14°54.8	328°53.9	9.5'	S01°52.4	-15.7'	60.8'
13	13°44.3	54.0	343°22.5	9.6'	02°08.1	-15.7'	60.8'
14	28°44.4	53.3	357°51.0	9.6'	02°23.8	-15.7'	60.7'
15	43°44.5	· · 52.5	12°19.6	9.6'	02°39.4	-15.6'	60.7'
16	58°44.6	51.8	26°48.2	9.6'	02°55.1	-15.6'	60.7'
17	73°44.7	51.0	41°16.8	9.6'	03°10.7	-15.6'	60.7'
18	88°44.8	N14°50.2	55°45.4	9.6'	S03°26.2	-15.6'	60.6'
19	103°44.9	49.5	70°14.0	9.6'	03°41.8	-15.5'	60.6'
20	118°45.0	48.7	84°42.7	9.6'	03°57.3	-15.5'	60.6'
21	133°45.1	· · 48.0	99°11.3	9.6'	04°12.8	-15.4'	60.6'
22	148°45.2	47.2	113°40.0	9.7'	04°28.2	-15.4'	60.5'
23	163°45.3	46.5	128°08.6	9.7'	04°43.6	-15.4'	60.5'
	SD.=15.8	d=-0.7	S.D.=16.6				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°45.4	N14°45.7	142°37.3	9.7'	S04°58.9	-15.3'	60.5'
1	193°45.5	44.9	157°06.0	9.7'	05°14.2	-15.3'	60.5'
2	208°45.6	44.2	171°34.6	9.7'	05°29.5	-15.2'	60.4'
3	223°45.8	· · 43.4	186°03.3	9.7'	05°44.7	-15.2'	60.4'
4	238°45.9	42.7	200°32.0	9.7'	05°59.9	-15.1'	60.4'
5	253°46.0	41.9	215°00.7	9.7'	06°15.0	-15.1'	60.4'
6	268°46.1	N14°41.1	229°29.3	9.7'	S06°30.0	-15.0'	60.3'
7	283°46.2	40.4	243°58.0	9.7'	06°45.0	-15.0'	60.3'
8	298°46.3	39.6	258°26.7	9.7'	07°00.0	-14.9'	60.3'
9	313°46.4	· · 38.9	272°55.4	9.7'	07°14.9	-14.9'	60.2'
10	328°46.5	38.1	287°24.1	9.7'	07°29.7	-14.8'	60.2'
11	343°46.6	37.3	301°52.7	9.7'	07°44.5	-14.8'	60.2'
12	358°46.8	N14°36.6	316°21.4	9.7'	S07°59.3	-14.7'	60.2'
13	13°46.9	35.8	330°50.1	9.7'	08°13.9	-14.6'	60.1'
14	28°47.0	35.0	345°18.7	9.7'	08°28.5	-14.6'	60.1'
15	43°47.1	· · 34.3	359°47.4	9.7'	08°43.1	-14.5'	60.1'
16	58°47.2	33.5	14°16.1	9.6'	08°57.5	-14.4'	60.0'
17	73°47.3	32.8	28°44.7	9.6'	09°11.9	-14.4'	60.0'
18	88°47.4	N14°32.0	43°13.3	9.6'	S09°26.3	-14.3'	60.0'
19	103°47.5	31.2	57°42.0	9.6'	09°40.5	-14.2'	59.9'
20	118°47.7	30.5	72°10.6	9.6'	09°54.7	-14.2'	59.9'
21	133°47.8	· · 29.7	86°39.2	9.6'	10°08.8	-14.1'	59.9'
22	148°47.9	28.9	101°07.8	9.6'	10°22.9	-14.0'	59.8'
23	163°48.0	28.2	115°36.4	9.6'	10°36.8	-13.9'	59.8'
	SD.=15.8	d=-0.8	S.D.=16.4				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 1-3 3-16%
11	05:18	05:13	12:05	13:16	00:50	
12	05:08	05:03	12:05	14:09	01:43	
13	04:58	04:53	12:05	15:01	02:35	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	322°18.8	136°20.4	S03°43.2	133°39.7	S03°24.9	319°17.1	S00°19.2	139°28.2	N01°09.9
1	337°21.2	151°20.7	44.4	148°40.7	25.6	334°19.7	19.2	154°30.4	09.8
2	352°23.7	166°20.9	45.7	163°41.8	26.2	349°22.3	19.3	169°32.7	09.7
3	7°26.2	181°21.2	·· 46.9	178°42.8	·· 26.9	4°24.9	·· 19.4	184°34.9	·· 09.6
4	22°28.6	196°21.5	48.1	193°43.8	27.5	19°27.5	19.5	199°37.1	09.5
5	37°31.1	211°21.8	49.3	208°44.8	28.2	34°30.1	19.5	214°39.3	09.4
6	52°33.6	226°22.0	S03°50.5	223°45.9	S03°28.8	49°32.8	S00°19.6	229°41.6	N01°09.3
7	67°36.0	241°22.3	51.7	238°46.9	29.5	64°35.4	19.7	244°43.8	09.2
8	82°38.5	256°22.6	53.0	253°47.9	30.1	79°38.0	19.8	259°46.0	09.1
9	97°40.9	271°22.8	·· 54.2	268°48.9	·· 30.7	94°40.6	·· 19.9	274°48.3	·· 09.0
10	112°43.4	286°23.1	55.4	283°50.0	31.4	109°43.2	19.9	289°50.5	08.9
11	127°45.9	301°23.4	56.6	298°51.0	32.0	124°45.9	20.0	304°52.7	08.8
12	142°48.3	316°23.6	S03°57.8	313°52.0	S03°32.7	139°48.5	S00°20.1	319°55.0	N01°08.7
13	157°50.8	331°23.9	03°59.0	328°53.1	33.3	154°51.1	20.2	334°57.2	08.6
14	172°53.3	346°24.2	04°00.3	343°54.1	34.0	169°53.7	20.3	349°59.4	08.4
15	187°55.7	1°24.5	·· 01.5	358°55.1	·· 34.6	184°56.3	·· 20.3	5°01.6	·· 08.3
16	202°58.2	16°24.7	02.7	13°56.1	35.3	199°59.0	20.4	20°03.9	08.2
17	218°00.7	31°25.0	03.9	28°57.2	35.9	215°01.6	20.5	35°06.1	08.1
18	233°03.1	46°25.3	S04°05.1	43°58.2	S03°36.6	230°04.2	S00°20.6	50°08.3	N01°08.0
19	248°05.6	61°25.6	06.3	58°59.2	37.2	245°06.8	20.7	65°10.6	07.9
20	263°08.1	76°25.8	07.5	74°00.2	37.9	260°09.5	20.7	80°12.8	07.8
21	278°10.5	91°26.1	·· 08.8	89°01.3	·· 38.5	275°12.1	·· 20.8	95°15.0	·· 07.7
22	293°13.0	106°26.4	10.0	104°02.3	39.2	290°14.7	20.9	110°17.2	07.6
23	308°15.4	121°26.7	11.2	119°03.3	39.8	305°17.3	21.0	125°19.5	07.5
Mer.pass.:02:30		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	323°17.9	136°27.0	S04°12.4	134°04.3	S03°40.5	320°19.9	S00°21.1	140°21.7	N01°07.4
1	338°20.4	151°27.2	13.6	149°05.4	41.1	335°22.6	21.1	155°23.9	07.3
2	353°22.8	166°27.5	14.8	164°06.4	41.8	350°25.2	21.2	170°26.1	07.2
3	8°25.3	181°27.8	·· 16.0	179°07.4	·· 42.4	5°27.8	·· 21.3	185°28.4	·· 07.1
4	23°27.8	196°28.1	17.2	194°08.4	43.1	20°30.4	21.4	200°30.6	06.9
5	38°30.2	211°28.4	18.5	209°09.5	43.7	35°33.1	21.5	215°32.8	06.8
6	53°32.7	226°28.6	S04°19.7	224°10.5	S03°44.3	50°35.7	S00°21.5	230°35.1	N01°06.7
7	68°35.2	241°28.9	20.9	239°11.5	45.0	65°38.3	21.6	245°37.3	06.6
8	83°37.6	256°29.2	22.1	254°12.5	45.6	80°41.0	21.7	260°39.5	06.5
9	98°40.1	271°29.5	·· 23.3	269°13.6	·· 46.3	95°43.6	·· 21.8	275°41.7	·· 06.4
10	113°42.6	286°29.8	24.5	284°14.6	46.9	110°46.2	21.9	290°44.0	06.3
11	128°45.0	301°30.1	25.7	299°15.6	47.6	125°48.8	22.0	305°46.2	06.2
12	143°47.5	316°30.3	S04°26.9	314°16.6	S03°48.2	140°51.5	S00°22.0	320°48.4	N01°06.1
13	158°49.9	331°30.6	28.1	329°17.6	48.9	155°54.1	22.1	335°50.6	06.0
14	173°52.4	346°30.9	29.4	344°18.7	49.5	170°56.7	22.2	350°52.9	05.9
15	188°54.9	1°31.2	·· 30.6	359°19.7	·· 50.2	185°59.3	·· 22.3	5°55.1	·· 05.8
16	203°57.3	16°31.5	31.8	14°20.7	50.8	201°02.0	22.4	20°57.3	05.7
17	218°59.8	31°31.8	33.0	29°21.7	51.5	216°04.6	22.5	35°59.5	05.5
18	234°02.3	46°32.1	S04°34.2	44°22.8	S03°52.1	231°07.2	S00°22.5	51°01.8	N01°05.4
19	249°04.7	61°32.4	35.4	59°23.8	52.8	246°09.9	22.6	66°04.0	05.3
20	264°07.2	76°32.6	36.6	74°24.8	53.4	261°12.5	22.7	81°06.2	05.2
21	279°09.7	91°32.9	·· 37.8	89°25.8	·· 54.1	276°15.1	·· 22.8	96°08.5	·· 05.1
22	294°12.1	106°33.2	39.0	104°26.8	54.7	291°17.7	22.9	111°10.7	05.0
23	309°14.6	121°33.5	40.2	119°27.9	55.4	306°20.4	22.9	126°12.9	04.9
Mer.pass.:02:26		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	324°17.0	136°33.8	S04°41.4	134°28.9	S03°56.0	321°23.0	S00°23.0	141°15.1	N01°04.8
1	339°19.5	151°34.1	42.7	149°29.9	56.6	336°25.6	23.1	156°17.4	04.7
2	354°22.0	166°34.4	43.9	164°30.9	57.3	351°28.3	23.2	171°19.6	04.6
3	9°24.4	181°34.7	·· 45.1	179°31.9	·· 57.9	6°30.9	·· 23.3	186°21.8	·· 04.5
4	24°26.9	196°35.0	46.3	194°33.0	58.6	21°33.5	23.4	201°24.0	04.4
5	39°29.4	211°35.3	47.5	209°34.0	59.2	36°36.2	23.5	216°26.3	04.2
6	54°31.8	226°35.6	S04°48.7	224°35.0	S03°59.9	51°38.8	S00°23.5	231°28.5	N01°04.1
7	69°34.3	241°35.9	49.9	239°36.0	04°00.5	66°41.4	23.6	246°30.7	04.0
8	84°36.8	256°36.2	51.1	254°37.0	01.2	81°44.1	23.7	261°32.9	03.9
9	99°39.2	271°36.5	·· 52.3	269°38.1	·· 01.8	96°46.7	·· 23.8	276°35.2	·· 03.8
10	114°41.7	286°36.7	53.5	284°39.1	02.5	111°49.3	23.9	291°37.4	03.7
11	129°44.2	301°37.0	54.7	299°40.1	03.1	126°52.0	24.0	306°39.6	03.6
12	144°46.6	316°37.3	S04°55.9	314°41.1	S04°03.8	141°54.6	S00°24.0	321°41.8	N01°03.5
13	159°49.1	331°37.6	57.1	329°42.1	04.4	156°57.2	24.1	336°44.1	03.4
14	174°51.5	346°37.9	58.3	344°43.2	05.1	171°59.9	24.2	351°46.3	03.3
15	189°54.0	1°38.2	04°59.5	359°44.2	·· 05.7	187°02.5	·· 24.3	6°48.5	·· 03.2
16	204°56.5	16°38.5	05°00.8	14°45.2	06.4	202°05.1	24.4	21°50.7	03.1
17	219°58.9	31°38.8	02.0	29°46.2	07.0	217°07.8	24.5	36°53.0	02.9
18	235°01.4	46°39.1	S05°03.2	44°47.2	S04°07.7	232°10.4	S00°24.6	51°55.2	N01°02.8
19	250°03.9	61°39.4	04.4	59°48.2	08.3	247°13.0	24.6	66°57.4	02.7
20	265°06.3	76°39.7	05.6	74°49.3	09.0	262°15.7	24.7	81°59.6	02.6
21	280°08.8	91°40.1	·· 06.8	89°50.3	·· 09.6	277°18.3	·· 24.8	97°01.9	·· 02.5
22	295°11.3	106°40.4	08.0	104°51.3	10.2	292°21.0	24.9	112°04.1	02.4
23	310°13.7	121°40.7	09.2	119°52.3	10.9	307°23.6	25.0	127°06.3	02.3
Mer.pass.:02:22		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.1
Ankaa	353°17.3	-42°14.5
Schedar	349°42.6	56°35.7
Diphda	348°57.7	-17°55.4
Achernar	335°27.9	-57°10.6
Hamal	328°03.0	23°30.8
Polaris	318°43.2	89°18.4
Acamar	315°19.8	-40°15.4
Menkar	314°17.2	4°08.0
Mirfak	308°43.3	49°53.8
Aldebaran	290°51.8	16°31.9
Rigel	281°14.2	-8°11.2
Capella	280°37.7	46°00.4
Bellatrix	278°34.4	6°21.6
Elnath	278°15.4	28°36.9
Alnilam	275°48.6	-1°11.6
Betelgeuse	271°03.7	7°24.6
Canopus	263°57.4	-52°41.8
Sirius	258°35.8	-16°43.7
Adhara	255°14.4	-28°59.0
Procyon	245°02.1	5°11.9
Pollux	243°30.5	28°00.0
Avior	234°19.6	-59°32.6
Suhail	222°54.5	-43°28.5
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.3	-63°09.7
Gacrux	172°03.7	-57°10.6
Alioth	166°22.7	55°54.3
Spica	158°33.6	-11°13.1
Alkaid	153°00.6	49°15.8
Hadar	148°51.2	-60°25.8
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.7	-60°53.0
Kochab	137°19.8	74°07.0
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.7	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.2	-69°03.0
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.8	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.9
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.6
Al Na'ir	27°45.7	-46°54.3
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.1	28°08.6
Markab	13°40.1	15°15.9

Aug 14 Sat	**SHA**	**Mer.pass**
Venus	174°01.6	14:54
Mars	171°20.9	15:04
Jupiter	356°58.3	02:42
Saturn	177°09.4	14:40

Aug 15 Sun	**SHA**	**Mer.pass**
Venus	173°09.0	14:54
Mars	170°46.4	15:03
Jupiter	357°02.0	02:38
Saturn	177°03.8	14:36

Aug 16 Mon	**SHA**	**Mer.pass**
Venus	172°16.8	14:53
Mars	170°11.8	15:01
Jupiter	357°06.0	02:34
Saturn	176°58.1	14:33

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.1	N14°27.4	130°04.9	9.6'	S10°50.7	-13.9'	59.8'
1	193°48.2	26.6	144°33.5	9.6'	11°04.6	-13.8'	59.7'
2	208°48.3	25.9	159°02.0	9.5'	11°18.3	-13.7'	59.7'
3	223°48.5	·· 25.1	173°30.6	9.5'	11°31.9	-13.6'	59.7'
4	238°48.6	24.3	187°59.1	9.5'	11°45.5	-13.5'	59.6'
5	253°48.7	23.5	202°27.6	9.5'	11°59.0	-13.4'	59.6'
6	268°48.8	N14°22.8	216°56.1	9.5'	S12°12.4	-13.4'	59.6'
7	283°48.9	22.0	231°24.5	9.5'	12°25.7	-13.3'	59.5'
8	298°49.0	21.2	245°53.0	9.4'	12°39.0	-13.2'	59.5'
9	313°49.1	·· 20.5	260°21.4	9.4'	12°52.1	-13.1'	59.5'
10	328°49.3	19.7	274°49.9	9.4'	13°05.1	-13.0'	59.4'
11	343°49.4	18.9	289°18.3	9.4'	13°18.1	-12.9'	59.4'
12	358°49.5	N14°18.1	303°46.6	9.4'	S13°31.0	-12.8'	59.4'
13	13°49.6	17.4	318°15.0	9.4'	13°43.8	-12.7'	59.3'
14	28°49.7	16.6	332°43.4	9.3'	13°56.4	-12.6'	59.3'
15	43°49.9	·· 15.8	347°11.7	9.3'	14°09.0	-12.5'	59.3'
16	58°50.0	15.1	1°40.0	9.3'	14°21.5	-12.4'	59.2'
17	73°50.1	14.3	16°08.3	9.3'	14°33.9	-12.3'	59.2'
18	88°50.2	N14°13.5	30°36.5	9.3'	S14°46.2	-12.2'	59.2'
19	103°50.3	12.7	45°04.8	9.2'	14°58.4	-12.1'	59.1'
20	118°50.4	12.0	59°33.0	9.2'	15°10.5	-12.0'	59.1'
21	133°50.6	·· 11.2	74°01.2	9.2'	15°22.5	-11.9'	59.0'
22	148°50.7	10.4	88°29.4	9.2'	15°34.4	-11.8'	59.0'
23	163°50.8	09.6	102°57.5	9.1'	15°46.2	-11.7'	59.0'
	SD.=15.8	d=-0.8			S.D.=16.2		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.9	N14°08.8	117°25.7	9.1'	S15°57.9	-11.6'	58.9'
1	193°51.0	08.1	131°53.8	9.1'	16°09.5	-11.5'	58.9'
2	208°51.2	07.3	146°21.9	9.1'	16°20.9	-11.4'	58.9'
3	223°51.3	·· 06.5	160°49.9	9.1'	16°32.3	-11.3'	58.8'
4	238°51.4	05.7	175°18.0	9.0'	16°43.6	-11.2'	58.8'
5	253°51.5	05.0	189°46.0	9.0'	16°54.7	-11.1'	58.8'
6	268°51.7	N14°04.2	204°14.0	9.0'	S17°05.7	-11.0'	58.7'
7	283°51.8	03.4	218°42.0	9.0'	17°16.7	-10.9'	58.7'
8	298°51.9	02.6	233°09.9	8.9'	17°27.5	-10.8'	58.6'
9	313°52.0	·· 01.8	247°37.8	8.9'	17°38.2	-10.6'	58.6'
10	328°52.1	01.1	262°05.7	8.9'	17°48.8	-10.5'	58.6'
11	343°52.3	14°00.3	276°33.6	8.9'	17°59.2	-10.4'	58.5'
12	358°52.4	N13°59.5	291°01.5	8.8'	S18°09.6	-10.3'	58.5'
13	13°52.5	58.7	305°29.3	8.8'	18°19.8	-10.2'	58.5'
14	28°52.6	57.9	319°57.1	8.8'	18°29.9	-10.1'	58.4'
15	43°52.8	·· 57.1	334°24.9	8.8'	18°39.9	-9.9'	58.4'
16	58°52.9	56.4	348°52.7	8.7'	18°49.8	-9.8'	58.4'
17	73°53.0	55.6	3°20.4	8.7'	18°59.6	-9.7'	58.3'
18	88°53.1	N13°54.8	17°48.1	8.7'	S19°09.2	-9.6'	58.3'
19	103°53.3	54.0	32°15.8	8.7'	19°18.7	-9.5'	58.2'
20	118°53.4	53.2	46°43.5	8.7'	19°28.1	-9.3'	58.2'
21	133°53.5	·· 52.4	61°11.1	8.6'	19°37.4	-9.2'	58.2'
22	148°53.6	51.7	75°38.7	8.6'	19°46.6	-9.1'	58.1'
23	163°53.8	50.9	90°06.4	8.6'	19°55.6	-9.0'	58.1'
	SD.=15.8	d=-0.8			S.D.=15.9		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.9	N13°50.1	104°33.9	8.6'	S20°04.5	-8.8'	58.1'
1	193°54.0	49.3	119°01.5	8.6'	20°13.3	-8.7'	58.0'
2	208°54.1	48.5	133°29.0	8.5'	20°21.9	-8.6'	58.0'
3	223°54.3	·· 47.7	147°56.6	8.5'	20°30.5	-8.5'	58.0'
4	238°54.4	46.9	162°24.1	8.5'	20°38.9	-8.3'	57.9'
5	253°54.5	46.1	176°51.5	8.5'	20°47.1	-8.2'	57.9'
6	268°54.6	N13°45.4	191°19.0	8.5'	S20°55.3	-8.1'	57.8'
7	283°54.8	44.6	205°46.4	8.4'	21°03.3	-7.9'	57.8'
8	298°54.9	43.8	220°13.9	8.4'	21°11.2	-7.8'	57.8'
9	313°55.0	·· 43.0	234°41.3	8.4'	21°18.9	-7.7'	57.7'
10	328°55.2	42.2	249°08.6	8.4'	21°26.6	-7.6'	57.7'
11	343°55.3	41.4	263°36.0	8.4'	21°34.0	-7.4'	57.7'
12	358°55.4	N13°40.6	278°03.4	8.3'	S21°41.4	-7.3'	57.6'
13	13°55.5	39.8	292°30.7	8.3'	21°48.6	-7.2'	57.6'
14	28°55.7	39.0	306°58.0	8.3'	21°55.7	-7.0'	57.6'
15	43°55.8	·· 38.2	321°25.3	8.3'	22°02.7	-6.9'	57.5'
16	58°55.9	37.4	335°52.6	8.3'	22°09.5	-6.8'	57.5'
17	73°56.1	36.7	350°19.9	8.3'	22°16.2	-6.6'	57.5'
18	88°56.2	N13°35.9	4°47.2	8.3'	S22°22.8	-6.5'	57.4'
19	103°56.3	35.1	19°14.4	8.2'	22°29.2	-6.4'	57.4'
20	118°56.4	34.3	33°41.7	8.2'	22°35.5	-6.2'	57.4'
21	133°56.6	·· 33.5	48°08.9	8.2'	22°41.6	-6.1'	57.3'
22	148°56.7	32.7	62°36.1	8.2'	22°47.7	-6.0'	57.3'
23	163°56.8	31.9	77°03.3	8.2'	22°53.5	-5.8'	57.3'
	SD.=15.8	d=-0.8			S.D.=15.7		

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 26-47%
14	04:48	04:42	12:05	15:53	03:27	
15	04:36	04:30	12:05	16:46	04:19	
16	04:24	04:18	12:04	17:40	05:13	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	325°16.2	136°41.0	S05°10.4	134°53.3	S04°11.5	322°26.2	S00°25.1	142°08.5	N01°02.2
1	340°18.7	151°41.3	11.6	149°54.4	12.2	337°28.9	25.2	157°10.8	02.1
2	355°21.1	166°41.6	12.8	164°55.4	12.8	352°31.5	25.2	172°13.0	02.0
3	10°23.6	181°41.9	·· 14.0	179°56.4	·· 13.5	7°34.1	·· 25.3	187°15.2	·· 01.9
4	25°26.0	196°42.2	15.2	194°57.4	14.1	22°36.8	25.4	202°17.4	01.8
5	40°28.5	211°42.5	16.4	209°58.4	14.8	37°39.4	25.5	217°19.6	01.6
6	55°31.0	226°42.8	S05°17.6	224°59.4	S04°15.4	52°42.1	S00°25.6	232°21.9	N01°01.5
7	70°33.4	241°43.1	18.8	240°00.5	16.1	67°44.7	25.7	247°24.1	01.4
8	85°35.9	256°43.4	20.0	255°01.5	16.7	82°47.3	25.8	262°26.3	01.3
9	100°38.4	271°43.7	·· 21.2	270°02.5	·· 17.4	97°50.0	·· 25.9	277°28.5	·· 01.2
10	115°40.8	286°44.0	22.4	285°03.5	18.0	112°52.6	25.9	292°30.8	01.1
11	130°43.3	301°44.4	23.6	300°04.5	18.7	127°55.3	26.0	307°33.0	01.0
12	145°45.8	316°44.7	S05°24.8	315°05.5	S04°19.3	142°57.9	S00°26.1	322°35.2	N01°00.9
13	160°48.2	331°45.0	26.0	330°06.5	20.0	158°00.5	26.2	337°37.4	00.8
14	175°50.7	346°45.3	27.2	345°07.6	20.6	173°03.2	26.3	352°39.7	00.7
15	190°53.1	1°45.6	·· 28.4	0°08.6	·· 21.3	188°05.8	·· 26.4	7°41.9	·· 00.6
16	205°55.6	16°45.9	29.6	15°09.6	21.9	203°08.5	26.5	22°44.1	00.4
17	220°58.1	31°46.2	30.8	30°10.6	22.6	218°11.1	26.6	37°46.3	00.3
18	236°00.5	46°46.5	S05°32.0	45°11.6	S04°23.2	233°13.7	S00°26.6	52°48.5	N01°00.2
19	251°03.0	61°46.9	33.2	60°12.6	23.8	248°16.4	26.7	67°50.8	00.1
20	266°05.5	76°47.2	34.4	75°13.6	24.5	263°19.0	26.8	82°53.0	01°00.0
21	281°07.9	91°47.5	·· 35.6	90°14.7	·· 25.1	278°21.7	·· 26.9	97°55.2	00°59.9
22	296°10.4	106°47.8	36.8	105°15.7	25.8	293°24.3	27.0	112°57.4	59.8
23	311°12.9	121°48.1	38.0	120°16.7	26.4	308°27.0	27.1	127°59.7	59.7
Mer.pass.:02:19		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	326°15.3	136°48.4	S05°39.2	135°17.7	S04°27.1	323°29.6	S00°27.2	143°01.9	N00°59.6
1	341°17.8	151°48.8	40.4	150°18.7	27.7	338°32.2	27.3	158°04.1	59.5
2	356°20.3	166°49.1	41.6	165°19.7	28.4	353°34.9	27.3	173°06.3	59.4
3	11°22.7	181°49.4	·· 42.8	180°20.7	·· 29.0	8°37.5	·· 27.4	188°08.5	·· 59.2
4	26°25.2	196°49.7	44.0	195°21.8	29.7	23°40.2	27.5	203°10.8	59.1
5	41°27.6	211°50.0	45.2	210°22.8	30.3	38°42.8	27.6	218°13.0	59.0
6	56°30.1	226°50.4	S05°46.4	225°23.8	S04°31.0	53°45.5	S00°27.7	233°15.2	N00°58.9
7	71°32.6	241°50.7	47.6	240°24.8	31.6	68°48.1	27.8	248°17.4	58.8
8	86°35.0	256°51.0	48.8	255°25.8	32.3	83°50.8	27.9	263°19.7	58.7
9	101°37.5	271°51.3	·· 50.0	270°26.8	·· 32.9	98°53.4	·· 28.0	278°21.9	·· 58.6
10	116°40.0	286°51.7	51.2	285°27.8	33.6	113°56.1	28.1	293°24.1	58.5
11	131°42.4	301°52.0	52.4	300°28.8	34.2	128°58.7	28.2	308°26.3	58.4
12	146°44.9	316°52.3	S05°53.5	315°29.8	S04°34.9	144°01.3	S00°28.2	323°28.5	N00°58.3
13	161°47.4	331°52.6	54.7	330°30.9	35.5	159°04.0	28.3	338°30.8	58.1
14	176°49.8	346°53.0	55.9	345°31.9	36.1	174°06.6	28.4	353°33.0	58.0
15	191°52.3	1°53.3	·· 57.1	0°32.9	·· 36.8	189°09.3	·· 28.5	8°35.2	·· 57.9
16	206°54.8	16°53.6	58.3	15°33.9	37.4	204°11.9	28.6	23°37.4	57.8
17	221°57.2	31°53.9	05°59.5	30°34.9	38.1	219°14.6	28.7	38°39.6	57.7
18	236°59.7	46°54.3	S06°00.7	45°35.9	S04°38.7	234°17.2	S00°28.8	53°41.9	N00°57.6
19	252°02.1	61°54.6	01.9	60°36.9	39.4	249°19.9	28.9	68°44.1	57.5
20	267°04.6	76°54.9	03.1	75°37.9	40.0	264°22.5	29.0	83°46.3	57.4
21	282°07.1	91°55.3	·· 04.3	90°38.9	·· 40.7	279°25.2	·· 29.1	98°48.5	·· 57.3
22	297°09.5	106°55.6	05.5	105°40.0	41.3	294°27.8	29.1	113°50.7	57.2
23	312°12.0	121°55.9	06.7	120°41.0	42.0	309°30.5	29.2	128°53.0	57.0
Mer.pass.:02:15		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.6 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	327°14.5	136°56.2	S06°07.9	135°42.0	S04°42.6	324°33.1	S00°29.3	143°55.2	N00°56.9
1	342°16.9	151°56.6	09.1	150°43.0	43.3	339°35.8	29.4	158°57.4	56.8
2	357°19.4	166°56.9	10.2	165°44.0	43.9	354°38.4	29.5	173°59.6	56.7
3	12°21.9	181°57.2	·· 11.4	180°45.0	·· 44.6	9°41.1	·· 29.6	189°01.8	·· 56.6
4	27°24.3	196°57.6	12.6	195°46.0	45.2	24°43.7	29.7	204°04.1	56.5
5	42°26.8	211°57.9	13.8	210°47.0	45.9	39°46.4	29.8	219°06.3	56.4
6	57°29.3	226°58.2	S06°15.0	225°48.0	S04°46.5	54°49.0	S00°29.9	234°08.5	N00°56.3
7	72°31.7	241°58.6	16.2	240°49.0	47.2	69°51.7	30.0	249°10.7	56.2
8	87°34.2	256°58.9	17.4	255°50.0	47.8	84°54.3	30.1	264°12.9	56.1
9	102°36.6	271°59.3	·· 18.6	270°51.0	·· 48.4	99°57.0	·· 30.2	279°15.2	·· 55.9
10	117°39.1	286°59.6	19.8	285°52.1	49.1	114°59.6	30.3	294°17.4	55.8
11	132°41.6	301°59.9	21.0	300°53.1	49.7	130°02.3	30.3	309°19.6	55.7
12	147°44.0	317°00.3	S06°22.1	315°54.1	S04°50.4	145°04.9	S00°30.4	324°21.8	N00°55.6
13	162°46.5	332°00.6	23.3	330°55.1	51.0	160°07.6	30.5	339°24.0	55.5
14	177°49.0	347°00.9	24.5	345°56.1	51.7	175°10.3	30.6	354°26.3	55.4
15	192°51.4	2°01.3	·· 25.7	0°57.1	·· 52.3	190°12.9	·· 30.7	9°28.5	·· 55.3
16	207°53.9	17°01.6	26.9	15°58.1	53.0	205°15.6	30.8	24°30.7	55.2
17	222°56.4	32°02.0	28.1	30°59.1	53.6	220°18.2	30.9	39°32.9	55.1
18	237°58.8	47°02.3	S06°29.3	46°00.1	S04°54.3	235°20.9	S00°31.0	54°35.1	N00°55.0
19	253°01.3	62°02.7	30.5	61°01.1	54.9	250°23.5	31.1	69°37.4	54.8
20	268°03.8	77°03.0	31.6	76°02.1	55.6	265°26.2	31.2	84°39.6	54.7
21	283°06.2	92°03.3	·· 32.8	91°03.1	·· 56.2	280°28.8	·· 31.3	99°41.8	·· 54.6
22	298°08.7	107°03.7	34.0	106°04.1	56.9	295°31.5	31.4	114°44.0	54.5
23	313°11.1	122°04.0	35.2	121°05.1	57.5	310°34.1	31.5	129°46.2	54.4
Mer.pass.:02:11		v0.3 d-1.2 m-4.2		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.1
Ankaa	353°17.3	-42°14.5
Schedar	349°42.6	56°35.7
Diphda	348°57.7	-17°55.4
Achernar	335°27.8	-57°10.6
Hamal	328°03.0	23°30.8
Polaris	318°41.5	89°18.4
Acamar	315°19.7	-40°15.4
Menkar	314°17.1	4°08.0
Mirfak	308°43.3	49°53.8
Aldebaran	290°51.8	16°31.9
Rigel	281°14.1	-8°11.2
Capella	280°37.7	46°00.4
Bellatrix	278°34.3	6°21.6
Elnath	278°15.4	28°36.9
Alnilam	275°48.6	-1°11.6
Betelgeuse	271°03.7	7°24.6
Canopus	263°57.4	-52°41.8
Sirius	258°35.7	-16°43.7
Adhara	255°14.4	-28°59.0
Procyon	245°02.1	5°11.9
Pollux	243°30.5	28°00.0
Avior	234°19.5	-59°32.5
Suhail	222°54.4	-43°28.5
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.7
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.3	-63°09.7
Gacrux	172°03.7	-57°10.6
Alioth	166°22.7	55°54.3
Spica	158°33.6	-11°13.1
Alkaid	153°00.6	49°15.8
Hadar	148°51.2	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.8	-60°53.0
Kochab	137°19.9	74°06.9
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.7	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.2	-69°03.1
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.8	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.0	38°47.9
Nunki	76°00.5	-26°16.9
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.6
Al Na'ir	27°45.7	-46°54.3
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.1	28°08.6
Markab	13°40.1	15°15.9

Aug 17 Tue	**SHA**	**Mer.pass**
Venus	171°24.8	14:53
Mars	169°37.1	14:59
Jupiter	357°10.0	02:30
Saturn	176°52.3	14:29

Aug 18 Wed	**SHA**	**Mer.pass**
Venus	170°33.1	14:52
Mars	169°02.4	14:58
Jupiter	357°14.3	02:26
Saturn	176°46.6	14:26

Aug 19 Thu	**SHA**	**Mer.pass**
Venus	169°41.8	14:52
Mars	168°27.5	14:56
Jupiter	357°18.7	02:21
Saturn	176°40.7	14:22

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	178°57.0	N13°31.1	91°30.5	8.2'	S22°59.3	-5.7'	57.2'
1	193°57.1	30.3	105°57.7	8.2'	23°04.9	-5.5'	57.2'
2	208°57.2	29.5	120°24.9	8.2'	23°10.4	-5.4'	57.1'
3	223°57.4	·· 28.7	134°52.1	8.2'	23°15.7	-5.3'	57.1'
4	238°57.5	27.9	149°19.3	8.2'	23°20.9	-5.1'	57.1'
5	253°57.6	27.1	163°46.5	8.2'	23°26.0	-5.0'	57.0'
6	268°57.8	N13°26.3	178°13.6	8.2'	S23°30.9	-4.9'	57.0'
7	283°57.9	25.5	192°40.8	8.2'	23°35.7	-4.7'	57.0'
8	298°58.0	24.7	207°08.0	8.2'	23°40.3	-4.6'	56.9'
9	313°58.2	·· 23.9	221°35.1	8.2'	23°44.8	-4.4'	56.9'
10	328°58.3	23.1	236°02.3	8.2'	23°49.2	-4.3'	56.9'
11	343°58.4	22.3	250°29.5	8.2'	23°53.4	-4.2'	56.9'
12	358°58.6	N13°21.5	264°56.6	8.2'	S23°57.5	-4.0'	56.8'
13	13°58.7	20.7	279°23.8	8.2'	24°01.5	-3.9'	56.8'
14	28°58.8	19.9	293°51.0	8.2'	24°05.3	-3.7'	56.8'
15	43°59.0	·· 19.1	308°18.1	8.2'	24°08.9	-3.6'	56.7'
16	58°59.1	18.3	322°45.3	8.2'	24°12.5	-3.5'	56.7'
17	73°59.2	17.5	337°12.5	8.2'	24°15.9	-3.3'	56.7'
18	88°59.4	N13°16.7	351°39.7	8.2'	S24°19.1	-3.2'	56.6'
19	103°59.5	15.9	6°06.9	8.2'	24°22.2	-3.0'	56.6'
20	118°59.7	15.1	20°34.1	8.2'	24°25.2	-2.9'	56.6'
21	133°59.8	·· 14.3	35°01.3	8.2'	24°28.1	-2.8'	56.5'
22	148°59.9	13.5	49°28.6	8.2'	24°30.8	-2.6'	56.5'
23	164°00.1	12.7	63°55.8	8.3'	24°33.3	-2.5'	56.5'
	SD.=15.8	d=-0.8	S.D.=15.5				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°00.2	N13°11.9	78°23.1	8.3'	S24°35.7	-2.4'	56.4'
1	194°00.3	11.1	92°50.3	8.3'	24°38.0	-2.2'	56.4'
2	209°00.5	10.3	107°17.6	8.3'	24°40.2	-2.1'	56.4'
3	224°00.6	·· 09.5	121°44.9	8.3'	24°42.2	-1.9'	56.4'
4	239°00.7	08.7	136°12.3	8.3'	24°44.1	-1.8'	56.3'
5	254°00.9	07.9	150°39.6	8.3'	24°45.8	-1.7'	56.3'
6	269°01.0	N13°07.1	165°07.0	8.4'	S24°47.4	-1.5'	56.3'
7	284°01.2	06.3	179°34.3	8.4'	24°48.8	-1.4'	56.2'
8	299°01.3	05.5	194°01.7	8.4'	24°50.1	-1.2'	56.2'
9	314°01.4	·· 04.6	208°29.2	8.4'	24°51.3	-1.1'	56.2'
10	329°01.6	03.8	222°56.6	8.5'	24°52.4	-1.0'	56.2'
11	344°01.7	03.0	237°24.1	8.5'	24°53.3	-0.8'	56.1'
12	359°01.9	N13°02.2	251°51.6	8.5'	S24°54.0	-0.7'	56.1'
13	14°02.0	01.4	266°19.1	8.5'	24°54.7	-0.6'	56.1'
14	29°02.1	13°00.6	280°46.6	8.6'	24°55.2	-0.4'	56.0'
15	44°02.3	12°59.8	295°14.2	8.6'	24°55.5	-0.3'	56.0'
16	59°02.4	59.0	309°41.8	8.6'	24°55.8	-0.2'	56.0'
17	74°02.6	58.2	324°09.5	8.7'	24°55.8	-0.0'	56.0'
18	89°02.7	N12°57.4	338°37.1	8.7'	S24°55.8	0.1'	55.9'
19	104°02.8	56.6	353°04.8	8.7'	24°55.6	0.2'	55.9'
20	119°03.0	55.7	7°32.6	8.8'	24°55.3	0.4'	55.9'
21	134°03.1	·· 54.9	22°00.4	8.8'	24°54.9	0.5'	55.9'
22	149°03.3	54.1	36°28.2	8.8'	24°54.3	0.6'	55.8'
23	164°03.4	53.3	50°56.0	8.9'	24°53.6	0.8'	55.8'
	SD.=15.8	d=-0.8	S.D.=15.3				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°03.6	N12°52.5	65°23.9	8.9'	S24°52.7	0.9'	55.8'
1	194°03.7	51.7	79°51.8	8.9'	24°51.8	1.0'	55.7'
2	209°03.8	50.9	94°19.8	9.0'	24°50.7	1.2'	55.7'
3	224°04.0	·· 50.1	108°47.8	9.0'	24°49.4	1.3'	55.7'
4	239°04.1	49.2	123°15.8	9.1'	24°48.0	1.4'	55.7'
5	254°04.3	48.4	137°43.9	9.1'	24°46.6	1.6'	55.6'
6	269°04.4	N12°47.6	152°12.0	9.1'	S24°44.9	1.7'	55.6'
7	284°04.6	46.8	166°40.2	9.2'	24°43.2	1.8'	55.6'
8	299°04.7	46.0	181°08.4	9.2'	24°41.3	1.9'	55.6'
9	314°04.8	·· 45.2	195°36.6	9.3'	24°39.3	2.1'	55.5'
10	329°05.0	44.4	210°04.9	9.3'	24°37.1	2.2'	55.5'
11	344°05.1	43.5	224°33.3	9.4'	24°34.9	2.3'	55.5'
12	359°05.3	N12°42.7	239°01.7	9.4'	S24°32.5	2.5'	55.5'
13	14°05.4	41.9	253°30.1	9.5'	24°30.0	2.6'	55.5'
14	29°05.6	41.1	267°58.6	9.5'	24°27.3	2.7'	55.4'
15	44°05.7	·· 40.3	282°27.2	9.6'	24°24.6	2.8'	55.4'
16	59°05.9	39.4	296°55.7	9.6'	24°21.7	2.9'	55.4'
17	74°06.0	38.6	311°24.4	9.7'	24°18.7	3.1'	55.4'
18	89°06.2	N12°37.8	325°53.1	9.7'	S24°15.5	3.2'	55.3'
19	104°06.3	37.0	340°21.8	9.8'	24°12.3	3.3'	55.3'
20	119°06.4	36.2	354°50.6	9.8'	24°08.9	3.4'	55.3'
21	134°06.6	·· 35.4	9°19.5	9.9'	24°05.4	3.6'	55.3'
22	149°06.7	34.5	23°48.4	9.9'	24°01.8	3.7'	55.3'
23	164°06.9	33.7	38°17.4	10.0'	23°58.1	3.8'	55.2'
	SD.=15.8	d=-0.8	S.D.=15.1				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 7-9 58-77%
17	04:12	04:06	12:04	18:35	06:07	
18	03:59	03:53	12:04	19:29	07:02	
19	03:46	03:39	12:04	20:21	07:55	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	328°13.6	137°04.4	S06°36.4	136°06.1	S04°58.2	325°36.8	S00°31.6	144°48.5	N00°54.3
1	343°16.1	152°04.7	37.6	151°07.1	58.8	340°39.5	31.6	159°50.7	54.2
2	358°18.5	167°05.1	38.7	166°08.2	04°59.4	355°42.1	31.7	174°52.9	54.1
3	13°21.0	182°05.4	·· 39.9	181°09.2	05°00.1	10°44.8	·· 31.8	189°55.1	·· 54.0
4	28°23.5	197°05.8	41.1	196°10.2	00.7	25°47.4	31.9	204°57.3	53.8
5	43°25.9	212°06.1	42.3	211°11.2	01.4	40°50.1	32.0	219°59.5	53.7
6	58°28.4	227°06.5	S06°43.5	226°12.2	S05°02.0	55°52.7	S00°32.1	235°01.8	N00°53.6
7	73°30.9	242°06.8	44.7	241°13.2	02.7	70°55.4	32.2	250°04.0	53.5
8	88°33.3	257°07.2	45.9	256°14.2	03.3	85°58.1	32.3	265°06.2	53.4
9	103°35.8	272°07.5	·· 47.0	271°15.2	·· 04.0	101°00.7	·· 32.4	280°08.4	·· 53.3
10	118°38.2	287°07.9	48.2	286°16.2	04.6	116°03.4	32.5	295°10.6	53.2
11	133°40.7	302°08.2	49.4	301°17.2	05.3	131°06.0	32.6	310°12.9	53.1
12	148°43.2	317°08.6	S06°50.6	316°18.2	S05°05.9	146°08.7	S00°32.7	325°15.1	N00°53.0
13	163°45.6	332°08.9	51.8	331°19.2	06.6	161°11.4	32.8	340°17.3	52.8
14	178°48.1	347°09.3	52.9	346°20.2	07.2	176°14.0	32.9	355°19.5	52.7
15	193°50.6	2°09.6	·· 54.1	1°21.2	·· 07.9	191°16.7	·· 33.0	10°21.7	·· 52.6
16	208°53.0	17°10.0	55.3	16°22.2	08.5	206°19.3	33.1	25°23.9	52.5
17	223°55.5	32°10.3	56.5	31°23.2	09.2	221°22.0	33.2	40°26.2	52.4
18	238°58.0	47°10.7	S06°57.7	46°24.2	S05°09.8	236°24.7	S00°33.3	55°28.4	N00°52.3
19	254°00.4	62°11.1	06°58.8	61°25.2	10.4	251°27.3	33.4	70°30.6	52.2
20	269°02.9	77°11.4	07°00.0	76°26.2	11.1	266°30.0	33.5	85°32.8	52.1
21	284°05.4	92°11.8	·· 01.2	91°27.2	·· 11.7	281°32.6	·· 33.5	100°35.0	·· 52.0
22	299°07.8	107°12.1	02.4	106°28.2	12.4	296°35.3	33.6	115°37.2	51.8
23	314°10.3	122°12.5	03.6	121°29.2	13.0	311°38.0	33.7	130°39.5	51.7
Mer.pass.:02:07		v0.3 d-1.2 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	329°12.7	137°12.9	S07°04.7	136°30.2	S05°13.7	326°40.6	S00°33.8	145°41.7	N00°51.6
1	344°15.2	152°13.2	05.9	151°31.2	14.3	341°43.3	33.9	160°43.9	51.5
2	359°17.7	167°13.6	07.1	166°32.2	15.0	356°46.0	34.0	175°46.1	51.4
3	14°20.1	182°13.9	·· 08.3	181°33.2	·· 15.6	11°48.6	·· 34.1	190°48.3	·· 51.3
4	29°22.6	197°14.3	09.4	196°34.2	16.3	26°51.3	34.2	205°50.5	51.2
5	44°25.1	212°14.7	10.6	211°35.2	16.9	41°53.9	34.3	220°52.8	51.1
6	59°27.5	227°15.0	S07°11.8	226°36.2	S05°17.6	56°56.6	S00°34.4	235°55.0	N00°51.0
7	74°30.0	242°15.4	13.0	241°37.2	18.2	71°59.3	34.5	250°57.2	50.8
8	89°32.5	257°15.8	14.2	256°38.2	18.9	87°01.9	34.6	265°59.4	50.7
9	104°34.9	272°16.1	·· 15.3	271°39.2	·· 19.5	102°04.6	·· 34.7	281°01.6	·· 50.6
10	119°37.4	287°16.5	16.5	286°40.2	20.1	117°07.3	34.8	296°03.8	50.5
11	134°39.9	302°16.9	17.7	301°41.2	20.8	132°09.9	34.9	311°06.1	50.4
12	149°42.3	317°17.2	S07°18.9	316°42.2	S05°21.4	147°12.6	S00°35.0	326°08.3	N00°50.3
13	164°44.8	332°17.6	20.0	331°43.2	22.1	162°15.3	35.1	341°10.5	50.2
14	179°47.2	347°18.0	21.2	346°44.2	22.7	177°17.9	35.2	356°12.7	50.1
15	194°49.7	2°18.3	·· 22.4	1°45.2	·· 23.4	192°20.6	·· 35.3	11°14.9	·· 50.0
16	209°52.2	17°18.7	23.6	16°46.2	24.0	207°23.3	35.4	26°17.1	49.8
17	224°54.6	32°19.1	24.7	31°47.2	24.7	222°25.9	35.5	41°19.4	49.7
18	239°57.1	47°19.4	S07°25.9	46°48.2	S05°25.3	237°28.6	S00°35.6	56°21.6	N00°49.6
19	254°59.6	62°19.8	27.1	61°49.2	26.0	252°31.3	35.7	71°23.8	49.5
20	270°02.0	77°20.2	28.2	76°50.2	26.6	267°33.9	35.8	86°26.0	49.4
21	285°04.5	92°20.6	·· 29.4	91°51.2	·· 27.3	282°36.6	·· 35.9	101°28.2	·· 49.3
22	300°07.0	107°20.9	30.6	106°52.2	27.9	297°39.3	36.0	116°30.4	49.2
23	315°09.4	122°21.3	31.8	121°53.2	28.5	312°41.9	36.1	131°32.7	49.1
Mer.pass.:02:03		v0.4 d-1.2 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	330°11.9	137°21.7	S07°32.9	136°54.2	S05°29.2	327°44.6	S00°36.2	146°34.9	N00°48.9
1	345°14.4	152°22.0	34.1	151°55.2	29.8	342°47.3	36.3	161°37.1	48.8
2	0°16.8	167°22.4	35.3	166°56.2	30.5	357°49.9	36.4	176°39.3	48.7
3	15°19.3	182°22.8	·· 36.4	181°57.2	·· 31.1	12°52.6	·· 36.5	191°41.5	·· 48.6
4	30°21.7	197°23.2	37.6	196°58.2	31.8	27°55.3	36.6	206°43.7	48.5
5	45°24.2	212°23.6	38.8	211°59.2	32.4	42°58.0	36.7	221°45.9	48.4
6	60°26.7	227°23.9	S07°39.9	227°00.2	S05°33.1	58°00.6	S00°36.8	236°48.2	N00°48.3
7	75°29.1	242°24.3	41.1	242°01.2	33.7	73°03.3	36.9	251°50.4	48.2
8	90°31.6	257°24.7	42.3	257°02.2	34.4	88°06.0	37.0	266°52.6	48.1
9	105°34.1	272°25.1	·· 43.5	272°03.2	·· 35.0	103°08.6	·· 37.1	281°54.8	·· 47.9
10	120°36.5	287°25.5	44.6	287°04.2	35.7	118°11.3	37.2	296°57.0	47.8
11	135°39.0	302°25.8	45.8	302°05.2	36.3	133°14.0	37.3	311°59.2	47.7
12	150°41.5	317°26.2	S07°47.0	317°06.2	S05°36.9	148°16.6	S00°37.4	327°01.4	N00°47.6
13	165°43.9	332°26.6	48.1	332°07.2	37.6	163°19.3	37.5	342°03.7	47.5
14	180°46.4	347°27.0	49.3	347°08.1	38.2	178°22.0	37.6	357°05.9	47.4
15	195°48.8	2°27.4	·· 50.5	2°09.1	·· 38.9	193°24.7	·· 37.7	12°08.1	·· 47.3
16	210°51.3	17°27.7	51.6	17°10.1	39.5	208°27.3	37.8	27°10.3	47.2
17	225°53.8	32°28.1	52.8	32°11.1	40.2	223°30.0	37.9	42°12.5	47.0
18	240°56.2	47°28.5	S07°53.9	47°12.1	S05°40.8	238°32.7	S00°38.0	57°14.7	N00°46.9
19	255°58.7	62°28.9	55.1	62°13.1	41.5	253°35.4	38.1	72°16.9	46.8
20	271°01.2	77°29.3	56.3	77°14.1	42.1	268°38.0	38.2	87°19.2	46.7
21	286°03.6	92°29.7	·· 57.4	92°15.1	·· 42.8	283°40.7	·· 38.3	102°21.4	·· 46.6
22	301°06.1	107°30.1	58.6	107°16.1	43.4	298°43.4	38.4	117°23.6	46.5
23	316°08.6	122°30.5	59.8	122°17.1	44.1	313°46.0	38.5	132°25.8	46.4
Mer.pass.:01:59		v0.4 d-1.2 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.1
Ankaa	353°17.3	-42°14.5
Schedar	349°42.6	56°35.7
Diphda	348°57.6	-17°55.4
Achernar	335°27.8	-57°10.6
Hamal	328°02.9	23°30.8
Polaris	318°40.1	89°18.4
Acamar	315°19.7	-40°15.4
Menkar	314°17.1	4°08.1
Mirfak	308°43.3	49°53.8
Aldebaran	290°51.8	16°31.9
Rigel	281°14.1	-8°11.2
Capella	280°37.6	46°00.4
Bellatrix	278°34.3	6°21.6
Elnath	278°15.3	28°36.9
Alnilam	275°48.6	-1°11.6
Betelgeuse	271°03.7	7°24.6
Canopus	263°57.4	-52°41.8
Sirius	258°35.7	-16°43.7
Adhara	255°14.4	-28°59.0
Procyon	245°02.1	5°11.9
Pollux	243°30.5	28°00.0
Avior	234°19.5	-59°32.5
Suhail	222°54.4	-43°28.5
Miaplacidus	221°41.2	-69°45.7
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.3	-63°09.7
Gacrux	172°03.8	-57°10.6
Alioth	166°22.7	55°54.3
Spica	158°33.6	-11°13.1
Alkaid	153°00.6	49°15.8
Hadar	148°51.2	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.8	-60°53.0
Kochab	137°20.0	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.2	-69°03.1
Sabik	102°14.7	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.8	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.1	38°47.9
Nunki	76°00.5	-26°17.0
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.6
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.6
Markab	13°40.1	15°16.0

Aug 20 Fri	**SHA**	**Mer.pass**
Venus	168°50.8	14:51
Mars	167°52.5	14:55
Jupiter	357°23.2	02:17
Saturn	176°34.8	14:19

Aug 21 Sat	**SHA**	**Mer.pass**
Venus	168°00.1	14:51
Mars	167°17.5	14:53
Jupiter	357°27.9	02:13
Saturn	176°28.9	14:15

Aug 22 Sun	**SHA**	**Mer.pass**
Venus	167°09.8	14:50
Mars	166°42.3	14:51
Jupiter	357°32.7	02:09
Saturn	176°23.0	14:12

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0504 sec ΔT = TT-UT1 = +66.2344 sec

2010 August 20 to Aug. 22 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°07.0	N12°32.9	52°46.4	10.1'	S23°54.2	3.9'	55.2'
1	194°07.2	32.1	67°15.5	10.1'	23°50.2	4.0'	55.2'
2	209°07.3	31.2	81°44.6	10.2'	23°46.2	4.1'	55.2'
3	224°07.5	·· 30.4	96°13.8	10.2'	23°41.9	4.3'	55.1'
4	239°07.6	29.6	110°43.1	10.3'	23°37.6	4.4'	55.1'
5	254°07.8	28.8	125°12.4	10.3'	23°33.2	4.5'	55.1'
6	269°07.9	N12°28.0	139°41.8	10.4'	S23°28.7	4.6'	55.1'
7	284°08.1	27.1	154°11.2	10.5'	23°24.0	4.7'	55.1'
8	299°08.2	26.3	168°40.7	10.5'	23°19.2	4.8'	55.0'
9	314°08.4	·· 25.5	183°10.2	10.6'	23°14.3	4.9'	55.0'
10	329°08.5	24.7	197°39.8	10.6'	23°09.3	5.0'	55.0'
11	344°08.7	23.8	212°09.5	10.7'	23°04.2	5.2'	55.0'
12	359°08.8	N12°23.0	226°39.2	10.8'	S22°59.0	5.3'	55.0'
13	14°09.0	22.2	241°09.0	10.8'	22°53.7	5.4'	55.0'
14	29°09.1	21.4	255°38.9	10.9'	22°48.3	5.5'	54.9'
15	44°09.3	·· 20.5	270°08.8	11.0'	22°42.7	5.6'	54.9'
16	59°09.4	19.7	284°38.8	11.0'	22°37.1	5.7'	54.9'
17	74°09.6	18.9	299°08.9	11.1'	22°31.4	5.8'	54.9'
18	89°09.7	N12°18.1	313°39.0	11.1'	S22°25.5	5.9'	54.9'
19	104°09.9	17.2	328°09.2	11.2'	22°19.6	6.0'	54.8'
20	119°10.0	16.4	342°39.4	11.3'	22°13.5	6.1'	54.8'
21	134°10.2	·· 15.6	357°09.7	11.3'	22°07.3	6.2'	54.8'
22	149°10.3	14.7	11°40.1	11.4'	22°01.1	6.3'	54.8'
23	164°10.5	13.9	26°10.5	11.5'	21°54.7	6.4'	54.8'
	SD.=15.8	d=-0.8	S.D.=15.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°10.6	N12°13.1	40°41.0	11.5'	S21°48.3	6.5'	54.8'
1	194°10.8	12.3	55°11.6	11.6'	21°41.7	6.6'	54.7'
2	209°10.9	11.4	69°42.2	11.7'	21°35.0	6.7'	54.7'
3	224°11.1	·· 10.6	84°12.9	11.7'	21°28.3	6.8'	54.7'
4	239°11.3	09.8	98°43.6	11.8'	21°21.4	6.9'	54.7'
5	254°11.4	08.9	113°14.5	11.9'	21°14.5	7.0'	54.7'
6	269°11.6	N12°08.1	127°45.4	11.9'	S21°07.5	7.1'	54.7'
7	284°11.7	07.3	142°16.3	12.0'	21°00.3	7.2'	54.6'
8	299°11.9	06.4	156°47.3	12.1'	20°53.1	7.3'	54.6'
9	314°12.0	·· 05.6	171°18.4	12.1'	20°45.8	7.4'	54.6'
10	329°12.2	04.8	185°49.6	12.2'	20°38.4	7.5'	54.6'
11	344°12.3	03.9	200°20.8	12.3'	20°30.9	7.5'	54.6'
12	359°12.5	N12°03.1	214°52.1	12.3'	S20°23.3	7.6'	54.6'
13	14°12.6	02.3	229°23.4	12.4'	20°15.6	7.7'	54.6'
14	29°12.8	01.4	243°54.8	12.4'	20°07.8	7.8'	54.5'
15	44°13.0	12°00.6	258°26.3	12.5'	20°00.0	7.9'	54.5'
16	59°13.1	11°59.8	272°57.9	12.6'	19°52.1	8.0'	54.5'
17	74°13.3	58.9	287°29.5	12.6'	19°44.0	8.1'	54.5'
18	89°13.4	N11°58.1	302°01.1	12.7'	S19°35.9	8.1'	54.5'
19	104°13.6	57.3	316°32.9	12.8'	19°27.7	8.2'	54.5'
20	119°13.7	56.4	331°04.7	12.8'	19°19.5	8.3'	54.5'
21	134°13.9	·· 55.6	345°36.5	12.9'	19°11.1	8.4'	54.5'
22	149°14.0	54.8	0°08.5	13.0'	19°02.7	8.5'	54.4'
23	164°14.2	53.9	14°40.5	13.0'	18°54.2	8.6'	54.4'
	SD.=15.8	d=-0.8	S.D.=14.9				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°14.4	N11°53.1	29°12.5	13.1'	S18°45.6	8.6'	54.4'
1	194°14.5	52.3	43°44.7	13.2'	18°36.9	8.7'	54.4'
2	209°14.7	51.4	58°16.8	13.2'	18°28.1	8.8'	54.4'
3	224°14.8	·· 50.6	72°49.1	13.3'	18°19.3	8.9'	54.4'
4	239°15.0	49.7	87°21.4	13.3'	18°10.4	8.9'	54.4'
5	254°15.2	48.9	101°53.8	13.4'	18°01.4	9.0'	54.4'
6	269°15.3	N11°48.1	116°26.2	13.5'	S17°52.4	9.1'	54.3'
7	284°15.5	47.2	130°58.7	13.5'	17°43.3	9.2'	54.3'
8	299°15.6	46.4	145°31.2	13.6'	17°34.1	9.2'	54.3'
9	314°15.8	·· 45.5	160°03.9	13.6'	17°24.8	9.3'	54.3'
10	329°15.9	44.7	174°36.5	13.7'	17°15.5	9.4'	54.3'
11	344°16.1	43.9	189°09.3	13.8'	17°06.1	9.4'	54.3'
12	359°16.3	N11°43.0	203°42.1	13.8'	S16°56.6	9.5'	54.3'
13	14°16.4	42.2	218°14.9	13.9'	16°47.1	9.6'	54.3'
14	29°16.6	41.3	232°47.8	13.9'	16°37.4	9.6'	54.3'
15	44°16.7	·· 40.5	247°20.8	14.0'	16°27.8	9.7'	54.3'
16	59°16.9	39.7	261°53.8	14.1'	16°18.0	9.8'	54.2'
17	74°17.1	38.8	276°26.9	14.1'	16°08.2	9.8'	54.2'
18	89°17.2	N11°38.0	291°00.1	14.2'	S15°58.3	9.9'	54.2'
19	104°17.4	37.1	305°33.3	14.2'	15°48.4	10.0'	54.2'
20	119°17.6	36.3	320°06.5	14.3'	15°38.4	10.0'	54.2'
21	134°17.7	·· 35.4	334°39.8	14.3'	15°28.4	10.1'	54.2'
22	149°17.9	34.6	349°13.2	14.4'	15°18.2	10.1'	54.2'
23	164°18.0	33.8	3°46.6	14.4'	15°08.1	10.2'	54.2'
	SD.=15.8	d=-0.8	S.D.=14.8				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 10-12 85-96%
20	03:32	03:25	12:03	21:12	08:47	
21	03:17	03:10	12:03	21:59	09:36	
22	03:03	02:55	12:03	22:44	10:22	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	331°11.0	137°30.8	S08°00.9	137°18.1	S05°44.7	328°48.7	S00°38.6	147°28.0	N00°46.3
1	346°13.5	152°31.2	02.1	152°19.1	45.3	343°51.4	38.7	162°30.2	46.1
2	1°16.0	167°31.6	03.3	167°20.1	46.0	358°54.1	38.8	177°32.4	46.0
3	16°18.4	182°32.0	·· 04.4	182°21.1	·· 46.6	13°56.7	·· 38.9	192°34.7	·· 45.9
4	31°20.9	197°32.4	05.6	197°22.1	47.3	28°59.4	39.0	207°36.9	45.8
5	46°23.3	212°32.8	06.7	212°23.1	47.9	44°02.1	39.1	222°39.1	45.7
6	61°25.8	227°33.2	S08°07.9	227°24.0	S05°48.6	59°04.8	S00°39.2	237°41.3	N00°45.6
7	76°28.3	242°33.6	09.1	242°25.0	49.2	74°07.4	39.3	252°43.5	45.5
8	91°30.7	257°34.0	10.2	257°26.0	49.9	89°10.1	39.4	267°45.7	45.4
9	106°33.2	272°34.4	·· 11.4	272°27.0	·· 50.5	104°12.8	·· 39.5	282°47.9	·· 45.2
10	121°35.7	287°34.8	12.5	287°28.0	51.2	119°15.5	39.6	297°50.1	45.1
11	136°38.1	302°35.2	13.7	302°29.0	51.8	134°18.2	39.7	312°52.4	45.0
12	151°40.6	317°35.6	S08°14.9	317°30.0	S05°52.5	149°20.8	S00°39.8	327°54.6	N00°44.9
13	166°43.1	332°36.0	16.0	332°31.0	53.1	164°23.5	39.9	342°56.8	44.8
14	181°45.5	347°36.4	17.2	347°32.0	53.7	179°26.2	40.0	357°59.0	44.7
15	196°48.0	2°36.8	·· 18.3	2°33.0	·· 54.4	194°28.9	·· 40.1	13°01.2	·· 44.6
16	211°50.4	17°37.2	19.5	17°34.0	55.0	209°31.5	40.2	28°03.4	44.5
17	226°52.9	32°37.6	20.7	32°34.9	55.7	224°34.2	40.3	43°05.6	44.3
18	241°55.4	47°38.0	S08°21.8	47°35.9	S05°56.3	239°36.9	S00°40.4	58°07.8	N00°44.2
19	256°57.8	62°38.4	23.0	62°36.9	57.0	254°39.6	40.5	73°10.1	44.1
20	272°00.3	77°38.8	24.1	77°37.9	57.6	269°42.3	40.6	88°12.3	44.0
21	287°02.8	92°39.2	·· 25.3	92°38.9	·· 58.3	284°44.9	·· 40.7	103°14.5	·· 43.9
22	302°05.2	107°39.6	26.4	107°39.9	58.9	299°47.6	40.8	118°16.7	43.8
23	317°07.7	122°40.0	27.6	122°40.9	59.6	314°50.3	40.9	133°18.9	43.7
Mer.pass.:01:55		v0.4 d-1.2 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	332°10.2	137°40.4	S08°28.7	137°41.9	S06°00.2	329°53.0	S00°41.0	148°21.1	N00°43.6
1	347°12.6	152°40.8	29.9	152°42.9	00.8	344°55.7	41.1	163°23.3	43.4
2	2°15.1	167°41.2	31.1	167°43.8	01.5	359°58.3	41.2	178°25.5	43.3
3	17°17.6	182°41.6	·· 32.2	182°44.8	·· 02.1	15°01.0	·· 41.3	193°27.8	·· 43.2
4	32°20.0	197°42.0	33.4	197°45.8	02.8	30°03.7	41.4	208°30.0	43.1
5	47°22.5	212°42.4	34.5	212°46.8	03.4	45°06.4	41.5	223°32.2	43.0
6	62°24.9	227°42.8	S08°35.7	227°47.8	S06°04.1	60°09.1	S00°41.7	238°34.4	N00°42.9
7	77°27.4	242°43.2	36.8	242°48.8	04.7	75°11.7	41.8	253°36.6	42.8
8	92°29.9	257°43.7	38.0	257°49.8	05.4	90°14.4	41.9	268°38.8	42.7
9	107°32.3	272°44.1	·· 39.1	272°50.8	·· 06.0	105°17.1	·· 42.0	283°41.0	·· 42.5
10	122°34.8	287°44.5	40.3	287°51.8	06.6	120°19.8	42.1	298°43.2	42.4
11	137°37.3	302°44.9	41.4	302°52.7	07.3	135°22.5	42.2	313°45.5	42.3
12	152°39.7	317°45.3	S08°42.6	317°53.7	S06°07.9	150°25.2	S00°42.3	328°47.7	N00°42.2
13	167°42.2	332°45.7	43.7	332°54.7	08.6	165°27.8	42.4	343°49.9	42.1
14	182°44.7	347°46.1	44.9	347°55.7	09.2	180°30.5	42.5	358°52.1	42.0
15	197°47.1	2°46.5	·· 46.0	2°56.7	·· 09.9	195°33.2	·· 42.6	13°54.3	·· 41.9
16	212°49.6	17°47.0	47.2	17°57.7	10.5	210°35.9	42.7	28°56.5	41.7
17	227°52.1	32°47.4	48.3	32°58.7	11.2	225°38.6	42.8	43°58.7	41.6
18	242°54.5	47°47.8	S08°49.5	47°59.6	S06°11.8	240°41.3	S00°42.9	59°00.9	N00°41.5
19	257°57.0	62°48.2	50.6	63°00.6	12.5	255°43.9	43.0	74°03.1	41.4
20	272°59.4	77°48.6	51.8	78°01.6	13.1	270°46.6	43.1	89°05.4	41.3
21	288°01.9	92°49.1	·· 52.9	93°02.6	·· 13.7	285°49.3	·· 43.2	104°07.6	·· 41.2
22	303°04.4	107°49.5	54.1	108°03.6	14.4	300°52.0	43.3	119°09.8	41.1
23	318°06.8	122°49.9	55.2	123°04.6	15.0	315°54.7	43.4	134°12.0	41.0
Mer.pass.:01:51		v0.4 d-1.2 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.1	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	333°09.3	137°50.3	S08°56.4	138°05.6	S06°15.7	330°57.4	S00°43.5	149°14.2	N00°40.8
1	348°11.8	152°50.7	57.5	153°06.5	16.3	346°00.1	43.6	164°16.4	40.7
2	3°14.2	167°51.2	58.7	168°07.5	17.0	1°02.7	43.7	179°18.6	40.6
3	18°16.7	182°51.6	08°59.8	183°08.5	·· 17.6	16°05.4	·· 43.9	194°20.8	·· 40.5
4	33°19.2	197°52.0	09°00.9	198°09.5	18.3	31°08.1	44.0	209°23.0	40.4
5	48°21.6	212°52.4	02.1	213°10.5	18.9	46°10.8	44.1	224°25.2	40.3
6	63°24.1	227°52.9	S09°03.2	228°11.5	S06°19.5	61°13.5	S00°44.2	239°27.5	N00°40.2
7	78°26.5	242°53.3	04.4	243°12.4	20.2	76°16.2	44.3	254°29.7	40.0
8	93°29.0	257°53.7	05.5	258°13.4	20.8	91°18.9	44.4	269°31.9	39.9
9	108°31.5	272°54.1	·· 06.7	273°14.4	·· 21.5	106°21.5	·· 44.5	284°34.1	·· 39.8
10	123°33.9	287°54.6	07.8	288°15.4	22.1	121°24.2	44.6	299°36.3	39.7
11	138°36.4	302°55.0	08.9	303°16.4	22.8	136°26.9	44.7	314°38.5	39.6
12	153°38.9	317°55.4	S09°10.1	318°17.4	S06°23.4	151°29.6	S00°44.8	329°40.7	N00°39.5
13	168°41.3	332°55.8	11.2	333°18.3	24.1	166°32.3	44.9	344°42.9	39.4
14	183°43.8	347°56.3	12.4	348°19.3	24.7	181°35.0	45.0	359°45.1	39.2
15	198°46.3	2°56.7	·· 13.5	3°20.3	·· 25.3	196°37.7	·· 45.1	14°47.3	·· 39.1
16	213°48.7	17°57.1	14.7	18°21.3	26.0	211°40.4	45.2	29°49.6	39.0
17	228°51.2	32°57.6	15.8	33°22.3	26.6	226°43.1	45.3	44°51.8	38.9
18	243°53.7	47°58.0	S09°16.9	48°23.2	S06°27.3	241°45.7	S00°45.5	59°54.0	N00°38.8
19	258°56.1	62°58.4	18.1	63°24.2	27.9	256°48.4	45.6	74°56.2	38.7
20	273°58.6	77°58.9	19.2	78°25.2	28.6	271°51.1	45.7	89°58.4	38.6
21	289°01.0	92°59.3	·· 20.3	93°26.2	·· 29.2	286°53.8	·· 45.8	105°00.6	·· 38.5
22	304°03.5	107°59.7	21.5	108°27.2	29.9	301°56.5	45.9	120°02.8	38.3
23	319°06.0	123°00.2	22.6	123°28.1	30.5	316°59.2	46.0	135°05.0	38.2
Mer.pass.:01:47		v0.4 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.1
Ankaa	353°17.2	-42°14.6
Schedar	349°42.5	56°35.8
Diphda	348°57.6	-17°55.4
Achernar	335°27.8	-57°10.6
Hamal	328°02.9	23°30.9
Polaris	318°38.8	89°18.4
Acamar	315°19.7	-40°15.3
Menkar	314°17.1	4°08.1
Mirfak	308°43.2	49°53.8
Aldebaran	290°51.8	16°31.9
Rigel	281°14.1	-8°11.2
Capella	280°37.6	46°00.4
Bellatrix	278°34.3	6°21.6
Elnath	278°15.3	28°36.9
Alnilam	275°48.5	-1°11.6
Betelgeuse	271°03.6	7°24.6
Canopus	263°57.4	-52°41.8
Sirius	258°35.7	-16°43.7
Adhara	255°14.4	-28°59.0
Procyon	245°02.1	5°11.9
Pollux	243°30.5	28°00.0
Avior	234°19.5	-59°32.5
Suhail	222°54.4	-43°28.5
Miaplacidus	221°41.2	-69°45.6
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.7
Gacrux	172°03.8	-57°10.6
Alioth	166°22.7	55°54.3
Spica	158°33.6	-11°13.1
Alkaid	153°00.6	49°15.8
Hadar	148°51.2	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.8	-60°53.0
Kochab	137°20.0	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.3	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.8	51°29.5
Kaus Aust.	83°46.2	-34°22.8
Vega	80°40.1	38°47.9
Nunki	76°00.5	-26°17.0
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.6
Markab	13°40.0	15°16.0

Aug 23 Mon	**SHA**	**Mer.pass**
Venus	166°19.8	14:50
Mars	166°07.1	14:50
Jupiter	357°37.7	02:04
Saturn	176°17.0	14:08

Aug 24 Tue	**SHA**	**Mer.pass**
Venus	165°30.2	14:49
Mars	165°31.7	14:48
Jupiter	357°42.8	02:00
Saturn	176°11.0	14:05

Aug 25 Wed	**SHA**	**Mer.pass**
Venus	164°41.0	14:48
Mars	164°56.3	14:47
Jupiter	357°48.1	01:56
Saturn	176°04.9	14:01

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0505 sec ΔT = TT-UT1 = +66.2345 sec

2010 August 23 to Aug. 25 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°18.2	N11°32.9	18°20.1	14.5'	S14°57.8	10.3'	54.2'
1	194°18.4	32.1	32°53.6	14.6'	14°47.5	10.3'	54.2'
2	209°18.5	31.2	47°27.2	14.6'	14°37.2	10.4'	54.2'
3	224°18.7	· · 30.4	62°00.9	14.7'	14°26.8	10.4'	54.1'
4	239°18.9	29.5	76°34.5	14.7'	14°16.3	10.5'	54.1'
5	254°19.0	28.7	91°08.3	14.8'	14°05.8	10.5'	54.1'
6	269°19.2	N11°27.8	105°42.1	14.8'	S13°55.2	10.6'	54.1'
7	284°19.3	27.0	120°15.9	14.9'	13°44.6	10.6'	54.1'
8	299°19.5	26.1	134°49.8	14.9'	13°33.9	10.7'	54.1'
9	314°19.7	· · 25.3	149°23.7	15.0'	13°23.2	10.8'	54.1'
10	329°19.8	24.4	163°57.7	15.0'	13°12.4	10.8'	54.1'
11	344°20.0	23.6	178°31.8	15.1'	13°01.6	10.9'	54.1'
12	359°20.2	N11°22.8	193°05.8	15.1'	S12°50.7	10.9'	54.1'
13	14°20.3	21.9	207°40.0	15.2'	12°39.8	10.9'	54.1'
14	29°20.5	21.1	222°14.1	15.2'	12°28.8	11.0'	54.1'
15	44°20.7	· · 20.2	236°48.4	15.2'	12°17.8	11.0'	54.1'
16	59°20.8	19.4	251°22.6	15.3'	12°06.8	11.1'	54.1'
17	74°21.0	18.5	265°56.9	15.3'	11°55.6	11.1'	54.1'
18	89°21.2	N11°17.7	280°31.3	15.4'	S11°44.5	11.2'	54.0'
19	104°21.3	16.8	295°05.7	15.4'	11°33.3	11.2'	54.0'
20	119°21.5	16.0	309°40.1	15.5'	11°22.1	11.3'	54.0'
21	134°21.7	· · 15.1	324°14.6	15.5'	11°10.8	11.3'	54.0'
22	149°21.8	14.3	338°49.1	15.5'	10°59.4	11.3'	54.0'
23	164°22.0	13.4	353°23.7	15.6'	10°48.1	11.4'	54.0'
	SD.=15.8	d=-0.8	S.D.=14.7				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°22.2	N11°12.5	7°58.3	15.6'	S10°36.7	11.4'	54.0'
1	194°22.3	11.7	22°32.9	15.7'	10°25.2	11.5'	54.0'
2	209°22.5	10.8	37°07.6	15.7'	10°13.8	11.5'	54.0'
3	224°22.7	· · 10.0	51°42.3	15.7'	10°02.2	11.5'	54.0'
4	239°22.8	09.1	66°17.0	15.8'	09°50.7	11.6'	54.0'
5	254°23.0	08.3	80°51.8	15.8'	09°39.1	11.6'	54.0'
6	269°23.2	N11°07.4	95°26.6	15.8'	S09°27.5	11.6'	54.0'
7	284°23.3	06.6	110°01.5	15.9'	09°15.8	11.7'	54.0'
8	299°23.5	05.7	124°36.4	15.9'	09°04.1	11.7'	54.0'
9	314°23.7	· · 04.9	139°11.3	15.9'	08°52.4	11.7'	54.0'
10	329°23.8	04.0	153°46.3	16.0'	08°40.6	11.8'	54.0'
11	344°24.0	03.2	168°21.2	16.0'	08°28.9	11.8'	54.0'
12	359°24.2	N11°02.3	182°56.3	16.0'	S08°17.0	11.8'	54.0'
13	14°24.3	01.4	197°31.3	16.1'	08°05.2	11.9'	54.0'
14	29°24.5	11°00.6	212°06.4	16.1'	07°53.3	11.9'	54.0'
15	44°24.7	10°59.7	226°41.5	16.1'	07°41.4	11.9'	54.0'
16	59°24.8	58.9	241°16.6	16.1'	07°29.5	11.9'	54.0'
17	74°25.0	58.0	255°51.8	16.2'	07°17.5	12.0'	54.0'
18	89°25.2	N10°57.2	270°26.9	16.2'	S07°05.5	12.0'	54.0'
19	104°25.4	56.3	285°02.2	16.2'	06°53.5	12.0'	54.0'
20	119°25.5	55.4	299°37.4	16.2'	06°41.5	12.0'	54.0'
21	134°25.7	· · 54.6	314°12.6	16.3'	06°29.4	12.1'	54.0'
22	149°25.9	53.7	328°47.9	16.3'	06°17.3	12.1'	54.0'
23	164°26.0	52.9	343°23.2	16.3'	06°05.2	12.1'	54.0'
	SD.=15.8	d=-0.9	S.D.=14.7				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°26.2	N10°52.0	357°58.5	16.3'	S05°53.1	12.1'	54.0'
1	194°26.4	51.1	12°33.9	16.4'	05°41.0	12.2'	54.0'
2	209°26.6	50.3	27°09.3	16.4'	05°28.8	12.2'	54.0'
3	224°26.7	· · 49.4	41°44.6	16.4'	05°16.6	12.2'	53.9'
4	239°26.9	48.6	56°20.0	16.4'	05°04.4	12.2'	53.9'
5	254°27.1	47.7	70°55.5	16.4'	04°52.2	12.2'	53.9'
6	269°27.2	N10°46.8	85°30.9	16.4'	S04°39.9	12.3'	53.9'
7	284°27.4	46.0	100°06.4	16.5'	04°27.7	12.3'	53.9'
8	299°27.6	45.1	114°41.8	16.5'	04°15.4	12.3'	53.9'
9	314°27.8	· · 44.3	129°17.3	16.5'	04°03.1	12.3'	54.0'
10	329°27.9	43.4	143°52.8	16.5'	03°50.8	12.3'	54.0'
11	344°28.1	42.5	158°28.3	16.5'	03°38.5	12.3'	54.0'
12	359°28.3	N10°41.7	173°03.8	16.5'	S03°26.1	12.3'	54.0'
13	14°28.5	40.8	187°39.4	16.5'	03°13.8	12.4'	54.0'
14	29°28.6	39.9	202°14.9	16.5'	03°01.4	12.4'	54.0'
15	44°28.8	· · 39.1	216°50.5	16.6'	02°49.1	12.4'	54.0'
16	59°29.0	38.2	231°26.0	16.6'	02°36.7	12.4'	54.0'
17	74°29.2	37.4	246°01.6	16.6'	02°24.3	12.4'	54.0'
18	89°29.3	N10°36.5	260°37.2	16.6'	S02°11.9	12.4'	54.0'
19	104°29.5	35.6	275°12.7	16.6'	01°59.5	12.4'	54.0'
20	119°29.7	34.8	289°48.3	16.6'	01°47.1	12.4'	54.0'
21	134°29.9	· · 33.9	304°23.9	16.6'	01°34.7	12.4'	54.0'
22	149°30.0	33.0	318°59.5	16.6'	01°22.3	12.4'	54.0'
23	164°30.2	32.2	333°35.1	16.6'	01°09.8	12.4'	54.0'
	SD.=15.8	d=-0.9	S.D.=14.7				

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

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

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 13-15 99-99%
23	02:47	02:39	12:03	23:27	11:06	○
24	02:31	02:23	12:02	–:–	11:48	
25	02:15	02:07	12:02	00:08	12:29	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	334°08.4	138°00.6	S09°23.8	138°29.1	S06°31.1	332°01.9	S00°46.1	150°07.2	N00°38.1
1	349°10.9	153°01.1	24.9	153°30.1	31.8	347°04.6	46.2	165°09.4	38.0
2	4°13.4	168°01.5	26.0	168°31.1	32.4	2°07.3	46.3	180°11.6	37.9
3	19°15.8	183°01.9	·· 27.2	183°32.1	·· 33.1	17°10.0	·· 46.4	195°13.9	·· 37.8
4	34°18.3	198°02.4	28.3	198°33.0	33.7	32°12.7	46.5	210°16.1	37.7
5	49°20.8	213°02.8	29.4	213°34.0	34.4	47°15.3	46.6	225°18.3	37.5
6	64°23.2	228°03.3	S09°30.6	228°35.0	S06°35.0	62°18.0	S00°46.7	240°20.5	N00°37.4
7	79°25.7	243°03.7	31.7	243°36.0	35.6	77°20.7	46.9	255°22.7	37.3
8	94°28.1	258°04.1	32.8	258°37.0	36.3	92°23.4	47.0	270°24.9	37.2
9	109°30.6	273°04.6	·· 34.0	273°37.9	·· 36.9	107°26.1	·· 47.1	285°27.1	·· 37.1
10	124°33.1	288°05.0	35.1	288°38.9	37.6	122°28.8	47.2	300°29.3	37.0
11	139°35.5	303°05.5	36.2	303°39.9	38.2	137°31.5	47.3	315°31.5	36.9
12	154°38.0	318°05.9	S09°37.4	318°40.9	S06°38.9	152°34.2	S00°47.4	330°33.7	N00°36.7
13	169°40.5	333°06.4	38.5	333°41.9	39.5	167°36.9	47.5	345°35.9	36.6
14	184°42.9	348°06.8	39.6	348°42.8	40.2	182°39.6	47.6	0°38.1	36.5
15	199°45.4	3°07.3	·· 40.8	3°43.8	·· 40.8	197°42.3	·· 47.7	15°40.4	·· 36.4
16	214°47.9	18°07.7	41.9	18°44.8	41.4	212°45.0	47.8	30°42.6	36.3
17	229°50.3	33°08.2	43.0	33°45.8	42.1	227°47.7	47.9	45°44.8	36.2
18	244°52.8	48°08.6	S09°44.2	48°46.7	S06°42.7	242°50.4	S00°48.1	60°47.0	N00°36.1
19	259°55.3	63°09.1	45.3	63°47.7	43.4	257°53.1	48.2	75°49.2	35.9
20	274°57.7	78°09.5	46.4	78°48.7	44.0	272°55.8	48.3	90°51.4	35.8
21	290°00.2	93°10.0	·· 47.6	93°49.7	·· 44.7	287°58.5	·· 48.4	105°53.6	·· 35.7
22	305°02.6	108°10.4	48.7	108°50.7	45.3	303°01.2	48.5	120°55.8	35.6
23	320°05.1	123°10.9	49.8	123°51.6	45.9	318°03.8	48.6	135°58.0	35.5
Mer.pass.:01:43		v0.4 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	335°07.6	138°11.3	S09°50.9	138°52.6	S06°46.6	333°06.5	S00°48.7	151°00.2	N00°35.4
1	350°10.0	153°11.8	52.1	153°53.6	47.2	348°09.2	48.8	166°02.4	35.3
2	5°12.5	168°12.2	53.2	168°54.6	47.9	3°11.9	48.9	181°04.6	35.1
3	20°15.0	183°12.7	·· 54.3	183°55.5	·· 48.5	18°14.6	·· 49.0	196°06.8	·· 35.0
4	35°17.4	198°13.1	55.4	198°56.5	49.2	33°17.3	49.2	211°09.1	34.9
5	50°19.9	213°13.6	56.6	213°57.5	49.8	48°20.0	49.3	226°11.3	34.8
6	65°22.4	228°14.1	S09°57.7	228°58.5	S06°50.4	63°22.7	S00°49.4	241°13.5	N00°34.7
7	80°24.8	243°14.5	09°58.8	243°59.4	51.1	78°25.4	49.5	256°15.7	34.6
8	95°27.3	258°15.0	10°00.0	259°00.4	51.7	93°28.1	49.6	271°17.9	34.5
9	110°29.8	273°15.4	·· 01.1	274°01.4	·· 52.4	108°30.8	·· 49.7	286°20.1	·· 34.3
10	125°32.2	288°15.9	02.2	289°02.4	53.0	123°33.5	49.8	301°22.3	34.2
11	140°34.7	303°16.4	03.3	304°03.3	53.7	138°36.2	49.9	316°24.5	34.1
12	155°37.1	318°16.8	S10°04.4	319°04.3	S06°54.3	153°38.9	S00°50.0	331°26.7	N00°34.0
13	170°39.6	333°17.3	05.6	334°05.3	54.9	168°41.6	50.1	346°28.9	33.9
14	185°42.1	348°17.8	06.7	349°06.2	55.6	183°44.3	50.3	1°31.1	33.8
15	200°44.5	3°18.2	·· 07.8	4°07.2	·· 56.2	198°47.0	·· 50.4	16°33.3	·· 33.7
16	215°47.0	18°18.7	08.9	19°08.2	56.9	213°49.7	50.5	31°35.5	33.5
17	230°49.5	33°19.2	10.1	34°09.2	57.5	228°52.4	50.6	46°37.7	33.4
18	245°51.9	48°19.6	S10°11.2	49°10.1	S06°58.2	243°55.1	S00°50.7	61°40.0	N00°33.3
19	260°54.4	63°20.1	12.3	64°11.1	58.8	258°57.8	50.8	76°42.2	33.2
20	275°56.9	78°20.6	13.4	79°12.1	06°59.4	274°00.5	50.9	91°44.4	33.1
21	290°59.3	93°21.0	·· 14.5	94°13.1	07°00.1	289°03.2	·· 51.0	106°46.6	·· 33.0
22	306°01.8	108°21.5	15.7	109°14.0	00.7	304°05.9	51.1	121°48.8	32.8
23	321°04.2	123°22.0	16.8	124°15.0	01.4	319°08.6	51.3	136°51.0	32.7
Mer.pass.:01:39		v0.5 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	336°06.7	138°22.4	S10°17.9	139°16.0	S07°02.0	334°11.3	S00°51.4	151°53.2	N00°32.6
1	351°09.2	153°22.9	19.0	154°16.9	02.7	349°14.0	51.5	166°55.4	32.5
2	6°11.6	168°23.4	20.1	169°17.9	03.3	4°16.7	51.6	181°57.6	32.4
3	21°14.1	183°23.9	·· 21.2	184°18.9	·· 03.9	19°19.4	·· 51.7	196°59.8	·· 32.3
4	36°16.6	198°24.3	22.4	199°19.9	04.6	34°22.1	51.8	212°02.0	32.2
5	51°19.0	213°24.8	23.5	214°20.8	05.2	49°24.8	51.9	227°04.2	32.0
6	66°21.5	228°25.3	S10°24.6	229°21.8	S07°05.9	64°27.5	S00°52.0	242°06.4	N00°31.9
7	81°24.0	243°25.8	25.7	244°22.8	06.5	79°30.2	52.2	257°08.6	31.8
8	96°26.4	258°26.2	26.8	259°23.7	07.2	94°32.9	52.3	272°10.8	31.7
9	111°28.9	273°26.7	·· 27.9	274°24.7	·· 07.8	109°35.7	·· 52.4	287°13.0	·· 31.6
10	126°31.4	288°27.2	29.0	289°25.7	08.4	124°38.4	52.5	302°15.2	31.5
11	141°33.8	303°27.7	30.2	304°26.6	09.1	139°41.1	52.6	317°17.5	31.4
12	156°36.3	318°28.2	S10°31.3	319°27.6	S07°09.7	154°43.8	S00°52.7	332°19.7	N00°31.2
13	171°38.7	333°28.6	32.4	334°28.6	10.4	169°46.5	52.8	347°21.9	31.1
14	186°41.2	348°29.1	33.5	349°29.5	11.0	184°49.2	52.9	2°24.1	31.0
15	201°43.7	3°29.6	·· 34.6	4°30.5	·· 11.6	199°51.9	·· 53.1	17°26.3	·· 30.9
16	216°46.1	18°30.1	35.7	19°31.5	12.3	214°54.6	53.2	32°28.5	30.8
17	231°48.6	33°30.6	36.8	34°32.5	12.9	229°57.3	53.3	47°30.7	30.7
18	246°51.1	48°31.1	S10°37.9	49°33.4	S07°13.6	245°00.0	S00°53.4	62°32.9	N00°30.5
19	261°53.5	63°31.5	39.1	64°34.4	14.2	260°02.7	53.5	77°35.1	30.4
20	276°56.0	78°32.0	40.2	79°35.4	14.9	275°05.4	53.6	92°37.3	30.3
21	291°58.5	93°32.5	·· 41.3	94°36.3	·· 15.5	290°08.1	·· 53.7	107°39.5	·· 30.2
22	307°00.9	108°33.0	42.4	109°37.3	16.1	305°10.8	53.9	122°41.7	30.1
23	322°03.4	123°33.5	43.5	124°38.3	16.8	320°13.5	54.0	137°43.9	30.0
Mer.pass.:01:35		v0.5 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.1
Ankaa	353°17.2	-42°14.6
Schedar	349°42.5	56°35.8
Diphda	348°57.6	-17°55.4
Achernar	335°27.8	-57°10.6
Hamal	328°02.9	23°30.9
Polaris	318°37.6	89°18.4
Acamar	315°19.7	-40°15.4
Menkar	314°17.1	4°08.1
Mirfak	308°43.2	49°53.8
Aldebaran	290°51.7	16°31.9
Rigel	281°14.1	-8°11.2
Capella	280°37.6	46°00.4
Bellatrix	278°34.3	6°21.7
Elnath	278°15.3	28°36.9
Alnilam	275°48.5	-1°11.6
Betelgeuse	271°03.6	7°24.6
Canopus	263°57.3	-52°41.8
Sirius	258°35.7	-16°43.7
Adhara	255°14.4	-28°59.0
Procyon	245°02.1	5°11.9
Pollux	243°30.5	28°00.0
Avior	234°19.5	-59°32.5
Suhail	222°54.4	-43°28.5
Miaplacidus	221°41.2	-69°45.6
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.7
Gacrux	172°03.8	-57°10.6
Alioth	166°22.7	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.6	49°15.8
Hadar	148°51.2	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.8	-60°53.0
Kochab	137°20.1	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.7	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.3	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.8	51°29.5
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.1	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°09.9	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.3
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.6
Markab	13°40.0	15°16.0

Aug 26 Thu	**SHA**	**Mer.pass**
Venus	163°52.2	14:48
Mars	164°20.7	14:45
Jupiter	357°53.5	01:52
Saturn	175°58.8	13:57

Aug 27 Fri	**SHA**	**Mer.pass**
Venus	163°03.8	14:47
Mars	163°45.0	14:44
Jupiter	357°59.0	01:47
Saturn	175°52.7	13:54

Aug 28 Sat	**SHA**	**Mer.pass**
Venus	162°15.7	14:46
Mars	163°09.3	14:42
Jupiter	358°04.6	01:43
Saturn	175°46.5	13:50

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.0506 sec ΔT = TT-UT1 = +66.2346 sec

2010 August 26 to Aug. 28 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°30.4	N10°31.3	348°10.7	16.6'	S00°57.4	12.4'	54.0'
1	194°30.6	30.4	2°46.3	16.6'	00°45.0	12.4'	54.0'
2	209°30.7	29.6	17°21.9	16.6'	00°32.5	12.4'	54.0'
3	224°30.9	·· 28.7	31°57.5	16.6'	00°20.1	12.4'	54.0'
4	239°31.1	27.8	46°33.1	16.6'	S00°07.6	12.4'	54.0'
5	254°31.3	27.0	61°08.7	16.6'	N00°04.8	12.4'	54.0'
6	269°31.4	N10°26.1	75°44.3	16.6'	N00°17.3	12.4'	54.0'
7	284°31.6	25.2	90°19.9	16.6'	00°29.7	12.4'	54.0'
8	299°31.8	24.4	104°55.5	16.6'	00°42.2	12.4'	54.0'
9	314°32.0	·· 23.5	119°31.1	16.6'	00°54.6	12.4'	54.0'
10	329°32.1	22.6	134°06.7	16.6'	01°07.1	12.4'	54.0'
11	344°32.3	21.7	148°42.2	16.6'	01°19.5	12.4'	54.0'
12	359°32.5	N10°20.9	163°17.8	16.6'	N01°31.9	12.4'	54.0'
13	14°32.7	20.0	177°53.4	16.5'	01°44.4	12.4'	54.0'
14	29°32.9	19.1	192°28.9	16.5'	01°56.8	12.4'	54.0'
15	44°33.0	·· 18.3	207°04.4	16.5'	02°09.2	12.4'	54.0'
16	59°33.2	17.4	221°40.0	16.5'	02°21.6	12.4'	54.0'
17	74°33.4	16.5	236°15.5	16.5'	02°34.0	12.4'	54.0'
18	89°33.6	N10°15.7	250°51.0	16.5'	N02°46.4	12.4'	54.1'
19	104°33.7	14.8	265°26.4	16.5'	02°58.8	12.4'	54.1'
20	119°33.9	13.9	280°01.9	16.5'	03°11.2	12.4'	54.1'
21	134°34.1	·· 13.0	294°37.4	16.4'	03°23.6	12.4'	54.1'
22	149°34.3	12.2	309°12.8	16.4'	03°35.9	12.4'	54.1'
23	164°34.5	11.3	323°48.2	16.4'	03°48.3	12.3'	54.1'
	SD.=15.8	d=-0.9	S.D.=14.7				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°34.6	N10°10.4	338°23.6	16.4'	N04°00.6	12.3'	54.1'
1	194°34.8	09.5	352°59.0	16.4'	04°13.0	12.3'	54.1'
2	209°35.0	08.7	7°34.4	16.4'	04°25.3	12.3'	54.1'
3	224°35.2	·· 07.8	22°09.7	16.3'	04°37.6	12.3'	54.1'
4	239°35.4	06.9	36°45.0	16.3'	04°49.9	12.3'	54.1'
5	254°35.5	06.0	51°20.3	16.3'	05°02.1	12.3'	54.1'
6	269°35.7	N10°05.2	65°55.6	16.3'	N05°14.4	12.2'	54.1'
7	284°35.9	04.3	80°30.9	16.2'	05°26.6	12.2'	54.1'
8	299°36.1	03.4	95°06.1	16.2'	05°38.8	12.2'	54.2'
9	314°36.3	·· 02.5	109°41.3	16.2'	05°51.0	12.2'	54.2'
10	329°36.4	01.7	124°16.5	16.2'	06°03.2	12.2'	54.2'
11	344°36.6	10°00.8	138°51.6	16.1'	06°15.4	12.1'	54.2'
12	359°36.8	N09°59.9	153°26.7	16.1'	N06°27.5	12.1'	54.2'
13	14°37.0	59.0	168°01.8	16.1'	06°39.6	12.1'	54.2'
14	29°37.2	58.2	182°36.9	16.0'	06°51.7	12.1'	54.2'
15	44°37.4	·· 57.3	197°11.9	16.0'	07°03.8	12.1'	54.2'
16	59°37.5	56.4	211°46.9	16.0'	07°15.8	12.0'	54.2'
17	74°37.7	55.5	226°21.9	15.9'	07°27.8	12.0'	54.2'
18	89°37.9	N09°54.6	240°56.8	15.9'	N07°39.8	12.0'	54.2'
19	104°38.1	53.8	255°31.7	15.9'	07°51.8	12.0'	54.3'
20	119°38.3	52.9	270°06.5	15.8'	08°03.7	11.9'	54.3'
21	134°38.4	·· 52.0	284°41.4	15.8'	08°15.7	11.9'	54.3'
22	149°38.6	51.1	299°16.2	15.8'	08°27.6	11.9'	54.3'
23	164°38.8	50.3	313°50.9	15.7'	08°39.4	11.8'	54.3'
	SD.=15.8	d=-0.9	S.D.=14.8				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°39.0	N09°49.4	328°25.6	15.7'	N08°51.2	11.8'	54.3'
1	194°39.2	48.5	343°00.3	15.7'	09°03.0	11.8'	54.3'
2	209°39.4	47.6	357°34.9	15.6'	09°14.8	11.8'	54.3'
3	224°39.5	·· 46.7	12°09.5	15.6'	09°26.6	11.7'	54.3'
4	239°39.7	45.8	26°44.1	15.5'	09°38.3	11.7'	54.4'
5	254°39.9	45.0	41°18.6	15.5'	09°49.9	11.7'	54.4'
6	269°40.1	N09°44.1	55°53.0	15.4'	N10°01.6	11.6'	54.4'
7	284°40.3	43.2	70°27.5	15.4'	10°13.2	11.6'	54.4'
8	299°40.5	42.3	85°01.8	15.4'	10°24.7	11.5'	54.4'
9	314°40.7	·· 41.4	99°36.2	15.3'	10°36.3	11.5'	54.4'
10	329°40.8	40.6	114°10.5	15.3'	10°47.8	11.5'	54.4'
11	344°41.0	39.7	128°44.7	15.2'	10°59.2	11.4'	54.5'
12	359°41.2	N09°38.8	143°18.9	15.2'	N11°10.6	11.4'	54.5'
13	14°41.4	37.9	157°53.0	15.1'	11°22.0	11.4'	54.5'
14	29°41.6	37.0	172°27.1	15.1'	11°33.3	11.3'	54.5'
15	44°41.8	·· 36.1	187°01.1	15.0'	11°44.6	11.3'	54.5'
16	59°42.0	35.3	201°35.1	15.0'	11°55.9	11.2'	54.5'
17	74°42.1	34.4	216°09.1	14.9'	12°07.1	11.2'	54.5'
18	89°42.3	N09°33.5	230°42.9	14.9'	N12°18.3	11.1'	54.6'
19	104°42.5	32.6	245°16.8	14.8'	12°29.4	11.1'	54.6'
20	119°42.7	31.7	259°50.5	14.7'	12°40.4	11.1'	54.6'
21	134°42.9	·· 30.8	274°24.2	14.7'	12°51.5	11.0'	54.6'
22	149°43.1	29.9	288°57.9	14.6'	13°02.5	11.0'	54.6'
23	164°43.3	29.1	303°31.5	14.6'	13°13.4	10.9'	54.6'
	SD.=15.8	d=-0.9	S.D.=14.8				

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

Lat.	**Moonrise** Thu	Fri	Sat	**Moonset** Thu	Fri	Sat
N 72°	18:43	18:19	17:50	07:04	08:53	10:49
N 70°	18:47	18:30	18:11	07:03	08:45	10:31
68°	18:50	18:39	18:27	07:03	08:38	10:16
66°	18:52	18:47	18:41	07:02	08:32	10:04
64°	18:55	18:53	18:52	07:02	08:27	09:54
62°	18:56	18:58	19:01	07:02	08:23	09:46
60°	18:58	19:03	19:10	07:01	08:19	09:39
N 58°	19:00	19:08	19:17	07:01	08:16	09:32
56°	19:01	19:11	19:23	07:01	08:13	09:27
54°	19:02	19:15	19:29	07:01	08:11	09:22
52°	19:04	19:18	19:34	07:01	08:08	09:17
50°	19:05	19:21	19:39	07:01	08:06	09:13
45°	19:07	19:27	19:49	07:00	08:02	09:04
N 40°	19:09	19:32	19:58	07:00	07:58	08:57
35°	19:10	19:37	20:05	07:00	07:55	08:51
30°	19:12	19:41	20:11	06:59	07:52	08:45
20°	19:15	19:48	20:23	06:59	07:47	08:36
N 10°	19:17	19:54	20:33	06:59	07:43	08:28
0°	19:19	20:00	20:42	06:58	07:39	08:20
S 10°	19:21	20:06	20:52	06:58	07:35	08:12
20°	19:24	20:12	21:02	06:58	07:30	08:04
30°	19:26	20:19	21:14	06:57	07:25	07:55
35°	19:28	20:24	21:20	06:57	07:23	07:50
40°	19:30	20:28	21:28	06:57	07:19	07:44
45°	19:32	20:34	21:37	06:56	07:16	07:37
S 50°	19:35	20:41	21:48	06:56	07:11	07:28
52°	19:36	20:44	21:53	06:56	07:09	07:24
54°	19:37	20:47	21:59	06:55	07:07	07:20
56°	19:38	20:51	22:05	06:55	07:05	07:16
58°	19:40	20:55	22:13	06:55	07:02	07:10
S 60°	19:42	21:00	22:21	06:55	06:59	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 16-18 97-87%
26	01:58	01:50	12:02	00:49	13:09	
27	01:41	01:33	12:02	01:29	13:49	
28	01:24	01:15	12:01	02:10	14:31	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	337°05.8	138°34.0	S10°44.6	139°39.2	S07°17.4	335°16.2	S00°54.1	152°46.1	N00°29.9
1	352°08.3	153°34.5	45.7	154°40.2	18.1	350°18.9	54.2	167°48.3	29.7
2	7°10.8	168°35.0	46.8	169°41.2	18.7	5°21.6	54.3	182°50.5	29.6
3	22°13.2	183°35.5	·· 47.9	184°42.1	·· 19.3	20°24.4	·· 54.4	197°52.7	·· 29.5
4	37°15.7	198°36.0	49.0	199°43.1	20.0	35°27.1	54.5	212°54.9	29.4
5	52°18.2	213°36.4	50.1	214°44.1	20.6	50°29.8	54.7	227°57.1	29.3
6	67°20.6	228°36.9	S10°51.2	229°45.0	S07°21.3	65°32.5	S00°54.8	242°59.3	N00°29.2
7	82°23.1	243°37.4	52.3	244°46.0	21.9	80°35.2	54.9	258°01.5	29.0
8	97°25.6	258°37.9	53.4	259°47.0	22.6	95°37.9	55.0	273°03.8	28.9
9	112°28.0	273°38.4	·· 54.5	274°47.9	·· 23.2	110°40.6	·· 55.1	288°06.0	·· 28.8
10	127°30.5	288°38.9	55.6	289°48.9	23.8	125°43.3	55.2	303°08.2	28.7
11	142°33.0	303°39.4	56.7	304°49.8	24.5	140°46.0	55.3	318°10.4	28.6
12	157°35.4	318°39.9	S10°57.9	319°50.8	S07°25.1	155°48.7	S00°55.5	333°12.6	N00°28.5
13	172°37.9	333°40.4	10°59.0	334°51.8	25.8	170°51.4	55.6	348°14.8	28.4
14	187°40.3	348°40.9	11°00.1	349°52.7	26.4	185°54.1	55.7	3°17.0	28.2
15	202°42.8	3°41.4	·· 01.2	4°53.7	·· 27.0	200°56.9	·· 55.8	18°19.2	·· 28.1
16	217°45.3	18°41.9	02.3	19°54.7	27.7	215°59.6	55.9	33°21.4	28.0
17	232°47.7	33°42.4	03.4	34°55.6	28.3	231°02.3	56.0	48°23.6	27.9
18	247°50.2	48°42.9	S11°04.5	49°56.6	S07°29.0	246°05.0	S00°56.1	63°25.8	N00°27.8
19	262°52.7	63°43.4	05.6	64°57.6	29.6	261°07.7	56.3	78°28.0	27.7
20	277°55.1	78°43.9	06.7	79°58.5	30.2	276°10.4	56.4	93°30.2	27.5
21	292°57.6	93°44.5	·· 07.8	94°59.5	·· 30.9	291°13.1	·· 56.5	108°32.4	·· 27.4
22	308°00.1	108°45.0	08.9	110°00.4	31.5	306°15.8	56.6	123°34.6	27.3
23	323°02.5	123°45.5	09.9	125°01.4	32.2	321°18.5	56.7	138°36.8	27.2
Mer.pass.:01:31		v0.5 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	338°05.0	138°46.0	S11°11.0	140°02.4	S07°32.8	336°21.3	S00°56.8	153°39.0	N00°27.1
1	353°07.4	153°46.5	12.1	155°03.3	33.4	351°24.0	57.0	168°41.2	27.0
2	8°09.9	168°47.0	13.2	170°04.3	34.1	6°26.7	57.1	183°43.4	26.8
3	23°12.4	183°47.5	·· 14.3	185°05.3	·· 34.7	21°29.4	·· 57.2	198°45.6	·· 26.7
4	38°14.8	198°48.0	15.4	200°06.2	35.4	36°32.1	57.3	213°47.8	26.6
5	53°17.3	213°48.5	16.5	215°07.2	36.0	51°34.8	57.4	228°50.0	26.5
6	68°19.8	228°49.0	S11°17.6	230°08.1	S07°36.7	66°37.5	S00°57.5	243°52.2	N00°26.4
7	83°22.2	243°49.6	18.7	245°09.1	37.3	81°40.2	57.6	258°54.4	26.3
8	98°24.7	258°50.1	19.8	260°10.1	37.9	96°43.0	57.8	273°56.6	26.1
9	113°27.2	273°50.6	·· 20.9	275°11.0	·· 38.6	111°45.7	·· 57.9	288°58.8	·· 26.0
10	128°29.6	288°51.1	22.0	290°12.0	39.2	126°48.4	58.0	304°01.0	25.9
11	143°32.1	303°51.6	23.1	305°12.9	39.9	141°51.1	58.1	319°03.2	25.8
12	158°34.6	318°52.1	S11°24.2	320°13.9	S07°40.5	156°53.8	S00°58.2	334°05.4	N00°25.7
13	173°37.0	333°52.7	25.3	335°14.9	41.1	171°56.5	58.3	349°07.6	25.6
14	188°39.5	348°53.2	26.4	350°15.8	41.8	186°59.2	58.5	4°09.9	25.5
15	203°41.9	3°53.7	·· 27.4	5°16.8	·· 42.4	202°02.0	·· 58.6	19°12.1	·· 25.3
16	218°44.4	18°54.2	28.5	20°17.7	43.1	217°04.7	58.7	34°14.3	25.2
17	233°46.9	33°54.7	29.6	35°18.7	43.7	232°07.4	58.8	49°16.5	25.1
18	248°49.3	48°55.3	S11°30.7	50°19.7	S07°44.3	247°10.1	S00°58.9	64°18.7	N00°25.0
19	263°51.8	63°55.8	31.8	65°20.6	45.0	262°12.8	59.0	79°20.9	24.9
20	278°54.3	78°56.3	32.9	80°21.6	45.6	277°15.5	59.2	94°23.1	24.8
21	293°56.7	93°56.8	·· 34.0	95°22.5	·· 46.2	292°18.2	·· 59.3	109°25.3	·· 24.6
22	308°59.2	108°57.4	35.1	110°23.5	46.9	307°21.0	59.4	124°27.5	24.5
23	324°01.7	123°57.9	36.1	125°24.4	47.5	322°23.7	59.5	139°29.7	24.4
Mer.pass.:01:27		v0.5 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	339°04.1	138°58.4	S11°37.2	140°25.4	S07°48.2	337°26.4	S00°59.6	154°31.9	N00°24.3
1	354°06.6	153°58.9	38.3	155°26.4	48.8	352°29.1	59.8	169°34.1	24.2
2	9°09.1	168°59.5	39.4	170°27.3	49.4	7°31.8	00°59.9	184°36.3	24.1
3	24°11.5	184°00.0	·· 40.5	185°28.3	·· 50.1	22°34.5	01°00.0	199°38.5	·· 23.9
4	39°14.0	199°00.5	41.6	200°29.2	50.7	37°37.3	00.1	214°40.7	23.8
5	54°16.4	214°01.1	42.7	215°30.2	51.4	52°40.0	00.2	229°42.9	23.7
6	69°18.9	229°01.6	S11°43.7	230°31.1	S07°52.0	67°42.7	S01°00.3	244°45.1	N00°23.6
7	84°21.4	244°02.1	44.8	245°32.1	52.6	82°45.4	00.5	259°47.3	23.5
8	99°23.8	259°02.7	45.9	260°33.1	53.3	97°48.1	00.6	274°49.5	23.4
9	114°26.3	274°03.2	·· 47.0	275°34.0	·· 53.9	112°50.9	·· 00.7	289°51.7	·· 23.2
10	129°28.8	289°03.7	48.1	290°35.0	54.6	127°53.6	00.8	304°53.9	23.1
11	144°31.2	304°04.3	49.1	305°35.9	55.2	142°56.3	00.9	319°56.1	23.0
12	159°33.7	319°04.8	S11°50.2	320°36.9	S07°55.8	157°59.0	S01°01.0	334°58.3	N00°22.9
13	174°36.2	334°05.4	51.3	335°37.8	56.5	173°01.7	01.2	350°00.5	22.8
14	189°38.6	349°05.9	52.4	350°38.8	57.1	188°04.4	01.3	5°02.7	22.7
15	204°41.1	4°06.4	·· 53.5	5°39.7	·· 57.8	203°07.2	·· 01.4	20°04.9	·· 22.5
16	219°43.5	19°07.0	54.5	20°40.7	58.4	218°09.9	01.5	35°07.1	22.4
17	234°46.0	34°07.5	55.6	35°41.7	59.0	233°12.6	01.6	50°09.3	22.3
18	249°48.5	49°08.1	S11°56.7	50°42.6	S07°59.7	248°15.3	S01°01.8	65°11.5	N00°22.2
19	264°50.9	64°08.6	57.8	65°43.6	08°00.3	263°18.0	01.9	80°13.7	22.1
20	279°53.4	79°09.1	58.8	80°44.5	00.9	278°20.8	02.0	95°15.9	22.0
21	294°55.9	94°09.7	11°59.9	95°45.5	·· 01.6	293°23.5	·· 02.1	110°18.1	·· 21.8
22	309°58.3	109°10.2	12°01.0	110°46.4	02.2	308°26.2	02.2	125°20.3	21.7
23	325°00.8	124°10.8	02.1	125°47.4	02.9	323°28.9	02.4	140°22.5	21.6
Mer.pass.:01:23		v0.5 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.1
Ankaa	353°17.2	-42°14.6
Schedar	349°42.5	56°35.8
Diphda	348°57.6	-17°55.4
Achernar	335°27.7	-57°10.6
Hamal	328°02.9	23°30.9
Polaris	318°36.2	89°18.4
Acamar	315°19.7	-40°15.4
Menkar	314°17.0	4°08.1
Mirfak	308°43.2	49°53.8
Aldebaran	290°51.7	16°31.9
Rigel	281°14.1	-8°11.2
Capella	280°37.5	46°00.4
Bellatrix	278°34.3	6°21.7
Elnath	278°15.3	28°36.9
Alnilam	275°48.5	-1°11.6
Betelgeuse	271°03.6	7°24.6
Canopus	263°57.3	-52°41.8
Sirius	258°35.7	-16°43.7
Adhara	255°14.3	-28°59.0
Procyon	245°02.1	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°19.5	-59°32.5
Suhail	222°54.4	-43°28.5
Miaplacidus	221°41.2	-69°45.6
Alphard	217°58.4	-8°42.3
Regulus	207°46.0	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.7
Gacrux	172°03.8	-57°10.6
Alioth	166°22.7	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.8
Hadar	148°51.3	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.9	-60°53.0
Kochab	137°20.1	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.3	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.9	51°29.5
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.1	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.6
Markab	13°40.0	15°16.0

Aug 29 Sun	**SHA**	**Mer.pass**
Venus	161°28.1	14:45
Mars	162°33.4	14:40
Jupiter	358°10.4	01:39
Saturn	175°40.3	13:47

Aug 30 Mon	**SHA**	**Mer.pass**
Venus	160°41.0	14:44
Mars	161°57.4	14:39
Jupiter	358°16.3	01:34
Saturn	175°34.0	13:43

Aug 31 Tue	**SHA**	**Mer.pass**
Venus	159°54.3	14:44
Mars	161°21.3	14:37
Jupiter	358°22.3	01:30
Saturn	175°27.7	13:40

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.4	N09°28.2	318°05.1	14.5'	N13°24.3	10.9'	54.6'
1	194°43.6	27.3	332°38.5	14.5'	13°35.1	10.8'	54.7'
2	209°43.8	26.4	347°12.0	14.4'	13°45.9	10.8'	54.7'
3	224°44.0	·· 25.5	1°45.3	14.3'	13°56.6	10.7'	54.7'
4	239°44.2	24.6	16°18.6	14.3'	14°07.3	10.7'	54.7'
5	254°44.4	23.7	30°51.9	14.2'	14°17.9	10.6'	54.7'
6	269°44.6	N09°22.8	45°25.1	14.2'	N14°28.5	10.5'	54.7'
7	284°44.8	22.0	59°58.2	14.1'	14°39.0	10.5'	54.8'
8	299°44.9	21.1	74°31.2	14.0'	14°49.5	10.4'	54.8'
9	314°45.1	·· 20.2	89°04.2	14.0'	14°59.9	10.4'	54.8'
10	329°45.3	19.3	103°37.2	13.9'	15°10.2	10.3'	54.8'
11	344°45.5	18.4	118°10.0	13.8'	15°20.5	10.3'	54.8'
12	359°45.7	N09°17.5	132°42.8	13.8'	N15°30.8	10.2'	54.9'
13	14°45.9	16.6	147°15.5	13.7'	15°40.9	10.1'	54.9'
14	29°46.1	15.7	161°48.2	13.6'	15°51.0	10.1'	54.9'
15	44°46.3	·· 14.8	176°20.8	13.6'	16°01.1	10.0'	54.9'
16	59°46.5	14.0	190°53.3	13.5'	16°11.1	10.0'	54.9'
17	74°46.6	13.1	205°25.8	13.4'	16°21.0	9.9'	55.0'
18	89°46.8	N09°12.2	219°58.2	13.3'	N16°30.9	9.8'	55.0'
19	104°47.0	11.3	234°30.5	13.3'	16°40.6	9.8'	55.0'
20	119°47.2	10.4	249°02.7	13.2'	16°50.4	9.7'	55.0'
21	134°47.4	·· 09.5	263°34.9	13.1'	17°00.0	9.6'	55.0'
22	149°47.6	08.6	278°07.0	13.1'	17°09.6	9.6'	55.1'
23	164°47.8	07.7	292°39.0	13.0'	17°19.1	9.5'	55.1'
	SD.=15.8	d=-0.9	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.0	N09°06.8	307°10.9	12.9'	N17°28.6	9.4'	55.1'
1	194°48.2	05.9	321°42.8	12.8'	17°38.0	9.3'	55.1'
2	209°48.4	05.0	336°14.6	12.8'	17°47.3	9.3'	55.1'
3	224°48.5	·· 04.1	350°46.3	12.7'	17°56.5	9.2'	55.2'
4	239°48.7	03.2	5°18.0	12.6'	18°05.7	9.1'	55.2'
5	254°48.9	02.4	19°49.6	12.5'	18°14.7	9.0'	55.2'
6	269°49.1	N09°01.5	34°21.1	12.5'	N18°23.7	9.0'	55.2'
7	284°49.3	09°00.6	48°52.5	12.4'	18°32.7	8.9'	55.3'
8	299°49.5	08°59.7	63°23.8	12.3'	18°41.5	8.8'	55.3'
9	314°49.7	·· 58.8	77°55.1	12.2'	18°50.3	8.7'	55.3'
10	329°49.9	57.9	92°26.3	12.1'	18°59.0	8.7'	55.3'
11	344°50.1	57.0	106°57.4	12.1'	19°07.6	8.6'	55.4'
12	359°50.3	N08°56.1	121°28.4	12.0'	N19°16.1	8.5'	55.4'
13	14°50.5	55.2	135°59.3	11.9'	19°24.6	8.4'	55.4'
14	29°50.7	54.3	150°30.2	11.8'	19°32.9	8.3'	55.4'
15	44°50.8	·· 53.4	165°01.0	11.7'	19°41.2	8.2'	55.4'
16	59°51.0	52.5	179°31.7	11.7'	19°49.4	8.1'	55.5'
17	74°51.2	51.6	194°02.3	11.6'	19°57.5	8.1'	55.5'
18	89°51.4	N08°50.7	208°32.8	11.5'	N20°05.5	8.0'	55.5'
19	104°51.6	49.8	223°03.3	11.4'	20°13.4	7.9'	55.5'
20	119°51.8	48.9	237°33.7	11.3'	20°21.3	7.8'	55.6'
21	134°52.0	·· 48.0	252°04.0	11.3'	20°29.0	7.7'	55.6'
22	149°52.2	47.1	266°34.2	11.2'	20°36.7	7.6'	55.6'
23	164°52.4	46.2	281°04.3	11.1'	20°44.2	7.5'	55.7'
	SD.=15.8	d=-0.9	S.D.=15.1				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°52.6	N08°45.3	295°34.4	11.0'	N20°51.7	7.4'	55.7'
1	194°52.8	44.4	310°04.3	10.9'	20°59.1	7.3'	55.7'
2	209°53.0	43.5	324°34.2	10.8'	21°06.3	7.2'	55.7'
3	224°53.2	·· 42.6	339°04.0	10.8'	21°13.5	7.1'	55.8'
4	239°53.4	41.7	353°33.7	10.7'	21°20.6	7.0'	55.8'
5	254°53.6	40.8	8°03.4	10.6'	21°27.6	6.9'	55.8'
6	269°53.8	N08°39.9	22°32.9	10.5'	N21°34.4	6.8'	55.8'
7	284°53.9	39.0	37°02.4	10.4'	21°41.2	6.7'	55.9'
8	299°54.1	38.1	51°31.7	10.3'	21°47.9	6.6'	55.9'
9	314°54.3	·· 37.2	66°01.0	10.3'	21°54.5	6.5'	55.9'
10	329°54.5	36.3	80°30.3	10.2'	22°00.9	6.4'	56.0'
11	344°54.7	35.4	94°59.4	10.1'	22°07.3	6.3'	56.0'
12	359°54.9	N08°34.5	109°28.4	10.0'	N22°13.5	6.2'	56.0'
13	14°55.1	33.6	123°57.4	9.9'	22°19.7	6.1'	56.0'
14	29°55.3	32.7	138°26.3	9.8'	22°25.7	6.0'	56.1'
15	44°55.5	·· 31.8	152°55.1	9.8'	22°31.6	5.9'	56.1'
16	59°55.7	30.9	167°23.8	9.7'	22°37.4	5.8'	56.1'
17	74°55.9	30.0	181°52.4	9.6'	22°43.2	5.6'	56.2'
18	89°56.1	N08°29.1	196°21.0	9.5'	N22°48.7	5.5'	56.2'
19	104°56.3	28.2	210°49.4	9.4'	22°54.2	5.4'	56.2'
20	119°56.5	27.3	225°17.8	9.3'	22°59.6	5.3'	56.3'
21	134°56.7	·· 26.4	239°46.1	9.3'	23°04.8	5.2'	56.3'
22	149°56.9	25.5	254°14.4	9.2'	23°09.9	5.1'	56.3'
23	164°57.1	24.6	268°42.5	9.1'	23°15.0	4.9'	56.4'
	SD.=15.8	d=-0.9	S.D.=15.3				

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

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

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 80-63%
29	01:06	00:57	12:01	02:53	15:15	◑
30	00:48	00:39	12:01	03:38	16:02	
31	00:30	00:20	12:00	04:27	16:52	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	340°03.3	139°11.3	S12°03.1	140°48.3	S08°03.5	338°31.7	S01°02.5	155°24.7	N00°21.5
1	355°05.7	154°11.9	04.2	155°49.3	04.1	353°34.4	02.6	170°26.9	21.4
2	10°08.2	169°12.4	05.3	170°50.2	04.8	8°37.1	02.7	185°29.1	21.3
3	25°10.7	184°13.0	·· 06.4	185°51.2	·· 05.4	23°39.8	·· 02.8	200°31.3	·· 21.1
4	40°13.1	199°13.5	07.4	200°52.1	06.1	38°42.5	03.0	215°33.5	21.0
5	55°15.6	214°14.1	08.5	215°53.1	06.7	53°45.3	03.1	230°35.7	20.9
6	70°18.0	229°14.6	S12°09.6	230°54.0	S08°07.3	68°48.0	S01°03.2	245°37.9	N00°20.8
7	85°20.5	244°15.2	10.7	245°55.0	08.0	83°50.7	03.3	260°40.1	20.7
8	100°23.0	259°15.7	11.7	260°55.9	08.6	98°53.4	03.4	275°42.3	20.6
9	115°25.4	274°16.3	·· 12.8	275°56.9	·· 09.2	113°56.1	·· 03.6	290°44.5	·· 20.4
10	130°27.9	289°16.9	13.9	290°57.8	09.9	128°58.9	03.7	305°46.7	20.3
11	145°30.4	304°17.4	14.9	305°58.8	10.5	144°01.6	03.8	320°48.9	20.2
12	160°32.8	319°18.0	S12°16.0	320°59.7	S08°11.2	159°04.3	S01°03.9	335°51.1	N00°20.1
13	175°35.3	334°18.5	17.1	336°00.7	11.8	174°07.0	04.0	350°53.3	20.0
14	190°37.8	349°19.1	18.1	351°01.6	12.4	189°09.8	04.2	5°55.5	19.9
15	205°40.2	4°19.7	·· 19.2	6°02.6	·· 13.1	204°12.5	·· 04.3	20°57.7	·· 19.7
16	220°42.7	19°20.2	20.3	21°03.5	13.7	219°15.2	04.4	35°59.9	19.6
17	235°45.2	34°20.8	21.3	36°04.5	14.3	234°17.9	04.5	51°02.1	19.5
18	250°47.6	49°21.3	S12°22.4	51°05.4	S08°15.0	249°20.7	S01°04.6	66°04.3	N00°19.4
19	265°50.1	64°21.9	23.5	66°06.4	15.6	264°23.4	04.8	81°06.5	19.3
20	280°52.5	79°22.5	24.5	81°07.3	16.3	279°26.1	04.9	96°08.7	19.2
21	295°55.0	94°23.0	·· 25.6	96°08.3	·· 16.9	294°28.8	·· 05.0	111°10.9	·· 19.0
22	310°57.5	109°23.6	26.7	111°09.2	17.5	309°31.6	05.1	126°13.1	18.9
23	325°59.9	124°24.2	27.7	126°10.2	18.2	324°34.3	05.2	141°15.3	18.8
Mer.pass.:01:20		v0.5 d-1.1 m-4.3		v1.0 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	341°02.4	139°24.7	S12°28.8	141°11.1	S08°18.8	339°37.0	S01°05.4	156°17.5	N00°18.7
1	356°04.9	154°25.3	29.8	156°12.1	19.4	354°39.7	05.5	171°19.7	18.6
2	11°07.3	169°25.9	30.9	171°13.0	20.1	9°42.5	05.6	186°21.9	18.5
3	26°09.8	184°26.5	·· 32.0	186°14.0	·· 20.7	24°45.2	·· 05.7	201°24.1	·· 18.3
4	41°12.3	199°27.0	33.0	201°14.9	21.4	39°47.9	05.8	216°26.3	18.2
5	56°14.7	214°27.6	34.1	216°15.9	22.0	54°50.6	06.0	231°28.5	18.1
6	71°17.2	229°28.2	S12°35.1	231°16.8	S08°22.6	69°53.4	S01°06.1	246°30.7	N00°18.0
7	86°19.7	244°28.7	36.2	246°17.8	23.3	84°56.1	06.2	261°32.9	17.9
8	101°22.1	259°29.3	37.3	261°18.7	23.9	99°58.8	06.3	276°35.1	17.7
9	116°24.6	274°29.9	·· 38.3	276°19.7	·· 24.5	115°01.6	·· 06.4	291°37.3	·· 17.6
10	131°27.0	289°30.5	39.4	291°20.6	25.2	130°04.3	06.6	306°39.5	17.5
11	146°29.5	304°31.1	40.4	306°21.5	25.8	145°07.0	06.7	321°41.7	17.4
12	161°32.0	319°31.6	S12°41.5	321°22.5	S08°26.5	160°09.7	S01°06.8	336°43.9	N00°17.3
13	176°34.4	334°32.2	42.5	336°23.4	27.1	175°12.5	06.9	351°46.1	17.2
14	191°36.9	349°32.8	43.6	351°24.4	27.7	190°15.2	07.1	6°48.3	17.0
15	206°39.4	4°33.4	·· 44.6	6°25.3	·· 28.4	205°17.9	·· 07.2	21°50.5	·· 16.9
16	221°41.8	19°34.0	45.7	21°26.3	29.0	220°20.6	07.3	36°52.7	16.8
17	236°44.3	34°34.5	46.8	36°27.2	29.6	235°23.4	07.4	51°54.9	16.7
18	251°46.8	49°35.1	S12°47.8	51°28.2	S08°30.3	250°26.1	S01°07.5	66°57.1	N00°16.6
19	266°49.2	64°35.7	48.9	66°29.1	30.9	265°28.8	07.7	81°59.3	16.5
20	281°51.7	79°36.3	49.9	81°30.0	31.5	280°31.6	07.8	97°01.5	16.3
21	296°54.1	94°36.9	·· 51.0	96°31.0	·· 32.2	295°34.3	·· 07.9	112°03.7	·· 16.2
22	311°56.6	109°37.5	52.0	111°31.9	32.8	310°37.0	08.0	127°05.9	16.1
23	326°59.1	124°38.1	53.1	126°32.9	33.5	325°39.7	08.2	142°08.1	16.0
Mer.pass.:01:16		v0.6 d-1.1 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	342°01.5	139°38.7	S12°54.1	141°33.8	S08°34.1	340°42.5	S01°08.3	157°10.3	N00°15.9
1	357°04.0	154°39.3	55.2	156°34.8	34.7	355°45.2	08.4	172°12.5	15.8
2	12°06.5	169°39.8	56.2	171°35.7	35.4	10°47.9	08.5	187°14.7	15.6
3	27°08.9	184°40.4	·· 57.3	186°36.6	·· 36.0	25°50.7	·· 08.6	202°16.9	·· 15.5
4	42°11.4	199°41.0	58.3	201°37.6	36.6	40°53.4	08.8	217°19.1	15.4
5	57°13.9	214°41.6	12°59.4	216°38.5	37.3	55°56.1	08.9	232°21.3	15.3
6	72°16.3	229°42.2	S13°00.4	231°39.5	S08°37.9	70°58.9	S01°09.0	247°23.5	N00°15.2
7	87°18.8	244°42.8	01.4	246°40.4	38.5	86°01.6	09.1	262°25.7	15.0
8	102°21.3	259°43.4	02.5	261°41.4	39.2	101°04.3	09.3	277°27.9	14.9
9	117°23.7	274°44.0	·· 03.5	276°42.3	·· 39.8	116°07.1	·· 09.4	292°30.1	·· 14.8
10	132°26.2	289°44.6	04.6	291°43.2	40.4	131°09.8	09.5	307°32.3	14.7
11	147°28.6	304°45.2	05.6	306°44.2	41.1	146°12.5	09.6	322°34.5	14.6
12	162°31.1	319°45.8	S13°06.7	321°45.1	S08°41.7	161°15.2	S01°09.7	337°36.6	N00°14.5
13	177°33.6	334°46.4	07.7	336°46.1	42.3	176°18.0	09.9	352°38.8	14.3
14	192°36.0	349°47.0	08.7	351°47.0	43.0	191°20.7	10.0	7°41.0	14.2
15	207°38.5	4°47.6	·· 09.8	6°47.9	·· 43.6	206°23.4	·· 10.1	22°43.2	·· 14.1
16	222°41.0	19°48.2	10.8	21°48.9	44.3	221°26.2	10.2	37°45.4	14.0
17	237°43.4	34°48.8	11.9	36°49.8	44.9	236°28.9	10.4	52°47.6	13.9
18	252°45.9	49°49.5	S13°12.9	51°50.8	S08°45.5	251°31.6	S01°10.5	67°49.8	N00°13.8
19	267°48.4	64°50.1	13.9	66°51.7	46.2	266°34.4	10.6	82°52.0	13.6
20	282°50.8	79°50.7	15.0	81°52.6	46.8	281°37.1	10.7	97°54.2	13.5
21	297°53.3	94°51.3	·· 16.0	96°53.6	·· 47.4	296°39.8	·· 10.9	112°56.4	·· 13.4
22	312°55.8	109°51.9	17.1	111°54.5	48.1	311°42.6	11.0	127°58.6	13.3
23	327°58.2	124°52.5	18.1	126°55.4	48.7	326°45.3	11.1	143°00.8	13.2
Mer.pass.:01:12		v0.6 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.1
Ankaa	353°17.2	-42°14.6
Schedar	349°42.5	56°35.8
Diphda	348°57.6	-17°55.4
Achernar	335°27.7	-57°10.6
Hamal	328°02.9	23°30.9
Polaris	318°34.7	89°18.4
Acamar	315°19.6	-40°15.4
Menkar	314°17.0	4°08.1
Mirfak	308°43.2	49°53.8
Aldebaran	290°51.7	16°31.9
Rigel	281°14.0	-8°11.2
Capella	280°37.5	46°00.4
Bellatrix	278°34.2	6°21.7
Elnath	278°15.2	28°36.9
Alnilam	275°48.5	-1°11.6
Betelgeuse	271°03.6	7°24.6
Canopus	263°57.3	-52°41.8
Sirius	258°35.7	-16°43.7
Adhara	255°14.3	-28°59.0
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°19.5	-59°32.5
Suhail	222°54.4	-43°28.5
Miaplacidus	221°41.2	-69°45.6
Alphard	217°58.4	-8°42.3
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.7
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.8
Hadar	148°51.3	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.9	-60°53.0
Kochab	137°20.2	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.4	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.9	51°29.6
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.1	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.6
Markab	13°40.0	15°16.0

Sep 01 Wed	**SHA**	**Mer.pass**
Venus	159°08.1	14:43
Mars	160°45.1	14:36
Jupiter	358°28.4	01:26
Saturn	175°21.4	13:36

Sep 02 Thu	**SHA**	**Mer.pass**
Venus	158°22.3	14:42
Mars	160°08.7	14:34
Jupiter	358°34.6	01:21
Saturn	175°15.1	13:33

Sep 03 Fri	**SHA**	**Mer.pass**
Venus	157°37.1	14:41
Mars	159°32.3	14:33
Jupiter	358°40.9	01:17
Saturn	175°08.7	13:29

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	179°57.3	N08°23.7	283°10.6	9.0'	N23°19.8	4.8'	56.4'
1	194°57.5	22.8	297°38.6	8.9'	23°24.6	4.7'	56.4'
2	209°57.7	21.9	312°06.5	8.9'	23°29.3	4.6'	56.5'
3	224°57.9	· · 21.0	326°34.3	8.8'	23°33.8	4.5'	56.5'
4	239°58.1	20.1	341°02.0	8.7'	23°38.2	4.3'	56.5'
5	254°58.3	19.2	355°29.7	8.6'	23°42.5	4.2'	56.5'
6	269°58.5	N08°18.2	9°57.3	8.6'	N23°46.6	4.1'	56.6'
7	284°58.7	17.3	24°24.8	8.5'	23°50.6	4.0'	56.6'
8	299°58.9	16.4	38°52.3	8.4'	23°54.5	3.8'	56.6'
9	314°59.1	· · 15.5	53°19.6	8.3'	23°58.3	3.7'	56.7'
10	329°59.2	14.6	67°46.9	8.3'	24°02.0	3.6'	56.7'
11	344°59.4	13.7	82°14.1	8.2'	24°05.5	3.4'	56.7'
12	359°59.6	N08°12.8	96°41.3	8.1'	N24°08.8	3.3'	56.8'
13	14°59.8	11.9	111°08.3	8.0'	24°12.1	3.2'	56.8'
14	30°00.0	11.0	125°35.3	8.0'	24°15.2	3.1'	56.9'
15	45°00.2	· · 10.1	140°02.3	7.9'	24°18.2	2.9'	56.9'
16	60°00.4	09.2	154°29.1	7.8'	24°21.0	2.8'	56.9'
17	75°00.6	08.3	168°55.9	7.8'	24°23.8	2.6'	57.0'
18	90°00.8	N08°07.4	183°22.6	7.7'	N24°26.3	2.5'	57.0'
19	105°01.0	06.4	197°49.3	7.6'	24°28.8	2.4'	57.0'
20	120°01.2	05.5	212°15.8	7.5'	24°31.1	2.2'	57.1'
21	135°01.4	· · 04.6	226°42.4	7.5'	24°33.2	2.1'	57.1'
22	150°01.6	03.7	241°08.8	7.4'	24°35.3	2.0'	57.1'
23	165°01.8	02.8	255°35.2	7.4'	24°37.1	1.8'	57.2'
	SD.=15.8	d=-0.9	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°02.0	N08°01.9	270°01.5	7.3'	N24°38.9	1.7'	57.2'
1	195°02.2	01.0	284°27.8	7.2'	24°40.5	1.5'	57.2'
2	210°02.4	08°00.1	298°54.0	7.2'	24°41.9	1.4'	57.3'
3	225°02.6	07°59.2	313°20.1	7.1'	24°43.3	1.2'	57.3'
4	240°02.8	58.3	327°46.2	7.1'	24°44.4	1.1'	57.3'
5	255°03.0	57.3	342°12.2	7.0'	24°45.4	1.0'	57.4'
6	270°03.2	N07°56.4	356°38.2	6.9'	N24°46.3	0.8'	57.4'
7	285°03.4	55.5	11°04.1	6.9'	24°47.1	0.7'	57.5'
8	300°03.6	54.6	25°30.0	6.8'	24°47.6	0.5'	57.5'
9	315°03.8	· · 53.7	39°55.8	6.8'	24°48.1	0.4'	57.5'
10	330°04.0	52.8	54°21.6	6.7'	24°48.4	0.2'	57.6'
11	345°04.2	51.9	68°47.3	6.7'	24°48.5	0.1'	57.6'
12	0°04.4	N07°51.0	83°12.9	6.6'	N24°48.5	-0.1'	57.6'
13	15°04.6	50.0	97°38.5	6.6'	24°48.3	-0.2'	57.7'
14	30°04.8	49.1	112°04.1	6.5'	24°48.0	-0.4'	57.7'
15	45°05.0	· · 48.2	126°29.6	6.5'	24°47.5	-0.5'	57.8'
16	60°05.2	47.3	140°55.1	6.5'	24°46.9	-0.7'	57.8'
17	75°05.4	46.4	155°20.5	6.4'	24°46.2	-0.8'	57.8'
18	90°05.6	N07°45.5	169°45.9	6.4'	N24°45.2	-1.0'	57.9'
19	105°05.9	44.6	184°11.2	6.3'	24°44.2	-1.2'	57.9'
20	120°06.1	43.7	198°36.6	6.3'	24°42.9	-1.3'	57.9'
21	135°06.3	· · 42.7	213°01.8	6.3'	24°41.6	-1.5'	58.0'
22	150°06.5	41.8	227°27.1	6.2'	24°40.0	-1.6'	58.0'
23	165°06.7	40.9	241°52.3	6.2'	24°38.3	-1.8'	58.1'
	SD.=15.8	d=-0.9	S.D.=15.7				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°06.9	N07°40.0	256°17.4	6.2'	N24°36.5	-1.9'	58.1'
1	195°07.1	39.1	270°42.6	6.1'	24°34.5	-2.1'	58.1'
2	210°07.3	38.2	285°07.7	6.1'	24°32.3	-2.2'	58.2'
3	225°07.5	· · 37.2	299°32.8	6.1'	24°30.0	-2.4'	58.2'
4	240°07.7	36.3	313°57.8	6.0'	24°27.5	-2.6'	58.3'
5	255°07.9	35.4	328°22.9	6.0'	24°24.9	-2.7'	58.3'
6	270°08.1	N07°34.5	342°47.9	6.0'	N24°22.1	-2.9'	58.3'
7	285°08.3	33.6	357°12.8	6.0'	24°19.2	-3.0'	58.4'
8	300°08.5	32.7	11°37.8	5.9'	24°16.0	-3.2'	58.4'
9	315°08.7	· · 31.7	26°02.7	5.9'	24°12.8	-3.3'	58.4'
10	330°08.9	30.8	40°27.7	5.9'	24°09.4	-3.5'	58.5'
11	345°09.1	29.9	54°52.6	5.9'	24°05.8	-3.7'	58.5'
12	0°09.3	N07°29.0	69°17.4	5.9'	N24°02.1	-3.8'	58.6'
13	15°09.5	28.1	83°42.3	5.9'	23°58.2	-4.0'	58.6'
14	30°09.7	27.2	98°07.2	5.9'	23°54.1	-4.1'	58.6'
15	45°09.9	· · 26.2	112°32.0	5.8'	23°49.9	-4.3'	58.7'
16	60°10.1	25.3	126°56.9	5.8'	23°45.5	-4.4'	58.7'
17	75°10.3	24.4	141°21.7	5.8'	23°41.0	-4.6'	58.8'
18	90°10.5	N07°23.5	155°46.5	5.8'	N23°36.3	-4.8'	58.8'
19	105°10.7	22.6	170°11.3	5.8'	23°31.5	-4.9'	58.8'
20	120°10.9	21.6	184°36.1	5.8'	23°26.5	-5.1'	58.9'
21	135°11.1	· · 20.7	199°01.0	5.8'	23°21.4	-5.2'	58.9'
22	150°11.3	19.8	213°25.8	5.8'	23°16.0	-5.4'	58.9'
23	165°11.5	18.9	227°50.6	5.8'	23°10.6	-5.5'	59.0'
	SD.=15.8	d=-0.9	S.D.=16.0				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 22-24 52-31%
01	00:11	00:01	12:00	05:19	17:46	
02	00:08	00:18	12:00	06:14	18:43	
03	00:27	00:37	11:59	07:12	19:41	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°00.7	139°53.1	S13°19.1	141°56.4	S08°49.3	341°48.0	S01°11.2	158°03.0	N00°13.0
1	358°03.1	154°53.7	20.2	156°57.3	50.0	356°50.8	11.4	173°05.2	12.9
2	13°05.6	169°54.3	21.2	171°58.3	50.6	11°53.5	11.5	188°07.4	12.8
3	28°08.1	184°55.0	·· 22.2	186°59.2	·· 51.2	26°56.2	·· 11.6	203°09.6	·· 12.7
4	43°10.5	199°55.6	23.3	202°00.1	51.9	41°59.0	11.7	218°11.8	12.6
5	58°13.0	214°56.2	24.3	217°01.1	52.5	57°01.7	11.9	233°14.0	12.5
6	73°15.5	229°56.8	S13°25.3	232°02.0	S08°53.1	72°04.5	S01°12.0	248°16.2	N00°12.3
7	88°17.9	244°57.4	26.4	247°02.9	53.8	87°07.2	12.1	263°18.4	12.2
8	103°20.4	259°58.1	27.4	262°03.9	54.4	102°09.9	12.2	278°20.6	12.1
9	118°22.9	274°58.7	·· 28.4	277°04.8	·· 55.0	117°12.7	·· 12.3	293°22.8	·· 12.0
10	133°25.3	289°59.3	29.5	292°05.8	55.7	132°15.4	12.5	308°25.0	11.9
11	148°27.8	304°59.9	30.5	307°06.7	56.3	147°18.1	12.6	323°27.2	11.7
12	163°30.3	320°00.6	S13°31.5	322°07.6	S08°56.9	162°20.9	S01°12.7	338°29.4	N00°11.6
13	178°32.7	335°01.2	32.6	337°08.6	57.6	177°23.6	12.8	353°31.6	11.5
14	193°35.2	350°01.8	33.6	352°09.5	58.2	192°26.3	13.0	8°33.8	11.4
15	208°37.6	5°02.4	·· 34.6	7°10.4	·· 58.8	207°29.1	·· 13.1	23°36.0	·· 11.3
16	223°40.1	20°03.1	35.6	22°11.4	08°59.5	222°31.8	13.2	38°38.2	11.2
17	238°42.6	35°03.7	36.7	37°12.3	09°00.1	237°34.5	13.3	53°40.4	11.0
18	253°45.0	50°04.3	S13°37.7	52°13.2	S09°00.7	252°37.3	S01°13.5	68°42.6	N00°10.9
19	268°47.5	65°05.0	38.7	67°14.2	01.4	267°40.0	13.6	83°44.7	10.8
20	283°50.0	80°05.6	39.8	82°15.1	02.0	282°42.8	13.7	98°46.9	10.7
21	298°52.4	95°06.2	·· 40.8	97°16.0	·· 02.6	297°45.5	·· 13.8	113°49.1	·· 10.6
22	313°54.9	110°06.9	41.8	112°17.0	03.3	312°48.2	14.0	128°51.3	10.4
23	328°57.4	125°07.5	42.8	127°17.9	03.9	327°51.0	14.1	143°53.5	10.3
Mer.pass.:01:08		v0.6 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°59.8	140°08.1	S13°43.8	142°18.8	S09°04.5	342°53.7	S01°14.2	158°55.7	N00°10.2
1	359°02.3	155°08.8	44.9	157°19.8	05.2	357°56.4	14.3	173°57.9	10.1
2	14°04.8	170°09.4	45.9	172°20.7	05.8	12°59.2	14.5	189°00.1	10.0
3	29°07.2	185°10.0	·· 46.9	187°21.6	·· 06.4	28°01.9	·· 14.6	204°02.3	·· 09.9
4	44°09.7	200°10.7	47.9	202°22.6	07.1	43°04.7	14.7	219°04.5	09.7
5	59°12.1	215°11.3	49.0	217°23.5	07.7	58°07.4	14.8	234°06.7	09.6
6	74°14.6	230°12.0	S13°50.0	232°24.4	S09°08.3	73°10.1	S01°15.0	249°08.9	N00°09.5
7	89°17.1	245°12.6	51.0	247°25.4	09.0	88°12.9	15.1	264°11.1	09.4
8	104°19.5	260°13.3	52.0	262°26.3	09.6	103°15.6	15.2	279°13.3	09.3
9	119°22.0	275°13.9	·· 53.0	277°27.2	·· 10.2	118°18.4	·· 15.4	294°15.5	·· 09.1
10	134°24.5	290°14.6	54.0	292°28.1	10.9	133°21.1	15.5	309°17.7	09.0
11	149°26.9	305°15.2	55.1	307°29.1	11.5	148°23.8	15.6	324°19.9	08.9
12	164°29.4	320°15.8	S13°56.1	322°30.0	S09°12.1	163°26.6	S01°15.7	339°22.1	N00°08.8
13	179°31.9	335°16.5	57.1	337°30.9	12.8	178°29.3	15.9	354°24.3	08.7
14	194°34.3	350°17.2	58.1	352°31.9	13.4	193°32.1	16.0	9°26.5	08.6
15	209°36.8	5°17.8	13°59.1	7°32.8	·· 14.0	208°34.8	·· 16.1	24°28.7	·· 08.4
16	224°39.2	20°18.5	14°00.1	22°33.7	14.7	223°37.5	16.2	39°30.9	08.3
17	239°41.7	35°19.1	01.1	37°34.7	15.3	238°40.3	16.4	54°33.0	08.2
18	254°44.2	50°19.8	S14°02.2	52°35.6	S09°15.9	253°43.0	S01°16.5	69°35.2	N00°08.1
19	269°46.6	65°20.4	03.2	67°36.5	16.6	268°45.8	16.6	84°37.4	08.0
20	284°49.1	80°21.1	04.2	82°37.4	17.2	283°48.5	16.7	99°39.6	07.8
21	299°51.6	95°21.7	·· 05.2	97°38.4	·· 17.8	298°51.2	·· 16.9	114°41.8	·· 07.7
22	314°54.0	110°22.4	06.2	112°39.3	18.5	313°54.0	17.0	129°44.0	07.6
23	329°56.5	125°23.1	07.2	127°40.2	19.1	328°56.7	17.1	144°46.2	07.5
Mer.pass.:01:04		v0.6 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°59.0	140°23.7	S14°08.2	142°41.2	S09°19.7	343°59.5	S01°17.2	159°48.4	N00°07.4
1	0°01.4	155°24.4	09.2	157°42.1	20.3	359°02.2	17.4	174°50.6	07.2
2	15°03.9	170°25.0	10.2	172°43.0	21.0	14°04.9	17.5	189°52.8	07.1
3	30°06.4	185°25.7	·· 11.2	187°43.9	·· 21.6	29°07.7	·· 17.6	204°55.0	·· 07.0
4	45°08.8	200°26.4	12.3	202°44.9	22.2	44°10.4	17.8	219°57.2	06.9
5	60°11.3	215°27.0	13.3	217°45.8	22.9	59°13.2	17.9	234°59.4	06.8
6	75°13.7	230°27.7	S14°14.3	232°46.7	S09°23.5	74°15.9	S01°18.0	250°01.6	N00°06.7
7	90°16.2	245°28.4	15.3	247°47.6	24.1	89°18.7	18.1	265°03.8	06.5
8	105°18.7	260°29.1	16.3	262°48.6	24.8	104°21.4	18.3	280°06.0	06.4
9	120°21.1	275°29.7	·· 17.3	277°49.5	·· 25.4	119°24.1	·· 18.4	295°08.2	·· 06.3
10	135°23.6	290°30.4	18.3	292°50.4	26.0	134°26.9	18.5	310°10.4	06.2
11	150°26.1	305°31.1	19.3	307°51.3	26.7	149°29.6	18.6	325°12.6	06.1
12	165°28.5	320°31.7	S14°20.3	322°52.3	S09°27.3	164°32.4	S01°18.8	340°14.7	N00°05.9
13	180°31.0	335°32.4	21.3	337°53.2	27.9	179°35.1	18.9	355°16.9	05.8
14	195°33.5	350°33.1	22.3	352°54.1	28.5	194°37.9	19.0	10°19.1	05.7
15	210°35.9	5°33.8	·· 23.3	7°55.0	·· 29.2	209°40.6	·· 19.1	25°21.3	·· 05.6
16	225°38.4	20°34.5	24.3	22°56.0	29.8	224°43.3	19.3	40°23.5	05.5
17	240°40.9	35°35.1	25.3	37°56.9	30.4	239°46.1	19.4	55°25.7	05.4
18	255°43.3	50°35.8	S14°26.3	52°57.8	S09°31.1	254°48.8	S01°19.5	70°27.9	N00°05.2
19	270°45.8	65°36.5	27.3	67°58.7	31.7	269°51.6	19.7	85°30.1	05.1
20	285°48.2	80°37.2	28.3	82°59.7	32.3	284°54.3	19.8	100°32.3	05.0
21	300°50.7	95°37.9	·· 29.3	98°00.6	·· 33.0	299°57.1	·· 19.9	115°34.5	·· 04.9
22	315°53.2	110°38.5	30.3	113°01.5	33.6	314°59.8	20.0	130°36.7	04.8
23	330°55.6	125°39.2	31.3	128°02.4	34.2	330°02.6	20.2	145°38.9	04.6
Mer.pass.:01:00		v0.7 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Stars

	SHA	Dec
Alpheratz	357°45.3	29°09.1
Ankaa	353°17.2	-42°14.6
Schedar	349°42.4	56°35.8
Diphda	348°57.6	-17°55.4
Achernar	335°27.7	-57°10.6
Hamal	328°02.8	23°30.9
Polaris	318°33.3	89°18.4
Acamar	315°19.6	-40°15.4
Menkar	314°17.0	4°08.1
Mirfak	308°43.1	49°53.9
Aldebaran	290°51.7	16°31.9
Rigel	281°14.0	-8°11.2
Capella	280°37.5	46°00.4
Bellatrix	278°34.2	6°21.7
Elnath	278°15.2	28°36.9
Alnilam	275°48.5	-1°11.6
Betelgeuse	271°03.6	7°24.6
Canopus	263°57.3	-52°41.8
Sirius	258°35.6	-16°43.7
Adhara	255°14.3	-28°59.0
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°19.4	-59°32.5
Suhail	222°54.4	-43°28.4
Miaplacidus	221°41.1	-69°45.6
Alphard	217°58.4	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.7
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.7
Hadar	148°51.3	-60°25.7
Menkent	148°10.2	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.9	-60°53.0
Kochab	137°20.2	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.7	-26°27.4
Atria	107°32.4	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.5	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.9	51°29.6
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.1	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 04 Sat	SHA	Mer.pass
Venus	156°52.4	14:40
Mars	158°55.7	14:31
Jupiter	358°47.4	01:13
Saturn	175°02.3	13:26

Sep 05 Sun	SHA	Mer.pass
Venus	156°08.3	14:39
Mars	158°19.0	14:30
Jupiter	358°53.9	01:08
Saturn	174°55.9	13:22

Sep 06 Mon	SHA	Mer.pass
Venus	155°24.8	14:38
Mars	157°42.2	14:28
Jupiter	359°00.5	01:04
Saturn	174°49.5	13:19

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.0518 sec ΔT = TT-UT1 = +66.2358 sec

2010 September 04 to Sep. 06 UT

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°11.8	N07°18.0	242°15.4	5.8'	N23°05.0	-5.7'	59.0'
1	195°12.0	17.0	256°40.2	5.8'	22°59.2	-5.9'	59.1'
2	210°12.2	16.1	271°05.0	5.8'	22°53.2	-6.0'	59.1'
3	225°12.4	·· 15.2	285°29.8	5.8'	22°47.1	-6.2'	59.1'
4	240°12.6	14.3	299°54.6	5.8'	22°40.9	-6.3'	59.2'
5	255°12.8	13.3	314°19.5	5.8'	22°34.5	-6.5'	59.2'
6	270°13.0	N07°12.4	328°44.3	5.8'	N22°27.9	-6.6'	59.2'
7	285°13.2	11.5	343°09.2	5.9'	22°21.2	-6.8'	59.3'
8	300°13.4	10.6	357°34.0	5.9'	22°14.4	-6.9'	59.3'
9	315°13.6	·· 09.7	11°58.9	5.9'	22°07.4	-7.1'	59.4'
10	330°13.8	08.7	26°23.8	5.9'	22°00.2	-7.2'	59.4'
11	345°14.0	07.8	40°48.7	5.9'	21°52.9	-7.4'	59.4'
12	0°14.2	N07°06.9	55°13.6	5.9'	N21°45.4	-7.5'	59.5'
13	15°14.4	06.0	69°38.6	5.9'	21°37.8	-7.7'	59.5'
14	30°14.6	05.0	84°03.5	6.0'	21°30.0	-7.8'	59.5'
15	45°14.8	·· 04.1	98°28.5	6.0'	21°22.1	-8.0'	59.6'
16	60°15.0	03.2	112°53.5	6.0'	21°14.0	-8.1'	59.6'
17	75°15.3	02.3	127°18.5	6.0'	21°05.8	-8.3'	59.7'
18	90°15.5	N07°01.3	141°43.5	6.0'	N20°57.4	-8.4'	59.7'
19	105°15.7	07°00.4	156°08.6	6.1'	20°48.9	-8.6'	59.7'
20	120°15.9	06°59.5	170°33.7	6.1'	20°40.2	-8.7'	59.8'
21	135°16.1	·· 58.6	184°58.8	6.1'	20°31.4	-8.9'	59.8'
22	150°16.3	57.6	199°23.9	6.1'	20°22.5	-9.0'	59.8'
23	165°16.5	56.7	213°49.1	6.2'	20°13.4	-9.2'	59.9'
	SD.=15.8	d=-0.9	S.D.=16.2				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.7	N06°55.8	228°14.2	6.2'	N20°04.2	-9.3'	59.9'
1	195°16.9	54.9	242°39.5	6.2'	19°54.8	-9.4'	59.9'
2	210°17.1	53.9	257°04.7	6.3'	19°45.3	-9.6'	60.0'
3	225°17.3	·· 53.0	271°30.0	6.3'	19°35.6	-9.7'	60.0'
4	240°17.5	52.1	285°55.3	6.3'	19°25.8	-9.9'	60.0'
5	255°17.7	51.2	300°20.6	6.4'	19°15.9	-10.0'	60.1'
6	270°17.9	N06°50.2	314°46.0	6.4'	N19°05.9	-10.1'	60.1'
7	285°18.2	49.3	329°11.4	6.4'	18°55.6	-10.3'	60.1'
8	300°18.4	48.4	343°36.8	6.4'	18°45.3	-10.4'	60.2'
9	315°18.6	·· 47.5	358°02.3	6.5'	18°34.8	-10.5'	60.2'
10	330°18.8	46.5	12°27.8	6.5'	18°24.2	-10.7'	60.2'
11	345°19.0	45.6	26°53.3	6.6'	18°13.5	-10.8'	60.3'
12	0°19.2	N06°44.7	41°18.9	6.6'	N18°02.7	-10.9'	60.3'
13	15°19.4	43.7	55°44.5	6.6'	17°51.7	-11.1'	60.3'
14	30°19.6	42.8	70°10.1	6.7'	17°40.6	-11.2'	60.4'
15	45°19.8	·· 41.9	84°35.8	6.7'	17°29.3	-11.3'	60.4'
16	60°20.0	41.0	99°01.5	6.7'	17°18.0	-11.4'	60.4'
17	75°20.2	40.0	113°27.3	6.8'	17°06.5	-11.5'	60.4'
18	90°20.4	N06°39.1	127°53.1	6.8'	N16°54.9	-11.7'	60.5'
19	105°20.7	38.2	142°18.9	6.8'	16°43.1	-11.8'	60.5'
20	120°20.9	37.2	156°44.8	6.9'	16°31.3	-11.9'	60.5'
21	135°21.1	·· 36.3	171°10.7	6.9'	16°19.3	-12.0'	60.6'
22	150°21.3	35.4	185°36.6	7.0'	16°07.2	-12.1'	60.6'
23	165°21.5	34.5	200°02.6	7.0'	15°55.0	-12.3'	60.6'
	SD.=15.9	d=-0.9	S.D.=16.4				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.7	N06°33.5	214°28.6	7.0'	N15°42.7	-12.4'	60.6'
1	195°21.9	32.6	228°54.7	7.1'	15°30.3	-12.5'	60.7'
2	210°22.1	31.7	243°20.8	7.1'	15°17.8	-12.6'	60.7'
3	225°22.3	·· 30.7	257°46.9	7.2'	15°05.1	-12.7'	60.7'
4	240°22.5	29.8	272°13.1	7.2'	14°52.4	-12.8'	60.7'
5	255°22.8	28.9	286°39.3	7.2'	14°39.5	-12.9'	60.8'
6	270°23.0	N06°27.9	301°05.5	7.3'	N14°26.5	-13.0'	60.8'
7	285°23.2	27.0	315°31.8	7.3'	14°13.5	-13.1'	60.8'
8	300°23.4	26.1	329°58.2	7.4'	14°00.3	-13.2'	60.8'
9	315°23.6	·· 25.1	344°24.5	7.4'	13°47.0	-13.3'	60.9'
10	330°23.8	24.2	358°50.9	7.4'	13°33.7	-13.4'	60.9'
11	345°24.0	23.3	13°17.4	7.5'	13°20.2	-13.5'	60.9'
12	0°24.2	N06°22.4	27°43.9	7.5'	N13°06.7	-13.6'	60.9'
13	15°24.4	21.4	42°10.4	7.5'	12°53.0	-13.7'	61.0'
14	30°24.6	20.5	56°37.0	7.6'	12°39.3	-13.8'	61.0'
15	45°24.9	·· 19.6	71°03.6	7.6'	12°25.4	-13.9'	61.0'
16	60°25.1	18.6	85°30.2	7.7'	12°11.5	-14.0'	61.0'
17	75°25.3	17.7	99°56.9	7.7'	11°57.5	-14.0'	61.0'
18	90°25.5	N06°16.8	114°23.6	7.7'	N11°43.4	-14.1'	61.1'
19	105°25.7	15.8	128°50.4	7.8'	11°29.3	-14.2'	61.1'
20	120°25.9	14.9	143°17.1	7.8'	11°15.0	-14.3'	61.1'
21	135°26.1	·· 14.0	157°44.0	7.8'	11°00.7	-14.4'	61.1'
22	150°26.3	13.0	172°10.8	7.9'	10°46.3	-14.4'	61.1'
23	165°26.5	12.1	186°37.7	7.9'	10°31.8	-14.5'	61.1'
	SD.=15.9	d=-0.9	S.D.=16.6				

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

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

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 25-27 21-6%
04	00:47	00:57	11:59	08:10	20:39	
05	01:07	01:17	11:59	09:08	21:37	
06	01:27	01:37	11:58	10:05	22:32	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	345°58.1	140°39.9	S14°32.3	143°03.4	S09°34.9	345°05.3	S01°20.3	160°41.1	N00°04.5
1	1°00.6	155°40.6	33.3	158°04.3	35.5	0°08.0	20.4	175°43.3	04.4
2	16°03.0	170°41.3	34.2	173°05.2	36.1	15°10.8	20.6	190°45.5	04.3
3	31°05.5	185°42.0	·· 35.2	188°06.1	·· 36.7	30°13.5	·· 20.7	205°47.7	·· 04.2
4	46°08.0	200°42.7	36.2	203°07.0	37.4	45°16.3	20.8	220°49.8	04.0
5	61°10.4	215°43.4	37.2	218°08.0	38.0	60°19.0	20.9	235°52.0	03.9
6	76°12.9	230°44.1	S14°38.2	233°08.9	S09°38.6	75°21.8	S01°21.1	250°54.2	N00°03.8
7	91°15.3	245°44.8	39.2	248°09.8	39.3	90°24.5	21.2	265°56.4	03.7
8	106°17.8	260°45.5	40.2	263°10.7	39.9	105°27.3	21.3	280°58.6	03.6
9	121°20.3	275°46.2	·· 41.2	278°11.6	·· 40.5	120°30.0	·· 21.5	296°00.8	·· 03.4
10	136°22.7	290°46.9	42.2	293°12.6	41.1	135°32.8	21.6	311°03.0	03.3
11	151°25.2	305°47.6	43.2	308°13.5	41.8	150°35.5	21.7	326°05.2	03.2
12	166°27.7	320°48.3	S14°44.1	323°14.4	S09°42.4	165°38.2	S01°21.8	341°07.4	N00°03.1
13	181°30.1	335°49.0	45.1	338°15.3	43.0	180°41.0	22.0	356°09.6	03.0
14	196°32.6	350°49.7	46.1	353°16.2	43.7	195°43.7	22.1	11°11.8	02.9
15	211°35.1	5°50.4	·· 47.1	8°17.2	·· 44.3	210°46.5	·· 22.2	26°14.0	·· 02.7
16	226°37.5	20°51.1	48.1	23°18.1	44.9	225°49.2	22.3	41°16.2	02.6
17	241°40.0	35°51.8	49.1	38°19.0	45.5	240°52.0	22.5	56°18.4	02.5
18	256°42.5	50°52.5	S14°50.1	53°19.9	S09°46.2	255°54.7	S01°22.6	71°20.5	N00°02.4
19	271°44.9	65°53.2	51.0	68°20.8	46.8	270°57.5	22.7	86°22.7	02.3
20	286°47.4	80°53.9	52.0	83°21.8	47.4	286°00.2	22.9	101°24.9	02.1
21	301°49.8	95°54.6	·· 53.0	98°22.7	·· 48.1	301°03.0	·· 23.0	116°27.1	·· 02.0
22	316°52.3	110°55.3	54.0	113°23.6	48.7	316°05.7	23.1	131°29.3	01.9
23	331°54.8	125°56.0	55.0	128°24.5	49.3	331°08.5	23.3	146°31.5	01.8
Mer.pass.:00:56		v0.7 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	346°57.2	140°56.8	S14°55.9	143°25.4	S09°49.9	346°11.2	S01°23.4	161°33.7	N00°01.7
1	1°59.7	155°57.5	56.9	158°26.3	50.6	1°14.0	23.5	176°35.9	01.5
2	17°02.2	170°58.2	57.9	173°27.3	51.2	16°16.7	23.6	191°38.1	01.4
3	32°04.6	185°58.9	·· 58.9	188°28.2	·· 51.8	31°19.5	·· 23.8	206°40.3	·· 01.3
4	47°07.1	200°59.6	14°59.8	203°29.1	52.5	46°22.2	23.9	221°42.5	01.2
5	62°09.6	216°00.3	15°00.8	218°30.0	53.1	61°25.0	24.0	236°44.7	01.1
6	77°12.0	231°01.1	S15°01.8	233°30.9	S09°53.7	76°27.7	S01°24.2	251°46.9	N00°00.9
7	92°14.5	246°01.8	02.8	248°31.8	54.3	91°30.5	24.3	266°49.1	00.8
8	107°16.9	261°02.5	03.8	263°32.8	55.0	106°33.2	24.4	281°51.2	00.7
9	122°19.4	276°03.2	·· 04.7	278°33.7	·· 55.6	121°36.0	·· 24.5	296°53.4	·· 00.6
10	137°21.9	291°04.0	05.7	293°34.6	56.2	136°38.7	24.7	311°55.6	00.5
11	152°24.3	306°04.7	06.7	308°35.5	56.8	151°41.5	24.8	326°57.8	00.4
12	167°26.8	321°05.4	S15°07.6	323°36.4	S09°57.5	166°44.2	S01°24.9	342°00.0	N00°00.2
13	182°29.3	336°06.2	08.6	338°37.3	58.1	181°47.0	25.1	357°02.2	N00°00.1
14	197°31.7	351°06.9	09.6	353°38.2	58.7	196°49.7	25.2	12°04.4	S00°00.0
15	212°34.2	6°07.6	·· 10.6	8°39.2	09°59.4	211°52.5	·· 25.3	27°06.6	·· 00.1
16	227°36.7	21°08.3	11.5	23°40.1	10°00.0	226°55.2	25.4	42°08.8	00.2
17	242°39.1	36°09.1	12.5	38°41.0	00.6	241°58.0	25.6	57°11.0	00.4
18	257°41.6	51°09.8	S15°13.5	53°41.9	S10°01.2	257°00.7	S01°25.7	72°13.2	S00°00.5
19	272°44.1	66°10.6	14.4	68°42.8	01.9	272°03.5	25.8	87°15.4	00.6
20	287°46.5	81°11.3	15.4	83°43.7	02.5	287°06.2	26.0	102°17.5	00.7
21	302°49.0	96°12.0	·· 16.4	98°44.6	·· 03.1	302°09.0	·· 26.1	117°19.7	·· 00.8
22	317°51.4	111°12.8	17.3	113°45.6	03.7	317°11.7	26.2	132°21.9	01.0
23	332°53.9	126°13.5	18.3	128°46.5	04.4	332°14.5	26.4	147°24.1	01.1
Mer.pass.:00:52		v0.7 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	347°56.4	141°14.3	S15°19.2	143°47.4	S10°05.0	347°17.2	S01°26.5	162°26.3	S00°01.2
1	2°58.8	156°15.0	20.2	158°48.3	05.6	2°20.0	26.6	177°28.5	01.3
2	18°01.3	171°15.8	21.2	173°49.2	06.2	17°22.7	26.7	192°30.7	01.4
3	33°03.8	186°16.5	·· 22.1	188°50.1	·· 06.9	32°25.5	·· 26.9	207°32.9	·· 01.6
4	48°06.2	201°17.2	23.1	203°51.0	07.5	47°28.2	27.0	222°35.1	01.7
5	63°08.7	216°18.0	24.1	218°51.9	08.1	62°31.0	27.1	237°37.3	01.8
6	78°11.2	231°18.7	S15°25.0	233°52.8	S10°08.7	77°33.7	S01°27.3	252°39.5	S00°01.9
7	93°13.6	246°19.5	26.0	248°53.8	09.4	92°36.5	27.4	267°41.7	02.0
8	108°16.1	261°20.3	26.9	263°54.7	10.0	107°39.2	27.5	282°43.8	02.2
9	123°18.6	276°21.0	·· 27.9	278°55.6	·· 10.6	122°42.0	·· 27.7	297°46.0	·· 02.3
10	138°21.0	291°21.8	28.8	293°56.5	11.3	137°44.7	27.8	312°48.2	02.4
11	153°23.5	306°22.5	29.8	308°57.4	11.9	152°47.5	27.9	327°50.4	02.5
12	168°25.9	321°23.3	S15°30.8	323°58.3	S10°12.5	167°50.2	S01°28.0	342°52.6	S00°02.6
13	183°28.4	336°24.0	31.7	338°59.2	13.1	182°53.0	28.2	357°54.8	02.8
14	198°30.9	351°24.8	32.7	354°00.1	13.8	197°55.7	28.3	12°57.0	02.9
15	213°33.3	6°25.6	·· 33.6	9°01.0	·· 14.4	212°58.5	·· 28.4	27°59.2	·· 03.0
16	228°35.8	21°26.3	34.6	24°01.9	15.0	228°01.2	28.6	43°01.4	03.1
17	243°38.3	36°27.1	35.5	39°02.8	15.6	243°04.0	28.7	58°03.6	03.2
18	258°40.7	51°27.8	S15°36.5	54°03.8	S10°16.3	258°06.8	S01°28.8	73°05.8	S00°03.4
19	273°43.2	66°28.6	37.4	69°04.7	16.9	273°09.5	29.0	88°07.9	03.5
20	288°45.7	81°29.4	38.4	84°05.6	17.5	288°12.3	29.1	103°10.1	03.6
21	303°48.1	96°30.2	·· 39.3	99°06.5	·· 18.1	303°15.0	·· 29.2	118°12.3	·· 03.7
22	318°50.6	111°30.9	40.3	114°07.4	18.7	318°17.8	29.4	133°14.5	03.8
23	333°53.0	126°31.7	41.2	129°08.3	19.4	333°20.5	29.5	148°16.7	03.9
Mer.pass.:00:48		v0.7 d-1.0 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.2
Ankaa	353°17.2	-42°14.6
Schedar	349°42.4	56°35.8
Diphda	348°57.6	-17°55.4
Achernar	335°27.7	-57°10.6
Hamal	328°02.8	23°30.9
Polaris	318°32.2	89°18.4
Acamar	315°19.6	-40°15.4
Menkar	314°17.0	4°08.1
Mirfak	308°43.1	49°53.9
Aldebaran	290°51.6	16°31.9
Rigel	281°14.0	-8°11.2
Capella	280°37.4	46°00.4
Bellatrix	278°34.2	6°21.7
Elnath	278°15.2	28°37.0
Alnilam	275°48.4	-1°11.6
Betelgeuse	271°03.5	7°24.6
Canopus	263°57.2	-52°41.8
Sirius	258°35.6	-16°43.7
Adhara	255°14.3	-28°59.0
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°19.4	-59°32.4
Suhail	222°54.4	-43°28.4
Miaplacidus	221°41.1	-69°45.6
Alphard	217°58.4	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.6
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.7
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.7
Hadar	148°51.3	-60°25.7
Menkent	148°10.3	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°54.9	-60°52.9
Kochab	137°20.3	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.8	-26°27.4
Atria	107°32.4	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.8
Rasalhague	96°08.2	12°33.3
Eltanin	90°46.9	51°29.6
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.2	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.8	-56°42.0
Deneb	49°32.5	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 07 Tue	**SHA**	**Mer.pass**
Venus	154°41.8	14:37
Mars	157°05.3	14:27
Jupiter	359°07.2	00:59
Saturn	174°43.0	13:15

Sep 08 Wed	**SHA**	**Mer.pass**
Venus	153°59.5	14:36
Mars	156°28.2	14:25
Jupiter	359°14.0	00:55
Saturn	174°36.5	13:12

Sep 09 Thu	**SHA**	**Mer.pass**
Venus	153°17.9	14:34
Mars	155°51.0	14:24
Jupiter	359°20.8	00:51
Saturn	174°29.9	13:08

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°26.8	N06°11.2	201°04.7	7.9'	N10°17.2	-14.6'	61.2'
1	195°27.0	10.2	215°31.6	8.0'	10°02.6	-14.7'	61.2'
2	210°27.2	09.3	229°58.6	8.0'	09°47.9	-14.7'	61.2'
3	225°27.4	·· 08.3	244°25.7	8.1'	09°33.1	-14.8'	61.2'
4	240°27.6	07.4	258°52.7	8.1'	09°18.3	-14.9'	61.2'
5	255°27.8	06.5	273°19.8	8.1'	09°03.4	-14.9'	61.2'
6	270°28.0	N06°05.5	287°47.0	8.1'	N08°48.4	-15.0'	61.2'
7	285°28.2	04.6	302°14.1	8.2'	08°33.4	-15.1'	61.3'
8	300°28.5	03.7	316°41.3	8.2'	08°18.3	-15.1'	61.3'
9	315°28.7	·· 02.7	331°08.5	8.2'	08°03.1	-15.2'	61.3'
10	330°28.9	01.8	345°35.8	8.3'	07°47.9	-15.2'	61.3'
11	345°29.1	06°00.9	0°03.1	8.3'	07°32.7	-15.3'	61.3'
12	0°29.3	N05°59.9	14°30.4	8.3'	N07°17.4	-15.3'	61.3'
13	15°29.5	59.0	28°57.7	8.4'	07°02.0	-15.4'	61.3'
14	30°29.7	58.0	43°25.1	8.4'	06°46.6	-15.4'	61.3'
15	45°29.9	·· 57.1	57°52.5	8.4'	06°31.1	-15.5'	61.3'
16	60°30.2	56.2	72°19.9	8.4'	06°15.7	-15.5'	61.3'
17	75°30.4	55.2	86°47.4	8.5'	06°00.1	-15.6'	61.3'
18	90°30.6	N05°54.3	101°14.9	8.5'	N05°44.5	-15.6'	61.3'
19	105°30.8	53.4	115°42.4	8.5'	05°28.9	-15.6'	61.4'
20	120°31.0	52.4	130°09.9	8.5'	05°13.3	-15.7'	61.4'
21	135°31.2	·· 51.5	144°37.4	8.6'	04°57.6	-15.7'	61.4'
22	150°31.4	50.5	159°05.0	8.6'	04°41.9	-15.7'	61.4'
23	165°31.6	49.6	173°32.6	8.6'	04°26.1	-15.8'	61.4'
	SD.=15.9	d=-0.9	S.D.=16.7				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°31.9	N05°48.7	188°00.2	8.6'	N04°10.3	-15.8'	61.4'
1	195°32.1	47.7	202°27.8	8.6'	03°54.5	-15.8'	61.4'
2	210°32.3	46.8	216°55.5	8.7'	03°38.7	-15.8'	61.4'
3	225°32.5	·· 45.9	231°23.1	8.7'	03°22.9	-15.9'	61.4'
4	240°32.7	44.9	245°50.8	8.7'	03°07.0	-15.9'	61.4'
5	255°32.9	44.0	260°18.5	8.7'	02°51.1	-15.9'	61.4'
6	270°33.1	N05°43.0	274°46.2	8.7'	N02°35.2	-15.9'	61.4'
7	285°33.4	42.1	289°14.0	8.7'	02°19.3	-15.9'	61.4'
8	300°33.6	41.2	303°41.7	8.8'	02°03.3	-15.9'	61.4'
9	315°33.8	·· 40.2	318°09.5	8.8'	01°47.4	-16.0'	61.4'
10	330°34.0	39.3	332°37.3	8.8'	01°31.4	-16.0'	61.4'
11	345°34.2	38.3	347°05.0	8.8'	01°15.4	-16.0'	61.4'
12	0°34.4	N05°37.4	1°32.8	8.8'	N00°59.5	-16.0'	61.4'
13	15°34.6	36.5	16°00.7	8.8'	00°43.5	-16.0'	61.4'
14	30°34.9	35.5	30°28.5	8.8'	00°27.5	-16.0'	61.3'
15	45°35.1	·· 34.6	44°56.3	8.8'	N00°11.6	-16.0'	61.3'
16	60°35.3	33.6	59°24.1	8.8'	S00°04.4	-16.0'	61.3'
17	75°35.5	32.7	73°52.0	8.8'	00°20.4	-16.0'	61.3'
18	90°35.7	N05°31.7	88°19.8	8.9'	S00°36.3	-16.0'	61.3'
19	105°35.9	30.8	102°47.7	8.9'	00°52.3	-15.9'	61.3'
20	120°36.1	29.9	117°15.6	8.9'	01°08.2	-15.9'	61.3'
21	135°36.4	·· 28.9	131°43.4	8.9'	01°24.2	-15.9'	61.3'
22	150°36.6	28.0	146°11.3	8.9'	01°40.1	-15.9'	61.3'
23	165°36.8	27.0	160°39.2	8.9'	01°56.0	-15.9'	61.3'
	SD.=15.9	d=-0.9	S.D.=16.7				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°37.0	N05°26.1	175°07.1	8.9'	S02°11.8	-15.9'	61.3'
1	195°37.2	25.2	189°34.9	8.9'	02°27.7	-15.8'	61.2'
2	210°37.4	24.2	204°02.8	8.9'	02°43.5	-15.8'	61.2'
3	225°37.7	·· 23.3	218°30.7	8.9'	02°59.4	-15.8'	61.2'
4	240°37.9	22.3	232°58.6	8.9'	03°15.1	-15.8'	61.2'
5	255°38.1	21.4	247°26.4	8.9'	03°30.9	-15.7'	61.2'
6	270°38.3	N05°20.4	261°54.3	8.9'	S03°46.6	-15.7'	61.2'
7	285°38.5	19.5	276°22.2	8.9'	04°02.3	-15.7'	61.2'
8	300°38.7	18.5	290°50.1	8.9'	04°18.0	-15.6'	61.1'
9	315°38.9	·· 17.6	305°17.9	8.9'	04°33.6	-15.6'	61.1'
10	330°39.2	16.7	319°45.8	8.9'	04°49.2	-15.6'	61.1'
11	345°39.4	15.7	334°13.6	8.8'	05°04.8	-15.5'	61.1'
12	0°39.6	N05°14.8	348°41.5	8.8'	S05°20.3	-15.5'	61.1'
13	15°39.8	13.8	3°09.3	8.8'	05°35.8	-15.5'	61.1'
14	30°40.0	12.9	17°37.1	8.8'	05°51.2	-15.4'	61.0'
15	45°40.2	·· 11.9	32°05.0	8.8'	06°06.6	-15.4'	61.0'
16	60°40.5	11.0	46°32.8	8.8'	06°21.9	-15.3'	61.0'
17	75°40.7	10.0	61°00.6	8.8'	06°37.2	-15.3'	61.0'
18	90°40.9	N05°09.1	75°28.4	8.8'	S06°52.4	-15.2'	61.0'
19	105°41.1	08.2	89°56.1	8.8'	07°07.6	-15.2'	60.9'
20	120°41.3	07.2	104°23.9	8.8'	07°22.7	-15.1'	60.9'
21	135°41.5	·· 06.3	118°51.6	8.7'	07°37.8	-15.0'	60.9'
22	150°41.8	05.3	133°19.4	8.7'	07°52.8	-15.0'	60.9'
23	165°42.0	04.4	147°47.1	8.7'	08°07.8	-14.9'	60.8'
	SD.=15.9	d=-0.9	S.D.=16.6				

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

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

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 28-1 1-2%
07	01:47	01:57	11:58	11:00	23:27	
08	02:07	02:18	11:58	11:54	–:–	
09	02:28	02:38	11:57	12:47	00:20	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	348°55.5	141°32.5	S15°42.2	144°09.2	S10°20.0	348°23.3	S01°29.6	163°18.9	S00°04.1
1	3°58.0	156°33.2	43.1	159°10.1	20.6	3°26.0	29.7	178°21.1	04.2
2	19°00.4	171°34.0	44.1	174°11.0	21.2	18°28.8	29.9	193°23.3	04.3
3	34°02.9	186°34.8	·· 45.0	189°11.9	·· 21.9	33°31.5	·· 30.0	208°25.5	·· 04.4
4	49°05.4	201°35.6	46.0	204°12.8	22.5	48°34.3	30.1	223°27.7	04.5
5	64°07.8	216°36.4	46.9	219°13.7	23.1	63°37.0	30.3	238°29.9	04.7
6	79°10.3	231°37.1	S15°47.8	234°14.6	S10°23.7	78°39.8	S01°30.4	253°32.0	S00°04.8
7	94°12.8	246°37.9	48.8	249°15.5	24.4	93°42.6	30.5	268°34.2	04.9
8	109°15.2	261°38.7	49.7	264°16.4	25.0	108°45.3	30.7	283°36.4	05.0
9	124°17.7	276°39.5	·· 50.7	279°17.3	·· 25.6	123°48.1	·· 30.8	298°38.6	·· 05.1
10	139°20.2	291°40.3	51.6	294°18.2	26.2	138°50.8	30.9	313°40.8	05.3
11	154°22.6	306°41.1	52.6	309°19.2	26.9	153°53.6	31.1	328°43.0	05.4
12	169°25.1	321°41.8	S15°53.5	324°20.1	S10°27.5	168°56.3	S01°31.2	343°45.2	S00°05.5
13	184°27.5	336°42.6	54.4	339°21.0	28.1	183°59.1	31.3	358°47.4	05.6
14	199°30.0	351°43.4	55.4	354°21.9	28.7	199°01.8	31.5	13°49.6	05.7
15	214°32.5	6°44.2	·· 56.3	9°22.8	·· 29.4	214°04.6	·· 31.6	28°51.8	·· 05.9
16	229°34.9	21°45.0	57.2	24°23.7	30.0	229°07.4	31.7	43°53.9	06.0
17	244°37.4	36°45.8	58.2	39°24.6	30.6	244°10.1	31.8	58°56.1	06.1
18	259°39.9	51°46.6	S15°59.1	54°25.5	S10°31.2	259°12.9	S01°32.0	73°58.3	S00°06.2
19	274°42.3	66°47.4	16°00.0	69°26.4	31.8	274°15.6	32.1	89°00.5	06.3
20	289°44.8	81°48.2	01.0	84°27.3	32.5	289°18.4	32.2	104°02.7	06.5
21	304°47.3	96°49.0	·· 01.9	99°28.2	·· 33.1	304°21.1	·· 32.4	119°04.9	·· 06.6
22	319°49.7	111°49.8	02.8	114°29.1	33.7	319°23.9	32.5	134°07.1	06.7
23	334°52.2	126°50.6	03.8	129°30.0	34.3	334°26.7	32.6	149°09.3	06.8
Mer.pass.:00:44		v0.8 d-0.9 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°54.6	141°51.4	S16°04.7	144°30.9	S10°35.0	349°29.4	S01°32.8	164°11.5	S00°06.9
1	4°57.1	156°52.2	05.6	159°31.8	35.6	4°32.2	32.9	179°13.7	07.1
2	19°59.6	171°53.0	06.6	174°32.7	36.2	19°34.9	33.0	194°15.8	07.2
3	35°02.0	186°53.8	·· 07.5	189°33.6	·· 36.8	34°37.7	·· 33.2	209°18.0	·· 07.3
4	50°04.5	201°54.6	08.4	204°34.5	37.4	49°40.4	33.3	224°20.2	07.4
5	65°07.0	216°55.5	09.4	219°35.4	38.1	64°43.2	33.4	239°22.4	07.5
6	80°09.4	231°56.3	S16°10.3	234°36.3	S10°38.7	79°45.9	S01°33.6	254°24.6	S00°07.7
7	95°11.9	246°57.1	11.2	249°37.2	39.3	94°48.7	33.7	269°26.8	07.8
8	110°14.4	261°57.9	12.1	264°38.1	39.9	109°51.5	33.8	284°29.0	07.9
9	125°16.8	276°58.7	·· 13.1	279°39.0	·· 40.5	124°54.2	·· 34.0	299°31.2	·· 08.0
10	140°19.3	291°59.5	14.0	294°39.9	41.2	139°57.0	34.1	314°33.4	08.1
11	155°21.8	307°00.4	14.9	309°40.8	41.8	154°59.7	34.2	329°35.5	08.3
12	170°24.2	322°01.2	S16°15.8	324°41.7	S10°42.4	170°02.5	S01°34.3	344°37.7	S00°08.4
13	185°26.7	337°02.0	16.7	339°42.6	43.0	185°05.3	34.5	359°39.9	08.5
14	200°29.1	352°02.8	17.7	354°43.5	43.7	200°08.0	34.6	14°42.1	08.6
15	215°31.6	7°03.7	·· 18.6	9°44.4	·· 44.3	215°10.8	·· 34.7	29°44.3	·· 08.7
16	230°34.1	22°04.5	19.5	24°45.3	44.9	230°13.5	34.9	44°46.5	08.9
17	245°36.5	37°05.3	20.4	39°46.2	45.5	245°16.3	35.0	59°48.7	09.0
18	260°39.0	52°06.1	S16°21.3	54°47.1	S10°46.1	260°19.0	S01°35.1	74°50.9	S00°09.1
19	275°41.5	67°07.0	22.3	69°48.0	46.8	275°21.8	35.3	89°53.1	09.2
20	290°43.9	82°07.8	23.2	84°48.9	47.4	290°24.6	35.4	104°55.3	09.3
21	305°46.4	97°08.6	·· 24.1	99°49.8	·· 48.0	305°27.3	·· 35.5	119°57.4	·· 09.5
22	320°48.9	112°09.5	25.0	114°50.7	48.6	320°30.1	35.7	134°59.6	09.6
23	335°51.3	127°10.3	25.9	129°51.6	49.2	335°32.8	35.8	150°01.8	09.7
Mer.pass.:00:40		v0.8 d-0.9 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°53.8	142°11.1	S16°26.8	144°52.4	S10°49.9	350°35.6	S01°35.9	165°04.0	S00°09.8
1	5°56.2	157°12.0	27.7	159°53.3	50.5	5°38.4	36.1	180°06.2	09.9
2	20°58.7	172°12.8	28.7	174°54.2	51.1	20°41.1	36.2	195°08.4	10.1
3	36°01.2	187°13.7	·· 29.6	189°55.1	·· 51.7	35°43.9	·· 36.3	210°10.6	·· 10.2
4	51°03.6	202°14.5	30.5	204°56.0	52.3	50°46.6	36.5	225°12.8	10.3
5	66°06.1	217°15.4	31.4	219°56.9	53.0	65°49.4	36.6	240°15.0	10.4
6	81°08.6	232°16.2	S16°32.3	234°57.8	S10°53.6	80°52.2	S01°36.7	255°17.1	S00°10.5
7	96°11.0	247°17.0	33.2	249°58.7	54.2	95°54.9	36.9	270°19.3	10.7
8	111°13.5	262°17.9	34.1	264°59.6	54.8	110°57.7	37.0	285°21.5	10.8
9	126°16.0	277°18.7	·· 35.0	280°00.5	·· 55.4	126°00.4	·· 37.1	300°23.7	·· 10.9
10	141°18.4	292°19.6	35.9	295°01.4	56.1	141°03.2	37.3	315°25.9	11.0
11	156°20.9	307°20.5	36.8	310°02.3	56.7	156°06.0	37.4	330°28.1	11.1
12	171°23.4	322°21.3	S16°37.7	325°03.2	S10°57.3	171°08.7	S01°37.5	345°30.3	S00°11.3
13	186°25.8	337°22.2	38.6	340°04.1	57.9	186°11.5	37.7	0°32.5	11.4
14	201°28.3	352°23.0	39.5	355°05.0	58.5	201°14.2	37.8	15°34.6	11.5
15	216°30.7	7°23.9	·· 40.4	10°05.9	·· 59.1	216°17.0	·· 37.9	30°36.8	·· 11.6
16	231°33.2	22°24.7	41.3	25°06.7	10°59.8	231°19.8	38.1	45°39.0	11.7
17	246°35.7	37°25.6	42.2	40°07.6	11°00.4	246°22.5	38.2	60°41.2	11.9
18	261°38.1	52°26.5	S16°43.1	55°08.5	S11°01.0	261°25.3	S01°38.3	75°43.4	S00°12.0
19	276°40.6	67°27.3	44.0	70°09.4	01.6	276°28.0	38.5	90°45.6	12.1
20	291°43.1	82°28.2	44.9	85°10.3	02.2	291°30.8	38.6	105°47.8	12.2
21	306°45.5	97°29.1	·· 45.8	100°11.2	·· 02.9	306°33.6	·· 38.7	120°50.0	·· 12.3
22	321°48.0	112°29.9	46.7	115°12.1	03.5	321°36.3	38.9	135°52.2	12.5
23	336°50.5	127°30.8	47.6	130°13.0	04.1	336°39.1	39.0	150°54.3	12.6
Mer.pass.:00:36		v0.8 d-0.9 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Stars

	SHA	Dec
Alpheratz	357°45.3	29°09.2
Ankaa	353°17.2	-42°14.6
Schedar	349°42.4	56°35.8
Diphda	348°57.5	-17°55.4
Achernar	335°27.6	-57°10.6
Hamal	328°02.8	23°30.9
Polaris	318°30.9	89°18.5
Acamar	315°19.6	-40°15.4
Menkar	314°17.0	4°08.1
Mirfak	308°43.1	49°53.9
Aldebaran	290°51.6	16°31.9
Rigel	281°14.0	-8°11.2
Capella	280°37.4	46°00.4
Bellatrix	278°34.2	6°21.7
Elnath	278°15.2	28°36.9
Alnilam	275°48.4	-1°11.6
Betelgeuse	271°03.5	7°24.6
Canopus	263°57.2	-52°41.8
Sirius	258°35.6	-16°43.7
Adhara	255°14.3	-28°59.0
Procyon	245°02.0	5°11.9
Pollux	243°30.4	28°00.0
Avior	234°19.4	-59°32.4
Suhail	222°54.4	-43°28.4
Miaplacidus	221°41.1	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.5
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.7
Hadar	148°51.3	-60°25.7
Menkent	148°10.3	-36°25.5
Arcturus	145°57.7	19°07.7
Rigil Kent.	139°55.0	-60°52.9
Kochab	137°20.3	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.8	-26°27.4
Atria	107°32.5	-69°03.1
Sabik	102°14.8	-15°44.3
Shaula	96°24.6	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.0	51°29.6
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.2	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.8	-56°42.1
Deneb	49°32.5	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 10 Fri	SHA	Mer.pass
Venus	152°37.0	14:33
Mars	155°13.7	14:23
Jupiter	359°27.8	00:46
Saturn	174°23.4	13:05

Sep 11 Sat	SHA	Mer.pass
Venus	151°56.8	14:32
Mars	154°36.2	14:21
Jupiter	359°34.8	00:42
Saturn	174°16.8	13:01

Sep 12 Sun	SHA	Mer.pass
Venus	151°17.4	14:30
Mars	153°58.7	14:20
Jupiter	359°41.8	00:38
Saturn	174°10.2	12:58

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.0537 sec ΔT = TT-UT1 = +66.2377 sec

2010 September 10 to Sep. 12 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°42.2	N05°03.4	162°14.8	8.7'	S08°22.6	-14.9'	60.8'
1	195°42.4	02.5	176°42.5	8.7'	08°37.5	-14.8'	60.8'
2	210°42.6	01.5	191°10.2	8.7'	08°52.2	-14.7'	60.8'
3	225°42.8	05°00.6	205°37.8	8.7'	09°06.9	-14.7'	60.8'
4	240°43.1	04°59.6	220°05.5	8.6'	09°21.5	-14.6'	60.7'
5	255°43.3	58.7	234°33.1	8.6'	09°36.1	-14.5'	60.7'
6	270°43.5	N04°57.7	249°00.7	8.6'	S09°50.6	-14.4'	60.7'
7	285°43.7	56.8	263°28.3	8.6'	10°05.0	-14.4'	60.6'
8	300°43.9	55.9	277°55.9	8.6'	10°19.3	-14.3'	60.6'
9	315°44.1	·· 54.9	292°23.4	8.5'	10°33.6	-14.2'	60.6'
10	330°44.4	54.0	306°51.0	8.5'	10°47.8	-14.1'	60.6'
11	345°44.6	53.0	321°18.5	8.5'	11°01.9	-14.1'	60.5'
12	0°44.8	N04°52.1	335°46.0	8.5'	S11°15.9	-14.0'	60.5'
13	15°45.0	51.1	350°13.5	8.5'	11°29.8	-13.9'	60.5'
14	30°45.2	50.2	4°40.9	8.4'	11°43.7	-13.8'	60.4'
15	45°45.5	·· 49.2	19°08.3	8.4'	11°57.4	-13.7'	60.4'
16	60°45.7	48.3	33°35.7	8.4'	12°11.1	-13.6'	60.4'
17	75°45.9	47.3	48°03.1	8.4'	12°24.7	-13.5'	60.4'
18	90°46.1	N04°46.4	62°30.5	8.3'	S12°38.2	-13.5'	60.3'
19	105°46.3	45.4	76°57.8	8.3'	12°51.6	-13.4'	60.3'
20	120°46.5	44.5	91°25.1	8.3'	13°04.9	-13.3'	60.3'
21	135°46.8	·· 43.5	105°52.4	8.3'	13°18.1	-13.2'	60.2'
22	150°47.0	42.6	120°19.7	8.3'	13°31.3	-13.1'	60.2'
23	165°47.2	41.6	134°46.9	8.2'	13°44.3	-13.0'	60.2'
	SD.=15.9	d=-0.9	S.D.=16.5				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°47.4	N04°40.7	149°14.1	8.2'	S13°57.2	-12.9'	60.1'
1	195°47.6	39.7	163°41.3	8.2'	14°10.0	-12.8'	60.1'
2	210°47.9	38.8	178°08.5	8.2'	14°22.8	-12.7'	60.1'
3	225°48.1	·· 37.8	192°35.6	8.1'	14°35.4	-12.6'	60.0'
4	240°48.3	36.9	207°02.8	8.1'	14°47.9	-12.5'	60.0'
5	255°48.5	35.9	221°29.9	8.1'	15°00.3	-12.4'	60.0'
6	270°48.7	N04°35.0	235°56.9	8.1'	S15°12.6	-12.3'	59.9'
7	285°48.9	34.0	250°24.0	8.0'	15°24.8	-12.1'	59.9'
8	300°49.2	33.1	264°51.0	8.0'	15°36.9	-12.0'	59.9'
9	315°49.4	·· 32.1	279°18.0	8.0'	15°48.9	-11.9'	59.8'
10	330°49.6	31.2	293°45.0	8.0'	16°00.8	-11.8'	59.8'
11	345°49.8	30.2	308°11.9	7.9'	16°12.5	-11.7'	59.7'
12	0°50.0	N04°29.3	322°38.8	7.9'	S16°24.2	-11.6'	59.7'
13	15°50.3	28.3	337°05.7	7.9'	16°35.7	-11.5'	59.7'
14	30°50.5	27.4	351°32.6	7.9'	16°47.1	-11.4'	59.6'
15	45°50.7	·· 26.4	5°59.4	7.8'	16°58.4	-11.2'	59.6'
16	60°50.9	25.5	20°26.2	7.8'	17°09.6	-11.1'	59.6'
17	75°51.1	24.5	34°53.0	7.8'	17°20.6	-11.0'	59.5'
18	90°51.4	N04°23.6	49°19.8	7.8'	S17°31.6	-10.9'	59.5'
19	105°51.6	22.6	63°46.6	7.7'	17°42.4	-10.8'	59.5'
20	120°51.8	21.7	78°13.3	7.7'	17°53.1	-10.6'	59.4'
21	135°52.0	·· 20.7	92°40.0	7.7'	18°03.7	-10.5'	59.4'
22	150°52.2	19.7	107°06.7	7.7'	18°14.1	-10.4'	59.3'
23	165°52.5	18.8	121°33.3	7.6'	18°24.4	-10.3'	59.3'
	SD.=15.9	d=-0.9	S.D.=16.3				

Sun	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°52.7	N04°17.8	136°00.0	7.6'	S18°34.6	-10.1'	59.3'
1	195°52.9	16.9	150°26.6	7.6'	18°44.7	-10.0'	59.2'
2	210°53.1	15.9	164°53.2	7.6'	18°54.6	-9.9'	59.2'
3	225°53.3	·· 15.0	179°19.7	7.6'	19°04.4	-9.7'	59.1'
4	240°53.6	14.0	193°46.3	7.5'	19°14.1	-9.6'	59.1'
5	255°53.8	13.1	208°12.8	7.5'	19°23.7	-9.5'	59.1'
6	270°54.0	N04°12.1	222°39.3	7.5'	S19°33.1	-9.4'	59.0'
7	285°54.2	11.2	237°05.8	7.5'	19°42.4	-9.2'	59.0'
8	300°54.4	10.2	251°32.3	7.5'	19°51.5	-9.1'	58.9'
9	315°54.7	·· 09.3	265°58.7	7.4'	20°00.6	-9.0'	58.9'
10	330°54.9	08.3	280°25.2	7.4'	20°09.4	-8.8'	58.9'
11	345°55.1	07.4	294°51.6	7.4'	20°18.2	-8.7'	58.8'
12	0°55.3	N04°06.4	309°18.0	7.4'	S20°26.8	-8.5'	58.8'
13	15°55.5	05.4	323°44.4	7.4'	20°35.3	-8.4'	58.8'
14	30°55.8	04.5	338°10.8	7.4'	20°43.6	-8.3'	58.7'
15	45°56.0	·· 03.5	352°37.1	7.3'	20°51.8	-8.1'	58.7'
16	60°56.2	02.6	7°03.5	7.3'	20°59.9	-8.0'	58.6'
17	75°56.4	01.6	21°29.8	7.3'	21°07.8	-7.9'	58.6'
18	90°56.6	N04°00.7	35°56.1	7.3'	S21°15.6	-7.7'	58.6'
19	105°56.9	03°59.7	50°22.4	7.3'	21°23.3	-7.6'	58.5'
20	120°57.1	58.8	64°48.7	7.3'	21°30.8	-7.4'	58.5'
21	135°57.3	·· 57.8	79°15.0	7.3'	21°38.2	-7.3'	58.4'
22	150°57.5	56.8	93°41.3	7.3'	21°45.4	-7.2'	58.4'
23	165°57.7	55.9	108°07.5	7.3'	21°52.5	-7.0'	58.4'
	SD.=15.9	d=-1.0	S.D.=16.0				

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

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

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 2-4 7-22%
10	02:49	02:59	11:57	13:41	01:14	
11	03:10	03:20	11:57	14:35	02:08	
12	03:31	03:41	11:56	15:31	03:03	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	351°52.9	142°31.7	S16°48.5	145°13.9	S11°04.7	351°41.8	S01°39.1	165°56.5	S00°12.7
1	6°55.4	157°32.6	49.4	160°14.8	05.3	6°44.6	39.2	180°58.7	12.8
2	21°57.9	172°33.4	50.3	175°15.7	05.9	21°47.4	39.4	196°00.9	12.9
3	37°00.3	187°34.3	·· 51.2	190°16.5	·· 06.6	36°50.1	·· 39.5	211°03.1	·· 13.1
4	52°02.8	202°35.2	52.1	205°17.4	07.2	51°52.9	39.6	226°05.3	13.2
5	67°05.2	217°36.1	53.0	220°18.3	07.8	66°55.6	39.8	241°07.5	13.3
6	82°07.7	232°37.0	S16°53.9	235°19.2	S11°08.4	81°58.4	S01°39.9	256°09.7	S00°13.4
7	97°10.2	247°37.8	54.8	250°20.1	09.0	97°01.2	40.0	271°11.8	13.5
8	112°12.6	262°38.7	55.7	265°21.0	09.7	112°03.9	40.2	286°14.0	13.7
9	127°15.1	277°39.6	·· 56.6	280°21.9	·· 10.3	127°06.7	·· 40.3	301°16.2	·· 13.8
10	142°17.6	292°40.5	57.4	295°22.8	10.9	142°09.5	40.4	316°18.4	13.9
11	157°20.0	307°41.4	58.3	310°23.7	11.5	157°12.2	40.6	331°20.6	14.0
12	172°22.5	322°42.3	S16°59.2	325°24.5	S11°12.1	172°15.0	S01°40.7	346°22.8	S00°14.2
13	187°25.0	337°43.2	17°00.1	340°25.4	12.7	187°17.7	40.8	1°25.0	14.3
14	202°27.4	352°44.1	01.0	355°26.3	13.4	202°20.5	41.0	16°27.2	14.4
15	217°29.9	7°45.0	·· 01.9	10°27.2	·· 14.0	217°23.3	·· 41.1	31°29.3	·· 14.5
16	232°32.4	22°45.9	02.7	25°28.1	14.6	232°26.0	41.2	46°31.5	14.6
17	247°34.8	37°46.8	03.6	40°29.0	15.2	247°28.8	41.4	61°33.7	14.8
18	262°37.3	52°47.7	S17°04.5	55°29.9	S11°15.8	262°31.6	S01°41.5	76°35.9	S00°14.9
19	277°39.7	67°48.6	05.4	70°30.8	16.4	277°34.3	41.6	91°38.1	15.0
20	292°42.2	82°49.5	06.3	85°31.6	17.0	292°37.1	41.8	106°40.3	15.1
21	307°44.7	97°50.4	·· 07.2	100°32.5	·· 17.7	307°39.8	·· 41.9	121°42.5	·· 15.2
22	322°47.1	112°51.3	08.0	115°33.4	18.3	322°42.6	42.0	136°44.7	15.4
23	337°49.6	127°52.2	08.9	130°34.3	18.9	337°45.4	42.2	151°46.8	15.5
Mer.pass.:00:32		v0.9 d-0.9 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m1.0	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	352°52.1	142°53.1	S17°09.8	145°35.2	S11°19.5	352°48.1	S01°42.3	166°49.0	S00°15.6
1	7°54.5	157°54.0	10.7	160°36.1	20.1	7°50.9	42.4	181°51.2	15.7
2	22°57.0	172°54.9	11.5	175°36.9	20.7	22°53.7	42.6	196°53.4	15.8
3	37°59.5	187°55.8	·· 12.4	190°37.8	·· 21.4	37°56.4	·· 42.7	211°55.6	·· 16.0
4	53°01.9	202°56.8	13.3	205°38.7	22.0	52°59.2	42.8	226°57.8	16.1
5	68°04.4	217°57.7	14.2	220°39.6	22.6	68°01.9	43.0	242°00.0	16.2
6	83°06.8	232°58.6	S17°15.0	235°40.5	S11°23.2	83°04.7	S01°43.1	257°02.2	S00°16.3
7	98°09.3	247°59.5	15.9	250°41.4	23.8	98°07.5	43.2	272°04.3	16.4
8	113°11.8	263°00.4	16.8	265°42.2	24.4	113°10.2	43.4	287°06.5	16.6
9	128°14.2	278°01.4	·· 17.6	280°43.1	·· 25.0	128°13.0	·· 43.5	302°08.7	·· 16.7
10	143°16.7	293°02.3	18.5	295°44.0	25.7	143°15.8	43.6	317°10.9	16.8
11	158°19.2	308°03.2	19.4	310°44.9	26.3	158°18.5	43.8	332°13.1	16.9
12	173°21.6	323°04.1	S17°20.2	325°45.8	S11°26.9	173°21.3	S01°43.9	347°15.3	S00°17.0
13	188°24.1	338°05.1	21.1	340°46.7	27.5	188°24.1	44.0	2°17.5	17.2
14	203°26.6	353°06.0	22.0	355°47.5	28.1	203°26.8	44.2	17°19.7	17.3
15	218°29.0	8°06.9	·· 22.8	10°48.4	·· 28.7	218°29.6	·· 44.3	32°21.8	·· 17.4
16	233°31.5	23°07.9	23.7	25°49.3	29.3	233°32.4	44.4	47°24.0	17.5
17	248°34.0	38°08.8	24.6	40°50.2	30.0	248°35.1	44.6	62°26.2	17.6
18	263°36.4	53°09.7	S17°25.4	55°51.1	S11°30.6	263°37.9	S01°44.7	77°28.4	S00°17.8
19	278°38.9	68°10.7	26.3	70°51.9	31.2	278°40.6	44.8	92°30.6	17.9
20	293°41.3	83°11.6	27.1	85°52.8	31.8	293°43.4	45.0	107°32.8	18.0
21	308°43.8	98°12.6	·· 28.0	100°53.7	·· 32.4	308°46.2	·· 45.1	122°35.0	·· 18.1
22	323°46.3	113°13.5	28.9	115°54.6	33.0	323°48.9	45.2	137°37.1	18.2
23	338°48.7	128°14.5	29.7	130°55.5	33.6	338°51.7	45.4	152°39.3	18.4
Mer.pass.:00:28		v0.9 d-0.9 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	353°51.2	143°15.4	S17°30.6	145°56.3	S11°34.2	353°54.5	S01°45.5	167°41.5	S00°18.5
1	8°53.7	158°16.4	31.4	160°57.2	34.9	8°57.2	45.6	182°43.7	18.6
2	23°56.1	173°17.3	32.3	175°58.1	35.5	24°00.0	45.8	197°45.9	18.7
3	38°58.6	188°18.3	·· 33.1	190°59.0	·· 36.1	39°02.8	·· 45.9	212°48.1	·· 18.9
4	54°01.1	203°19.2	34.0	205°59.9	36.7	54°05.5	46.1	227°50.3	19.0
5	69°03.5	218°20.2	34.9	221°00.7	37.3	69°08.3	46.2	242°52.5	19.1
6	84°06.0	233°21.1	S17°35.7	236°01.6	S11°37.9	84°11.1	S01°46.3	257°54.6	S00°19.2
7	99°08.5	248°22.1	36.6	251°02.5	38.5	99°13.8	46.5	272°56.8	19.3
8	114°10.9	263°23.1	37.4	266°03.4	39.1	114°16.6	46.6	287°59.0	19.5
9	129°13.4	278°24.0	·· 38.3	281°04.3	·· 39.8	129°19.4	·· 46.7	303°01.2	·· 19.6
10	144°15.8	293°25.0	39.1	296°05.1	40.4	144°22.1	46.9	318°03.4	19.7
11	159°18.3	308°26.0	40.0	311°06.0	41.0	159°24.9	47.0	333°05.6	19.8
12	174°20.8	323°26.9	S17°40.8	326°06.9	S11°41.6	174°27.6	S01°47.1	348°07.8	S00°19.9
13	189°23.2	338°27.9	41.7	341°07.8	42.2	189°30.4	47.3	3°09.9	20.1
14	204°25.7	353°28.9	42.5	356°08.6	42.8	204°33.2	47.4	18°12.1	20.2
15	219°28.2	8°29.8	·· 43.3	11°09.5	·· 43.4	219°35.9	·· 47.5	33°14.3	·· 20.3
16	234°30.6	23°30.8	44.2	26°10.4	44.0	234°38.7	47.7	48°16.5	20.4
17	249°33.1	38°31.8	45.0	41°11.3	44.7	249°41.5	47.8	63°18.7	20.5
18	264°35.6	53°32.8	S17°45.9	56°12.1	S11°45.3	264°44.2	S01°47.9	78°20.9	S00°20.7
19	279°38.0	68°33.8	46.7	71°13.0	45.9	279°47.0	48.1	93°23.1	20.8
20	294°40.5	83°34.7	47.6	86°13.9	46.5	294°49.8	48.2	108°25.2	20.9
21	309°43.0	98°35.7	·· 48.4	101°14.8	·· 47.1	309°52.5	·· 48.3	123°27.4	·· 21.0
22	324°45.4	113°36.7	49.2	116°15.6	47.7	324°55.3	48.5	138°29.6	21.1
23	339°47.9	128°37.7	50.1	131°16.5	48.3	339°58.1	48.6	153°31.8	21.3
Mer.pass.:00:25		v1.0 d-0.9 m-4.4		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.2
Ankaa	353°17.1	-42°14.6
Schedar	349°42.4	56°35.9
Diphda	348°57.5	-17°55.4
Achernar	335°27.6	-57°10.6
Hamal	328°02.8	23°30.9
Polaris	318°29.5	89°18.5
Acamar	315°19.5	-40°15.4
Menkar	314°16.9	4°08.1
Mirfak	308°43.0	49°53.9
Aldebaran	290°51.6	16°31.9
Rigel	281°13.9	-8°11.2
Capella	280°37.4	46°00.4
Bellatrix	278°34.1	6°21.7
Elnath	278°15.1	28°36.9
Alnilam	275°48.4	-1°11.6
Betelgeuse	271°03.5	7°24.6
Canopus	263°57.2	-52°41.8
Sirius	258°35.6	-16°43.7
Adhara	255°14.2	-28°59.0
Procyon	245°02.0	5°11.9
Pollux	243°30.3	27°59.9
Avior	234°19.4	-59°32.4
Suhail	222°54.3	-43°28.4
Miaplacidus	221°41.1	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.5
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.2
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.7
Hadar	148°51.4	-60°25.7
Menkent	148°10.3	-36°25.5
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.0	-60°52.9
Kochab	137°20.4	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.8	-26°27.4
Atria	107°32.5	-69°03.1
Sabik	102°14.8	-15°44.2
Shaula	96°24.6	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.0	51°29.6
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.2	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.8	-56°42.1
Deneb	49°32.6	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.7	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 13 Mon	**SHA**	**Mer.pass**
Venus	150°38.8	14:29
Mars	153°21.0	14:18
Jupiter	359°48.9	00:33
Saturn	174°03.6	12:54

Sep 14 Tue	**SHA**	**Mer.pass**
Venus	150°01.0	14:28
Mars	152°43.1	14:17
Jupiter	359°56.1	00:29
Saturn	173°57.0	12:51

Sep 15 Wed	**SHA**	**Mer.pass**
Venus	149°24.2	14:26
Mars	152°05.1	14:15
Jupiter	0°03.3	00:24
Saturn	173°50.3	12:47

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	180°58.0	N03°54.9	122°33.8	7.3'	S21°59.4	-6.9'	58.3'
1	195°58.2	54.0	137°00.1	7.3'	22°06.2	-6.7'	58.3'
2	210°58.4	53.0	151°26.3	7.2'	22°12.9	-6.6'	58.2'
3	225°58.6	·· 52.1	165°52.5	7.2'	22°19.4	-6.4'	58.2'
4	240°58.8	51.1	180°18.8	7.2'	22°25.8	-6.3'	58.2'
5	255°59.1	50.2	194°45.0	7.2'	22°32.0	-6.2'	58.1'
6	270°59.3	N03°49.2	209°11.3	7.2'	S22°38.1	-6.0'	58.1'
7	285°59.5	48.2	223°37.5	7.2'	22°44.0	-5.9'	58.0'
8	300°59.7	47.3	238°03.7	7.2'	22°49.8	-5.7'	58.0'
9	316°00.0	·· 46.3	252°30.0	7.2'	22°55.5	-5.6'	58.0'
10	331°00.2	45.4	266°56.2	7.2'	23°01.0	-5.4'	57.9'
11	346°00.4	44.4	281°22.4	7.2'	23°06.3	-5.3'	57.9'
12	1°00.6	N03°43.5	295°48.7	7.2'	S23°11.6	-5.1'	57.8'
13	16°00.8	42.5	310°14.9	7.3'	23°16.6	-5.0'	57.8'
14	31°01.1	41.5	324°41.2	7.3'	23°21.6	-4.9'	57.8'
15	46°01.3	·· 40.6	339°07.4	7.3'	23°26.3	-4.7'	57.7'
16	61°01.5	39.6	353°33.7	7.3'	23°31.0	-4.6'	57.7'
17	76°01.7	38.7	8°00.0	7.3'	23°35.5	-4.4'	57.6'
18	91°01.9	N03°37.7	22°26.3	7.3'	S23°39.8	-4.3'	57.6'
19	106°02.2	36.8	36°52.6	7.3'	23°44.0	-4.1'	57.6'
20	121°02.4	35.8	51°18.9	7.3'	23°48.0	-4.0'	57.5'
21	136°02.6	·· 34.8	65°45.2	7.3'	23°51.9	-3.8'	57.5'
22	151°02.8	33.9	80°11.5	7.3'	23°55.7	-3.7'	57.4'
23	166°03.1	32.9	94°37.9	7.4'	23°59.3	-3.5'	57.4'
	SD.=15.9	d=-1.0	S.D.=15.8				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°03.3	N03°32.0	109°04.3	7.4'	S24°02.8	-3.4'	57.4'
1	196°03.5	31.0	123°30.7	7.4'	24°06.1	-3.2'	57.3'
2	211°03.7	30.0	137°57.1	7.4'	24°09.3	-3.1'	57.3'
3	226°03.9	·· 29.1	152°23.5	7.4'	24°12.3	-3.0'	57.3'
4	241°04.2	28.1	166°49.9	7.5'	24°15.2	-2.8'	57.2'
5	256°04.4	27.2	181°16.4	7.5'	24°17.9	-2.7'	57.2'
6	271°04.6	N03°26.2	195°42.9	7.5'	S24°20.5	-2.5'	57.1'
7	286°04.8	25.3	210°09.4	7.5'	24°23.0	-2.4'	57.1'
8	301°05.0	24.3	224°36.0	7.6'	24°25.3	-2.2'	57.1'
9	316°05.3	·· 23.3	239°02.5	7.6'	24°27.4	-2.1'	57.0'
10	331°05.5	22.4	253°29.1	7.6'	24°29.4	-1.9'	57.0'
11	346°05.7	21.4	267°55.8	7.6'	24°31.3	-1.8'	57.0'
12	1°05.9	N03°20.5	282°22.4	7.7'	S24°33.0	-1.7'	56.9'
13	16°06.2	19.5	296°49.1	7.7'	24°34.6	-1.5'	56.9'
14	31°06.4	18.5	311°15.8	7.7'	24°36.1	-1.4'	56.8'
15	46°06.6	·· 17.6	325°42.6	7.8'	24°37.4	-1.2'	56.8'
16	61°06.8	16.6	340°09.4	7.8'	24°38.5	-1.1'	56.8'
17	76°07.0	15.7	354°36.2	7.8'	24°39.5	-0.9'	56.7'
18	91°07.3	N03°14.7	9°03.1	7.9'	S24°40.4	-0.8'	56.7'
19	106°07.5	13.7	23°30.0	7.9'	24°41.1	-0.7'	56.7'
20	121°07.7	12.8	37°56.9	8.0'	24°41.7	-0.5'	56.6'
21	136°07.9	·· 11.8	52°23.9	8.0'	24°42.2	-0.4'	56.6'
22	151°08.2	10.9	66°50.9	8.0'	24°42.5	-0.2'	56.6'
23	166°08.4	09.9	81°18.0	8.1'	24°42.7	-0.1'	56.5'
	SD.=15.9	d=-1.0	S.D.=15.5				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°08.6	N03°08.9	95°45.1	8.1'	S24°42.7	0.0'	56.5'
1	196°08.8	08.0	110°12.2	8.2'	24°42.6	0.2'	56.5'
2	211°09.1	07.0	124°39.4	8.2'	24°42.4	0.3'	56.4'
3	226°09.3	·· 06.0	139°06.6	8.3'	24°42.0	0.4'	56.4'
4	241°09.5	05.1	153°33.9	8.3'	24°41.5	0.6'	56.4'
5	256°09.7	04.1	168°01.2	8.4'	24°40.8	0.7'	56.3'
6	271°09.9	N03°03.2	182°28.6	8.4'	S24°40.1	0.8'	56.3'
7	286°10.2	02.2	196°56.1	8.5'	24°39.1	1.0'	56.3'
8	301°10.4	01.2	211°23.5	8.5'	24°38.1	1.1'	56.2'
9	316°10.6	03°00.3	225°51.1	8.6'	24°36.9	1.3'	56.2'
10	331°10.8	02°59.3	240°18.6	8.6'	24°35.6	1.4'	56.2'
11	346°11.1	58.4	254°46.3	8.7'	24°34.1	1.5'	56.1'
12	1°11.3	N02°57.4	269°14.0	8.7'	S24°32.6	1.6'	56.1'
13	16°11.5	56.4	283°41.7	8.8'	24°30.9	1.8'	56.1'
14	31°11.7	55.5	298°09.5	8.8'	24°29.0	1.9'	56.0'
15	46°11.9	·· 54.5	312°37.3	8.9'	24°27.0	2.0'	56.0'
16	61°12.2	53.5	327°05.3	8.9'	24°24.9	2.2'	56.0'
17	76°12.4	52.6	341°33.2	9.0'	24°22.7	2.3'	55.9'
18	91°12.6	N02°51.6	356°01.2	9.1'	S24°20.4	2.4'	55.9'
19	106°12.8	50.7	10°29.3	9.1'	24°17.9	2.5'	55.9'
20	121°13.1	49.7	24°57.5	9.2'	24°15.3	2.7'	55.8'
21	136°13.3	·· 48.7	39°25.7	9.2'	24°12.5	2.8'	55.8'
22	151°13.5	47.8	53°53.9	9.3'	24°09.7	2.9'	55.8'
23	166°13.7	46.8	68°22.3	9.4'	24°06.7	3.0'	55.8'
	SD.=15.9	d=-1.0	S.D.=15.3				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 5-7 32-53%
13	03:52	04:02	11:56	16:27	03:59	
14	04:13	04:24	11:56	17:22	04:55	
15	04:34	04:45	11:55	18:17	05:50	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	354°50.3	143°38.7	S17°50.9	146°17.4	S11°48.9	355°00.8	S01°48.7	168°34.0	S00°21.4
1	9°52.8	158°39.7	51.7	161°18.3	49.5	10°03.6	48.9	183°36.2	21.5
2	24°55.3	173°40.7	52.6	176°19.1	50.1	25°06.4	49.0	198°38.4	21.6
3	39°57.7	188°41.7	·· 53.4	191°20.0	·· 50.8	40°09.1	·· 49.1	213°40.6	·· 21.7
4	55°00.2	203°42.7	54.2	206°20.9	51.4	55°11.9	49.3	228°42.7	21.9
5	70°02.7	218°43.7	55.1	221°21.7	52.0	70°14.7	49.4	243°44.9	22.0
6	85°05.1	233°44.7	S17°55.9	236°22.6	S11°52.6	85°17.4	S01°49.5	258°47.1	S00°22.1
7	100°07.6	248°45.7	56.7	251°23.5	53.2	100°20.2	49.7	273°49.3	22.2
8	115°10.1	263°46.7	57.6	266°24.4	53.8	115°23.0	49.8	288°51.5	22.4
9	130°12.5	278°47.7	·· 58.4	281°25.2	·· 54.4	130°25.7	·· 49.9	303°53.7	·· 22.5
10	145°15.0	293°48.7	17°59.2	296°26.1	55.0	145°28.5	50.1	318°55.9	22.6
11	160°17.4	308°49.7	18°00.1	311°27.0	55.6	160°31.3	50.2	333°58.0	22.7
12	175°19.9	323°50.7	S18°00.9	326°27.9	S11°56.2	175°34.0	S01°50.3	349°00.2	S00°22.8
13	190°22.4	338°51.7	01.7	341°28.7	56.9	190°36.8	50.5	4°02.4	23.0
14	205°24.8	353°52.7	02.5	356°29.6	57.5	205°39.6	50.6	19°04.6	23.1
15	220°27.3	8°53.7	·· 03.4	11°30.5	·· 58.1	220°42.3	·· 50.7	34°06.8	·· 23.2
16	235°29.8	23°54.8	04.2	26°31.3	58.7	235°45.1	50.9	49°09.0	23.3
17	250°32.2	38°55.8	05.0	41°32.2	59.3	250°47.9	51.0	64°11.1	23.4
18	265°34.7	53°56.8	S18°05.8	56°33.1	S11°59.9	265°50.6	S01°51.1	79°13.3	S00°23.6
19	280°37.2	68°57.8	06.7	71°33.9	12°00.5	280°53.4	51.3	94°15.5	23.7
20	295°39.6	83°58.8	07.5	86°34.8	01.1	295°56.2	51.4	109°17.7	23.8
21	310°42.1	98°59.9	·· 08.3	101°35.7	·· 01.7	310°58.9	·· 51.5	124°19.9	·· 23.9
22	325°44.6	114°00.9	09.1	116°36.5	02.3	326°01.7	51.7	139°22.1	24.0
23	340°47.0	129°01.9	09.9	131°37.4	02.9	341°04.5	51.8	154°24.3	24.2
Mer.pass.:00:21		v1.0 d-0.8 m-4.5		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	355°49.5	144°03.0	S18°10.7	146°38.3	S12°03.5	356°07.2	S01°51.9	169°26.4	S00°24.3
1	10°51.9	159°04.0	11.6	161°39.2	04.2	11°10.0	52.1	184°28.6	24.4
2	25°54.4	174°05.0	12.4	176°40.0	04.8	26°12.8	52.2	199°30.8	24.5
3	40°56.9	189°06.1	·· 13.2	191°40.9	·· 05.4	41°15.5	·· 52.4	214°33.0	·· 24.6
4	55°59.3	204°07.1	14.0	206°41.8	06.0	56°18.3	52.5	229°35.2	24.8
5	71°01.8	219°08.1	14.8	221°42.6	06.6	71°21.1	52.6	244°37.4	24.9
6	86°04.3	234°09.2	S18°15.6	236°43.5	S12°07.2	86°23.8	S01°52.8	259°39.6	S00°25.0
7	101°06.7	249°10.2	16.4	251°44.4	07.8	101°26.6	52.9	274°41.7	25.1
8	116°09.2	264°11.3	17.2	266°45.2	08.4	116°29.4	53.0	289°43.9	25.3
9	131°11.7	279°12.3	·· 18.1	281°46.1	·· 09.0	131°32.2	·· 53.2	304°46.1	·· 25.4
10	146°14.1	294°13.4	18.9	296°47.0	09.6	146°34.9	53.3	319°48.3	25.5
11	161°16.6	309°14.4	19.7	311°47.8	10.2	161°37.7	53.4	334°50.5	25.6
12	176°19.1	324°15.5	S18°20.5	326°48.7	S12°10.8	176°40.5	S01°53.6	349°52.7	S00°25.7
13	191°21.5	339°16.5	21.3	341°49.6	11.4	191°43.2	53.7	4°54.9	25.9
14	206°24.0	354°17.6	22.1	356°50.4	12.0	206°46.0	53.8	19°57.0	26.0
15	221°26.4	9°18.7	·· 22.9	11°51.3	·· 12.6	221°48.8	·· 54.0	34°59.2	·· 26.1
16	236°28.9	24°19.7	23.7	26°52.1	13.3	236°51.5	54.1	50°01.4	26.2
17	251°31.4	39°20.8	24.5	41°53.0	13.9	251°54.3	54.2	65°03.6	26.3
18	266°33.8	54°21.8	S18°25.3	56°53.9	S12°14.5	266°57.1	S01°54.4	80°05.8	S00°26.5
19	281°36.3	69°22.9	26.1	71°54.7	15.1	281°59.8	54.5	95°08.0	26.6
20	296°38.8	84°24.0	26.9	86°55.6	15.7	297°02.6	54.6	110°10.1	26.7
21	311°41.2	99°25.1	·· 27.7	101°56.5	·· 16.3	312°05.4	·· 54.8	125°12.3	·· 26.8
22	326°43.7	114°26.1	28.5	116°57.3	16.9	327°08.1	54.9	140°14.5	26.9
23	341°46.2	129°27.2	29.3	131°58.2	17.5	342°10.9	55.0	155°16.7	27.1
Mer.pass.:00:17		v1.0 d-0.8 m-4.5		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	356°48.6	144°28.3	S18°30.1	146°59.1	S12°18.1	357°13.7	S01°55.2	170°18.9	S00°27.2
1	11°51.1	159°29.4	30.9	161°59.9	18.7	12°16.4	55.3	185°21.1	27.3
2	26°53.5	174°30.4	31.7	177°00.8	19.3	27°19.2	55.4	200°23.3	27.4
3	41°56.0	189°31.5	·· 32.5	192°01.6	·· 19.9	42°22.0	·· 55.6	215°25.4	·· 27.5
4	56°58.5	204°32.6	33.2	207°02.5	20.5	57°24.7	55.7	230°27.6	27.7
5	72°00.9	219°33.7	34.0	222°03.4	21.1	72°27.5	55.8	245°29.8	27.8
6	87°03.4	234°34.8	S18°34.8	237°04.2	S12°21.7	87°30.3	S01°56.0	260°32.0	S00°27.9
7	102°05.9	249°35.9	35.6	252°05.1	22.3	102°33.1	56.1	275°34.2	28.0
8	117°08.3	264°37.0	36.4	267°05.9	22.9	117°35.8	56.2	290°36.4	28.2
9	132°10.8	279°38.1	·· 37.2	282°06.8	·· 23.5	132°38.6	·· 56.4	305°38.5	·· 28.3
10	147°13.3	294°39.2	38.0	297°07.7	24.1	147°41.4	56.5	320°40.7	28.4
11	162°15.7	309°40.3	38.8	312°08.5	24.7	162°44.1	56.6	335°42.9	28.5
12	177°18.2	324°41.4	S18°39.5	327°09.4	S12°25.3	177°46.9	S01°56.8	350°45.1	S00°28.6
13	192°20.7	339°42.5	40.3	342°10.2	26.0	192°49.7	56.9	5°47.3	28.8
14	207°23.1	354°43.6	41.1	357°11.1	26.6	207°52.4	57.1	20°49.5	28.9
15	222°25.6	9°44.7	·· 41.9	12°12.0	·· 27.2	222°55.2	·· 57.2	35°51.7	·· 29.0
16	237°28.0	24°45.8	42.7	27°12.8	27.8	237°58.0	57.3	50°53.8	29.1
17	252°30.5	39°46.9	43.4	42°13.7	28.4	253°00.7	57.5	65°56.0	29.2
18	267°33.0	54°48.0	S18°44.2	57°14.5	S12°29.0	268°03.5	S01°57.6	80°58.2	S00°29.4
19	282°35.4	69°49.1	45.0	72°15.4	29.6	283°06.3	57.7	96°00.4	29.5
20	297°37.9	84°50.2	45.8	87°16.3	30.2	298°09.0	57.9	111°02.6	29.6
21	312°40.4	99°51.3	·· 46.6	102°17.1	·· 30.8	313°11.8	·· 58.0	126°04.8	·· 29.7
22	327°42.8	114°52.5	47.3	117°18.0	31.4	328°14.6	58.1	141°06.9	29.8
23	342°45.3	129°53.6	48.1	132°18.8	32.0	343°17.4	58.3	156°09.1	30.0
Mer.pass.:00:13		v1.1 d-0.8 m-4.5		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.6
Schedar	349°42.4	56°35.9
Diphda	348°57.5	-17°55.4
Achernar	335°27.6	-57°10.6
Hamal	328°02.8	23°30.9
Polaris	318°28.2	89°18.5
Acamar	315°19.5	-40°15.4
Menkar	314°16.9	4°08.1
Mirfak	308°43.0	49°53.9
Aldebaran	290°51.6	16°31.9
Rigel	281°13.9	-8°11.2
Capella	280°37.3	46°00.4
Bellatrix	278°34.1	6°21.7
Elnath	278°15.1	28°37.0
Alnilam	275°48.4	-1°11.6
Betelgeuse	271°03.5	7°24.6
Canopus	263°57.1	-52°41.8
Sirius	258°35.5	-16°43.7
Adhara	255°14.2	-28°59.0
Procyon	245°01.9	5°11.9
Pollux	243°30.3	27°59.9
Avior	234°19.3	-59°32.4
Suhail	222°54.3	-43°28.4
Miaplacidus	221°41.0	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.5
Denebola	182°36.0	14°30.8
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.1
Spica	158°33.6	-11°13.0
Alkaid	153°00.7	49°15.7
Hadar	148°51.4	-60°25.7
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.0	-60°52.9
Kochab	137°20.4	74°06.9
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.8	-26°27.4
Atria	107°32.6	-69°03.1
Sabik	102°14.8	-15°44.2
Shaula	96°24.6	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.0	51°29.6
Kaus Aust.	83°46.3	-34°22.8
Vega	80°40.2	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.9	-56°42.1
Deneb	49°32.6	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.7	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 16 Thu	**SHA**	**Mer.pass**
Venus	148°48.3	14:24
Mars	151°27.0	14:14
Jupiter	0°10.5	00:20
Saturn	173°43.6	12:44

Sep 17 Fri	**SHA**	**Mer.pass**
Venus	148°13.5	14:23
Mars	150°48.8	14:13
Jupiter	0°17.8	00:15
Saturn	173°37.0	12:40

Sep 18 Sat	**SHA**	**Mer.pass**
Venus	147°39.7	14:21
Mars	150°10.4	14:11
Jupiter	0°25.1	00:11
Saturn	173°30.3	12:37

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°14.0	N02°45.8	82°50.6	9.4'	S24°03.6	3.2'	55.7'
1	196°14.2	44.9	97°19.1	9.5'	24°00.4	3.3'	55.7'
2	211°14.4	43.9	111°47.6	9.5'	23°57.0	3.4'	55.7'
3	226°14.6	· · 43.0	126°16.2	9.6'	23°53.5	3.5'	55.6'
4	241°14.8	42.0	140°44.8	9.7'	23°50.0	3.6'	55.6'
5	256°15.1	41.0	155°13.5	9.7'	23°46.2	3.8'	55.6'
6	271°15.3	N02°40.1	169°42.3	9.8'	S23°42.4	3.9'	55.6'
7	286°15.5	39.1	184°11.1	9.9'	23°38.5	4.0'	55.5'
8	301°15.7	38.1	198°40.0	9.9'	23°34.4	4.1'	55.5'
9	316°16.0	· · 37.2	213°09.0	10.0'	23°30.2	4.2'	55.5'
10	331°16.2	36.2	227°38.0	10.1'	23°25.9	4.3'	55.4'
11	346°16.4	35.2	242°07.1	10.1'	23°21.5	4.5'	55.4'
12	1°16.6	N02°34.3	256°36.3	10.2'	S23°17.0	4.6'	55.4'
13	16°16.9	33.3	271°05.6	10.3'	23°12.4	4.7'	55.4'
14	31°17.1	32.3	285°34.9	10.3'	23°07.6	4.8'	55.3'
15	46°17.3	· · 31.4	300°04.2	10.4'	23°02.8	4.9'	55.3'
16	61°17.5	30.4	314°33.7	10.5'	22°57.8	5.0'	55.3'
17	76°17.7	29.5	329°03.2	10.5'	22°52.8	5.1'	55.3'
18	91°18.0	N02°28.5	343°32.8	10.6'	S22°47.6	5.2'	55.2'
19	106°18.2	27.5	358°02.4	10.7'	22°42.3	5.3'	55.2'
20	121°18.4	26.6	12°32.2	10.8'	22°36.9	5.4'	55.2'
21	136°18.6	· · 25.6	27°02.0	10.8'	22°31.4	5.6'	55.2'
22	151°18.9	24.6	41°31.8	10.9'	22°25.8	5.7'	55.1'
23	166°19.1	23.7	56°01.8	11.0'	22°20.1	5.8'	55.1'
	SD.=15.9	d=-1.0	S.D.=15.1				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°19.3	N02°22.7	70°31.8	11.0'	S22°14.2	5.9'	55.1'
1	196°19.5	21.7	85°01.8	11.1'	22°08.3	6.0'	55.1'
2	211°19.8	20.8	99°32.0	11.2'	22°02.3	6.1'	55.1'
3	226°20.0	· · 19.8	114°02.2	11.3'	21°56.2	6.2'	55.0'
4	241°20.2	18.8	128°32.5	11.3'	21°50.0	6.3'	55.0'
5	256°20.4	17.9	143°02.9	11.4'	21°43.7	6.4'	55.0'
6	271°20.7	N02°16.9	157°33.3	11.5'	S21°37.2	6.5'	55.0'
7	286°20.9	15.9	172°03.8	11.5'	21°30.7	6.6'	54.9'
8	301°21.1	15.0	186°34.4	11.6'	21°24.1	6.7'	54.9'
9	316°21.3	· · 14.0	201°05.0	11.7'	21°17.4	6.8'	54.9'
10	331°21.5	13.0	215°35.7	11.7'	21°10.6	6.8'	54.9'
11	346°21.8	12.1	230°06.5	11.8'	21°03.7	6.9'	54.9'
12	1°22.0	N02°11.1	244°37.4	11.9'	S20°56.7	7.0'	54.8'
13	16°22.2	10.1	259°08.3	12.0'	20°49.7	7.1'	54.8'
14	31°22.4	09.2	273°39.3	12.0'	20°42.5	7.2'	54.8'
15	46°22.7	· · 08.2	288°10.3	12.1'	20°35.2	7.3'	54.8'
16	61°22.9	07.2	302°41.5	12.2'	20°27.9	7.4'	54.8'
17	76°23.1	06.3	317°12.7	12.2'	20°20.4	7.5'	54.7'
18	91°23.3	N02°05.3	331°44.0	12.3'	S20°12.9	7.6'	54.7'
19	106°23.6	04.3	346°15.3	12.4'	20°05.3	7.7'	54.7'
20	121°23.8	03.4	0°46.7	12.4'	19°57.6	7.7'	54.7'
21	136°24.0	· · 02.4	15°18.2	12.5'	19°49.8	7.8'	54.7'
22	151°24.2	01.4	29°49.8	12.6'	19°42.0	7.9'	54.7'
23	166°24.5	00.5	44°21.4	12.7'	19°34.0	8.0'	54.6'
	SD.=15.9	d=-1.0	S.D.=14.9				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°24.7	N01°59.5	58°53.1	12.7'	S19°26.0	8.1'	54.6'
1	196°24.9	58.5	73°24.8	12.8'	19°17.9	8.2'	54.6'
2	211°25.1	57.6	87°56.6	12.9'	19°09.7	8.2'	54.6'
3	226°25.3	· · 56.6	102°28.5	12.9'	19°01.4	8.3'	54.6'
4	241°25.6	55.6	117°00.5	13.0'	18°53.1	8.4'	54.6'
5	256°25.8	54.7	131°32.5	13.1'	18°44.6	8.5'	54.5'
6	271°26.0	N01°53.7	146°04.6	13.1'	S18°36.1	8.5'	54.5'
7	286°26.2	52.7	160°36.8	13.2'	18°27.5	8.6'	54.5'
8	301°26.5	51.8	175°09.0	13.3'	18°18.9	8.7'	54.5'
9	316°26.7	· · 50.8	189°41.3	13.3'	18°10.1	8.8'	54.5'
10	331°26.9	49.8	204°13.6	13.4'	18°01.3	8.8'	54.5'
11	346°27.1	48.9	218°46.0	13.4'	17°52.4	8.9'	54.4'
12	1°27.4	N01°47.9	233°18.5	13.5'	S17°43.5	9.0'	54.4'
13	16°27.6	46.9	247°51.0	13.6'	17°34.5	9.1'	54.4'
14	31°27.8	46.0	262°23.6	13.6'	17°25.4	9.1'	54.4'
15	46°28.0	· · 45.0	276°56.3	13.7'	17°16.2	9.2'	54.4'
16	61°28.2	44.0	291°29.0	13.8'	17°07.0	9.3'	54.4'
17	76°28.5	43.1	306°01.8	13.8'	16°57.6	9.3'	54.4'
18	91°28.7	N01°42.1	320°34.7	13.9'	S16°48.3	9.4'	54.3'
19	106°28.9	41.1	335°07.6	13.9'	16°38.8	9.5'	54.3'
20	121°29.1	40.2	349°40.5	14.0'	16°29.3	9.5'	54.3'
21	136°29.4	· · 39.2	4°13.6	14.1'	16°19.8	9.6'	54.3'
22	151°29.6	38.2	18°46.7	14.1'	16°10.1	9.7'	54.3'
23	166°29.8	37.3	33°19.8	14.2'	16°00.4	9.7'	54.3'
	SD.=15.9	d=-1.0	S.D.=14.8				

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

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

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 8-10 63-80%
16	04:56	05:07	11:55	19:08	06:43	
17	05:17	05:28	11:55	19:57	07:33	
18	05:39	05:49	11:54	20:43	08:20	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	357°47.8	144°54.7	S18°48.9	147°19.7	S12°32.6	358°20.1	S01°58.4	171°11.3	S00°30.1
1	12°50.2	159°55.8	49.7	162°20.5	33.2	13°22.9	58.5	186°13.5	30.2
2	27°52.7	174°57.0	50.4	177°21.4	33.8	28°25.7	58.7	201°15.7	30.3
3	42°55.2	189°58.1	·· 51.2	192°22.3	·· 34.4	43°28.4	·· 58.8	216°17.9	·· 30.5
4	57°57.6	204°59.2	52.0	207°23.1	35.0	58°31.2	58.9	231°20.0	30.6
5	73°00.1	220°00.4	52.7	222°24.0	35.6	73°34.0	59.1	246°22.2	30.7
6	88°02.5	235°01.5	S18°53.5	237°24.8	S12°36.2	88°36.7	S01°59.2	261°24.4	S00°30.8
7	103°05.0	250°02.6	54.3	252°25.7	36.8	103°39.5	59.3	276°26.6	30.9
8	118°07.5	265°03.8	55.0	267°26.5	37.4	118°42.3	59.5	291°28.8	31.1
9	133°09.9	280°04.9	·· 55.8	282°27.4	·· 38.0	133°45.0	·· 59.6	306°31.0	·· 31.2
10	148°12.4	295°06.1	56.6	297°28.2	38.6	148°47.8	59.7	321°33.2	31.3
11	163°14.9	310°07.2	57.3	312°29.1	39.2	163°50.6	01°59.9	336°35.3	31.4
12	178°17.3	325°08.4	S18°58.1	327°29.9	S12°39.8	178°53.4	S02°00.0	351°37.5	S00°31.5
13	193°19.8	340°09.5	58.8	342°30.8	40.4	193°56.1	00.1	6°39.7	31.7
14	208°22.3	355°10.7	18°59.6	357°31.7	41.0	208°58.9	00.3	21°41.9	31.8
15	223°24.7	10°11.8	19°00.4	12°32.5	·· 41.6	224°01.7	·· 00.4	36°44.1	·· 31.9
16	238°27.2	25°13.0	01.1	27°33.4	42.2	239°04.4	00.5	51°46.3	32.0
17	253°29.6	40°14.1	01.9	42°34.2	42.8	254°07.2	00.7	66°48.4	32.1
18	268°32.1	55°15.3	S19°02.6	57°35.1	S12°43.4	269°10.0	S02°00.8	81°50.6	S00°32.3
19	283°34.6	70°16.4	03.4	72°35.9	44.0	284°12.7	00.9	96°52.8	32.4
20	298°37.0	85°17.6	04.1	87°36.8	44.6	299°15.5	01.1	111°55.0	32.5
21	313°39.5	100°18.8	·· 04.9	102°37.6	·· 45.2	314°18.3	·· 01.2	126°57.2	·· 32.6
22	328°42.0	115°19.9	05.6	117°38.5	45.8	329°21.1	01.3	141°59.4	32.8
23	343°44.4	130°21.1	06.4	132°39.3	46.4	344°23.8	01.5	157°01.5	32.9
Mer.pass.:00:09		v1.1 d-0.8 m-4.5		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	358°46.9	145°22.3	S19°07.1	147°40.2	S12°47.0	359°26.6	S02°01.6	172°03.7	S00°33.0
1	13°49.4	160°23.5	07.9	162°41.0	47.6	14°29.4	01.7	187°05.9	33.1
2	28°51.8	175°24.6	08.6	177°41.9	48.2	29°32.1	01.9	202°08.1	33.2
3	43°54.3	190°25.8	·· 09.4	192°42.7	·· 48.8	44°34.9	·· 02.0	217°10.3	·· 33.4
4	58°56.8	205°27.0	10.1	207°43.6	49.4	59°37.7	02.2	232°12.5	33.5
5	73°59.2	220°28.2	10.9	222°44.4	50.0	74°40.4	02.3	247°14.6	33.6
6	89°01.7	235°29.4	S19°11.6	237°45.3	S12°50.6	89°43.2	S02°02.4	262°16.8	S00°33.7
7	104°04.1	250°30.6	12.4	252°46.1	51.2	104°46.0	02.6	277°19.0	33.8
8	119°06.6	265°31.8	13.1	267°47.0	51.8	119°48.7	02.7	292°21.2	34.0
9	134°09.1	280°32.9	·· 13.8	282°47.8	·· 52.4	134°51.5	·· 02.8	307°23.4	·· 34.1
10	149°11.5	295°34.1	14.6	297°48.7	53.0	149°54.3	03.0	322°25.6	34.2
11	164°14.0	310°35.3	15.3	312°49.5	53.6	164°57.1	03.1	337°27.7	34.3
12	179°16.5	325°36.5	S19°16.1	327°50.4	S12°54.2	179°59.8	S02°03.2	352°29.9	S00°34.4
13	194°18.9	340°37.7	16.8	342°51.2	54.8	195°02.6	03.4	7°32.1	34.6
14	209°21.4	355°38.9	17.5	357°52.1	55.4	210°05.4	03.5	22°34.3	34.7
15	224°23.9	10°40.1	·· 18.3	12°52.9	·· 56.0	225°08.1	·· 03.6	37°36.5	·· 34.8
16	239°26.3	25°41.4	19.0	27°53.8	56.6	240°10.9	03.8	52°38.7	34.9
17	254°28.8	40°42.6	19.7	42°54.6	57.2	255°13.7	03.9	67°40.8	35.1
18	269°31.3	55°43.8	S19°20.5	57°55.5	S12°57.8	270°16.4	S02°04.0	82°43.0	S00°35.2
19	284°33.7	70°45.0	21.2	72°56.3	58.4	285°19.2	04.2	97°45.2	35.3
20	299°36.2	85°46.2	21.9	87°57.1	59.0	300°22.0	04.3	112°47.4	35.4
21	314°38.6	100°47.4	·· 22.7	102°58.0	12°59.5	315°24.8	·· 04.4	127°49.6	·· 35.5
22	329°41.1	115°48.6	23.4	117°58.8	13°00.1	330°27.5	04.6	142°51.8	35.7
23	344°43.6	130°49.9	24.1	132°59.7	00.7	345°30.3	04.7	157°53.9	35.8
Mer.pass.:00:05		v1.2 d-0.7 m-4.5		v0.9 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	359°46.0	145°51.1	S19°24.8	148°00.5	S13°01.3	0°33.1	S02°04.8	172°56.1	S00°35.9
1	14°48.5	160°52.3	25.6	163°01.4	01.9	15°35.8	05.0	187°58.3	36.0
2	29°51.0	175°53.5	26.3	178°02.2	02.5	30°38.6	05.1	203°00.5	36.1
3	44°53.4	190°54.8	·· 27.0	193°03.1	·· 03.1	45°41.4	·· 05.2	218°02.7	·· 36.3
4	59°55.9	205°56.0	27.7	208°03.9	03.7	60°44.1	05.4	233°04.9	36.4
5	74°58.4	220°57.2	28.5	223°04.7	04.3	75°46.9	05.5	248°07.0	36.5
6	90°00.8	235°58.5	S19°29.2	238°05.6	S13°04.9	90°49.7	S02°05.6	263°09.2	S00°36.6
7	105°03.3	250°59.7	29.9	253°06.4	05.5	105°52.5	05.8	278°11.4	36.7
8	120°05.7	266°01.0	30.6	268°07.3	06.1	120°55.2	05.9	293°13.6	36.9
9	135°08.2	281°02.2	·· 31.3	283°08.1	·· 06.7	135°58.0	·· 06.0	308°15.8	·· 37.0
10	150°10.7	296°03.5	32.0	298°09.0	07.3	151°00.8	06.2	323°18.0	37.1
11	165°13.1	311°04.7	32.8	313°09.8	07.9	166°03.5	06.3	338°20.1	37.2
12	180°15.6	326°06.0	S19°33.5	328°10.7	S13°08.5	181°06.3	S02°06.4	353°22.3	S00°37.4
13	195°18.1	341°07.2	34.2	343°11.5	09.1	196°09.1	06.6	8°24.5	37.5
14	210°20.5	356°08.5	34.9	358°12.3	09.7	211°11.8	06.7	23°26.7	37.6
15	225°23.0	11°09.7	·· 35.6	13°13.2	·· 10.3	226°14.6	·· 06.8	38°28.9	·· 37.7
16	240°25.5	26°11.0	36.3	28°14.0	10.9	241°17.4	07.0	53°31.0	37.8
17	255°27.9	41°12.2	37.0	43°14.9	11.5	256°20.2	07.1	68°33.2	38.0
18	270°30.4	56°13.5	S19°37.7	58°15.7	S13°12.0	271°22.9	S02°07.2	83°35.4	S00°38.1
19	285°32.9	71°14.8	38.4	73°16.5	12.6	286°25.7	07.4	98°37.6	38.2
20	300°35.3	86°16.1	39.1	88°17.4	13.2	301°28.5	07.5	113°39.8	38.3
21	315°37.8	101°17.3	·· 39.8	103°18.2	·· 13.8	316°31.2	·· 07.6	128°42.0	·· 38.4
22	330°40.2	116°18.6	40.5	118°19.1	14.4	331°34.0	07.8	143°44.1	38.6
23	345°42.7	131°19.9	41.2	133°19.9	15.0	346°36.8	07.9	158°46.3	38.7
Mer.pass.:23:57		v1.2 d-0.7 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.6
Schedar	349°42.4	56°35.9
Diphda	348°57.5	-17°55.4
Achernar	335°27.6	-57°10.6
Hamal	328°02.7	23°30.9
Polaris	318°27.2	89°18.5
Acamar	315°19.5	-40°15.4
Menkar	314°16.9	4°08.1
Mirfak	308°43.0	49°53.9
Aldebaran	290°51.5	16°31.9
Rigel	281°13.9	-8°11.2
Capella	280°37.3	46°00.4
Bellatrix	278°34.1	6°21.7
Elnath	278°15.1	28°37.0
Alnilam	275°48.3	-1°11.6
Betelgeuse	271°03.4	7°24.6
Canopus	263°57.1	-52°41.8
Sirius	258°35.5	-16°43.7
Adhara	255°14.2	-28°59.0
Procyon	245°01.9	5°11.9
Pollux	243°30.3	27°59.9
Avior	234°19.3	-59°32.4
Suhail	222°54.3	-43°28.4
Miaplacidus	221°41.0	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.6	61°41.5
Denebola	182°36.0	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.1
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.7
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.0	-60°52.9
Kochab	137°20.5	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.8	26°40.9
Antares	112°28.8	-26°27.4
Atria	107°32.6	-69°03.1
Sabik	102°14.9	-15°44.3
Shaula	96°24.6	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.0	51°29.6
Kaus Aust.	83°46.4	-34°22.8
Vega	80°40.2	38°47.9
Nunki	76°00.6	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.9	-56°42.1
Deneb	49°32.6	45°19.4
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.4
Fomalhaut	15°25.7	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 19 Sun	**SHA**	**Mer.pass**
Venus	147°06.9	14:19
Mars	149°31.9	14:10
Jupiter	0°32.4	00:07
Saturn	173°23.6	12:33

Sep 20 Mon	**SHA**	**Mer.pass**
Venus	146°35.4	14:17
Mars	148°53.3	14:09
Jupiter	0°39.7	00:02
Saturn	173°16.8	12:30

Sep 21 Tue	**SHA**	**Mer.pass**
Venus	146°05.1	14:15
Mars	148°14.5	14:07
Jupiter	0°47.0	23:53
Saturn	173°10.1	12:26

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°30.0	N01°36.3	47°53.0	14.2'	S15°50.7	9.8'	54.3'
1	196°30.3	35.3	62°26.3	14.3'	15°40.9	9.9'	54.3'
2	211°30.5	34.3	76°59.6	14.3'	15°31.0	9.9'	54.3'
3	226°30.7	·· 33.4	91°32.9	14.4'	15°21.0	10.0'	54.2'
4	241°30.9	32.4	106°06.4	14.5'	15°11.0	10.0'	54.2'
5	256°31.2	31.4	120°39.8	14.5'	15°01.0	10.1'	54.2'
6	271°31.4	N01°30.5	135°13.4	14.6'	S14°50.8	10.1'	54.2'
7	286°31.6	29.5	149°47.0	14.6'	14°40.7	10.2'	54.2'
8	301°31.8	28.5	164°20.6	14.7'	14°30.4	10.3'	54.2'
9	316°32.0	·· 27.6	178°54.3	14.7'	14°20.2	10.3'	54.2'
10	331°32.3	26.6	193°28.0	14.8'	14°09.8	10.4'	54.2'
11	346°32.5	25.6	208°01.8	14.8'	13°59.4	10.4'	54.2'
12	1°32.7	N01°24.7	222°35.7	14.9'	S13°49.0	10.5'	54.2'
13	16°32.9	23.7	237°09.6	14.9'	13°38.5	10.5'	54.1'
14	31°33.2	22.7	251°43.5	15.0'	13°27.9	10.6'	54.1'
15	46°33.4	·· 21.7	266°17.5	15.0'	13°17.3	10.6'	54.1'
16	61°33.6	20.8	280°51.5	15.1'	13°06.7	10.7'	54.1'
17	76°33.8	19.8	295°25.6	15.1'	12°56.0	10.7'	54.1'
18	91°34.1	N01°18.8	309°59.8	15.2'	S12°45.2	10.8'	54.1'
19	106°34.3	17.9	324°33.9	15.2'	12°34.4	10.8'	54.1'
20	121°34.5	16.9	339°08.1	15.2'	12°23.6	10.9'	54.1'
21	136°34.7	·· 15.9	353°42.4	15.3'	12°12.7	10.9'	54.1'
22	151°34.9	15.0	8°16.7	15.3'	12°01.7	11.0'	54.1'
23	166°35.2	14.0	22°51.1	15.4'	11°50.7	11.0'	54.1'
	SD.=15.9	d=-1.0	S.D.=14.8				

Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°35.4	N01°13.0	37°25.5	15.4'	S11°39.7	11.0'	54.1'
1	196°35.6	12.1	51°59.9	15.5'	11°28.6	11.1'	54.1'
2	211°35.8	11.1	66°34.4	15.5'	11°17.5	11.1'	54.1'
3	226°36.1	·· 10.1	81°08.9	15.5'	11°06.4	11.2'	54.1'
4	241°36.3	09.1	95°43.4	15.6'	10°55.2	11.2'	54.0'
5	256°36.5	08.2	110°18.0	15.6'	10°43.9	11.3'	54.0'
6	271°36.7	N01°07.2	124°52.6	15.6'	S10°32.7	11.3'	54.0'
7	286°37.0	06.2	139°27.3	15.7'	10°21.3	11.3'	54.0'
8	301°37.2	05.3	154°02.0	15.7'	10°10.0	11.4'	54.0'
9	316°37.4	·· 04.3	168°36.7	15.8'	09°58.6	11.4'	54.0'
10	331°37.6	03.3	183°11.5	15.8'	09°47.2	11.4'	54.0'
11	346°37.8	02.4	197°46.3	15.8'	09°35.7	11.5'	54.0'
12	1°38.1	N01°01.4	212°21.1	15.9'	S09°24.2	11.5'	54.0'
13	16°38.3	01°00.4	226°56.0	15.9'	09°12.7	11.6'	54.0'
14	31°38.5	00°59.4	241°30.9	15.9'	09°01.1	11.6'	54.0'
15	46°38.7	·· 58.5	256°05.8	15.9'	08°49.5	11.6'	54.0'
16	61°39.0	57.5	270°40.8	16.0'	08°37.9	11.7'	54.0'
17	76°39.2	56.5	285°15.8	16.0'	08°26.2	11.7'	54.0'
18	91°39.4	N00°55.6	299°50.8	16.0'	S08°14.5	11.7'	54.0'
19	106°39.6	54.6	314°25.8	16.1'	08°02.8	11.7'	54.0'
20	121°39.8	53.6	329°00.9	16.1'	07°51.0	11.8'	54.0'
21	136°40.1	·· 52.6	343°36.0	16.1'	07°39.2	11.8'	54.0'
22	151°40.3	51.7	358°11.1	16.1'	07°27.4	11.8'	54.0'
23	166°40.5	50.7	12°46.3	16.2'	07°15.6	11.9'	54.0'
	SD.=15.9	d=-1.0	S.D.=14.7				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°40.7	N00°49.7	27°21.5	16.2'	S07°03.7	11.9'	54.0'
1	196°41.0	48.8	41°56.6	16.2'	06°51.8	11.9'	54.0'
2	211°41.2	47.8	56°31.9	16.2'	06°39.9	11.9'	54.0'
3	226°41.4	·· 46.8	71°07.1	16.2'	06°27.9	12.0'	54.0'
4	241°41.6	45.8	85°42.4	16.3'	06°15.9	12.0'	54.0'
5	256°41.8	44.9	100°17.6	16.3'	06°04.0	12.0'	54.0'
6	271°42.1	N00°43.9	114°52.9	16.3'	S05°51.9	12.0'	54.0'
7	286°42.3	42.9	129°28.2	16.3'	05°39.9	12.1'	54.0'
8	301°42.5	42.0	144°03.6	16.3'	05°27.8	12.1'	54.0'
9	316°42.7	·· 41.0	158°38.9	16.4'	05°15.8	12.1'	54.0'
10	331°43.0	40.0	173°14.3	16.4'	05°03.6	12.1'	54.0'
11	346°43.2	39.0	187°49.6	16.4'	04°51.5	12.1'	54.0'
12	1°43.4	N00°38.1	202°25.0	16.4'	S04°39.4	12.1'	54.0'
13	16°43.6	37.1	217°00.4	16.4'	04°27.2	12.2'	54.0'
14	31°43.8	36.1	231°35.9	16.4'	04°15.1	12.2'	54.0'
15	46°44.1	·· 35.2	246°11.3	16.4'	04°02.9	12.2'	54.0'
16	61°44.3	34.2	260°46.7	16.4'	03°50.7	12.2'	54.0'
17	76°44.5	33.2	275°22.2	16.5'	03°38.4	12.2'	54.0'
18	91°44.7	N00°32.2	289°57.6	16.5'	S03°26.2	12.2'	54.0'
19	106°45.0	31.3	304°33.1	16.5'	03°14.0	12.3'	54.0'
20	121°45.2	30.3	319°08.6	16.5'	03°01.7	12.3'	54.0'
21	136°45.4	·· 29.3	333°44.0	16.5'	02°49.4	12.3'	54.0'
22	151°45.6	28.4	348°19.5	16.5'	02°37.1	12.3'	54.0'
23	166°45.8	27.4	2°55.0	16.5'	02°24.8	12.3'	54.0'
	SD.=15.9	d=-1.0	S.D.=14.7				

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

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

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 11-13 87-97%
19	06:00	06:11	11:54	21:26	09:05	
20	06:22	06:32	11:53	22:07	09:47	
21	06:43	06:54	11:53	22:48	10:28	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	0°45.2	146°21.2	S19°41.9	148°20.7	S13°15.6	1°39.6	S02°08.0	173°48.5	S00°38.8
1	15°47.6	161°22.4	42.7	163°21.6	16.2	16°42.3	08.2	188°50.7	38.9
2	30°50.1	176°23.7	43.3	178°22.4	16.8	31°45.1	08.3	203°52.9	39.0
3	45°52.6	191°25.0	·· 44.0	193°23.3	·· 17.4	46°47.9	·· 08.4	218°55.1	·· 39.2
4	60°55.0	206°26.3	44.7	208°24.1	18.0	61°50.6	08.6	233°57.2	39.3
5	75°57.5	221°27.6	45.4	223°24.9	18.6	76°53.4	08.7	248°59.4	39.4
6	91°00.0	236°28.9	S19°46.1	238°25.8	S13°19.2	91°56.2	S02°08.8	264°01.6	S00°39.5
7	106°02.4	251°30.2	46.8	253°26.6	19.8	106°58.9	09.0	279°03.8	39.7
8	121°04.9	266°31.5	47.5	268°27.4	20.3	122°01.7	09.1	294°06.0	39.8
9	136°07.3	281°32.8	·· 48.2	283°28.3	·· 20.9	137°04.5	·· 09.2	309°08.2	·· 39.9
10	151°09.8	296°34.1	48.9	298°29.1	21.5	152°07.3	09.4	324°10.3	40.0
11	166°12.3	311°35.4	49.6	313°30.0	22.1	167°10.0	09.5	339°12.5	40.1
12	181°14.7	326°36.7	S19°50.3	328°30.8	S13°22.7	182°12.8	S02°09.6	354°14.7	S00°40.3
13	196°17.2	341°38.0	51.0	343°31.6	23.3	197°15.6	09.8	9°16.9	40.4
14	211°19.7	356°39.3	51.7	358°32.5	23.9	212°18.3	09.9	24°19.1	40.5
15	226°22.1	11°40.6	·· 52.3	13°33.3	·· 24.5	227°21.1	·· 10.0	39°21.2	·· 40.6
16	241°24.6	26°41.9	53.0	28°34.1	25.1	242°23.9	10.2	54°23.4	40.7
17	256°27.1	41°43.2	53.7	43°35.0	25.7	257°26.6	10.3	69°25.6	40.9
18	271°29.5	56°44.6	S19°54.4	58°35.8	S13°26.3	272°29.4	S02°10.4	84°27.8	S00°41.0
19	286°32.0	71°45.9	55.1	73°36.6	26.8	287°32.2	10.6	99°30.0	41.1
20	301°34.5	86°47.2	55.8	88°37.5	27.4	302°35.0	10.7	114°32.2	41.2
21	316°36.9	101°48.5	·· 56.4	103°38.3	·· 28.0	317°37.7	·· 10.8	129°34.3	·· 41.3
22	331°39.4	116°49.9	57.1	118°39.1	28.6	332°40.5	11.0	144°36.5	41.5
23	346°41.8	131°51.2	57.8	133°40.0	29.2	347°43.3	11.1	159°38.7	41.6
Mer.pass.:23:53		v1.3 d-0.7 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	1°44.3	146°52.5	S19°58.5	148°40.8	S13°29.8	2°46.0	S02°11.2	174°40.9	S00°41.7
1	16°46.8	161°53.9	59.1	163°41.6	30.4	17°48.8	11.4	189°43.1	41.8
2	31°49.2	176°55.2	19°59.8	178°42.5	31.0	32°51.6	11.5	204°45.3	42.0
3	46°51.7	191°56.6	20°00.5	193°43.3	·· 31.6	47°54.3	·· 11.6	219°47.4	·· 42.1
4	61°54.2	206°57.9	01.1	208°44.1	32.2	62°57.1	11.8	234°49.6	42.2
5	76°56.6	221°59.3	01.8	223°45.0	32.7	77°59.9	11.9	249°51.8	42.3
6	91°59.1	237°00.6	S20°02.5	238°45.8	S13°33.3	93°02.7	S02°12.0	264°54.0	S00°42.4
7	107°01.6	252°02.0	03.2	253°46.6	33.9	108°05.4	12.2	279°56.2	42.6
8	122°04.0	267°03.3	03.8	268°47.5	34.5	123°08.2	12.3	294°58.3	42.7
9	137°06.5	282°04.7	·· 04.5	283°48.3	·· 35.1	138°11.0	·· 12.4	310°00.5	·· 42.8
10	152°08.9	297°06.0	05.2	298°49.1	35.7	153°13.7	12.6	325°02.7	42.9
11	167°11.4	312°07.4	05.8	313°50.0	36.3	168°16.5	12.7	340°04.9	43.0
12	182°13.9	327°08.8	S20°06.5	328°50.8	S13°36.9	183°19.3	S02°12.8	355°07.1	S00°43.2
13	197°16.3	342°10.1	07.1	343°51.6	37.4	198°22.0	13.0	10°09.3	43.3
14	212°18.8	357°11.5	07.8	358°52.4	38.0	213°24.8	13.1	25°11.4	43.4
15	227°21.3	12°12.9	·· 08.5	13°53.3	·· 38.6	228°27.6	·· 13.2	40°13.6	·· 43.5
16	242°23.7	27°14.2	09.1	28°54.1	39.2	243°30.4	13.4	55°15.8	43.6
17	257°26.2	42°15.6	09.8	43°54.9	39.8	258°33.1	13.5	70°18.0	43.8
18	272°28.7	57°17.0	S20°10.4	58°55.8	S13°40.4	273°35.9	S02°13.6	85°20.2	S00°43.9
19	287°31.1	72°18.4	11.1	73°56.6	41.0	288°38.7	13.8	100°22.3	44.0
20	302°33.6	87°19.8	11.7	88°57.4	41.6	303°41.4	13.9	115°24.5	44.1
21	317°36.1	102°21.1	·· 12.4	103°58.3	·· 42.1	318°44.2	·· 14.0	130°26.7	·· 44.3
22	332°38.5	117°22.5	13.0	118°59.1	42.7	333°47.0	14.2	145°28.9	44.4
23	347°41.0	132°23.9	13.7	133°59.9	43.3	348°49.7	14.3	160°31.1	44.5
Mer.pass.:23:49		v1.3 d-0.7 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	2°43.4	147°25.3	S20°14.3	149°00.7	S13°43.9	3°52.5	S02°14.4	175°33.3	S00°44.6
1	17°45.9	162°26.7	15.0	164°01.6	44.5	18°55.3	14.6	190°35.4	44.7
2	32°48.4	177°28.1	15.6	179°02.4	45.1	33°58.0	14.7	205°37.6	44.9
3	47°50.8	192°29.5	·· 16.3	194°03.2	·· 45.7	49°00.8	·· 14.8	220°39.8	·· 45.0
4	62°53.3	207°30.9	16.9	209°04.0	46.2	64°03.6	15.0	235°42.0	45.1
5	77°55.8	222°32.3	17.6	224°04.9	46.8	79°06.4	15.1	250°44.2	45.2
6	92°58.2	237°33.7	S20°18.2	239°05.7	S13°47.4	94°09.1	S02°15.2	265°46.3	S00°45.3
7	108°00.7	252°35.1	18.9	254°06.5	48.0	109°11.9	15.4	280°48.5	45.5
8	123°03.2	267°36.6	19.5	269°07.3	48.6	124°14.7	15.5	295°50.7	45.6
9	138°05.6	282°38.0	·· 20.1	284°08.2	·· 49.2	139°17.4	·· 15.6	310°52.9	·· 45.7
10	153°08.1	297°39.4	20.8	299°09.0	49.8	154°20.2	15.8	325°55.1	45.8
11	168°10.5	312°40.8	21.4	314°09.8	50.3	169°23.0	15.9	340°57.3	46.0
12	183°13.0	327°42.2	S20°22.0	329°10.6	S13°50.9	184°25.7	S02°16.0	355°59.4	S00°46.1
13	198°15.5	342°43.7	22.7	344°11.5	51.5	199°28.5	16.2	11°01.6	46.2
14	213°17.9	357°45.1	23.3	359°12.3	52.1	214°31.3	16.3	26°03.8	46.3
15	228°20.4	12°46.5	·· 23.9	14°13.1	·· 52.7	229°34.1	·· 16.4	41°06.0	·· 46.4
16	243°22.9	27°48.0	24.6	29°13.9	53.3	244°36.8	16.6	56°08.2	46.6
17	258°25.3	42°49.4	25.2	44°14.8	53.9	259°39.6	16.7	71°10.3	46.7
18	273°27.8	57°50.8	S20°25.8	59°15.6	S13°54.4	274°42.4	S02°16.8	86°12.5	S00°46.8
19	288°30.3	72°52.3	26.5	74°16.4	55.0	289°45.1	17.0	101°14.7	46.9
20	303°32.7	87°53.7	27.1	89°17.2	55.6	304°47.9	17.1	116°16.9	47.0
21	318°35.2	102°55.2	·· 27.7	104°18.1	·· 56.2	319°50.7	·· 17.2	131°19.1	·· 47.2
22	333°37.7	117°56.6	28.3	119°18.9	56.8	334°53.4	17.4	146°21.3	47.3
23	348°40.1	132°58.1	28.9	134°19.7	57.4	349°56.2	17.5	161°23.4	47.4
Mer.pass.:23:45		v1.4 d-0.6 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.6
Schedar	349°42.4	56°35.9
Diphda	348°57.5	-17°55.4
Achernar	335°27.6	-57°10.7
Hamal	328°02.7	23°30.9
Polaris	318°26.3	89°18.5
Acamar	315°19.5	-40°15.4
Menkar	314°16.9	4°08.1
Mirfak	308°42.9	49°53.9
Aldebaran	290°51.5	16°31.9
Rigel	281°13.9	-8°11.2
Capella	280°37.3	46°00.4
Bellatrix	278°34.1	6°21.7
Elnath	278°15.1	28°37.0
Alnilam	275°48.3	-1°11.6
Betelgeuse	271°03.4	7°24.6
Canopus	263°57.1	-52°41.8
Sirius	258°35.5	-16°43.7
Adhara	255°14.2	-28°59.0
Procyon	245°01.9	5°11.9
Pollux	243°30.3	27°59.9
Avior	234°19.3	-59°32.4
Suhail	222°54.3	-43°28.4
Miaplacidus	221°41.0	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.5	61°41.5
Denebola	182°36.0	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.5
Alioth	166°22.8	55°54.1
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.7
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.0	-60°52.9
Kochab	137°20.5	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.9
Antares	112°28.8	-26°27.4
Atria	107°32.6	-69°03.0
Sabik	102°14.9	-15°44.2
Shaula	96°24.6	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.1	51°29.6
Kaus Aust.	83°46.4	-34°22.8
Vega	80°40.2	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.9	-56°42.1
Deneb	49°32.6	45°19.5
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.5
Fomalhaut	15°25.7	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 22 Wed	**SHA**	**Mer.pass**
Venus	145°36.0	14:13
Mars	147°35.6	14:06
Jupiter	0°54.4	23:49
Saturn	173°03.3	12:23

Sep 23 Thu	**SHA**	**Mer.pass**
Venus	145°08.2	14:11
Mars	146°56.5	14:05
Jupiter	1°01.7	23:45
Saturn	172°56.6	12:19

Sep 24 Fri	**SHA**	**Mer.pass**
Venus	144°41.9	14:09
Mars	146°17.3	14:03
Jupiter	1°09.1	23:40
Saturn	172°49.8	12:16

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h — Sun — Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°46.1	N00°26.4	17°30.5	16.5'	S02°12.5	12.3'	54.0'
1	196°46.3	25.4	32°06.0	16.5'	02°00.2	12.3'	54.0'
2	211°46.5	24.5	46°41.5	16.5'	01°47.9	12.3'	54.0'
3	226°46.7	·· 23.5	61°17.0	16.5'	01°35.5	12.3'	54.0'
4	241°47.0	22.5	75°52.5	16.5'	01°23.2	12.3'	54.0'
5	256°47.2	21.6	90°28.0	16.5'	01°10.9	12.4'	54.0'
6	271°47.4	N00°20.6	105°03.5	16.5'	S00°58.5	12.4'	54.0'
7	286°47.6	19.6	119°39.0	16.5'	00°46.1	12.4'	54.0'
8	301°47.8	18.6	134°14.5	16.5'	00°33.8	12.4'	54.0'
9	316°48.1	·· 17.7	148°50.0	16.5'	00°21.4	12.4'	54.0'
10	331°48.3	16.7	163°25.5	16.5'	S00°09.0	12.4'	54.0'
11	346°48.5	15.7	178°01.0	16.5'	N00°03.3	12.4'	54.0'
12	1°48.7	N00°14.7	192°36.5	16.5'	N00°15.7	12.4'	54.0'
13	16°48.9	13.8	207°12.0	16.5'	00°28.1	12.4'	54.0'
14	31°49.2	12.8	221°47.4	16.5'	00°40.5	12.4'	54.1'
15	46°49.4	·· 11.8	236°22.9	16.5'	00°52.8	12.4'	54.1'
16	61°49.6	10.9	250°58.3	16.4'	01°05.2	12.4'	54.1'
17	76°49.8	09.9	265°33.8	16.4'	01°17.6	12.4'	54.1'
18	91°50.0	N00°08.9	280°09.2	16.4'	N01°30.0	12.4'	54.1'
19	106°50.3	07.9	294°44.6	16.4'	01°42.3	12.4'	54.1'
20	121°50.5	07.0	309°20.0	16.4'	01°54.7	12.4'	54.1'
21	136°50.7	·· 06.0	323°55.4	16.4'	02°07.1	12.4'	54.1'
22	151°50.9	05.0	338°30.8	16.4'	02°19.4	12.4'	54.1'
23	166°51.1	04.1	353°06.2	16.4'	02°31.8	12.3'	54.1'
	SD.=15.9	d=-1.0	S.D.=14.7				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°51.4	N00°03.1	7°41.5	16.3'	N02°44.1	12.3'	54.1'
1	196°51.6	02.1	22°16.9	16.3'	02°56.4	12.3'	54.1'
2	211°51.8	01.1	36°52.2	16.3'	03°08.8	12.3'	54.1'
3	226°52.0	N00°00.2	51°27.5	16.3'	03°21.1	12.3'	54.1'
4	241°52.3	S00°00.8	66°02.8	16.3'	03°33.4	12.3'	54.1'
5	256°52.5	01.8	80°38.0	16.3'	03°45.7	12.3'	54.1'
6	271°52.7	S00°02.8	95°13.3	16.2'	N03°58.0	12.3'	54.1'
7	286°52.9	03.7	109°48.5	16.2'	04°10.2	12.3'	54.2'
8	301°53.1	04.7	124°23.7	16.2'	04°22.5	12.3'	54.2'
9	316°53.4	·· 05.7	138°58.9	16.2'	04°34.7	12.2'	54.2'
10	331°53.6	06.6	153°34.0	16.1'	04°47.0	12.2'	54.2'
11	346°53.8	07.6	168°09.2	16.1'	04°59.2	12.2'	54.2'
12	1°54.0	S00°08.6	182°44.3	16.1'	N05°11.4	12.2'	54.2'
13	16°54.2	09.6	197°19.3	16.1'	05°23.6	12.2'	54.2'
14	31°54.5	10.5	211°54.4	16.0'	05°35.7	12.2'	54.2'
15	46°54.7	·· 11.5	226°29.4	16.0'	05°47.9	12.1'	54.2'
16	61°54.9	12.5	241°04.4	16.0'	06°00.0	12.1'	54.2'
17	76°55.1	13.5	255°39.4	16.0'	06°12.1	12.1'	54.2'
18	91°55.3	S00°14.4	270°14.3	15.9'	N06°24.2	12.1'	54.2'
19	106°55.5	15.4	284°49.2	15.9'	06°36.3	12.1'	54.3'
20	121°55.8	16.4	299°24.1	15.9'	06°48.4	12.0'	54.3'
21	136°56.0	·· 17.4	313°59.0	15.8'	07°00.4	12.0'	54.3'
22	151°56.2	18.3	328°33.8	15.8'	07°12.4	12.0'	54.3'
23	166°56.4	19.3	343°08.5	15.8'	07°24.4	12.0'	54.3'
	SD.=15.9	d=-1.0	S.D.=14.8				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°56.6	S00°20.3	357°43.3	15.7'	N07°36.3	11.9'	54.3'
1	196°56.9	21.2	12°18.0	15.7'	07°48.2	11.9'	54.3'
2	211°57.1	22.2	26°52.7	15.7'	08°00.1	11.9'	54.3'
3	226°57.3	·· 23.2	41°27.3	15.6'	08°12.0	11.9'	54.3'
4	241°57.5	24.2	56°01.9	15.6'	08°23.9	11.8'	54.3'
5	256°57.7	25.1	70°36.5	15.5'	08°35.7	11.8'	54.4'
6	271°58.0	S00°26.1	85°11.0	15.5'	N08°47.5	11.8'	54.4'
7	286°58.2	27.1	99°45.5	15.5'	08°59.2	11.7'	54.4'
8	301°58.4	28.1	114°19.9	15.4'	09°10.9	11.7'	54.4'
9	316°58.6	·· 29.0	128°54.3	15.4'	09°22.6	11.7'	54.4'
10	331°58.8	30.0	143°28.6	15.3'	09°34.3	11.6'	54.4'
11	346°59.1	31.0	158°03.0	15.3'	09°45.9	11.6'	54.4'
12	1°59.3	S00°31.9	172°37.2	15.2'	N09°57.5	11.6'	54.4'
13	16°59.5	32.9	187°11.5	15.2'	10°09.1	11.5'	54.4'
14	31°59.7	33.9	201°45.6	15.2'	10°20.6	11.5'	54.5'
15	46°59.9	·· 34.9	216°19.8	15.1'	10°32.1	11.5'	54.5'
16	62°00.1	35.8	230°53.9	15.1'	10°43.5	11.4'	54.5'
17	77°00.4	36.8	245°27.9	15.0'	10°54.9	11.4'	54.5'
18	92°00.6	S00°37.8	260°01.9	15.0'	N11°06.3	11.3'	54.5'
19	107°00.8	38.8	274°35.8	14.9'	11°17.6	11.3'	54.5'
20	122°01.0	39.7	289°09.7	14.9'	11°28.9	11.3'	54.5'
21	137°01.2	·· 40.7	303°43.6	14.8'	11°40.1	11.2'	54.5'
22	152°01.5	41.7	318°17.4	14.8'	11°51.3	11.2'	54.5'
23	167°01.7	42.7	332°51.1	14.7'	12°02.5	11.1'	54.6'
	SD.=15.9	d=-1.0	S.D.=14.8				

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

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

Day	Sun Eqn.of Time 00^h mm:ss	Sun Eqn.of Time 12^h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 14-16 99-99%
22	07:04	07:15	11:53	23:28	11:08	
23	07:25	07:36	11:52	–:–	11:49	
24	07:47	07:57	11:52	00:09	12:30	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	3°42.6	147°59.5	S20°29.6	149°20.5	S13°57.9	4°59.0	S02°17.6	176°25.6	S00°47.5
1	18°45.0	163°01.0	30.2	164°21.3	58.5	20°01.7	17.8	191°27.8	47.6
2	33°47.5	178°02.5	30.8	179°22.2	59.1	35°04.5	17.9	206°30.0	47.8
3	48°50.0	193°03.9	·· 31.4	194°23.0	13°59.7	50°07.3	·· 18.0	221°32.2	·· 47.9
4	63°52.4	208°05.4	32.0	209°23.8	14°00.3	65°10.0	18.2	236°34.3	48.0
5	78°54.9	223°06.9	32.7	224°24.6	00.8	80°12.8	18.3	251°36.5	48.1
6	93°57.4	238°08.3	S20°33.3	239°25.4	S14°01.4	95°15.6	S02°18.4	266°38.7	S00°48.3
7	108°59.8	253°09.8	33.9	254°26.3	02.0	110°18.4	18.5	281°40.9	48.4
8	124°02.3	268°11.3	34.5	269°27.1	02.6	125°21.1	18.7	296°43.1	48.5
9	139°04.8	283°12.8	·· 35.1	284°27.9	·· 03.2	140°23.9	·· 18.8	311°45.3	·· 48.6
10	154°07.2	298°14.2	35.7	299°28.7	03.8	155°26.7	18.9	326°47.4	48.7
11	169°09.7	313°15.7	36.3	314°29.5	04.3	170°29.4	19.1	341°49.6	48.9
12	184°12.2	328°17.2	S20°36.9	329°30.4	S14°04.9	185°32.2	S02°19.2	356°51.8	S00°49.0
13	199°14.6	343°18.7	37.5	344°31.2	05.5	200°35.0	19.3	11°54.0	49.1
14	214°17.1	358°20.2	38.1	359°32.0	06.1	215°37.7	19.5	26°56.2	49.2
15	229°19.5	13°21.7	·· 38.7	14°32.8	·· 06.7	230°40.5	·· 19.6	41°58.3	·· 49.3
16	244°22.0	28°23.2	39.4	29°33.6	07.2	245°43.3	19.7	57°00.5	49.5
17	259°24.5	43°24.7	40.0	44°34.4	07.8	260°46.0	19.9	72°02.7	49.6
18	274°26.9	58°26.2	S20°40.6	59°35.3	S14°08.4	275°48.8	S02°20.0	87°04.9	S00°49.7
19	289°29.4	73°27.7	41.2	74°36.1	09.0	290°51.6	20.1	102°07.1	49.8
20	304°31.9	88°29.2	41.7	89°36.9	09.6	305°54.3	20.3	117°09.2	49.9
21	319°34.3	103°30.7	·· 42.3	104°37.7	·· 10.1	320°57.1	·· 20.4	132°11.4	·· 50.1
22	334°36.8	118°32.2	42.9	119°38.5	10.7	335°59.9	20.5	147°13.6	50.2
23	349°39.3	133°33.7	43.5	134°39.3	11.3	351°02.7	20.7	162°15.8	50.3
Mer.pass.:23:41		v1.5 d-0.6 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	4°41.7	148°35.3	S20°44.1	149°40.1	S14°11.9	6°05.4	S02°20.8	177°18.0	S00°50.4
1	19°44.2	163°36.8	44.7	164°41.0	12.5	21°08.2	20.9	192°20.2	50.6
2	34°46.6	178°38.3	45.3	179°41.8	13.0	36°11.0	21.0	207°22.3	50.7
3	49°49.1	193°39.8	·· 45.9	194°42.6	·· 13.6	51°13.7	·· 21.2	222°24.5	·· 50.8
4	64°51.6	208°41.4	46.5	209°43.4	14.2	66°16.5	21.3	237°26.7	50.9
5	79°54.0	223°42.9	47.1	224°44.2	14.8	81°19.3	21.4	252°28.9	51.0
6	94°56.5	238°44.4	S20°47.7	239°45.0	S14°15.4	96°22.0	S02°21.6	267°31.1	S00°51.2
7	109°59.0	253°46.0	48.2	254°45.8	15.9	111°24.8	21.7	282°33.2	51.3
8	125°01.4	268°47.5	48.8	269°46.7	16.5	126°27.6	21.8	297°35.4	51.4
9	140°03.9	283°49.1	·· 49.4	284°47.5	·· 17.1	141°30.3	·· 22.0	312°37.6	·· 51.5
10	155°06.4	298°50.6	50.0	299°48.3	17.7	156°33.1	22.1	327°39.8	51.6
11	170°08.8	313°52.2	50.6	314°49.1	18.2	171°35.9	22.2	342°42.0	51.8
12	185°11.3	328°53.7	S20°51.1	329°49.9	S14°18.8	186°38.6	S02°22.4	357°44.1	S00°51.9
13	200°13.8	343°55.3	51.7	344°50.7	19.4	201°41.4	22.5	12°46.3	52.0
14	215°16.2	358°56.8	52.3	359°51.5	20.0	216°44.2	22.6	27°48.5	52.1
15	230°18.7	13°58.4	·· 52.9	14°52.3	·· 20.6	231°46.9	·· 22.8	42°50.7	·· 52.2
16	245°21.1	29°00.0	53.4	29°53.2	21.1	246°49.7	22.9	57°52.9	52.4
17	260°23.6	44°01.5	54.0	44°54.0	21.7	261°52.5	23.0	72°55.0	52.5
18	275°26.1	59°03.1	S20°54.6	59°54.8	S14°22.3	276°55.2	S02°23.1	87°57.2	S00°52.6
19	290°28.5	74°04.7	55.2	74°55.6	22.9	291°58.0	23.3	102°59.4	52.7
20	305°31.0	89°06.2	55.7	89°56.4	23.4	307°00.8	23.4	118°01.6	52.9
21	320°33.5	104°07.8	·· 56.3	104°57.2	·· 24.0	322°03.5	·· 23.5	133°03.8	·· 53.0
22	335°35.9	119°09.4	56.9	119°58.0	24.6	337°06.3	23.7	148°06.0	53.1
23	350°38.4	134°11.0	57.4	134°58.8	25.2	352°09.1	23.8	163°08.1	53.2
Mer.pass.:23:37		v1.5 d-0.6 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	5°40.9	149°12.6	S20°58.0	149°59.6	S14°25.7	7°11.8	S02°23.9	178°10.3	S00°53.3
1	20°43.3	164°14.2	58.5	165°00.4	26.3	22°14.6	24.1	193°12.5	53.5
2	35°45.8	179°15.7	59.1	180°01.3	26.9	37°17.4	24.2	208°14.7	53.6
3	50°48.2	194°17.3	20°59.7	195°02.1	·· 27.5	52°20.1	·· 24.3	223°16.9	·· 53.7
4	65°50.7	209°18.9	21°00.2	210°02.9	28.0	67°22.9	24.5	238°19.0	53.8
5	80°53.2	224°20.5	00.8	225°03.7	28.6	82°25.7	24.6	253°21.2	53.9
6	95°55.6	239°22.1	S21°01.3	240°04.5	S14°29.2	97°28.4	S02°24.7	268°23.4	S00°54.1
7	110°58.1	254°23.7	01.9	255°05.3	29.8	112°31.2	24.8	283°25.6	54.2
8	126°00.6	269°25.4	02.4	270°06.1	30.3	127°34.0	25.0	298°27.8	54.3
9	141°03.0	284°27.0	·· 03.0	285°06.9	·· 30.9	142°36.8	·· 25.1	313°29.9	·· 54.4
10	156°05.5	299°28.6	03.5	300°07.7	31.5	157°39.5	25.2	328°32.1	54.5
11	171°08.0	314°30.2	04.1	315°08.5	32.1	172°42.3	25.4	343°34.3	54.7
12	186°10.4	329°31.8	S21°04.6	330°09.3	S14°32.6	187°45.1	S02°25.5	358°36.5	S00°54.8
13	201°12.9	344°33.4	05.2	345°10.1	33.2	202°47.8	25.6	13°38.7	54.9
14	216°15.4	359°35.1	05.7	0°10.9	33.8	217°50.6	25.8	28°40.8	55.0
15	231°17.8	14°36.7	·· 06.3	15°11.7	·· 34.4	232°53.4	·· 25.9	43°43.0	·· 55.1
16	246°20.3	29°38.3	06.8	30°12.5	34.9	247°56.1	26.0	58°45.2	55.3
17	261°22.7	44°40.0	07.4	45°13.3	35.5	262°58.9	26.1	73°47.4	55.4
18	276°25.2	59°41.6	S21°07.9	60°14.1	S14°36.1	278°01.6	S02°26.3	88°49.6	S00°55.5
19	291°27.7	74°43.2	08.4	75°15.0	36.6	293°04.4	26.4	103°51.8	55.6
20	306°30.1	89°44.9	09.0	90°15.8	37.2	308°07.2	26.5	118°53.9	55.8
21	321°32.6	104°46.5	·· 09.5	105°16.6	·· 37.8	323°09.9	·· 26.7	133°56.1	·· 55.9
22	336°35.1	119°48.2	10.0	120°17.4	38.4	338°12.7	26.8	148°58.3	56.0
23	351°37.5	134°49.8	10.6	135°18.2	38.9	353°15.5	26.9	164°00.5	56.1
Mer.pass.:23:33		v1.6 d-0.6 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.6
Schedar	349°42.4	56°35.9
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.7
Hamal	328°02.7	23°30.9
Polaris	318°25.2	89°18.5
Acamar	315°19.5	-40°15.4
Menkar	314°16.9	4°08.1
Mirfak	308°42.9	49°53.9
Aldebaran	290°51.5	16°31.9
Rigel	281°13.9	-8°11.2
Capella	280°37.3	46°00.4
Bellatrix	278°34.1	6°21.7
Elnath	278°15.0	28°37.0
Alnilam	275°48.3	-1°11.6
Betelgeuse	271°03.4	7°24.6
Canopus	263°57.1	-52°41.8
Sirius	258°35.5	-16°43.7
Adhara	255°14.2	-28°59.0
Procyon	245°01.9	5°11.9
Pollux	243°30.2	27°59.9
Avior	234°19.2	-59°32.4
Suhail	222°54.3	-43°28.4
Miaplacidus	221°40.9	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.5	61°41.5
Denebola	182°36.0	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.1
Spica	158°33.7	-11°13.0
Alkaid	153°00.8	49°15.7
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.0	-60°52.9
Kochab	137°20.6	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.9
Antares	112°28.9	-26°27.4
Atria	107°32.7	-69°03.0
Sabik	102°14.9	-15°44.2
Shaula	96°24.7	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.1	51°29.6
Kaus Aust.	83°46.4	-34°22.8
Vega	80°40.3	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.0	8°54.0
Peacock	53°21.9	-56°42.1
Deneb	49°32.6	45°19.5
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.5
Fomalhaut	15°25.8	-29°33.7
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.0

Sep 25 Sat	**SHA**	**Mer.pass**
Venus	144°17.0	14:07
Mars	145°37.9	14:02
Jupiter	1°16.4	23:36
Saturn	172°43.0	12:13

Sep 26 Sun	**SHA**	**Mer.pass**
Venus	143°53.5	14:04
Mars	144°58.4	14:01
Jupiter	1°23.7	23:31
Saturn	172°36.3	12:09

Sep 27 Mon	**SHA**	**Mer.pass**
Venus	143°31.7	14:02
Mars	144°18.8	13:59
Jupiter	1°31.0	23:27
Saturn	172°29.5	12:06

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°01.9	S00°43.6	347°24.8	14.7'	N12°13.6	11.1'	54.6'
1	197°02.1	44.6	1°58.5	14.6'	12°24.7	11.0'	54.6'
2	212°02.3	45.6	16°32.0	14.6'	12°35.7	11.0'	54.6'
3	227°02.5	·· 46.5	31°05.6	14.5'	12°46.7	10.9'	54.6'
4	242°02.8	47.5	45°39.1	14.5'	12°57.6	10.9'	54.6'
5	257°03.0	48.5	60°12.5	14.4'	13°08.4	10.8'	54.6'
6	272°03.2	S00°49.5	74°45.8	14.3'	N13°19.3	10.8'	54.7'
7	287°03.4	50.4	89°19.2	14.3'	13°30.0	10.7'	54.7'
8	302°03.6	51.4	103°52.4	14.2'	13°40.8	10.7'	54.7'
9	317°03.8	·· 52.4	118°25.6	14.2'	13°51.4	10.6'	54.7'
10	332°04.1	53.4	132°58.7	14.1'	14°02.0	10.6'	54.7'
11	347°04.3	54.3	147°31.8	14.0'	14°12.6	10.5'	54.7'
12	2°04.5	S00°55.3	162°04.8	14.0'	N14°23.1	10.5'	54.7'
13	17°04.7	56.3	176°37.8	13.9'	14°33.6	10.4'	54.8'
14	32°04.9	57.3	191°10.7	13.9'	14°43.9	10.4'	54.8'
15	47°05.1	·· 58.2	205°43.5	13.8'	14°54.3	10.3'	54.8'
16	62°05.4	00°59.2	220°16.3	13.7'	15°04.6	10.2'	54.8'
17	77°05.6	01°00.2	234°49.0	13.7'	15°14.8	10.2'	54.8'
18	92°05.8	S01°01.2	249°21.7	13.6'	N15°24.9	10.1'	54.8'
19	107°06.0	02.1	263°54.3	13.6'	15°35.0	10.1'	54.8'
20	122°06.2	03.1	278°26.8	13.5'	15°45.0	10.0'	54.9'
21	137°06.4	·· 04.1	292°59.3	13.4'	15°55.0	9.9'	54.9'
22	152°06.7	05.0	307°31.6	13.4'	16°04.9	9.9'	54.9'
23	167°06.9	06.0	322°04.0	13.3'	16°14.7	9.8'	54.9'
	SD.=15.9	d=-1.0	S.D.=14.9				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°07.1	S01°07.0	336°36.2	13.2'	N16°24.5	9.7'	54.9'
1	197°07.3	08.0	351°08.4	13.2'	16°34.2	9.7'	54.9'
2	212°07.5	08.9	5°40.6	13.1'	16°43.8	9.6'	55.0'
3	227°07.7	·· 09.9	20°12.6	13.0'	16°53.4	9.5'	55.0'
4	242°08.0	10.9	34°44.6	13.0'	17°02.9	9.5'	55.0'
5	257°08.2	11.9	49°16.6	12.9'	17°12.3	9.4'	55.0'
6	272°08.4	S01°12.8	63°48.4	12.8'	N17°21.7	9.3'	55.0'
7	287°08.6	13.8	78°20.2	12.8'	17°30.9	9.2'	55.0'
8	302°08.8	14.8	92°51.9	12.7'	17°40.1	9.2'	55.1'
9	317°09.0	·· 15.8	107°23.6	12.6'	17°49.3	9.1'	55.1'
10	332°09.2	16.7	121°55.2	12.5'	17°58.3	9.0'	55.1'
11	347°09.5	17.7	136°26.7	12.5'	18°07.3	8.9'	55.1'
12	2°09.7	S01°18.7	150°58.1	12.4'	N18°16.2	8.9'	55.1'
13	17°09.9	19.6	165°29.5	12.3'	18°25.0	8.8'	55.1'
14	32°10.1	20.6	180°00.8	12.3'	18°33.8	8.7'	55.2'
15	47°10.3	·· 21.6	194°32.0	12.2'	18°42.4	8.6'	55.2'
16	62°10.5	22.6	209°03.2	12.1'	18°51.0	8.5'	55.2'
17	77°10.7	23.5	223°34.3	12.1'	18°59.5	8.5'	55.2'
18	92°11.0	S01°24.5	238°05.3	12.0'	N19°07.9	8.4'	55.2'
19	107°11.2	25.5	252°36.2	11.9'	19°16.2	8.3'	55.3'
20	122°11.4	26.5	267°07.1	11.8'	19°24.4	8.2'	55.3'
21	137°11.6	·· 27.4	281°37.9	11.8'	19°32.6	8.1'	55.3'
22	152°11.8	28.4	296°08.6	11.7'	19°40.7	8.0'	55.3'
23	167°12.0	29.4	310°39.3	11.6'	19°48.6	7.9'	55.3'
	SD.=15.9	d=-1.0	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°12.2	S01°30.4	325°09.9	11.5'	N19°56.5	7.8'	55.4'
1	197°12.5	31.3	339°40.4	11.5'	20°04.3	7.8'	55.4'
2	212°12.7	32.3	354°10.8	11.4'	20°12.0	7.7'	55.4'
3	227°12.9	·· 33.3	8°41.2	11.3'	20°19.6	7.6'	55.4'
4	242°13.1	34.2	23°11.5	11.3'	20°27.2	7.5'	55.4'
5	257°13.3	35.2	37°41.7	11.2'	20°34.6	7.4'	55.5'
6	272°13.5	S01°36.2	52°11.8	11.1'	N20°41.9	7.3'	55.5'
7	287°13.7	37.2	66°41.9	11.0'	20°49.2	7.2'	55.5'
8	302°13.9	38.1	81°11.9	11.0'	20°56.3	7.1'	55.5'
9	317°14.2	·· 39.1	95°41.8	10.9'	21°03.3	7.0'	55.5'
10	332°14.4	40.1	110°11.7	10.8'	21°10.3	6.9'	55.6'
11	347°14.6	41.1	124°41.4	10.7'	21°17.1	6.8'	55.6'
12	2°14.8	S01°42.0	139°11.2	10.7'	N21°23.8	6.7'	55.6'
13	17°15.0	43.0	153°40.8	10.6'	21°30.5	6.6'	55.6'
14	32°15.2	44.0	168°10.3	10.5'	21°37.0	6.5'	55.6'
15	47°15.4	·· 44.9	182°39.8	10.5'	21°43.4	6.4'	55.7'
16	62°15.6	45.9	197°09.3	10.4'	21°49.8	6.3'	55.7'
17	77°15.9	46.9	211°38.6	10.3'	21°56.0	6.2'	55.7'
18	92°16.1	S01°47.9	226°07.9	10.2'	N22°02.1	6.1'	55.7'
19	107°16.3	48.8	240°37.1	10.2'	22°08.1	5.9'	55.8'
20	122°16.5	49.8	255°06.2	10.1'	22°14.0	5.8'	55.8'
21	137°16.7	·· 50.8	269°35.3	10.0'	22°19.8	5.7'	55.8'
22	152°16.9	51.8	284°04.3	10.0'	22°25.5	5.6'	55.8'
23	167°17.1	52.7	298°33.2	9.9'	22°31.0	5.5'	55.8'
	SD.=15.9	d=-1.0	S.D.=15.2				

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

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

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 96-85%
25	08:08	08:18	11:52	00:52	13:14	
26	08:28	08:39	11:51	01:37	14:00	
27	08:49	08:59	11:51	02:24	14:49	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	6°40.0	149°51.5	S21°11.1	150°19.0	S14°39.5	8°18.2	S02°27.1	179°02.7	S00°56.2
1	21°42.5	164°53.1	11.6	165°19.8	40.1	23°21.0	27.2	194°04.8	56.4
2	36°44.9	179°54.8	12.2	180°20.6	40.7	38°23.8	27.3	209°07.0	56.5
3	51°47.4	194°56.5	·· 12.7	195°21.4	·· 41.2	53°26.5	·· 27.4	224°09.2	·· 56.6
4	66°49.9	209°58.1	13.2	210°22.2	41.8	68°29.3	27.6	239°11.4	56.7
5	81°52.3	224°59.8	13.7	225°23.0	42.4	83°32.1	27.7	254°13.6	56.8
6	96°54.8	240°01.5	S21°14.3	240°23.8	S14°42.9	98°34.8	S02°27.8	269°15.7	S00°57.0
7	111°57.2	255°03.2	14.8	255°24.6	43.5	113°37.6	28.0	284°17.9	57.1
8	126°59.7	270°04.8	15.3	270°25.4	44.1	128°40.4	28.1	299°20.1	57.2
9	142°02.2	285°06.5	·· 15.8	285°26.2	·· 44.6	143°43.1	·· 28.2	314°22.3	·· 57.3
10	157°04.6	300°08.2	16.4	300°27.0	45.2	158°45.9	28.4	329°24.5	57.4
11	172°07.1	315°09.9	16.9	315°27.8	45.8	173°48.7	28.5	344°26.6	57.6
12	187°09.6	330°11.6	S21°17.4	330°28.6	S14°46.4	188°51.4	S02°28.6	359°28.8	S00°57.7
13	202°12.0	345°13.3	17.9	345°29.4	46.9	203°54.2	28.7	14°31.0	57.8
14	217°14.5	0°15.0	18.4	0°30.2	47.5	218°57.0	28.9	29°33.2	57.9
15	232°17.0	15°16.7	·· 18.9	15°31.0	·· 48.1	233°59.7	·· 29.0	44°35.4	·· 58.1
16	247°19.4	30°18.4	19.4	30°31.8	48.6	249°02.5	29.1	59°37.5	58.2
17	262°21.9	45°20.1	19.9	45°32.6	49.2	264°05.3	29.3	74°39.7	58.3
18	277°24.3	60°21.8	S21°20.5	60°33.4	S14°49.8	279°08.0	S02°29.4	89°41.9	S00°58.4
19	292°26.8	75°23.5	21.0	75°34.2	50.3	294°10.8	29.5	104°44.1	58.5
20	307°29.3	90°25.2	21.5	90°35.0	50.9	309°13.6	29.6	119°46.3	58.7
21	322°31.7	105°26.9	·· 22.0	105°35.8	·· 51.5	324°16.3	·· 29.8	134°48.4	·· 58.8
22	337°34.2	120°28.7	22.5	120°36.6	52.1	339°19.1	29.9	149°50.6	58.9
23	352°36.7	135°30.4	23.0	135°37.4	52.6	354°21.8	30.0	164°52.8	59.0
Mer.pass.:23:29		v1.7 d-0.5 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	7°39.1	150°32.1	S21°23.5	150°38.2	S14°53.2	9°24.6	S02°30.2	179°55.0	S00°59.1
1	22°41.6	165°33.8	24.0	165°38.9	53.8	24°27.4	30.3	194°57.2	59.3
2	37°44.1	180°35.6	24.5	180°39.7	54.3	39°30.1	30.4	209°59.4	59.4
3	52°46.5	195°37.3	·· 25.0	195°40.5	·· 54.9	54°32.9	·· 30.5	225°01.5	·· 59.5
4	67°49.0	210°39.1	25.5	210°41.3	55.5	69°35.7	30.7	240°03.7	59.6
5	82°51.5	225°40.8	26.0	225°42.1	56.0	84°38.4	30.8	255°05.9	59.7
6	97°53.9	240°42.5	S21°26.4	240°42.9	S14°56.6	99°41.2	S02°30.9	270°08.1	S00°59.9
7	112°56.4	255°44.3	26.9	255°43.7	57.2	114°44.0	31.1	285°10.3	01°00.0
8	127°58.8	270°46.0	27.4	270°44.5	57.7	129°46.7	31.2	300°12.4	00.1
9	143°01.3	285°47.8	·· 27.9	285°45.3	·· 58.3	144°49.5	·· 31.3	315°14.6	·· 00.2
10	158°03.8	300°49.6	28.4	300°46.1	58.9	159°52.3	31.4	330°16.8	00.3
11	173°06.2	315°51.3	28.9	315°46.9	14°59.4	174°55.0	31.6	345°19.0	00.5
12	188°08.7	330°53.1	S21°29.4	330°47.7	S15°00.0	189°57.8	S02°31.7	0°21.2	S01°00.6
13	203°11.2	345°54.8	29.9	345°48.5	00.6	205°00.5	31.8	15°23.3	00.7
14	218°13.6	0°56.6	30.3	0°49.3	01.1	220°03.3	32.0	30°25.5	00.8
15	233°16.1	15°58.4	·· 30.8	15°50.1	·· 01.7	235°06.1	·· 32.1	45°27.7	·· 01.0
16	248°18.6	31°00.2	31.3	30°50.9	02.3	250°08.8	32.2	60°29.9	01.1
17	263°21.0	46°01.9	31.8	45°51.6	02.8	265°11.6	32.3	75°32.1	01.2
18	278°23.5	61°03.7	S21°32.2	60°52.4	S15°03.4	280°14.4	S02°32.5	90°34.2	S01°01.3
19	293°26.0	76°05.5	32.7	75°53.2	03.9	295°17.1	32.6	105°36.4	01.4
20	308°28.4	91°07.3	33.2	90°54.0	04.5	310°19.9	32.7	120°38.6	01.6
21	323°30.9	106°09.1	·· 33.7	105°54.8	·· 05.1	325°22.7	·· 32.9	135°40.8	·· 01.7
22	338°33.3	121°10.9	34.1	120°55.6	05.6	340°25.4	33.0	150°43.0	01.8
23	353°35.8	136°12.7	34.6	135°56.4	06.2	355°28.2	33.1	165°45.1	01.9
Mer.pass.:23:26		v1.7 d-0.5 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	8°38.3	151°14.5	S21°35.1	150°57.2	S15°06.8	10°30.9	S02°33.2	180°47.3	S01°02.0
1	23°40.7	166°16.3	35.5	165°58.0	07.3	25°33.7	33.4	195°49.5	02.2
2	38°43.2	181°18.1	36.0	180°58.8	07.9	40°36.5	33.5	210°51.7	02.3
3	53°45.7	196°19.9	·· 36.5	195°59.5	·· 08.5	55°39.2	·· 33.6	225°53.9	·· 02.4
4	68°48.1	211°21.7	36.9	211°00.3	09.0	70°42.0	33.7	240°56.0	02.5
5	83°50.6	226°23.5	37.4	226°01.1	09.6	85°44.8	33.9	255°58.2	02.6
6	98°53.1	241°25.4	S21°37.8	241°01.9	S15°10.2	100°47.5	S02°34.0	271°00.4	S01°02.8
7	113°55.5	256°27.2	38.3	256°02.7	10.7	115°50.3	34.1	286°02.6	02.9
8	128°58.0	271°29.0	38.7	271°03.5	11.3	130°53.0	34.3	301°04.8	03.0
9	144°00.5	286°30.8	·· 39.2	286°04.3	·· 11.8	145°55.8	·· 34.4	316°06.9	·· 03.1
10	159°02.9	301°32.7	39.6	301°05.1	12.4	160°58.6	34.5	331°09.1	03.2
11	174°05.4	316°34.5	40.1	316°05.9	13.0	176°01.3	34.6	346°11.3	03.4
12	189°07.8	331°36.4	S21°40.5	331°06.6	S15°13.5	191°04.1	S02°34.8	1°13.5	S01°03.5
13	204°10.3	346°38.2	41.0	346°07.4	14.1	206°06.8	34.9	16°15.7	03.6
14	219°12.8	1°40.0	41.4	1°08.2	14.7	221°09.6	35.0	31°17.8	03.7
15	234°15.2	16°41.9	·· 41.9	16°09.0	·· 15.2	236°12.4	·· 35.1	46°20.0	·· 03.8
16	249°17.7	31°43.7	42.3	31°09.8	15.8	251°15.1	35.3	61°22.2	04.0
17	264°20.2	46°45.6	42.8	46°10.6	16.3	266°17.9	35.4	76°24.4	04.1
18	279°22.6	61°47.5	S21°43.2	61°11.4	S15°16.9	281°20.7	S02°35.5	91°26.6	S01°04.2
19	294°25.1	76°49.3	43.7	76°12.1	17.5	296°23.4	35.7	106°28.7	04.3
20	309°27.6	91°51.2	44.1	91°12.9	18.0	311°26.2	35.8	121°30.9	04.5
21	324°30.0	106°53.1	·· 44.5	106°13.7	·· 18.6	326°28.9	·· 35.9	136°33.1	·· 04.6
22	339°32.5	121°54.9	45.0	121°14.5	19.1	341°31.7	36.0	151°35.3	04.7
23	354°35.0	136°56.8	45.4	136°15.3	19.7	356°34.5	36.2	166°37.5	04.8
Mer.pass.:23:22		v1.8 d-0.5 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°35.9
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.7
Hamal	328°02.7	23°30.9
Polaris	318°24.0	89°18.5
Acamar	315°19.4	-40°15.4
Menkar	314°16.9	4°08.1
Mirfak	308°42.9	49°53.9
Aldebaran	290°51.5	16°31.9
Rigel	281°13.8	-8°11.2
Capella	280°37.2	46°00.4
Bellatrix	278°34.0	6°21.7
Elnath	278°15.0	28°37.0
Alnilam	275°48.3	-1°11.6
Betelgeuse	271°03.4	7°24.6
Canopus	263°57.0	-52°41.8
Sirius	258°35.5	-16°43.7
Adhara	255°14.1	-28°59.0
Procyon	245°01.9	5°11.9
Pollux	243°30.2	27°59.9
Avior	234°19.2	-59°32.4
Suhail	222°54.2	-43°28.4
Miaplacidus	221°40.9	-69°45.5
Alphard	217°58.3	-8°42.2
Regulus	207°45.8	11°54.9
Dubhe	193°54.5	61°41.4
Denebola	182°36.0	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.6
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.1
Spica	158°33.7	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.1	-60°52.9
Kochab	137°20.6	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.9
Antares	112°28.9	-26°27.4
Atria	107°32.7	-69°03.0
Sabik	102°14.9	-15°44.2
Shaula	96°24.7	-37°06.8
Rasalhague	96°08.3	12°33.3
Eltanin	90°47.1	51°29.6
Kaus Aust.	83°46.4	-34°22.8
Vega	80°40.3	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°21.9	-56°42.1
Deneb	49°32.6	45°19.5
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.7
Markab	13°40.0	15°16.1

Sep 28 Tue	**SHA**	**Mer.pass**
Venus	143°11.5	13:59
Mars	143°39.0	13:58
Jupiter	1°38.3	23:22
Saturn	172°22.7	12:02

Sep 29 Wed	**SHA**	**Mer.pass**
Venus	142°53.0	13:56
Mars	142°59.0	13:57
Jupiter	1°45.5	23:18
Saturn	172°15.9	11:59

Sep 30 Thu	**SHA**	**Mer.pass**
Venus	142°36.2	13:53
Mars	142°18.9	13:55
Jupiter	1°52.7	23:14
Saturn	172°09.0	11:55

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°17.3	S01°53.7	313°02.0	9.8'	N22°36.5	5.4'	55.9'
1	197°17.6	54.7	327°30.8	9.7'	22°41.8	5.3'	55.9'
2	212°17.8	55.6	341°59.5	9.7'	22°47.0	5.2'	55.9'
3	227°18.0	·· 56.6	356°28.2	9.6'	22°52.1	5.1'	55.9'
4	242°18.2	57.6	10°56.7	9.5'	22°57.1	4.9'	56.0'
5	257°18.4	58.6	25°25.2	9.5'	23°02.0	4.8'	56.0'
6	272°18.6	S01°59.5	39°53.7	9.4'	N23°06.8	4.7'	56.0'
7	287°18.8	02°00.5	54°22.1	9.3'	23°11.4	4.6'	56.0'
8	302°19.0	01.5	68°50.4	9.3'	23°15.9	4.5'	56.1'
9	317°19.2	·· 02.5	83°18.6	9.2'	23°20.3	4.3'	56.1'
10	332°19.5	03.4	97°46.8	9.1'	23°24.6	4.2'	56.1'
11	347°19.7	04.4	112°14.9	9.1'	23°28.8	4.1'	56.1'
12	2°19.9	S02°05.4	126°43.0	9.0'	N23°32.8	4.0'	56.2'
13	17°20.1	06.3	141°11.0	9.0'	23°36.7	3.9'	56.2'
14	32°20.3	07.3	155°38.9	8.9'	23°40.5	3.7'	56.2'
15	47°20.5	·· 08.3	170°06.7	8.8'	23°44.2	3.6'	56.2'
16	62°20.7	09.3	184°34.5	8.8'	23°47.7	3.5'	56.3'
17	77°20.9	10.2	199°02.3	8.7'	23°51.1	3.3'	56.3'
18	92°21.1	S02°11.2	213°30.0	8.7'	N23°54.4	3.2'	56.3'
19	107°21.3	12.2	227°57.6	8.6'	23°57.6	3.1'	56.3'
20	122°21.6	13.2	242°25.2	8.5'	24°00.6	3.0'	56.4'
21	137°21.8	·· 14.1	256°52.7	8.5'	24°03.5	2.8'	56.4'
22	152°22.0	15.1	271°20.1	8.4'	24°06.3	2.7'	56.4'
23	167°22.2	16.1	285°47.5	8.4'	24°08.9	2.6'	56.4'
	SD.=16.0	d=-1.0	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°22.4	S02°17.0	300°14.9	8.3'	N24°11.4	2.4'	56.5'
1	197°22.6	18.0	314°42.2	8.3'	24°13.8	2.3'	56.5'
2	212°22.8	19.0	329°09.4	8.2'	24°16.0	2.2'	56.5'
3	227°23.0	·· 20.0	343°36.6	8.2'	24°18.1	2.0'	56.5'
4	242°23.2	20.9	358°03.8	8.1'	24°20.1	1.9'	56.6'
5	257°23.4	21.9	12°30.9	8.1'	24°21.9	1.8'	56.6'
6	272°23.6	S02°22.9	26°57.9	8.0'	N24°23.6	1.6'	56.6'
7	287°23.8	23.8	41°24.9	8.0'	24°25.2	1.5'	56.7'
8	302°24.1	24.8	55°51.8	7.9'	24°26.6	1.4'	56.7'
9	317°24.3	·· 25.8	70°18.7	7.9'	24°27.9	1.2'	56.7'
10	332°24.5	26.8	84°45.6	7.8'	24°29.1	1.1'	56.7'
11	347°24.7	27.7	99°12.4	7.8'	24°30.1	0.9'	56.8'
12	2°24.9	S02°28.7	113°39.2	7.8'	N24°31.0	0.8'	56.8'
13	17°25.1	29.7	128°05.9	7.7'	24°31.7	0.7'	56.8'
14	32°25.3	30.6	142°32.6	7.7'	24°32.3	0.5'	56.9'
15	47°25.5	·· 31.6	156°59.2	7.6'	24°32.8	0.4'	56.9'
16	62°25.7	32.6	171°25.9	7.6'	24°33.1	0.2'	56.9'
17	77°25.9	33.6	185°52.4	7.6'	24°33.2	0.1'	56.9'
18	92°26.1	S02°34.5	200°19.0	7.5'	N24°33.3	-0.0'	57.0'
19	107°26.3	35.5	214°45.5	7.5'	24°33.2	-0.2'	57.0'
20	122°26.5	36.5	229°12.0	7.5'	24°32.9	-0.3'	57.0'
21	137°26.7	·· 37.4	243°38.4	7.4'	24°32.5	-0.5'	57.1'
22	152°27.0	38.4	258°04.8	7.4'	24°32.0	-0.6'	57.1'
23	167°27.2	39.4	272°31.2	7.4'	24°31.3	-0.8'	57.1'
	SD.=16.0	d=-1.0	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°27.4	S02°40.4	286°57.5	7.3'	N24°30.5	-0.9'	57.1'
1	197°27.6	41.3	301°23.8	7.3'	24°29.5	-1.0'	57.2'
2	212°27.8	42.3	315°50.1	7.3'	24°28.4	-1.2'	57.2'
3	227°28.0	·· 43.3	330°16.4	7.3'	24°27.1	-1.3'	57.2'
4	242°28.2	44.2	344°42.7	7.2'	24°25.7	-1.5'	57.3'
5	257°28.4	45.2	359°08.9	7.2'	24°24.2	-1.6'	57.3'
6	272°28.6	S02°46.2	13°35.1	7.2'	N24°22.5	-1.8'	57.3'
7	287°28.8	47.2	28°01.3	7.2'	24°20.6	-1.9'	57.4'
8	302°29.0	48.1	42°27.4	7.2'	24°18.6	-2.1'	57.4'
9	317°29.2	·· 49.1	56°53.6	7.1'	24°16.5	-2.2'	57.4'
10	332°29.4	50.1	71°19.7	7.1'	24°14.2	-2.4'	57.4'
11	347°29.6	51.0	85°45.8	7.1'	24°11.8	-2.5'	57.5'
12	2°29.8	S02°52.0	100°11.9	7.1'	N24°09.2	-2.6'	57.5'
13	17°30.0	53.0	114°38.0	7.1'	24°06.5	-2.8'	57.5'
14	32°30.2	54.0	129°04.0	7.1'	24°03.6	-2.9'	57.6'
15	47°30.4	·· 54.9	143°30.1	7.1'	24°00.6	-3.1'	57.6'
16	62°30.6	55.9	157°56.2	7.0'	23°57.5	-3.2'	57.6'
17	77°30.9	56.9	172°22.2	7.0'	23°54.2	-3.4'	57.7'
18	92°31.1	S02°57.8	186°48.2	7.0'	N23°50.7	-3.5'	57.7'
19	107°31.3	58.8	201°14.3	7.0'	23°47.1	-3.7'	57.7'
20	122°31.5	02°59.8	215°40.3	7.0'	23°43.4	-3.8'	57.8'
21	137°31.7	03°00.7	230°06.3	7.0'	23°39.5	-4.0'	57.8'
22	152°31.9	01.7	244°32.3	7.0'	23°35.4	-4.1'	57.8'
23	167°32.1	02.7	258°58.3	7.0'	23°31.2	-4.3'	57.9'
	SD.=16.0	d=-1.0	S.D.=15.7				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 20-22 77-57%
28	09:09	09:19	11:51	03:15	15:41	
29	09:30	09:40	11:50	04:08	16:36	
30	09:49	09:59	11:50	05:04	17:32	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°37.4	151°58.7	S21°45.8	151°16.1	S15°20.3	11°37.2	S02°36.3	181°39.6	S01°04.9
1	24°39.9	167°00.6	46.3	166°16.8	20.8	26°40.0	36.4	196°41.8	05.1
2	39°42.3	182°02.5	46.7	181°17.6	21.4	41°42.7	36.5	211°44.0	05.2
3	54°44.8	197°04.3	·· 47.1	196°18.4	·· 21.9	56°45.5	·· 36.7	226°46.2	·· 05.3
4	69°47.3	212°06.2	47.5	211°19.2	22.5	71°48.3	36.8	241°48.4	05.4
5	84°49.7	227°08.1	48.0	226°20.0	23.1	86°51.0	36.9	256°50.6	05.5
6	99°52.2	242°10.0	S21°48.4	241°20.8	S15°23.6	101°53.8	S02°37.0	271°52.7	S01°05.7
7	114°54.7	257°11.9	48.8	256°21.5	24.2	116°56.5	37.2	286°54.9	05.8
8	129°57.1	272°13.8	49.2	271°22.3	24.7	131°59.3	37.3	301°57.1	05.9
9	144°59.6	287°15.7	·· 49.6	286°23.1	·· 25.3	147°02.1	·· 37.4	316°59.3	·· 06.0
10	160°02.1	302°17.7	50.1	301°23.9	25.9	162°04.8	37.5	332°01.5	06.1
11	175°04.5	317°19.6	50.5	316°24.7	26.4	177°07.6	37.7	347°03.6	06.3
12	190°07.0	332°21.5	S21°50.9	331°25.4	S15°27.0	192°10.3	S02°37.8	2°05.8	S01°06.4
13	205°09.4	347°23.4	51.3	346°26.2	27.5	207°13.1	37.9	17°08.0	06.5
14	220°11.9	2°25.3	51.7	1°27.0	28.1	222°15.9	38.1	32°10.2	06.6
15	235°14.4	17°27.3	·· 52.1	16°27.8	·· 28.6	237°18.6	·· 38.2	47°12.4	·· 06.7
16	250°16.8	32°29.2	52.5	31°28.6	29.2	252°21.4	38.3	62°14.5	06.9
17	265°19.3	47°31.1	52.9	46°29.3	29.8	267°24.1	38.4	77°16.7	07.0
18	280°21.8	62°33.1	S21°53.3	61°30.1	S15°30.3	282°26.9	S02°38.6	92°18.9	S01°07.1
19	295°24.2	77°35.0	53.7	76°30.9	30.9	297°29.7	38.7	107°21.1	07.2
20	310°26.7	92°36.9	54.1	91°31.7	31.4	312°32.4	38.8	122°23.3	07.3
21	325°29.2	107°38.9	·· 54.5	106°32.4	·· 32.0	327°35.2	·· 38.9	137°25.4	·· 07.5
22	340°31.6	122°40.8	54.9	121°33.2	32.5	342°37.9	39.1	152°27.6	07.6
23	355°34.1	137°42.8	55.3	136°34.0	33.1	357°40.7	39.2	167°29.8	07.7
Mer.pass.:23:18		v1.9 d-0.4 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°36.6	152°44.8	S21°55.7	151°34.8	S15°33.7	12°43.5	S02°39.3	182°32.0	S01°07.8
1	25°39.0	167°46.7	56.1	166°35.6	34.2	27°46.2	39.4	197°34.2	07.9
2	40°41.5	182°48.7	56.5	181°36.3	34.8	42°49.0	39.6	212°36.3	08.1
3	55°43.9	197°50.7	·· 56.9	196°37.1	·· 35.3	57°51.7	·· 39.7	227°38.5	·· 08.2
4	70°46.4	212°52.6	57.3	211°37.9	35.9	72°54.5	39.8	242°40.7	08.3
5	85°48.9	227°54.6	57.7	226°38.7	36.4	87°57.3	39.9	257°42.9	08.4
6	100°51.3	242°56.6	S21°58.1	241°39.4	S15°37.0	103°00.0	S02°40.1	272°45.1	S01°08.5
7	115°53.8	257°58.6	58.5	256°40.2	37.5	118°02.8	40.2	287°47.2	08.7
8	130°56.3	273°00.5	58.8	271°41.0	38.1	133°05.5	40.3	302°49.4	08.8
9	145°58.7	288°02.5	·· 59.2	286°41.8	·· 38.6	148°08.3	·· 40.4	317°51.6	·· 08.9
10	161°01.2	303°04.5	21°59.6	301°42.5	39.2	163°11.0	40.6	332°53.8	09.0
11	176°03.7	318°06.5	22°00.0	316°43.3	39.8	178°13.8	40.7	347°56.0	09.2
12	191°06.1	333°08.5	S22°00.4	331°44.1	S15°40.3	193°16.6	S02°40.8	2°58.1	S01°09.3
13	206°08.6	348°10.5	00.7	346°44.9	40.9	208°19.3	40.9	18°00.3	09.4
14	221°11.1	3°12.5	01.1	1°45.6	41.4	223°22.1	41.1	33°02.5	09.5
15	236°13.5	18°14.5	·· 01.5	16°46.4	·· 42.0	238°24.8	·· 41.2	48°04.7	·· 09.6
16	251°16.0	33°16.5	01.9	31°47.2	42.5	253°27.6	41.3	63°06.9	09.8
17	266°18.4	48°18.6	02.2	46°47.9	43.1	268°30.3	41.4	78°09.0	09.9
18	281°20.9	63°20.6	S22°02.6	61°48.7	S15°43.6	283°33.1	S02°41.6	93°11.2	S01°10.0
19	296°23.4	78°22.6	03.0	76°49.5	44.2	298°35.9	41.7	108°13.4	10.1
20	311°25.8	93°24.6	03.3	91°50.3	44.7	313°38.6	41.8	123°15.6	10.2
21	326°28.3	108°26.7	·· 03.7	106°51.0	·· 45.3	328°41.4	·· 41.9	138°17.8	·· 10.4
22	341°30.8	123°28.7	04.0	121°51.8	45.8	343°44.1	42.0	153°19.9	10.5
23	356°33.2	138°30.7	04.4	136°52.6	46.4	358°46.9	42.2	168°22.1	10.6
Mer.pass.:23:14		v2.0 d-0.4 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	11°35.7	153°32.8	S22°04.8	151°53.3	S15°46.9	13°49.6	S02°42.3	183°24.3	S01°10.7
1	26°38.2	168°34.8	05.1	166°54.1	47.5	28°52.4	42.4	198°26.5	10.8
2	41°40.6	183°36.9	05.5	181°54.9	48.0	43°55.2	42.5	213°28.7	11.0
3	56°43.1	198°38.9	·· 05.8	196°55.6	·· 48.6	58°57.9	·· 42.7	228°30.8	·· 11.1
4	71°45.5	213°41.0	06.2	211°56.4	49.1	74°00.7	42.8	243°33.0	11.2
5	86°48.0	228°43.0	06.5	226°57.2	49.7	89°03.4	42.9	258°35.2	11.3
6	101°50.5	243°45.1	S22°06.9	241°58.0	S15°50.2	104°06.2	S02°43.0	273°37.4	S01°11.4
7	116°52.9	258°47.1	07.2	256°58.7	50.8	119°08.9	43.2	288°39.6	11.6
8	131°55.4	273°49.2	07.6	271°59.5	51.3	134°11.7	43.3	303°41.7	11.7
9	146°57.9	288°51.3	·· 07.9	287°00.3	·· 51.9	149°14.4	·· 43.4	318°43.9	·· 11.8
10	162°00.3	303°53.4	08.3	302°01.0	52.4	164°17.2	43.5	333°46.1	11.9
11	177°02.8	318°55.4	08.6	317°01.8	53.0	179°20.0	43.7	348°48.3	12.0
12	192°05.3	333°57.5	S22°08.9	332°02.6	S15°53.5	194°22.7	S02°43.8	3°50.5	S01°12.2
13	207°07.7	348°59.6	09.3	347°03.3	54.1	209°25.5	43.9	18°52.6	12.3
14	222°10.2	4°01.7	09.6	2°04.1	54.6	224°28.2	44.0	33°54.8	12.4
15	237°12.7	19°03.8	·· 09.9	17°04.9	·· 55.2	239°31.0	·· 44.1	48°57.0	·· 12.5
16	252°15.1	34°05.9	10.3	32°05.6	55.7	254°33.7	44.3	63°59.2	12.6
17	267°17.6	49°08.0	10.6	47°06.4	56.3	269°36.5	44.4	79°01.4	12.8
18	282°20.0	64°10.1	S22°10.9	62°07.2	S15°56.8	284°39.2	S02°44.5	94°03.5	S01°12.9
19	297°22.5	79°12.2	11.3	77°07.9	57.4	299°42.0	44.6	109°05.7	13.0
20	312°25.0	94°14.3	11.6	92°08.7	57.9	314°44.7	44.8	124°07.9	13.1
21	327°27.4	109°16.4	·· 11.9	107°09.5	·· 58.5	329°47.5	·· 44.9	139°10.1	·· 13.2
22	342°29.9	124°18.5	12.2	122°10.2	59.0	344°50.3	45.0	154°12.3	13.4
23	357°32.4	139°20.6	12.5	137°11.0	59.6	359°53.0	45.1	169°14.4	13.5
Mer.pass.:23:10		v2.0 d-0.4 m-4.5		v0.8 d-0.6 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	Dec
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.7
Hamal	328°02.7	23°31.0
Polaris	318°23.0	89°18.6
Acamar	315°19.4	-40°15.4
Menkar	314°16.8	4°08.1
Mirfak	308°42.9	49°53.9
Aldebaran	290°51.5	16°31.9
Rigel	281°13.8	-8°11.2
Capella	280°37.2	46°00.4
Bellatrix	278°34.0	6°21.7
Elnath	278°15.0	28°37.0
Alnilam	275°48.3	-1°11.6
Betelgeuse	271°03.4	7°24.6
Canopus	263°57.0	-52°41.8
Sirius	258°35.4	-16°43.7
Adhara	255°14.1	-28°59.0
Procyon	245°01.8	5°11.9
Pollux	243°30.2	27°59.9
Avior	234°19.2	-59°32.4
Suhail	222°54.2	-43°28.4
Miaplacidus	221°40.8	-69°45.5
Alphard	217°58.2	-8°42.2
Regulus	207°45.8	11°54.9
Dubhe	193°54.5	61°41.4
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.1
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.1	-60°52.9
Kochab	137°20.6	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.9
Antares	112°28.9	-26°27.4
Atria	107°32.7	-69°03.0
Sabik	102°14.9	-15°44.2
Shaula	96°24.7	-37°06.8
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.1	51°29.6
Kaus Aust.	83°46.4	-34°22.8
Vega	80°40.3	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.0	-56°42.1
Deneb	49°32.6	45°19.5
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 01 Fri	SHA	Mer.pass
Venus	142°21.3	13:50
Mars	141°38.6	13:54
Jupiter	1°59.8	23:09
Saturn	172°02.2	11:52

Oct 02 Sat	SHA	Mer.pass
Venus	142°08.2	13:47
Mars	140°58.2	13:53
Jupiter	2°06.9	23:05
Saturn	171°55.4	11:48

Oct 03 Sun	SHA	Mer.pass
Venus	141°57.1	13:44
Mars	140°17.6	13:52
Jupiter	2°13.9	23:00
Saturn	171°48.6	11:45

Horizontal parallax	
Venus:	0.4
Mars:	0.1

DUT1 = UT1-UTC = -0.0601 sec ΔT = TT-UT1 = +66.2441 sec

2010 October 01 to Oct. 03 UT

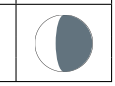
h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°32.3	S03°03.7	273°24.3	7.0'	N23°26.9	-4.4'	57.9'
1	197°32.5	04.6	287°50.3	7.0'	23°22.4	-4.6'	57.9'
2	212°32.7	05.6	302°16.4	7.0'	23°17.8	-4.7'	58.0'
3	227°32.9	·· 06.6	316°42.4	7.0'	23°13.0	-4.8'	58.0'
4	242°33.1	07.5	331°08.4	7.0'	23°08.1	-5.0'	58.0'
5	257°33.3	08.5	345°34.4	7.0'	23°03.1	-5.1'	58.0'
6	272°33.5	S03°09.5	0°00.5	7.0'	N22°57.9	-5.3'	58.1'
7	287°33.7	10.4	14°26.5	7.0'	22°52.5	-5.4'	58.1'
8	302°33.9	11.4	28°52.5	7.0'	22°47.0	-5.6'	58.1'
9	317°34.1	·· 12.4	43°18.6	7.1'	22°41.4	-5.7'	58.2'
10	332°34.3	13.4	57°44.7	7.1'	22°35.6	-5.9'	58.2'
11	347°34.5	14.3	72°10.7	7.1'	22°29.7	-6.0'	58.2'
12	2°34.7	S03°15.3	86°36.8	7.1'	N22°23.6	-6.1'	58.3'
13	17°34.9	16.3	101°02.9	7.1'	22°17.4	-6.3'	58.3'
14	32°35.1	17.2	115°29.0	7.1'	22°11.0	-6.4'	58.3'
15	47°35.3	·· 18.2	129°55.2	7.1'	22°04.5	-6.6'	58.4'
16	62°35.5	19.2	144°21.3	7.1'	21°57.9	-6.7'	58.4'
17	77°35.7	20.1	158°47.5	7.2'	21°51.1	-6.8'	58.4'
18	92°35.9	S03°21.1	173°13.6	7.2'	N21°44.2	-7.0'	58.5'
19	107°36.1	22.1	187°39.8	7.2'	21°37.2	-7.1'	58.5'
20	122°36.3	23.1	202°06.0	7.2'	21°30.0	-7.3'	58.5'
21	137°36.5	·· 24.0	216°32.3	7.2'	21°22.6	-7.4'	58.6'
22	152°36.7	25.0	230°58.5	7.3'	21°15.2	-7.5'	58.6'
23	167°36.9	26.0	245°24.8	7.3'	21°07.6	-7.7'	58.6'
	SD.=16.0	d=-1.0	S.D.=15.9				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°37.1	S03°26.9	259°51.1	7.3'	N20°59.8	-7.8'	58.7'
1	197°37.3	27.9	274°17.4	7.3'	20°51.9	-7.9'	58.7'
2	212°37.5	28.9	288°43.7	7.3'	20°43.9	-8.1'	58.7'
3	227°37.7	·· 29.8	303°10.1	7.4'	20°35.8	-8.2'	58.8'
4	242°37.9	30.8	317°36.5	7.4'	20°27.5	-8.4'	58.8'
5	257°38.1	31.8	332°02.9	7.4'	20°19.1	-8.5'	58.8'
6	272°38.3	S03°32.7	346°29.3	7.4'	N20°10.5	-8.6'	58.9'
7	287°38.5	33.7	0°55.8	7.5'	20°01.8	-8.7'	58.9'
8	302°38.7	34.7	15°22.2	7.5'	19°53.0	-8.9'	58.9'
9	317°38.9	·· 35.6	29°48.7	7.5'	19°44.1	-9.0'	59.0'
10	332°39.1	36.6	44°15.3	7.6'	19°35.0	-9.1'	59.0'
11	347°39.3	37.6	58°41.8	7.6'	19°25.8	-9.3'	59.0'
12	2°39.5	S03°38.5	73°08.4	7.6'	N19°16.5	-9.4'	59.1'
13	17°39.7	39.5	87°35.1	7.6'	19°07.0	-9.5'	59.1'
14	32°39.9	40.5	102°01.7	7.7'	18°57.4	-9.6'	59.1'
15	47°40.1	·· 41.4	116°28.4	7.7'	18°47.7	-9.8'	59.1'
16	62°40.3	42.4	130°55.1	7.7'	18°37.9	-9.9'	59.2'
17	77°40.5	43.4	145°21.8	7.8'	18°27.9	-10.0'	59.2'
18	92°40.7	S03°44.4	159°48.6	7.8'	N18°17.9	-10.1'	59.2'
19	107°40.9	45.3	174°15.4	7.8'	18°07.7	-10.3'	59.3'
20	122°41.1	46.3	188°42.2	7.8'	17°57.3	-10.4'	59.3'
21	137°41.3	·· 47.3	203°09.1	7.9'	17°46.9	-10.5'	59.3'
22	152°41.5	48.2	217°36.0	7.9'	17°36.3	-10.6'	59.4'
23	167°41.7	49.2	232°02.9	7.9'	17°25.7	-10.7'	59.4'
	SD.=16.0	d=-1.0	S.D.=16.1				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°41.9	S03°50.2	246°29.8	8.0'	N17°14.9	-10.9'	59.4'
1	197°42.1	51.1	260°56.8	8.0'	17°04.0	-11.0'	59.5'
2	212°42.3	52.1	275°23.8	8.0'	16°52.9	-11.1'	59.5'
3	227°42.5	·· 53.1	289°50.8	8.1'	16°41.8	-11.2'	59.5'
4	242°42.7	54.0	304°17.9	8.1'	16°30.6	-11.3'	59.6'
5	257°42.8	55.0	318°45.0	8.1'	16°19.2	-11.4'	59.6'
6	272°43.0	S03°56.0	333°12.2	8.1'	N16°07.7	-11.5'	59.6'
7	287°43.2	56.9	347°39.3	8.2'	15°56.2	-11.6'	59.6'
8	302°43.4	57.9	2°06.5	8.2'	15°44.5	-11.7'	59.7'
9	317°43.6	·· 58.9	16°33.7	8.2'	15°32.7	-11.8'	59.7'
10	332°43.8	03°59.8	31°01.0	8.3'	15°20.8	-11.9'	59.7'
11	347°44.0	04°00.8	45°28.3	8.3'	15°08.8	-12.1'	59.8'
12	2°44.2	S04°01.8	59°55.6	8.3'	N14°56.7	-12.2'	59.8'
13	17°44.4	02.7	74°22.9	8.4'	14°44.5	-12.3'	59.8'
14	32°44.6	03.7	88°50.3	8.4'	14°32.2	-12.4'	59.8'
15	47°44.8	·· 04.7	103°17.7	8.4'	14°19.8	-12.5'	59.9'
16	62°45.0	05.6	117°45.2	8.5'	14°07.3	-12.6'	59.9'
17	77°45.2	06.6	132°12.6	8.5'	13°54.7	-12.6'	59.9'
18	92°45.4	S04°07.5	146°40.1	8.5'	N13°42.0	-12.7'	60.0'
19	107°45.6	08.5	161°07.7	8.5'	13°29.2	-12.8'	60.0'
20	122°45.8	09.5	175°35.2	8.6'	13°16.3	-12.9'	60.0'
21	137°46.0	·· 10.4	190°02.8	8.6'	13°03.3	-13.0'	60.0'
22	152°46.2	11.4	204°30.4	8.6'	12°50.3	-13.1'	60.1'
23	167°46.3	12.4	218°58.0	8.7'	12°37.1	-13.2'	60.1'
	SD.=16.0	d=-1.0	S.D.=16.3				

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

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

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 23-25 46-25%
01	10:09	10:19	11:50	06:00	18:28	
02	10:28	10:38	11:49	06:56	19:24	
03	10:47	10:57	11:49	07:51	20:18	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	12°34.8	154°22.8	S22°12.9	152°11.7	S16°00.1	14°55.8	S02°45.2	184°16.6	S01°13.6
1	27°37.3	169°24.9	13.2	167°12.5	00.7	29°58.5	45.4	199°18.8	13.7
2	42°39.8	184°27.0	13.5	182°13.3	01.2	45°01.3	45.5	214°21.0	13.8
3	57°42.2	199°29.2	·· 13.8	197°14.0	·· 01.8	60°04.0	·· 45.6	229°23.2	·· 14.0
4	72°44.7	214°31.3	14.1	212°14.8	02.3	75°06.8	45.7	244°25.3	14.1
5	87°47.2	229°33.4	14.4	227°15.6	02.9	90°09.5	45.9	259°27.5	14.2
6	102°49.6	244°35.6	S22°14.7	242°16.3	S16°03.4	105°12.3	S02°46.0	274°29.7	S01°14.3
7	117°52.1	259°37.7	15.1	257°17.1	03.9	120°15.0	46.1	289°31.9	14.4
8	132°54.5	274°39.9	15.4	272°17.8	04.5	135°17.8	46.2	304°34.1	14.6
9	147°57.0	289°42.1	·· 15.7	287°18.6	·· 05.0	150°20.5	·· 46.3	319°36.2	·· 14.7
10	162°59.5	304°44.2	16.0	302°19.4	05.6	165°23.3	46.5	334°38.4	14.8
11	178°01.9	319°46.4	16.3	317°20.1	06.1	180°26.0	46.6	349°40.6	14.9
12	193°04.4	334°48.5	S22°16.6	332°20.9	S16°06.7	195°28.8	S02°46.7	4°42.8	S01°15.0
13	208°06.9	349°50.7	16.9	347°21.6	07.2	210°31.5	46.8	19°45.0	15.2
14	223°09.3	4°52.9	17.2	2°22.4	07.8	225°34.3	47.0	34°47.1	15.3
15	238°11.8	19°55.1	·· 17.4	17°23.2	·· 08.3	240°37.1	·· 47.1	49°49.3	·· 15.4
16	253°14.3	34°57.2	17.7	32°23.9	08.9	255°39.8	47.2	64°51.5	15.5
17	268°16.7	49°59.4	18.0	47°24.7	09.4	270°42.6	47.3	79°53.7	15.6
18	283°19.2	65°01.6	S22°18.3	62°25.4	S16°09.9	285°45.3	S02°47.4	94°55.9	S01°15.8
19	298°21.6	80°03.8	18.6	77°26.2	10.5	300°48.1	47.6	109°58.0	15.9
20	313°24.1	95°06.0	18.9	92°27.0	11.0	315°50.8	47.7	125°00.2	16.0
21	328°26.6	110°08.2	·· 19.2	107°27.7	·· 11.6	330°53.6	·· 47.8	140°02.4	·· 16.1
22	343°29.0	125°10.4	19.5	122°28.5	12.1	345°56.3	47.9	155°04.6	16.2
23	358°31.5	140°12.6	19.7	137°29.2	12.7	0°59.1	48.0	170°06.8	16.4
Mer.pass.:23:06		v2.1 d-0.3 m-4.4		v0.8 d-0.5 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	13°34.0	155°14.8	S22°20.0	152°30.0	S16°13.2	16°01.8	S02°48.2	185°08.9	S01°16.5
1	28°36.4	170°17.0	20.3	167°30.7	13.7	31°04.6	48.3	200°11.1	16.6
2	43°38.9	185°19.3	20.6	182°31.5	14.3	46°07.3	48.4	215°13.3	16.7
3	58°41.4	200°21.5	·· 20.8	197°32.3	·· 14.8	61°10.1	·· 48.5	230°15.5	·· 16.8
4	73°43.8	215°23.7	21.1	212°33.0	15.4	76°12.8	48.7	245°17.7	17.0
5	88°46.3	230°25.9	21.4	227°33.8	15.9	91°15.6	48.8	260°19.8	17.1
6	103°48.8	245°28.2	S22°21.6	242°34.5	S16°16.4	106°18.3	S02°48.9	275°22.0	S01°17.2
7	118°51.2	260°30.4	21.9	257°35.3	17.0	121°21.1	49.0	290°24.2	17.3
8	133°53.7	275°32.6	22.2	272°36.0	17.5	136°23.8	49.1	305°26.4	17.4
9	148°56.1	290°34.9	·· 22.4	287°36.8	·· 18.1	151°26.6	·· 49.3	320°28.6	·· 17.6
10	163°58.6	305°37.1	22.7	302°37.5	18.6	166°29.3	49.4	335°30.8	17.7
11	179°01.1	320°39.4	23.0	317°38.3	19.2	181°32.1	49.5	350°32.9	17.8
12	194°03.5	335°41.6	S22°23.2	332°39.0	S16°19.7	196°34.8	S02°49.6	5°35.1	S01°17.9
13	209°06.0	350°43.9	23.5	347°39.8	20.2	211°37.6	49.7	20°37.3	18.0
14	224°08.5	5°46.2	23.7	2°40.6	20.8	226°40.3	49.9	35°39.5	18.2
15	239°10.9	20°48.4	·· 24.0	17°41.3	·· 21.3	241°43.1	·· 50.0	50°41.7	·· 18.3
16	254°13.4	35°50.7	24.2	32°42.1	21.9	256°45.8	50.1	65°43.8	18.4
17	269°15.9	50°53.0	24.5	47°42.8	22.4	271°48.6	50.2	80°46.0	18.5
18	284°18.3	65°55.2	S22°24.7	62°43.6	S16°22.9	286°51.3	S02°50.3	95°48.2	S01°18.6
19	299°20.8	80°57.5	25.0	77°44.3	23.5	301°54.1	50.5	110°50.4	18.8
20	314°23.2	95°59.8	25.2	92°45.1	24.0	316°56.8	50.6	125°52.6	18.9
21	329°25.7	111°02.1	·· 25.4	107°45.8	·· 24.5	331°59.6	·· 50.7	140°54.7	·· 19.0
22	344°28.2	126°04.4	25.7	122°46.6	25.1	347°02.3	50.8	155°56.9	19.1
23	359°30.6	141°06.7	25.9	137°47.3	25.6	2°05.1	50.9	170°59.1	19.2
Mer.pass.:23:02		v2.2 d-0.3 m-4.4		v0.8 d-0.5 m1.5		v2.8 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	14°33.1	156°09.0	S22°26.1	152°48.1	S16°26.2	17°07.8	S02°51.0	186°01.3	S01°19.4
1	29°35.6	171°11.3	26.4	167°48.8	26.7	32°10.5	51.2	201°03.5	19.5
2	44°38.0	186°13.6	26.6	182°49.6	27.2	47°13.3	51.3	216°05.6	19.6
3	59°40.5	201°15.9	·· 26.8	197°50.3	·· 27.8	62°16.0	·· 51.4	231°07.8	·· 19.7
4	74°43.0	216°18.2	27.1	212°51.1	28.3	77°18.8	51.5	246°10.0	19.8
5	89°45.4	231°20.5	27.3	227°51.8	28.8	92°21.5	51.6	261°12.2	20.0
6	104°47.9	246°22.8	S22°27.5	242°52.6	S16°29.4	107°24.3	S02°51.8	276°14.4	S01°20.1
7	119°50.4	261°25.2	27.7	257°53.3	29.9	122°27.0	51.9	291°16.5	20.2
8	134°52.8	276°27.5	28.0	272°54.1	30.5	137°29.8	52.0	306°18.7	20.3
9	149°55.3	291°29.8	·· 28.2	287°54.8	·· 31.0	152°32.5	·· 52.1	321°20.9	·· 20.4
10	164°57.7	306°32.2	28.4	302°55.6	31.5	167°35.3	52.2	336°23.1	20.6
11	180°00.2	321°34.5	28.6	317°56.3	32.1	182°38.0	52.4	351°25.3	20.7
12	195°02.7	336°36.9	S22°28.8	332°57.1	S16°32.6	197°40.8	S02°52.5	6°27.4	S01°20.8
13	210°05.1	351°39.2	29.0	347°57.8	33.1	212°43.5	52.6	21°29.6	20.9
14	225°07.6	6°41.6	29.3	2°58.5	33.7	227°46.3	52.7	36°31.8	21.0
15	240°10.1	21°43.9	·· 29.5	17°59.3	·· 34.2	242°49.0	·· 52.8	51°34.0	·· 21.1
16	255°12.5	36°46.3	29.7	33°00.0	34.7	257°51.7	52.9	66°36.2	21.3
17	270°15.0	51°48.6	29.9	48°00.8	35.3	272°54.5	53.1	81°38.3	21.4
18	285°17.5	66°51.0	S22°30.1	63°01.5	S16°35.8	287°57.2	S02°53.2	96°40.5	S01°21.5
19	300°19.9	81°53.4	30.3	78°02.3	36.3	303°00.0	53.3	111°42.7	21.6
20	315°22.4	96°55.7	30.5	93°03.0	36.9	318°02.7	53.4	126°44.9	21.7
21	330°24.9	111°58.1	·· 30.7	108°03.8	·· 37.4	333°05.5	·· 53.5	141°47.1	·· 21.9
22	345°27.3	127°00.5	30.9	123°04.5	37.9	348°08.2	53.7	156°49.2	22.0
23	0°29.8	142°02.9	31.1	138°05.2	38.5	3°11.0	53.8	171°51.4	22.1
Mer.pass.:22:58		v2.3 d-0.2 m-4.4		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.2
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.7
Hamal	328°02.7	23°31.0
Polaris	318°22.2	89°18.6
Acamar	315°19.4	-40°15.4
Menkar	314°16.8	4°08.1
Mirfak	308°42.8	49°54.0
Aldebaran	290°51.4	16°31.9
Rigel	281°13.8	-8°11.2
Capella	280°37.2	46°00.4
Bellatrix	278°34.0	6°21.7
Elnath	278°15.0	28°37.0
Alnilam	275°48.2	-1°11.6
Betelgeuse	271°03.3	7°24.6
Canopus	263°57.0	-52°41.8
Sirius	258°35.4	-16°43.7
Adhara	255°14.1	-28°59.0
Procyon	245°01.8	5°11.9
Pollux	243°30.2	27°59.9
Avior	234°19.1	-59°32.4
Suhail	222°54.2	-43°28.4
Miaplacidus	221°40.8	-69°45.5
Alphard	217°58.2	-8°42.2
Regulus	207°45.8	11°54.9
Dubhe	193°54.5	61°41.4
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.1
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.1	-60°52.9
Kochab	137°20.7	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.9
Antares	112°28.9	-26°27.4
Atria	107°32.8	-69°03.0
Sabik	102°14.9	-15°44.2
Shaula	96°24.7	-37°06.8
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.2	51°29.6
Kaus Aust.	83°46.4	-34°22.8
Vega	80°40.3	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.0	-56°42.1
Deneb	49°32.7	45°19.5
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 04 Mon	**SHA**	**Mer.pass**
Venus	141°47.9	13:41
Mars	139°36.9	13:51
Jupiter	2°20.9	22:56
Saturn	171°41.8	11:41

Oct 05 Tue	**SHA**	**Mer.pass**
Venus	141°40.9	13:37
Mars	138°56.0	13:49
Jupiter	2°27.8	22:52
Saturn	171°35.0	11:38

Oct 06 Wed	**SHA**	**Mer.pass**
Venus	141°35.9	13:33
Mars	138°15.0	13:48
Jupiter	2°34.7	22:47
Saturn	171°28.2	11:34

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°46.5	S04°13.3	233°25.7	8.7'	N12°23.9	-13.3'	60.1'
1	197°46.7	14.3	247°53.4	8.7'	12°10.5	-13.4'	60.1'
2	212°46.9	15.3	262°21.1	8.7'	11°57.1	-13.5'	60.2'
3	227°47.1	· · 16.2	276°48.9	8.8'	11°43.6	-13.5'	60.2'
4	242°47.3	17.2	291°16.6	8.8'	11°30.1	-13.6'	60.2'
5	257°47.5	18.2	305°44.4	8.8'	11°16.4	-13.7'	60.2'
6	272°47.7	S04°19.1	320°12.2	8.8'	N11°02.7	-13.8'	60.3'
7	287°47.9	20.1	334°40.1	8.9'	10°48.9	-13.8'	60.3'
8	302°48.1	21.1	349°07.9	8.9'	10°35.0	-13.9'	60.3'
9	317°48.3	· · 22.0	3°35.8	8.9'	10°21.0	-14.0'	60.3'
10	332°48.5	23.0	18°03.7	8.9'	10°07.0	-14.1'	60.4'
11	347°48.7	24.0	32°31.7	8.9'	09°52.9	-14.1'	60.4'
12	2°48.8	S04°24.9	46°59.6	9.0'	N09°38.7	-14.2'	60.4'
13	17°49.0	25.9	61°27.6	9.0'	09°24.5	-14.3'	60.4'
14	32°49.2	26.8	75°55.6	9.0'	09°10.1	-14.3'	60.4'
15	47°49.4	· · 27.8	90°23.6	9.0'	08°55.8	-14.4'	60.5'
16	62°49.6	28.8	104°51.6	9.0'	08°41.3	-14.5'	60.5'
17	77°49.8	29.7	119°19.7	9.1'	08°26.8	-14.5'	60.5'
18	92°50.0	S04°30.7	133°47.7	9.1'	N08°12.3	-14.6'	60.5'
19	107°50.2	31.7	148°15.8	9.1'	07°57.6	-14.7'	60.6'
20	122°50.4	32.6	162°43.9	9.1'	07°43.0	-14.7'	60.6'
21	137°50.6	· · 33.6	177°12.0	9.1'	07°28.2	-14.8'	60.6'
22	152°50.7	34.6	191°40.1	9.1'	07°13.4	-14.8'	60.6'
23	167°50.9	35.5	206°08.3	9.1'	06°58.6	-14.9'	60.6'
	SD.=16.0	d=-1.0	S.D.=16.5				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°51.1	S04°36.5	220°36.4	9.2'	N06°43.7	-14.9'	60.6'
1	197°51.3	37.4	235°04.6	9.2'	06°28.8	-15.0'	60.7'
2	212°51.5	38.4	249°32.8	9.2'	06°13.8	-15.0'	60.7'
3	227°51.7	· · 39.4	264°01.0	9.2'	05°58.7	-15.1'	60.7'
4	242°51.9	40.3	278°29.2	9.2'	05°43.7	-15.1'	60.7'
5	257°52.1	41.3	292°57.4	9.2'	05°28.5	-15.1'	60.7'
6	272°52.3	S04°42.3	307°25.6	9.2'	N05°13.4	-15.2'	60.7'
7	287°52.4	43.2	321°53.8	9.2'	04°58.2	-15.2'	60.8'
8	302°52.6	44.2	336°22.1	9.2'	04°42.9	-15.3'	60.8'
9	317°52.8	· · 45.1	350°50.3	9.2'	04°27.7	-15.3'	60.8'
10	332°53.0	46.1	5°18.6	9.2'	04°12.4	-15.3'	60.8'
11	347°53.2	47.1	19°46.8	9.3'	03°57.0	-15.4'	60.8'
12	2°53.4	S04°48.0	34°15.1	9.3'	N03°41.6	-15.4'	60.8'
13	17°53.6	49.0	48°43.3	9.3'	03°26.2	-15.4'	60.8'
14	32°53.7	50.0	63°11.6	9.3'	03°10.8	-15.4'	60.9'
15	47°53.9	· · 50.9	77°39.8	9.3'	02°55.3	-15.5'	60.9'
16	62°54.1	51.9	92°08.1	9.3'	02°39.9	-15.5'	60.9'
17	77°54.3	52.8	106°36.4	9.3'	02°24.4	-15.5'	60.9'
18	92°54.5	S04°53.8	121°04.6	9.3'	N02°08.9	-15.5'	60.9'
19	107°54.7	54.8	135°32.9	9.3'	01°53.3	-15.5'	60.9'
20	122°54.9	55.7	150°01.1	9.3'	01°37.8	-15.6'	60.9'
21	137°55.1	· · 56.7	164°29.4	9.3'	01°22.2	-15.6'	60.9'
22	152°55.2	57.6	178°57.6	9.2'	01°06.6	-15.6'	60.9'
23	167°55.4	58.6	193°25.9	9.2'	00°51.0	-15.6'	60.9'
	SD.=16.0	d=-1.0	S.D.=16.6				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°55.6	S04°59.6	207°54.1	9.2'	N00°35.4	-15.6'	60.9'
1	197°55.8	05°00.5	222°22.4	9.2'	00°19.8	-15.6'	61.0'
2	212°56.0	01.5	236°50.6	9.2'	N00°04.2	-15.6'	61.0'
3	227°56.2	· · 02.4	251°18.8	9.2'	S00°11.4	-15.6'	61.0'
4	242°56.3	03.4	265°47.0	9.2'	00°27.1	-15.6'	61.0'
5	257°56.5	04.4	280°15.2	9.2'	00°42.7	-15.6'	61.0'
6	272°56.7	S05°05.3	294°43.4	9.2'	S00°58.3	-15.6'	61.0'
7	287°56.9	06.3	309°11.6	9.2'	01°13.9	-15.6'	61.0'
8	302°57.1	07.2	323°39.7	9.2'	01°29.5	-15.6'	61.0'
9	317°57.3	· · 08.2	338°07.9	9.1'	01°45.1	-15.6'	61.0'
10	332°57.4	09.2	352°36.0	9.1'	02°00.7	-15.6'	61.0'
11	347°57.6	10.1	7°04.1	9.1'	02°16.3	-15.6'	61.0'
12	2°57.8	S05°11.1	21°32.2	9.1'	S02°31.9	-15.6'	61.0'
13	17°58.0	12.0	36°00.3	9.1'	02°47.5	-15.6'	61.0'
14	32°58.2	13.0	50°28.4	9.1'	03°03.0	-15.5'	61.0'
15	47°58.4	· · 14.0	64°56.4	9.0'	03°18.5	-15.5'	61.0'
16	62°58.5	14.9	79°24.5	9.0'	03°34.0	-15.5'	61.0'
17	77°58.7	15.9	93°52.5	9.0'	03°49.5	-15.5'	61.0'
18	92°58.9	S05°16.8	108°20.5	9.0'	S04°05.0	-15.4'	61.0'
19	107°59.1	17.8	122°48.5	9.0'	04°20.4	-15.4'	61.0'
20	122°59.3	18.7	137°16.4	8.9'	04°35.8	-15.4'	61.0'
21	137°59.5	· · 19.7	151°44.3	8.9'	04°51.2	-15.4'	61.0'
22	152°59.6	20.7	166°12.3	8.9'	05°06.5	-15.3'	61.0'
23	167°59.8	21.6	180°40.1	8.9'	05°21.8	-15.3'	61.0'
	SD.=16.0	d=-1.0	S.D.=16.6				

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

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

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 26-28 15-3%
04	11:06	11:15	11:49	08:45	21:12	
05	11:24	11:34	11:48	09:38	22:04	
06	11:42	11:51	11:48	10:31	22:57	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	15°32.2	157°05.3	S22°31.2	153°06.0	S16°39.0	18°13.7	S02°53.9	186°53.6	S01°22.2
1	30°34.7	172°07.7	31.4	168°06.7	39.5	33°16.5	54.0	201°55.8	22.3
2	45°37.2	187°10.1	31.6	183°07.5	40.1	48°19.2	54.1	216°58.0	22.5
3	60°39.6	202°12.5	·· 31.8	198°08.2	·· 40.6	63°21.9	·· 54.2	232°00.1	·· 22.6
4	75°42.1	217°14.9	32.0	213°09.0	41.1	78°24.7	54.4	247°02.3	22.7
5	90°44.6	232°17.3	32.2	228°09.7	41.7	93°27.4	54.5	262°04.5	22.8
6	105°47.0	247°19.7	S22°32.4	243°10.4	S16°42.2	108°30.2	S02°54.6	277°06.7	S01°22.9
7	120°49.5	262°22.1	32.5	258°11.2	42.7	123°32.9	54.7	292°08.9	23.1
8	135°52.0	277°24.5	32.7	273°11.9	43.3	138°35.7	54.8	307°11.0	23.2
9	150°54.4	292°27.0	·· 32.9	288°12.7	·· 43.8	153°38.4	·· 54.9	322°13.2	·· 23.3
10	165°56.9	307°29.4	33.1	303°13.4	44.3	168°41.1	55.1	337°15.4	23.4
11	180°59.3	322°31.8	33.2	318°14.2	44.9	183°43.9	55.2	352°17.6	23.5
12	196°01.8	337°34.2	S22°33.4	333°14.9	S16°45.4	198°46.6	S02°55.3	7°19.8	S01°23.7
13	211°04.3	352°36.7	33.6	348°15.6	45.9	213°49.4	55.4	22°22.0	23.8
14	226°06.7	7°39.1	33.7	3°16.4	46.5	228°52.1	55.5	37°24.1	23.9
15	241°09.2	22°41.6	·· 33.9	18°17.1	·· 47.0	243°54.9	·· 55.6	52°26.3	·· 24.0
16	256°11.7	37°44.0	34.0	33°17.9	47.5	258°57.6	55.8	67°28.5	24.1
17	271°14.1	52°46.5	34.2	48°18.6	48.0	274°00.3	55.9	82°30.7	24.3
18	286°16.6	67°48.9	S22°34.4	63°19.3	S16°48.6	289°03.1	S02°56.0	97°32.9	S01°24.4
19	301°19.1	82°51.4	34.5	78°20.1	49.1	304°05.8	56.1	112°35.0	24.5
20	316°21.5	97°53.9	34.7	93°20.8	49.6	319°08.6	56.2	127°37.2	24.6
21	331°24.0	112°56.3	·· 34.8	108°21.5	·· 50.2	334°11.3	·· 56.3	142°39.4	·· 24.7
22	346°26.5	127°58.8	35.0	123°22.3	50.7	349°14.1	56.4	157°41.6	24.8
23	1°28.9	143°01.3	35.1	138°23.0	51.2	4°16.8	56.6	172°43.8	25.0
Mer.pass.:22:54		v2.4 d-0.2 m-4.4		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	16°31.4	158°03.8	S22°35.3	153°23.8	S16°51.7	19°19.5	S02°56.7	187°45.9	S01°25.1
1	31°33.8	173°06.3	35.4	168°24.5	52.3	34°22.3	56.8	202°48.1	25.2
2	46°36.3	188°08.7	35.5	183°25.2	52.8	49°25.0	56.9	217°50.3	25.3
3	61°38.8	203°11.2	·· 35.7	198°26.0	·· 53.3	64°27.8	·· 57.0	232°52.5	·· 25.4
4	76°41.2	218°13.7	35.8	213°26.7	53.9	79°30.5	57.1	247°54.7	25.6
5	91°43.7	233°16.2	36.0	228°27.4	54.4	94°33.2	57.3	262°56.8	25.7
6	106°46.2	248°18.7	S22°36.1	243°28.2	S16°54.9	109°36.0	S02°57.4	277°59.0	S01°25.8
7	121°48.6	263°21.2	36.2	258°28.9	55.4	124°38.7	57.5	293°01.2	25.9
8	136°51.1	278°23.8	36.4	273°29.6	56.0	139°41.5	57.6	308°03.4	26.0
9	151°53.6	293°26.3	·· 36.5	288°30.4	·· 56.5	154°44.2	·· 57.7	323°05.6	·· 26.2
10	166°56.0	308°28.8	36.6	303°31.1	57.0	169°46.9	57.8	338°07.7	26.3
11	181°58.5	323°31.3	36.7	318°31.8	57.5	184°49.7	57.9	353°09.9	26.4
12	197°00.9	338°33.8	S22°36.9	333°32.6	S16°58.1	199°52.4	S02°58.1	8°12.1	S01°26.5
13	212°03.4	353°36.4	37.0	348°33.3	58.6	214°55.2	58.2	23°14.3	26.6
14	227°05.9	8°38.9	37.1	3°34.0	59.1	229°57.9	58.3	38°16.5	26.8
15	242°08.3	23°41.5	·· 37.2	18°34.8	16°59.6	245°00.6	·· 58.4	53°18.6	·· 26.9
16	257°10.8	38°44.0	37.3	33°35.5	17°00.2	260°03.4	58.5	68°20.8	27.0
17	272°13.3	53°46.5	37.4	48°36.2	00.7	275°06.1	58.6	83°23.0	27.1
18	287°15.7	68°49.1	S22°37.5	63°37.0	S17°01.2	290°08.9	S02°58.7	98°25.2	S01°27.2
19	302°18.2	83°51.6	37.6	78°37.7	01.7	305°11.6	58.9	113°27.4	27.3
20	317°20.7	98°54.2	37.8	93°38.4	02.3	320°14.3	59.0	128°29.6	27.5
21	332°23.1	113°56.8	·· 37.9	108°39.2	·· 02.8	335°17.1	·· 59.1	143°31.7	·· 27.6
22	347°25.6	128°59.3	38.0	123°39.9	03.3	350°19.8	59.2	158°33.9	27.7
23	2°28.1	144°01.9	38.1	138°40.6	03.8	5°22.5	59.3	173°36.1	27.8
Mer.pass.:22:50		v2.5 d-0.1 m-4.4		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.8		v2.2 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	17°30.5	159°04.5	S22°38.2	153°41.4	S17°04.4	20°25.3	S02°59.4	188°38.3	S01°27.9
1	32°33.0	174°07.1	38.3	168°42.1	04.9	35°28.0	59.5	203°40.5	28.1
2	47°35.4	189°09.6	38.3	183°42.8	05.4	50°30.8	59.7	218°42.6	28.2
3	62°37.9	204°12.2	·· 38.4	198°43.5	·· 05.9	65°33.5	·· 59.8	233°44.8	·· 28.3
4	77°40.4	219°14.8	38.5	213°44.3	06.5	80°36.2	02°59.9	248°47.0	28.4
5	92°42.8	234°17.4	38.6	228°45.0	07.0	95°39.0	03°00.0	263°49.2	28.5
6	107°45.3	249°20.0	S22°38.7	243°45.7	S17°07.5	110°41.7	S03°00.1	278°51.4	S01°28.7
7	122°47.8	264°22.6	38.8	258°46.5	08.0	125°44.4	00.2	293°53.5	28.8
8	137°50.2	279°25.2	38.9	273°47.2	08.5	140°47.2	00.3	308°55.7	28.9
9	152°52.7	294°27.8	·· 38.9	288°47.9	·· 09.1	155°49.9	·· 00.4	323°57.9	·· 29.0
10	167°55.2	309°30.4	39.0	303°48.6	09.6	170°52.6	00.6	339°00.1	29.1
11	182°57.6	324°33.1	39.1	318°49.4	10.1	185°55.4	00.7	354°02.3	29.2
12	198°00.1	339°35.7	S22°39.2	333°50.1	S17°10.6	200°58.1	S03°00.8	9°04.4	S01°29.4
13	213°02.6	354°38.3	39.2	348°50.8	11.1	216°00.8	00.9	24°06.6	29.5
14	228°05.0	9°40.9	39.3	3°51.5	11.7	231°03.6	01.0	39°08.8	29.6
15	243°07.5	24°43.6	·· 39.4	18°52.3	·· 12.2	246°06.3	·· 01.1	54°11.0	·· 29.7
16	258°09.9	39°46.2	39.4	33°53.0	12.7	261°09.1	01.2	69°13.2	29.8
17	273°12.4	54°48.9	39.5	48°53.7	13.2	276°11.8	01.3	84°15.4	30.0
18	288°14.9	69°51.5	S22°39.6	63°54.4	S17°13.7	291°14.5	S03°01.5	99°17.5	S01°30.1
19	303°17.3	84°54.1	39.6	78°55.2	14.3	306°17.3	01.6	114°19.7	30.2
20	318°19.8	99°56.8	39.7	93°55.9	14.8	321°20.0	01.7	129°21.9	30.3
21	333°22.3	114°59.5	·· 39.7	108°56.6	·· 15.3	336°22.7	·· 01.8	144°24.1	·· 30.4
22	348°24.7	130°02.1	39.8	123°57.3	15.8	351°25.5	01.9	159°26.3	30.6
23	3°27.2	145°04.8	39.8	138°58.1	16.3	6°28.2	02.0	174°28.4	30.7
Mer.pass.:22:46		v2.6 d-0.1 m-4.4		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.7
Hamal	328°02.7	23°31.0
Polaris	318°21.4	89°18.6
Acamar	315°19.4	-40°15.4
Menkar	314°16.8	4°08.1
Mirfak	308°42.8	49°54.0
Aldebaran	290°51.4	16°31.9
Rigel	281°13.8	-8°11.2
Capella	280°37.1	46°00.4
Bellatrix	278°34.0	6°21.7
Elnath	278°14.9	28°37.0
Alnilam	275°48.2	-1°11.6
Betelgeuse	271°03.3	7°24.6
Canopus	263°56.9	-52°41.8
Sirius	258°35.4	-16°43.7
Adhara	255°14.1	-28°59.0
Procyon	245°01.8	5°11.9
Pollux	243°30.1	27°59.9
Avior	234°19.1	-59°32.4
Suhail	222°54.2	-43°28.4
Miaplacidus	221°40.8	-69°45.5
Alphard	217°58.2	-8°42.2
Regulus	207°45.8	11°54.9
Dubhe	193°54.5	61°41.4
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.0
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.7
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.7	74°06.8
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.9
Antares	112°28.9	-26°27.4
Atria	107°32.8	-69°03.0
Sabik	102°14.9	-15°44.2
Shaula	96°24.7	-37°06.8
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.2	51°29.6
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.3	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.0	-56°42.1
Deneb	49°32.7	45°19.5
Enif	33°48.8	9°55.7
Al Na'ir	27°45.7	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 07 Thu	**SHA**	**Mer.pass**
Venus	141°33.0	13:29
Mars	137°33.8	13:47
Jupiter	2°41.5	22:43
Saturn	171°21.4	11:31

Oct 08 Fri	**SHA**	**Mer.pass**
Venus	141°32.4	13:26
Mars	136°52.4	13:46
Jupiter	2°48.2	22:39
Saturn	171°14.6	11:27

Oct 09 Sat	**SHA**	**Mer.pass**
Venus	141°34.0	13:21
Mars	136°10.8	13:45
Jupiter	2°54.8	22:34
Saturn	171°07.8	11:24

Horizontal parallax	
Venus:	0.4
Mars:	0.1

DUT1 = UT1-UTC = -0.0661 sec ΔT = TT-UT1 = +66.2501 sec

2010 October 07 to Oct. 09 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°00.0	S05°22.6	195°08.0	8.8'	S05°37.1	-15.3'	61.0'
1	198°00.2	23.5	209°35.8	8.8'	05°52.4	-15.2'	61.0'
2	213°00.4	24.5	224°03.6	8.8'	06°07.6	-15.2'	61.0'
3	228°00.5	· · 25.5	238°31.4	8.8'	06°22.7	-15.1'	60.9'
4	243°00.7	26.4	252°59.2	8.7'	06°37.8	-15.1'	60.9'
5	258°00.9	27.4	267°26.9	8.7'	06°52.9	-15.1'	60.9'
6	273°01.1	S05°28.3	281°54.6	8.7'	S07°07.9	-15.0'	60.9'
7	288°01.3	29.3	296°22.3	8.7'	07°22.9	-15.0'	60.9'
8	303°01.4	30.2	310°49.9	8.6'	07°37.9	-14.9'	60.9'
9	318°01.6	· · 31.2	325°17.5	8.6'	07°52.7	-14.9'	60.9'
10	333°01.8	32.2	339°45.1	8.6'	08°07.6	-14.8'	60.9'
11	348°02.0	33.1	354°12.6	8.5'	08°22.3	-14.7'	60.9'
12	3°02.2	S05°34.1	8°40.2	8.5'	S08°37.1	-14.7'	60.9'
13	18°02.3	35.0	23°07.6	8.5'	08°51.7	-14.6'	60.8'
14	33°02.5	36.0	37°35.1	8.4'	09°06.3	-14.6'	60.8'
15	48°02.7	· · 36.9	52°02.5	8.4'	09°20.8	-14.5'	60.8'
16	63°02.9	37.9	66°29.9	8.4'	09°35.3	-14.4'	60.8'
17	78°03.0	38.8	80°57.2	8.3'	09°49.7	-14.4'	60.8'
18	93°03.2	S05°39.8	95°24.6	8.3'	S10°04.1	-14.3'	60.8'
19	108°03.4	40.8	109°51.8	8.3'	10°18.3	-14.2'	60.8'
20	123°03.6	41.7	124°19.1	8.2'	10°32.5	-14.2'	60.8'
21	138°03.8	· · 42.7	138°46.3	8.2'	10°46.6	-14.1'	60.7'
22	153°03.9	43.6	153°13.5	8.2'	11°00.7	-14.0'	60.7'
23	168°04.1	44.6	167°40.6	8.1'	11°14.7	-13.9'	60.7'
	SD.=16.0	d=-1.0	S.D.=16.6				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°04.3	S05°45.5	182°07.7	8.1'	S11°28.6	-13.9'	60.7'
1	198°04.5	46.5	196°34.8	8.0'	11°42.4	-13.8'	60.7'
2	213°04.6	47.4	211°01.8	8.0'	11°56.1	-13.7'	60.6'
3	228°04.8	· · 48.4	225°28.8	8.0'	12°09.8	-13.6'	60.6'
4	243°05.0	49.4	239°55.7	7.9'	12°23.3	-13.5'	60.6'
5	258°05.2	50.3	254°22.6	7.9'	12°36.8	-13.4'	60.6'
6	273°05.3	S05°51.3	268°49.5	7.9'	S12°50.2	-13.3'	60.6'
7	288°05.5	52.2	283°16.3	7.8'	13°03.5	-13.3'	60.5'
8	303°05.7	53.2	297°43.1	7.8'	13°16.7	-13.2'	60.5'
9	318°05.9	· · 54.1	312°09.9	7.7'	13°29.8	-13.1'	60.5'
10	333°06.0	55.1	326°36.6	7.7'	13°42.9	-13.0'	60.5'
11	348°06.2	56.0	341°03.3	7.7'	13°55.8	-12.9'	60.5'
12	3°06.4	S05°57.0	355°29.9	7.6'	S14°08.6	-12.8'	60.4'
13	18°06.6	57.9	9°56.5	7.6'	14°21.4	-12.7'	60.4'
14	33°06.7	58.9	24°23.1	7.5'	14°34.0	-12.6'	60.4'
15	48°06.9	05°59.8	38°49.6	7.5'	14°46.5	-12.5'	60.4'
16	63°07.1	06°00.8	53°16.1	7.5'	14°58.9	-12.4'	60.3'
17	78°07.3	01.7	67°42.5	7.4'	15°11.3	-12.3'	60.3'
18	93°07.4	S06°02.7	82°08.9	7.4'	S15°23.5	-12.2'	60.3'
19	108°07.6	03.6	96°35.3	7.3'	15°35.6	-12.1'	60.3'
20	123°07.8	04.6	111°01.6	7.3'	15°47.6	-11.9'	60.2'
21	138°07.9	· · 05.6	125°27.9	7.3'	15°59.5	-11.8'	60.2'
22	153°08.1	06.5	139°54.2	7.2'	16°11.2	-11.7'	60.2'
23	168°08.3	07.5	154°20.4	7.2'	16°22.9	-11.6'	60.2'
	SD.=16.0	d=-1.0	S.D.=16.5				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°08.5	S06°08.4	168°46.6	7.2'	S16°34.4	-11.5'	60.1'
1	198°08.6	09.4	183°12.7	7.1'	16°45.9	-11.4'	60.1'
2	213°08.8	10.3	197°38.8	7.1'	16°57.2	-11.3'	60.1'
3	228°09.0	· · 11.3	212°04.9	7.1'	17°08.4	-11.1'	60.0'
4	243°09.2	12.2	226°30.9	7.0'	17°19.4	-11.0'	60.0'
5	258°09.3	13.2	240°56.9	7.0'	17°30.4	-10.9'	60.0'
6	273°09.5	S06°14.1	255°22.9	6.9'	S17°41.2	-10.8'	60.0'
7	288°09.7	15.1	269°48.8	6.9'	17°51.9	-10.6'	59.9'
8	303°09.8	16.0	284°14.7	6.9'	18°02.5	-10.5'	59.9'
9	318°10.0	· · 17.0	298°40.6	6.8'	18°12.9	-10.4'	59.9'
10	333°10.2	17.9	313°06.4	6.8'	18°23.3	-10.3'	59.8'
11	348°10.3	18.9	327°32.2	6.8'	18°33.5	-10.1'	59.8'
12	3°10.5	S06°19.8	341°58.0	6.7'	S18°43.5	-10.0'	59.8'
13	18°10.7	20.8	356°23.7	6.7'	18°53.5	-9.9'	59.7'
14	33°10.9	21.7	10°49.4	6.7'	19°03.3	-9.7'	59.7'
15	48°11.0	· · 22.7	25°15.1	6.7'	19°12.9	-9.6'	59.7'
16	63°11.2	23.6	39°40.7	6.6'	19°22.5	-9.5'	59.6'
17	78°11.4	24.6	54°06.3	6.6'	19°31.9	-9.3'	59.6'
18	93°11.5	S06°25.5	68°31.9	6.6'	S19°41.1	-9.2'	59.6'
19	108°11.7	26.5	82°57.5	6.5'	19°50.2	-9.1'	59.5'
20	123°11.9	27.4	97°23.0	6.5'	19°59.2	-8.9'	59.5'
21	138°12.0	· · 28.4	111°48.5	6.5'	20°08.1	-8.8'	59.5'
22	153°12.2	29.3	126°14.0	6.5'	20°16.8	-8.6'	59.4'
23	168°12.4	30.3	140°39.5	6.5'	20°25.4	-8.5'	59.4'
	SD.=16.0	d=-1.0	S.D.=16.3				

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

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

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 0-4%
07	12:00	12:09	11:48	11:24	23:51	
08	12:17	12:26	11:48	12:19	–:–	
09	12:34	12:42	11:47	13:15	00:47	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	18°29.7	160°07.5	S22°39.9	153°58.8	S17°16.9	21°30.9	S03°02.1	189°30.6	S01°30.8
1	33°32.1	175°10.1	39.9	168°59.5	17.4	36°33.7	02.2	204°32.8	30.9
2	48°34.6	190°12.8	40.0	184°00.2	17.9	51°36.4	02.4	219°35.0	31.0
3	63°37.0	205°15.5	·· 40.0	199°01.0	·· 18.4	66°39.1	·· 02.5	234°37.2	·· 31.1
4	78°39.5	220°18.2	40.0	214°01.7	18.9	81°41.9	02.6	249°39.3	31.3
5	93°42.0	235°20.9	40.1	229°02.4	19.4	96°44.6	02.7	264°41.5	31.4
6	108°44.4	250°23.6	S22°40.1	244°03.1	S17°20.0	111°47.3	S03°02.8	279°43.7	S01°31.5
7	123°46.9	265°26.2	40.2	259°03.8	20.5	126°50.1	02.9	294°45.9	31.6
8	138°49.4	280°28.9	40.2	274°04.6	21.0	141°52.8	03.0	309°48.1	31.7
9	153°51.8	295°31.7	·· 40.2	289°05.3	·· 21.5	156°55.5	·· 03.1	324°50.3	·· 31.9
10	168°54.3	310°34.4	40.2	304°06.0	22.0	171°58.2	03.2	339°52.4	32.0
11	183°56.8	325°37.1	40.3	319°06.7	22.5	187°01.0	03.3	354°54.6	32.1
12	198°59.2	340°39.8	S22°40.3	334°07.5	S17°23.1	202°03.7	S03°03.5	9°56.8	S01°32.2
13	214°01.7	355°42.5	40.3	349°08.2	23.6	217°06.4	03.6	24°59.0	32.3
14	229°04.2	10°45.2	40.3	4°08.9	24.1	232°09.2	03.7	40°01.2	32.4
15	244°06.6	25°48.0	·· 40.3	19°09.6	·· 24.6	247°11.9	·· 03.8	55°03.3	·· 32.6
16	259°09.1	40°50.7	40.4	34°10.3	25.1	262°14.6	03.9	70°05.5	32.7
17	274°11.5	55°53.4	40.4	49°11.0	25.6	277°17.4	04.0	85°07.7	32.8
18	289°14.0	70°56.2	S22°40.4	64°11.8	S17°26.2	292°20.1	S03°04.1	100°09.9	S01°32.9
19	304°16.5	85°58.9	40.4	79°12.5	26.7	307°22.8	04.2	115°12.1	33.0
20	319°18.9	101°01.7	40.4	94°13.2	27.2	322°25.6	04.3	130°14.2	33.2
21	334°21.4	116°04.4	·· 40.4	109°13.9	·· 27.7	337°28.3	·· 04.5	145°16.4	·· 33.3
22	349°23.9	131°07.2	40.4	124°14.6	28.2	352°31.0	04.6	160°18.6	33.4
23	4°26.3	146°09.9	40.4	139°15.4	28.7	7°33.7	04.7	175°20.8	33.5
Mer.pass.:22:42		v2.7 d-0.0 m-4.4		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	19°28.8	161°12.7	S22°40.4	154°16.1	S17°29.2	22°36.5	S03°04.8	190°23.0	S01°33.6
1	34°31.3	176°15.5	40.4	169°16.8	29.7	37°39.2	04.9	205°25.2	33.7
2	49°33.7	191°18.2	40.4	184°17.5	30.3	52°41.9	05.0	220°27.3	33.9
3	64°36.2	206°21.0	·· 40.4	199°18.2	·· 30.8	67°44.7	·· 05.1	235°29.5	·· 34.0
4	79°38.7	221°23.8	40.4	214°18.9	31.3	82°47.4	05.2	250°31.7	34.1
5	94°41.1	236°26.6	40.3	229°19.6	31.8	97°50.1	05.3	265°33.9	34.2
6	109°43.6	251°29.4	S22°40.3	244°20.4	S17°32.3	112°52.8	S03°05.4	280°36.1	S01°34.3
7	124°46.0	266°32.2	40.3	259°21.1	32.8	127°55.6	05.5	295°38.2	34.5
8	139°48.5	281°35.0	40.3	274°21.8	33.3	142°58.3	05.7	310°40.4	34.6
9	154°51.0	296°37.8	·· 40.3	289°22.5	·· 33.8	158°01.0	·· 05.8	325°42.6	·· 34.7
10	169°53.4	311°40.6	40.2	304°23.2	34.3	173°03.8	05.9	340°44.8	34.8
11	184°55.9	326°43.4	40.2	319°23.9	34.9	188°06.5	06.0	355°47.0	34.9
12	199°58.4	341°46.2	S22°40.2	334°24.6	S17°35.4	203°09.2	S03°06.1	10°49.2	S01°35.0
13	215°00.8	356°49.0	40.1	349°25.4	35.9	218°11.9	06.2	25°51.3	35.2
14	230°03.3	11°51.8	40.1	4°26.1	36.4	233°14.7	06.3	40°53.5	35.3
15	245°05.8	26°54.6	·· 40.1	19°26.8	·· 36.9	248°17.4	·· 06.4	55°55.7	·· 35.4
16	260°08.2	41°57.5	40.0	34°27.5	37.4	263°20.1	06.5	70°57.9	35.5
17	275°10.7	57°00.3	40.0	49°28.2	37.9	278°22.8	06.6	86°00.1	35.6
18	290°13.1	72°03.1	S22°39.9	64°28.9	S17°38.4	293°25.6	S03°06.7	101°02.2	S01°35.8
19	305°15.6	87°06.0	39.9	79°29.6	38.9	308°28.3	06.8	116°04.4	35.9
20	320°18.1	102°08.8	39.9	94°30.3	39.4	323°31.0	06.9	131°06.6	36.0
21	335°20.5	117°11.7	·· 39.8	109°31.1	·· 40.0	338°33.7	·· 07.1	146°08.8	·· 36.1
22	350°23.0	132°14.5	39.8	124°31.8	40.5	353°36.5	07.2	161°11.0	36.2
23	5°25.5	147°17.4	39.7	139°32.5	41.0	8°39.2	07.3	176°13.2	36.3
Mer.pass.:22:38		v2.8 d0.0 m-4.3		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	20°27.9	162°20.2	S22°39.6	154°33.2	S17°41.5	23°41.9	S03°07.4	191°15.3	S01°36.5
1	35°30.4	177°23.1	39.6	169°33.9	42.0	38°44.6	07.5	206°17.5	36.6
2	50°32.9	192°26.0	39.5	184°34.6	42.5	53°47.4	07.6	221°19.7	36.7
3	65°35.3	207°28.8	·· 39.5	199°35.3	·· 43.0	68°50.1	·· 07.7	236°21.9	·· 36.8
4	80°37.8	222°31.7	39.4	214°36.0	43.5	83°52.8	07.8	251°24.1	36.9
5	95°40.3	237°34.6	39.3	229°36.7	44.0	98°55.5	07.9	266°26.2	37.1
6	110°42.7	252°37.5	S22°39.3	244°37.4	S17°44.5	113°58.3	S03°08.0	281°28.4	S01°37.2
7	125°45.2	267°40.4	39.2	259°38.1	45.0	129°01.0	08.1	296°30.6	37.3
8	140°47.6	282°43.2	39.1	274°38.9	45.5	144°03.7	08.2	311°32.8	37.4
9	155°50.1	297°46.1	·· 39.0	289°39.6	·· 46.0	159°06.4	·· 08.3	326°35.0	·· 37.5
10	170°52.6	312°49.0	39.0	304°40.3	46.5	174°09.2	08.4	341°37.2	37.6
11	185°55.0	327°51.9	38.9	319°41.0	47.0	189°11.9	08.5	356°39.3	37.8
12	200°57.5	342°54.8	S22°38.8	334°41.7	S17°47.5	204°14.6	S03°08.7	11°41.5	S01°37.9
13	216°00.0	357°57.8	38.7	349°42.4	48.1	219°17.3	08.8	26°43.7	38.0
14	231°02.4	13°00.7	38.6	4°43.1	48.6	234°20.0	08.9	41°45.9	38.1
15	246°04.9	28°03.6	·· 38.5	19°43.8	·· 49.1	249°22.8	·· 09.0	56°48.1	·· 38.2
16	261°07.4	43°06.5	38.4	34°44.5	49.6	264°25.5	09.1	71°50.3	38.3
17	276°09.8	58°09.4	38.3	49°45.2	50.1	279°28.2	09.2	86°52.4	38.5
18	291°12.3	73°12.4	S22°38.2	64°45.9	S17°50.6	294°30.9	S03°09.3	101°54.6	S01°38.6
19	306°14.8	88°15.3	38.1	79°46.6	51.1	309°33.7	09.4	116°56.8	38.7
20	321°17.2	103°18.2	38.0	94°47.3	51.6	324°36.4	09.5	131°59.0	38.8
21	336°19.7	118°21.2	·· 37.9	109°48.0	·· 52.1	339°39.1	·· 09.6	147°01.2	·· 38.9
22	351°22.1	133°24.1	37.8	124°48.7	52.6	354°41.8	09.7	162°03.3	39.1
23	6°24.6	148°27.1	37.7	139°49.4	53.1	9°44.5	09.8	177°05.5	39.2
Mer.pass.:22:34		v2.9 d0.1 m-4.3		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.7
Hamal	328°02.7	23°31.0
Polaris	318°20.4	89°18.6
Acamar	315°19.4	-40°15.4
Menkar	314°16.8	4°08.1
Mirfak	308°42.8	49°54.0
Aldebaran	290°51.4	16°31.9
Rigel	281°13.8	-8°11.2
Capella	280°37.1	46°00.4
Bellatrix	278°33.9	6°21.7
Elnath	278°14.9	28°37.0
Alnilam	275°48.2	-1°11.6
Betelgeuse	271°03.3	7°24.6
Canopus	263°56.9	-52°41.8
Sirius	258°35.4	-16°43.7
Adhara	255°14.0	-28°59.0
Procyon	245°01.8	5°11.9
Pollux	243°30.1	27°59.9
Avior	234°19.1	-59°32.4
Suhail	222°54.1	-43°28.4
Miaplacidus	221°40.7	-69°45.5
Alphard	217°58.2	-8°42.2
Regulus	207°45.8	11°54.8
Dubhe	193°54.4	61°41.4
Denebola	182°35.9	14°30.7
Gienah	175°54.7	-17°36.1
Acrux	173°12.4	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.0
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.8	74°06.7
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.8
Antares	112°28.9	-26°27.4
Atria	107°32.8	-69°03.0
Sabik	102°15.0	-15°44.2
Shaula	96°24.7	-37°06.7
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.2	51°29.6
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.4	38°47.9
Nunki	76°00.7	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.0	-56°42.1
Deneb	49°32.7	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 10 Sun	**SHA**	**Mer.pass**
Venus	141°37.8	13:17
Mars	135°29.1	13:43
Jupiter	3°01.3	22:30
Saturn	171°01.0	11:20

Oct 11 Mon	**SHA**	**Mer.pass**
Venus	141°43.9	13:13
Mars	134°47.3	13:42
Jupiter	3°07.7	22:25
Saturn	170°54.2	11:17

Oct 12 Tue	**SHA**	**Mer.pass**
Venus	141°52.3	13:08
Mars	134°05.2	13:41
Jupiter	3°14.0	22:21
Saturn	170°47.4	11:13

Horizontal parallax	
Venus:	0.5
Mars:	0.1

DUT1 = UT1-UTC = -0.0691 sec ΔT = TT-UT1 = +66.2531 sec

2010 October 10 to Oct. 12 UT

h — Sun — Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°12.5	S06°31.2	155°04.9	6.4'	S20°33.8	-8.4'	59.4'
1	198°12.7	32.2	169°30.3	6.4'	20°42.1	-8.2'	59.3'
2	213°12.9	33.1	183°55.7	6.4'	20°50.2	-8.1'	59.3'
3	228°13.0	·· 34.0	198°21.1	6.4'	20°58.2	-7.9'	59.3'
4	243°13.2	35.0	212°46.5	6.4'	21°06.1	-7.8'	59.2'
5	258°13.4	35.9	227°11.8	6.3'	21°13.8	-7.6'	59.2'
6	273°13.5	S06°36.9	241°37.1	6.3'	S21°21.4	-7.5'	59.1'
7	288°13.7	37.8	256°02.4	6.3'	21°28.8	-7.3'	59.1'
8	303°13.9	38.8	270°27.7	6.3'	21°36.0	-7.2'	59.1'
9	318°14.0	·· 39.7	284°53.0	6.3'	21°43.2	-7.1'	59.0'
10	333°14.2	40.7	299°18.3	6.3'	21°50.2	-6.9'	59.0'
11	348°14.4	41.6	313°43.6	6.3'	21°57.0	-6.8'	59.0'
12	3°14.5	S06°42.6	328°08.8	6.3'	S22°03.7	-6.6'	58.9'
13	18°14.7	43.5	342°34.1	6.2'	22°10.2	-6.5'	58.9'
14	33°14.9	44.5	356°59.3	6.2'	22°16.6	-6.3'	58.8'
15	48°15.0	·· 45.4	11°24.5	6.2'	22°22.8	-6.2'	58.8'
16	63°15.2	46.4	25°49.8	6.2'	22°28.9	-6.0'	58.8'
17	78°15.4	47.3	40°15.0	6.2'	22°34.8	-5.9'	58.7'
18	93°15.5	S06°48.2	54°40.2	6.2'	S22°40.6	-5.7'	58.7'
19	108°15.7	49.2	69°05.4	6.2'	22°46.2	-5.5'	58.7'
20	123°15.8	50.1	83°30.7	6.2'	22°51.7	-5.4'	58.6'
21	138°16.0	·· 51.1	97°55.9	6.2'	22°57.0	-5.2'	58.6'
22	153°16.2	52.0	112°21.1	6.2'	23°02.2	-5.1'	58.5'
23	168°16.3	53.0	126°46.4	6.2'	23°07.2	-4.9'	58.5'
	SD.=16.0	d=-0.9	S.D.=16.1				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°16.5	S06°53.9	141°11.6	6.2'	S23°12.0	-4.8'	58.5'
1	198°16.7	54.9	155°36.9	6.3'	23°16.8	-4.6'	58.4'
2	213°16.8	55.8	170°02.1	6.3'	23°21.3	-4.5'	58.4'
3	228°17.0	·· 56.7	184°27.4	6.3'	23°25.7	-4.3'	58.3'
4	243°17.1	57.7	198°52.7	6.3'	23°30.0	-4.2'	58.3'
5	258°17.3	58.6	213°18.0	6.3'	23°34.1	-4.0'	58.3'
6	273°17.5	S06°59.6	227°43.3	6.3'	S23°38.0	-3.9'	58.2'
7	288°17.6	07°00.5	242°08.6	6.3'	23°41.8	-3.7'	58.2'
8	303°17.8	01.5	256°33.9	6.4'	23°45.4	-3.6'	58.2'
9	318°18.0	·· 02.4	270°59.3	6.4'	23°48.9	-3.4'	58.1'
10	333°18.1	03.3	285°24.7	6.4'	23°52.3	-3.3'	58.1'
11	348°18.3	04.3	299°50.1	6.4'	23°55.4	-3.1'	58.0'
12	3°18.4	S07°05.2	314°15.5	6.4'	S23°58.5	-2.9'	58.0'
13	18°18.6	06.2	328°41.0	6.5'	24°01.3	-2.8'	58.0'
14	33°18.8	07.1	343°06.4	6.5'	24°04.1	-2.6'	57.9'
15	48°18.9	·· 08.1	357°32.0	6.5'	24°06.6	-2.5'	57.9'
16	63°19.1	09.0	11°57.5	6.5'	24°09.0	-2.3'	57.8'
17	78°19.2	09.9	26°23.0	6.6'	24°11.3	-2.2'	57.8'
18	93°19.4	S07°10.9	40°48.6	6.6'	S24°13.4	-2.0'	57.8'
19	108°19.6	11.8	55°14.3	6.6'	24°15.4	-1.9'	57.7'
20	123°19.7	12.8	69°39.9	6.7'	24°17.2	-1.7'	57.7'
21	138°19.9	·· 13.7	84°05.6	6.7'	24°18.9	-1.6'	57.6'
22	153°20.0	14.6	98°31.4	6.8'	24°20.4	-1.4'	57.6'
23	168°20.2	15.6	112°57.1	6.8'	24°21.7	-1.3'	57.6'
	SD.=16.0	d=-0.9	S.D.=15.8				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.3	S07°16.5	127°23.0	6.8'	S24°22.9	-1.1'	57.5'
1	198°20.5	17.5	141°48.8	6.9'	24°24.0	-1.0'	57.5'
2	213°20.7	18.4	156°14.7	6.9'	24°24.9	-0.8'	57.5'
3	228°20.8	·· 19.3	170°40.6	7.0'	24°25.7	-0.7'	57.4'
4	243°21.0	20.3	185°06.6	7.0'	24°26.3	-0.5'	57.4'
5	258°21.1	21.2	199°32.7	7.1'	24°26.8	-0.4'	57.3'
6	273°21.3	S07°22.2	213°58.7	7.1'	S24°27.1	-0.3'	57.3'
7	288°21.4	23.1	228°24.9	7.2'	24°27.3	-0.1'	57.3'
8	303°21.6	24.0	242°51.0	7.2'	24°27.4	0.0'	57.2'
9	318°21.8	·· 25.0	257°17.3	7.3'	24°27.2	0.2'	57.2'
10	333°21.9	25.9	271°43.6	7.3'	24°27.0	0.3'	57.1'
11	348°22.1	26.9	286°09.9	7.4'	24°26.6	0.5'	57.1'
12	3°22.2	S07°27.8	300°36.3	7.4'	S24°26.1	0.6'	57.1'
13	18°22.4	28.7	315°02.7	7.5'	24°25.4	0.7'	57.0'
14	33°22.5	29.7	329°29.2	7.5'	24°24.6	0.9'	57.0'
15	48°22.7	·· 30.6	343°55.8	7.6'	24°23.6	1.0'	57.0'
16	63°22.8	31.5	358°22.4	7.6'	24°22.5	1.2'	56.9'
17	78°23.0	32.5	12°49.1	7.7'	24°21.3	1.3'	56.9'
18	93°23.1	S07°33.4	27°15.8	7.8'	S24°19.9	1.4'	56.8'
19	108°23.3	34.4	41°42.6	7.8'	24°18.4	1.6'	56.8'
20	123°23.5	35.3	56°09.5	7.9'	24°16.8	1.7'	56.8'
21	138°23.6	·· 36.2	70°36.4	8.0'	24°15.0	1.9'	56.7'
22	153°23.8	37.2	85°03.4	8.0'	24°13.0	2.0'	56.7'
23	168°23.9	38.1	99°30.4	8.1'	24°11.0	2.1'	56.7'
	SD.=16.0	d=-0.9	S.D.=15.6				

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

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

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 3-5 10-27%
10	12:50	12:58	11:47	14:13	01:44	
11	13:06	13:14	11:47	15:10	02:41	
12	13:21	13:29	11:47	16:07	03:39	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	21°27.1	163°30.0	S22°37.6	154°50.1	S17°53.6	24°47.3	S03°09.9	192°07.7	S01°39.3
1	36°29.5	178°33.0	37.5	169°50.8	54.1	39°50.0	10.0	207°09.9	39.4
2	51°32.0	193°35.9	37.4	184°51.5	54.6	54°52.7	10.1	222°12.1	39.5
3	66°34.5	208°38.9	·· 37.3	199°52.2	·· 55.1	69°55.4	·· 10.2	237°14.3	·· 39.6
4	81°36.9	223°41.9	37.1	214°52.9	55.6	84°58.1	10.3	252°16.4	39.8
5	96°39.4	238°44.9	37.0	229°53.6	56.1	100°00.9	10.4	267°18.6	39.9
6	111°41.9	253°47.8	S22°36.9	244°54.3	S17°56.6	115°03.6	S03°10.5	282°20.8	S01°40.0
7	126°44.3	268°50.8	36.8	259°55.1	57.1	130°06.3	10.7	297°23.0	40.1
8	141°46.8	283°53.8	36.6	274°55.8	57.6	145°09.0	10.8	312°25.2	40.2
9	156°49.3	298°56.8	·· 36.5	289°56.5	·· 58.1	160°11.7	·· 10.9	327°27.4	·· 40.3
10	171°51.7	313°59.8	36.4	304°57.2	58.6	175°14.5	11.0	342°29.5	40.5
11	186°54.2	329°02.8	36.2	319°57.9	59.1	190°17.2	11.1	357°31.7	40.6
12	201°56.6	344°05.8	S22°36.1	334°58.6	S17°59.6	205°19.9	S03°11.2	12°33.9	S01°40.7
13	216°59.1	359°08.8	36.0	349°59.3	18°00.1	220°22.6	11.3	27°36.1	40.8
14	232°01.6	14°11.8	35.8	5°00.0	00.6	235°25.3	11.4	42°38.3	40.9
15	247°04.0	29°14.8	·· 35.7	20°00.7	·· 01.1	250°28.0	·· 11.5	57°40.4	·· 41.0
16	262°06.5	44°17.8	35.5	35°01.3	01.6	265°30.8	11.6	72°42.6	41.2
17	277°09.0	59°20.8	35.4	50°02.0	02.1	280°33.5	11.7	87°44.8	41.3
18	292°11.4	74°23.9	S22°35.2	65°02.7	S18°02.6	295°36.2	S03°11.8	102°47.0	S01°41.4
19	307°13.9	89°26.9	35.1	80°03.4	03.1	310°38.9	11.9	117°49.2	41.5
20	322°16.4	104°29.9	34.9	95°04.1	03.6	325°41.6	12.0	132°51.4	41.6
21	337°18.8	119°33.0	·· 34.7	110°04.8	·· 04.1	340°44.3	·· 12.1	147°53.5	·· 41.8
22	352°21.3	134°36.0	34.6	125°05.5	04.6	355°47.1	12.2	162°55.7	41.9
23	7°23.8	149°39.0	34.4	140°06.2	05.1	10°49.8	12.3	177°57.9	42.0
Mer.pass.:22:30		v3.0 d0.1 m-4.3		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	22°26.2	164°42.1	S22°34.2	155°06.9	S18°05.6	25°52.5	S03°12.4	193°00.1	S01°42.1
1	37°28.7	179°45.1	34.1	170°07.6	06.1	40°55.2	12.5	208°02.3	42.2
2	52°31.1	194°48.2	33.9	185°08.3	06.6	55°57.9	12.6	223°04.5	42.3
3	67°33.6	209°51.2	·· 33.7	200°09.0	·· 07.1	71°00.6	·· 12.7	238°06.6	·· 42.5
4	82°36.1	224°54.3	33.6	215°09.7	07.6	86°03.3	12.8	253°08.8	42.6
5	97°38.5	239°57.4	33.4	230°10.4	08.0	101°06.1	12.9	268°11.0	42.7
6	112°41.0	255°00.4	S22°33.2	245°11.1	S18°08.5	116°08.8	S03°13.0	283°13.2	S01°42.8
7	127°43.5	270°03.5	33.0	260°11.8	09.0	131°11.5	13.1	298°15.4	42.9
8	142°45.9	285°06.6	32.8	275°12.5	09.5	146°14.2	13.2	313°17.6	43.0
9	157°48.4	300°09.7	·· 32.6	290°13.2	·· 10.0	161°16.9	·· 13.3	328°19.7	·· 43.2
10	172°50.9	315°12.8	32.4	305°13.9	10.5	176°19.6	13.4	343°21.9	43.3
11	187°53.3	330°15.9	32.2	320°14.6	11.0	191°22.3	13.5	358°24.1	43.4
12	202°55.8	345°18.9	S22°32.1	335°15.3	S18°11.5	206°25.1	S03°13.6	13°26.3	S01°43.5
13	217°58.2	0°22.0	31.9	350°16.0	12.0	221°27.8	13.7	28°28.5	43.6
14	233°00.7	15°25.1	31.7	5°16.6	12.5	236°30.5	13.8	43°30.7	43.7
15	248°03.2	30°28.2	·· 31.5	20°17.3	·· 13.0	251°33.2	·· 13.9	58°32.8	·· 43.9
16	263°05.6	45°31.4	31.2	35°18.0	13.5	266°35.9	14.0	73°35.0	44.0
17	278°08.1	60°34.5	31.0	50°18.7	14.0	281°38.6	14.1	88°37.2	44.1
18	293°10.6	75°37.6	S22°30.8	65°19.4	S18°14.5	296°41.3	S03°14.2	103°39.4	S01°44.2
19	308°13.0	90°40.7	30.6	80°20.1	15.0	311°44.0	14.3	118°41.6	44.3
20	323°15.5	105°43.8	30.4	95°20.8	15.4	326°46.8	14.4	133°43.8	44.4
21	338°18.0	120°47.0	·· 30.2	110°21.5	·· 15.9	341°49.5	·· 14.5	148°45.9	·· 44.6
22	353°20.4	135°50.1	30.0	125°22.2	16.4	356°52.2	14.6	163°48.1	44.7
23	8°22.9	150°53.2	29.7	140°22.9	16.9	11°54.9	14.7	178°50.3	44.8
Mer.pass.:22:27		v3.1 d0.2 m-4.3		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	23°25.4	165°56.4	S22°29.5	155°23.6	S18°17.4	26°57.6	S03°14.8	193°52.5	S01°44.9
1	38°27.8	180°59.5	29.3	170°24.2	17.9	42°00.3	14.9	208°54.7	45.0
2	53°30.3	196°02.6	29.1	185°24.9	18.4	57°03.0	15.0	223°56.9	45.1
3	68°32.7	211°05.8	·· 28.8	200°25.6	·· 18.9	72°05.7	·· 15.1	238°59.0	·· 45.3
4	83°35.2	226°08.9	28.6	215°26.3	19.4	87°08.4	15.2	254°01.2	45.4
5	98°37.7	241°12.1	28.4	230°27.0	19.9	102°11.2	15.3	269°03.4	45.5
6	113°40.1	256°15.3	S22°28.1	245°27.7	S18°20.4	117°13.9	S03°15.4	284°05.6	S01°45.6
7	128°42.6	271°18.4	27.9	260°28.4	20.8	132°16.6	15.5	299°07.8	45.7
8	143°45.1	286°21.6	27.6	275°29.1	21.3	147°19.3	15.6	314°10.0	45.8
9	158°47.5	301°24.8	·· 27.4	290°29.8	·· 21.8	162°22.0	·· 15.7	329°12.1	·· 46.0
10	173°50.0	316°27.9	27.1	305°30.4	22.3	177°24.7	15.8	344°14.3	46.1
11	188°52.5	331°31.1	26.9	320°31.1	22.8	192°27.4	15.9	359°16.5	46.2
12	203°54.9	346°34.3	S22°26.6	335°31.8	S18°23.3	207°30.1	S03°16.0	14°18.7	S01°46.3
13	218°57.4	1°37.5	26.4	350°32.5	23.8	222°32.8	16.1	29°20.9	46.4
14	233°59.9	16°40.7	26.1	5°33.2	24.3	237°35.5	16.2	44°23.1	46.5
15	249°02.3	31°43.9	·· 25.9	20°33.9	·· 24.7	252°38.2	·· 16.3	59°25.2	·· 46.7
16	264°04.8	46°47.1	25.6	35°34.6	25.2	267°40.9	16.4	74°27.4	46.8
17	279°07.2	61°50.3	25.3	50°35.2	25.7	282°43.6	16.5	89°29.6	46.9
18	294°09.7	76°53.5	S22°25.1	65°35.9	S18°26.2	297°46.4	S03°16.6	104°31.8	S01°47.0
19	309°12.2	91°56.7	24.8	80°36.6	26.7	312°49.1	16.7	119°34.0	47.1
20	324°14.6	106°59.9	24.5	95°37.3	27.2	327°51.8	16.8	134°36.2	47.2
21	339°17.1	122°03.1	·· 24.2	110°38.0	·· 27.7	342°54.5	·· 16.9	149°38.3	·· 47.4
22	354°19.6	137°06.3	24.0	125°38.7	28.1	357°57.2	17.0	164°40.5	47.5
23	9°22.0	152°09.6	23.7	140°39.3	28.6	12°59.9	17.1	179°42.7	47.6
Mer.pass.:22:23		v3.1 d0.2 m-4.2		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.4
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°19.5	89°18.6
Acamar	315°19.4	-40°15.4
Menkar	314°16.8	4°08.1
Mirfak	308°42.8	49°54.0
Aldebaran	290°51.4	16°31.9
Rigel	281°13.7	-8°11.2
Capella	280°37.1	46°00.4
Bellatrix	278°33.9	6°21.7
Elnath	278°14.9	28°37.0
Alnilam	275°48.2	-1°11.6
Betelgeuse	271°03.3	7°24.6
Canopus	263°56.9	-52°41.8
Sirius	258°35.4	-16°43.7
Adhara	255°14.0	-28°59.0
Procyon	245°01.8	5°11.9
Pollux	243°30.1	27°59.9
Avior	234°19.0	-59°32.4
Suhail	222°54.1	-43°28.4
Miaplacidus	221°40.7	-69°45.5
Alphard	217°58.2	-8°42.2
Regulus	207°45.8	11°54.8
Dubhe	193°54.4	61°41.4
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.1
Acrux	173°12.4	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.0
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.6
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.8	74°06.7
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.8
Antares	112°28.9	-26°27.4
Atria	107°32.9	-69°03.0
Sabik	102°15.0	-15°44.2
Shaula	96°24.7	-37°06.7
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.2	51°29.6
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.4	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.1	-56°42.1
Deneb	49°32.7	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 13 Wed	**SHA**	**Mer.pass**
Venus	142°03.0	13:03
Mars	133°23.1	13:40
Jupiter	3°20.2	22:17
Saturn	170°40.6	11:10

Oct 14 Thu	**SHA**	**Mer.pass**
Venus	142°15.9	12:59
Mars	132°40.7	13:39
Jupiter	3°26.3	22:12
Saturn	170°33.9	11:06

Oct 15 Fri	**SHA**	**Mer.pass**
Venus	142°31.0	12:54
Mars	131°58.2	13:38
Jupiter	3°32.2	22:08
Saturn	170°27.1	11:03

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	183°24.1	S07°39.0	113°57.6	8.2'	S24°08.8	2.3'	56.6'
1	198°24.2	40.0	128°24.8	8.2'	24°06.5	2.4'	56.6'
2	213°24.4	40.9	142°52.0	8.3'	24°04.0	2.5'	56.6'
3	228°24.5	· · 41.8	157°19.4	8.4'	24°01.5	2.6'	56.5'
4	243°24.7	42.8	171°46.8	8.4'	23°58.7	2.8'	56.5'
5	258°24.8	43.7	186°14.2	8.5'	23°55.9	2.9'	56.5'
6	273°25.0	S07°44.6	200°41.8	8.6'	S23°52.9	3.0'	56.4'
7	288°25.1	45.6	215°09.4	8.6'	23°49.8	3.2'	56.4'
8	303°25.3	46.5	229°37.1	8.7'	23°46.6	3.3'	56.3'
9	318°25.4	· · 47.5	244°04.8	8.8'	23°43.3	3.4'	56.3'
10	333°25.6	48.4	258°32.7	8.9'	23°39.8	3.5'	56.3'
11	348°25.7	49.3	273°00.6	8.9'	23°36.2	3.7'	56.2'
12	3°25.9	S07°50.3	287°28.5	9.0'	S23°32.5	3.8'	56.2'
13	18°26.0	51.2	301°56.6	9.1'	23°28.6	3.9'	56.2'
14	33°26.2	52.1	316°24.7	9.2'	23°24.7	4.0'	56.1'
15	48°26.3	· · 53.1	330°52.9	9.2'	23°20.6	4.1'	56.1'
16	63°26.5	54.0	345°21.2	9.3'	23°16.4	4.3'	56.1'
17	78°26.6	54.9	359°49.6	9.4'	23°12.1	4.4'	56.0'
18	93°26.8	S07°55.9	14°18.0	9.5'	S23°07.6	4.5'	56.0'
19	108°26.9	56.8	28°46.6	9.6'	23°03.1	4.6'	56.0'
20	123°27.1	57.7	43°15.2	9.6'	22°58.4	4.7'	55.9'
21	138°27.2	· · 58.6	57°43.8	9.7'	22°53.6	4.8'	55.9'
22	153°27.4	07°59.6	72°12.6	9.8'	22°48.7	5.0'	55.9'
23	168°27.5	08°00.5	86°41.4	9.9'	22°43.7	5.1'	55.9'
	SD.=16.0	d=-0.9	S.D.=15.3				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	183°27.7	S08°01.4	101°10.4	10.0'	S22°38.6	5.2'	55.8'
1	198°27.8	02.4	115°39.4	10.0'	22°33.4	5.3'	55.8'
2	213°28.0	03.3	130°08.4	10.1'	22°28.1	5.4'	55.8'
3	228°28.1	· · 04.2	144°37.6	10.2'	22°22.6	5.5'	55.7'
4	243°28.3	05.2	159°06.8	10.3'	22°17.1	5.6'	55.7'
5	258°28.4	06.1	173°36.2	10.4'	22°11.4	5.7'	55.7'
6	273°28.5	S08°07.0	188°05.6	10.4'	S22°05.6	5.8'	55.6'
7	288°28.7	08.0	202°35.0	10.5'	21°59.8	5.9'	55.6'
8	303°28.8	08.9	217°04.6	10.6'	21°53.8	6.0'	55.6'
9	318°29.0	· · 09.8	231°34.3	10.7'	21°47.7	6.1'	55.6'
10	333°29.1	10.7	246°04.0	10.8'	21°41.5	6.2'	55.5'
11	348°29.3	11.7	260°33.8	10.8'	21°35.3	6.3'	55.5'
12	3°29.4	S08°12.6	275°03.7	10.9'	S21°28.9	6.4'	55.5'
13	18°29.6	13.5	289°33.6	11.0'	21°22.4	6.5'	55.4'
14	33°29.7	14.5	304°03.7	11.1'	21°15.8	6.6'	55.4'
15	48°29.8	· · 15.4	318°33.8	11.2'	21°09.2	6.7'	55.4'
16	63°30.0	16.3	333°04.0	11.3'	21°02.4	6.8'	55.4'
17	78°30.1	17.2	347°34.3	11.3'	20°55.6	6.9'	55.3'
18	93°30.3	S08°18.2	2°04.7	11.4'	S20°48.6	7.0'	55.3'
19	108°30.4	19.1	16°35.2	11.5'	20°41.6	7.1'	55.3'
20	123°30.6	20.0	31°05.7	11.6'	20°34.4	7.2'	55.3'
21	138°30.7	· · 21.0	45°36.3	11.7'	20°27.2	7.3'	55.2'
22	153°30.9	21.9	60°07.0	11.7'	20°19.9	7.4'	55.2'
23	168°31.0	22.8	74°37.8	11.8'	20°12.5	7.4'	55.2'
	SD.=16.0	d=-0.9	S.D.=15.1				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	183°31.1	S08°23.7	89°08.6	11.9'	S20°05.0	7.5'	55.2'
1	198°31.3	24.7	103°39.5	12.0'	19°57.4	7.6'	55.1'
2	213°31.4	25.6	118°10.6	12.0'	19°49.7	7.7'	55.1'
3	228°31.6	· · 26.5	132°41.6	12.1'	19°42.0	7.8'	55.1'
4	243°31.7	27.4	147°12.8	12.2'	19°34.2	7.9'	55.1'
5	258°31.8	28.4	161°44.0	12.3'	19°26.2	8.0'	55.0'
6	273°32.0	S08°29.3	176°15.4	12.4'	S19°18.2	8.0'	55.0'
7	288°32.1	30.2	190°46.8	12.4'	19°10.2	8.1'	55.0'
8	303°32.3	31.1	205°18.2	12.5'	19°02.0	8.2'	55.0'
9	318°32.4	· · 32.1	219°49.8	12.6'	18°53.8	8.3'	54.9'
10	333°32.5	33.0	234°21.4	12.7'	18°45.4	8.4'	54.9'
11	348°32.7	33.9	248°53.1	12.7'	18°37.0	8.4'	54.9'
12	3°32.8	S08°34.8	263°24.9	12.8'	S18°28.6	8.5'	54.9'
13	18°33.0	35.8	277°56.7	12.9'	18°20.0	8.6'	54.9'
14	33°33.1	36.7	292°28.6	13.0'	18°11.4	8.7'	54.8'
15	48°33.2	· · 37.6	307°00.6	13.0'	18°02.7	8.7'	54.8'
16	63°33.4	38.5	321°32.7	13.1'	17°53.9	8.8'	54.8'
17	78°33.5	39.5	336°04.8	13.2'	17°45.1	8.9'	54.8'
18	93°33.6	S08°40.4	350°37.0	13.2'	S17°36.2	8.9'	54.8'
19	108°33.8	41.3	5°09.3	13.3'	17°27.2	9.0'	54.7'
20	123°33.9	42.2	19°41.6	13.4'	17°18.1	9.1'	54.7'
21	138°34.1	· · 43.1	34°14.1	13.5'	17°09.0	9.2'	54.7'
22	153°34.2	44.1	48°46.5	13.5'	16°59.8	9.2'	54.7'
23	168°34.3	45.0	63°19.1	13.6'	16°50.6	9.3'	54.7'
	SD.=16.0	d=-0.9	S.D.=15.0				

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

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

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 36-56%
13	13:36	13:44	11:46	17:01	04:34	
14	13:51	13:58	11:46	17:51	05:26	
15	14:05	14:11	11:46	18:39	06:15	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	24°24.5	167°12.8	S22°23.4	155°40.0	S18°29.1	28°02.6	S03°17.2	194°44.9	S01°47.7
1	39°27.0	182°16.0	23.1	170°40.7	29.6	43°05.3	17.3	209°47.1	47.8
2	54°29.4	197°19.3	22.8	185°41.4	30.1	58°08.0	17.4	224°49.3	47.9
3	69°31.9	212°22.5	·· 22.5	200°42.1	·· 30.6	73°10.7	·· 17.5	239°51.4	·· 48.1
4	84°34.3	227°25.7	22.2	215°42.8	31.1	88°13.4	17.6	254°53.6	48.2
5	99°36.8	242°29.0	21.9	230°43.4	31.5	103°16.1	17.7	269°55.8	48.3
6	114°39.3	257°32.2	S22°21.6	245°44.1	S18°32.0	118°18.8	S03°17.8	284°58.0	S01°48.4
7	129°41.7	272°35.5	21.3	260°44.8	32.5	133°21.5	17.9	300°00.2	48.5
8	144°44.2	287°38.7	21.0	275°45.5	33.0	148°24.2	18.0	315°02.4	48.6
9	159°46.7	302°42.0	·· 20.7	290°46.2	·· 33.5	163°26.9	·· 18.1	330°04.5	·· 48.7
10	174°49.1	317°45.3	20.4	305°46.8	34.0	178°29.6	18.2	345°06.7	48.9
11	189°51.6	332°48.5	20.1	320°47.5	34.4	193°32.3	18.3	0°08.9	49.0
12	204°54.1	347°51.8	S22°19.8	335°48.2	S18°34.9	208°35.0	S03°18.4	15°11.1	S01°49.1
13	219°56.5	2°55.1	19.5	350°48.9	35.4	223°37.7	18.5	30°13.3	49.2
14	234°59.0	17°58.4	19.2	5°49.6	35.9	238°40.4	18.6	45°15.5	49.3
15	250°01.5	33°01.6	·· 18.9	20°50.2	·· 36.4	253°43.1	·· 18.7	60°17.7	·· 49.4
16	265°03.9	48°04.9	18.5	35°50.9	36.8	268°45.9	18.8	75°19.8	49.6
17	280°06.4	63°08.2	18.2	50°51.6	37.3	283°48.6	18.9	90°22.0	49.7
18	295°08.8	78°11.5	S22°17.9	65°52.3	S18°37.8	298°51.3	S03°19.0	105°24.2	S01°49.8
19	310°11.3	93°14.8	17.6	80°52.9	38.3	313°54.0	19.0	120°26.4	49.9
20	325°13.8	108°18.1	17.2	95°53.6	38.8	328°56.7	19.1	135°28.6	50.0
21	340°16.2	123°21.4	·· 16.9	110°54.3	·· 39.2	343°59.4	·· 19.2	150°30.8	·· 50.1
22	355°18.7	138°24.7	16.6	125°55.0	39.7	359°02.1	19.3	165°32.9	50.3
23	10°21.2	153°28.0	16.2	140°55.7	40.2	14°04.8	19.4	180°35.1	50.4
Mer.pass.:22:19		v3.2 d0.3 m-4.2		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	25°23.6	168°31.3	S22°15.9	155°56.3	S18°40.7	29°07.5	S03°19.5	195°37.3	S01°50.5
1	40°26.1	183°34.6	15.5	170°57.0	41.2	44°10.2	19.6	210°39.5	50.6
2	55°28.6	198°38.0	15.2	185°57.7	41.6	59°12.9	19.7	225°41.7	50.7
3	70°31.0	213°41.3	·· 14.8	200°58.4	·· 42.1	74°15.6	·· 19.8	240°43.9	·· 50.8
4	85°33.5	228°44.6	14.5	215°59.0	42.6	89°18.3	19.9	255°46.1	51.0
5	100°36.0	243°47.9	14.1	230°59.7	43.1	104°21.0	20.0	270°48.2	51.1
6	115°38.4	258°51.3	S22°13.8	246°00.4	S18°43.5	119°23.7	S03°20.1	285°50.4	S01°51.2
7	130°40.9	273°54.6	13.4	261°01.1	44.0	134°26.4	20.2	300°52.6	51.3
8	145°43.3	288°57.9	13.0	276°01.7	44.5	149°29.1	20.3	315°54.8	51.4
9	160°45.8	304°01.3	·· 12.7	291°02.4	·· 45.0	164°31.8	·· 20.4	330°57.0	·· 51.5
10	175°48.3	319°04.6	12.3	306°03.1	45.5	179°34.5	20.5	345°59.2	51.6
11	190°50.7	334°08.0	11.9	321°03.8	45.9	194°37.1	20.6	1°01.3	51.8
12	205°53.2	349°11.3	S22°11.6	336°04.4	S18°46.4	209°39.8	S03°20.7	16°03.5	S01°51.9
13	220°55.7	4°14.7	11.2	351°05.1	46.9	224°42.5	20.8	31°05.7	52.0
14	235°58.1	19°18.1	10.8	6°05.8	47.4	239°45.2	20.8	46°07.9	52.1
15	251°00.6	34°21.4	·· 10.4	21°06.4	·· 47.8	254°47.9	·· 20.9	61°10.1	·· 52.2
16	266°03.1	49°24.8	10.1	36°07.1	48.3	269°50.6	21.0	76°12.3	52.3
17	281°05.5	64°28.2	09.7	51°07.8	48.8	284°53.3	21.1	91°14.5	52.5
18	296°08.0	79°31.5	S22°09.3	66°08.5	S18°49.3	299°56.0	S03°21.2	106°16.6	S01°52.6
19	311°10.4	94°34.9	08.9	81°09.1	49.7	314°58.7	21.3	121°18.8	52.7
20	326°12.9	109°38.3	08.5	96°09.8	50.2	330°01.4	21.4	136°21.0	52.8
21	341°15.4	124°41.7	·· 08.1	111°10.5	·· 50.7	345°04.1	·· 21.5	151°23.2	·· 52.9
22	356°17.8	139°45.1	07.7	126°11.1	51.1	0°06.8	21.6	166°25.4	53.0
23	11°20.3	154°48.5	07.3	141°11.8	51.6	15°09.5	21.7	181°27.6	53.1
Mer.pass.:22:15		v3.3 d0.3 m-4.2		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	26°22.8	169°51.8	S22°06.9	156°12.5	S18°52.1	30°12.2	S03°21.8	196°29.7	S01°53.3
1	41°25.2	184°55.2	06.5	171°13.1	52.6	45°14.9	21.9	211°31.9	53.4
2	56°27.7	199°58.6	06.1	186°13.8	53.0	60°17.6	22.0	226°34.1	53.5
3	71°30.2	215°02.0	·· 05.7	201°14.5	·· 53.5	75°20.3	·· 22.1	241°36.3	·· 53.6
4	86°32.6	230°05.5	05.3	216°15.2	54.0	90°23.0	22.1	256°38.5	53.7
5	101°35.1	245°08.9	04.9	231°15.8	54.5	105°25.7	22.2	271°40.7	53.8
6	116°37.6	260°12.3	S22°04.4	246°16.5	S18°54.9	120°28.4	S03°22.3	286°42.9	S01°54.0
7	131°40.0	275°15.7	04.0	261°17.2	55.4	135°31.1	22.4	301°45.0	54.1
8	146°42.5	290°19.1	03.6	276°17.8	55.9	150°33.8	22.5	316°47.2	54.2
9	161°44.9	305°22.5	·· 03.2	291°18.5	·· 56.3	165°36.4	·· 22.6	331°49.4	·· 54.3
10	176°47.4	320°26.0	02.8	306°19.2	56.8	180°39.1	22.7	346°51.6	54.4
11	191°49.9	335°29.4	02.3	321°19.8	57.3	195°41.8	22.8	1°53.8	54.5
12	206°52.3	350°32.8	S22°01.9	336°20.5	S18°57.7	210°44.5	S03°22.9	16°56.0	S01°54.6
13	221°54.8	5°36.3	01.5	351°21.2	58.2	225°47.2	23.0	31°58.2	54.8
14	236°57.3	20°39.7	01.0	6°21.8	58.7	240°49.9	23.1	47°00.3	54.9
15	251°59.7	35°43.1	·· 00.6	21°22.5	·· 59.2	255°52.6	·· 23.2	62°02.5	·· 55.0
16	267°02.2	50°46.6	22°00.1	36°23.1	18°59.6	270°55.3	23.2	77°04.7	55.1
17	282°04.7	65°50.0	21°59.7	51°23.8	19°00.1	285°58.0	23.3	92°06.9	55.2
18	297°07.1	80°53.5	S21°59.2	66°24.5	S19°00.6	301°00.7	S03°23.4	107°09.1	S01°55.3
19	312°09.6	95°56.9	58.8	81°25.1	01.0	316°03.4	23.5	122°11.3	55.5
20	327°12.0	111°00.4	58.3	96°25.8	01.5	331°06.0	23.6	137°13.5	55.6
21	342°14.5	126°03.9	·· 57.9	111°26.5	·· 02.0	346°08.7	·· 23.7	152°15.6	·· 55.7
22	357°17.0	141°07.3	57.4	126°27.1	02.4	1°11.4	23.8	167°17.8	55.8
23	12°19.4	156°10.8	57.0	141°27.8	02.9	16°14.1	23.9	182°20.0	55.9
Mer.pass.:22:11		v3.4 d0.4 m-4.2		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°18.9	89°18.6
Acamar	315°19.3	-40°15.5
Menkar	314°16.8	4°08.1
Mirfak	308°42.7	49°54.0
Aldebaran	290°51.4	16°31.9
Rigel	281°13.7	-8°11.2
Capella	280°37.0	46°00.4
Bellatrix	278°33.9	6°21.7
Elnath	278°14.9	28°37.0
Alnilam	275°48.2	-1°11.6
Betelgeuse	271°03.2	7°24.6
Canopus	263°56.8	-52°41.8
Sirius	258°35.3	-16°43.7
Adhara	255°14.0	-28°59.0
Procyon	245°01.7	5°11.9
Pollux	243°30.1	27°59.9
Avior	234°19.0	-59°32.4
Suhail	222°54.1	-43°28.4
Miaplacidus	221°40.6	-69°45.4
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°54.4	61°41.3
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.1
Acrux	173°12.4	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.0
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.6
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.8	74°06.7
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.8
Antares	112°28.9	-26°27.4
Atria	107°32.9	-69°03.0
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.3	51°29.5
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.4	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.1	-56°42.1
Deneb	49°32.7	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 16 Sat	**SHA**	**Mer.pass**
Venus	142°48.3	12:48
Mars	131°15.5	13:37
Jupiter	3°38.1	22:04
Saturn	170°20.4	10:59

Oct 17 Sun	**SHA**	**Mer.pass**
Venus	143°07.7	12:43
Mars	130°32.7	13:36
Jupiter	3°43.8	22:00
Saturn	170°13.7	10:56

Oct 18 Mon	**SHA**	**Mer.pass**
Venus	143°29.1	12:38
Mars	129°49.7	13:35
Jupiter	3°49.4	21:55
Saturn	170°07.0	10:52

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°34.5	S08°45.9	77°51.7	13.7'	S16°41.3	9.4'	54.6'
1	198°34.6	46.8	92°24.4	13.7'	16°31.9	9.4'	54.6'
2	213°34.7	47.8	106°57.2	13.8'	16°22.4	9.5'	54.6'
3	228°34.9	· · 48.7	121°30.0	13.9'	16°12.9	9.5'	54.6'
4	243°35.0	49.6	136°02.9	13.9'	16°03.3	9.6'	54.6'
5	258°35.1	50.5	150°35.8	14.0'	15°53.7	9.7'	54.6'
6	273°35.3	S08°51.4	165°08.8	14.0'	S15°44.0	9.7'	54.5'
7	288°35.4	52.4	179°41.9	14.1'	15°34.2	9.8'	54.5'
8	303°35.6	53.3	194°15.1	14.2'	15°24.4	9.9'	54.5'
9	318°35.7	· · 54.2	208°48.3	14.2'	15°14.5	9.9'	54.5'
10	333°35.8	55.1	223°21.5	14.3'	15°04.6	10.0'	54.5'
11	348°36.0	56.0	237°54.8	14.4'	14°54.6	10.0'	54.5'
12	3°36.1	S08°56.9	252°28.2	14.4'	S14°44.5	10.1'	54.5'
13	18°36.2	57.9	267°01.7	14.5'	14°34.4	10.1'	54.4'
14	33°36.4	58.8	281°35.2	14.5'	14°24.3	10.2'	54.4'
15	48°36.5	08°59.7	296°08.7	14.6'	14°14.1	10.2'	54.4'
16	63°36.6	09°00.6	310°42.3	14.6'	14°03.8	10.3'	54.4'
17	78°36.8	01.5	325°16.0	14.7'	13°53.5	10.3'	54.4'
18	93°36.9	S09°02.5	339°49.7	14.7'	S13°43.1	10.4'	54.4'
19	108°37.0	03.4	354°23.5	14.8'	13°32.7	10.4'	54.4'
20	123°37.1	04.3	8°57.3	14.9'	13°22.2	10.5'	54.3'
21	138°37.3	· · 05.2	23°31.2	14.9'	13°11.7	10.5'	54.3'
22	153°37.4	06.1	38°05.1	15.0'	13°01.1	10.6'	54.3'
23	168°37.5	07.0	52°39.1	15.0'	12°50.5	10.6'	54.3'
	SD.=16.0	d=-0.9	S.D.=14.8				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°37.7	S09°08.0	67°13.1	15.1'	S12°39.8	10.7'	54.3'
1	198°37.8	08.9	81°47.2	15.1'	12°29.1	10.7'	54.3'
2	213°37.9	09.8	96°21.4	15.2'	12°18.3	10.8'	54.3'
3	228°38.1	· · 10.7	110°55.5	15.2'	12°07.5	10.8'	54.3'
4	243°38.2	11.6	125°29.8	15.2'	11°56.7	10.9'	54.3'
5	258°38.3	12.5	140°04.0	15.3'	11°45.8	10.9'	54.2'
6	273°38.4	S09°13.4	154°38.4	15.3'	S11°34.9	11.0'	54.2'
7	288°38.6	14.4	169°12.7	15.4'	11°23.9	11.0'	54.2'
8	303°38.7	15.3	183°47.1	15.4'	11°12.9	11.0'	54.2'
9	318°38.8	· · 16.2	198°21.6	15.5'	11°01.8	11.1'	54.2'
10	333°39.0	17.1	212°56.1	15.5'	10°50.7	11.1'	54.2'
11	348°39.1	18.0	227°30.6	15.6'	10°39.6	11.2'	54.2'
12	3°39.2	S09°18.9	242°05.2	15.6'	S10°28.4	11.2'	54.2'
13	18°39.3	19.8	256°39.8	15.6'	10°17.2	11.2'	54.2'
14	33°39.5	20.8	271°14.4	15.7'	10°06.0	11.3'	54.2'
15	48°39.6	· · 21.7	285°49.1	15.7'	09°54.7	11.3'	54.2'
16	63°39.7	22.6	300°23.8	15.7'	09°43.3	11.3'	54.2'
17	78°39.8	23.5	314°58.6	15.8'	09°32.0	11.4'	54.2'
18	93°40.0	S09°24.4	329°33.4	15.8'	S09°20.6	11.4'	54.1'
19	108°40.1	25.3	344°08.2	15.8'	09°09.2	11.4'	54.1'
20	123°40.2	26.2	358°43.1	15.9'	08°57.7	11.5'	54.1'
21	138°40.3	· · 27.1	13°18.0	15.9'	08°46.2	11.5'	54.1'
22	153°40.5	28.0	27°52.9	15.9'	08°34.7	11.5'	54.1'
23	168°40.6	29.0	42°27.9	16.0'	08°23.1	11.6'	54.1'
	SD.=16.0	d=-0.9	S.D.=14.8				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°40.7	S09°29.9	57°02.8	16.0'	S08°11.6	11.6'	54.1'
1	198°40.8	30.8	71°37.9	16.0'	07°59.9	11.6'	54.1'
2	213°41.0	31.7	86°12.9	16.1'	07°48.3	11.7'	54.1'
3	228°41.1	· · 32.6	100°48.0	16.1'	07°36.6	11.7'	54.1'
4	243°41.2	33.5	115°23.1	16.1'	07°24.9	11.7'	54.1'
5	258°41.3	34.4	129°58.2	16.1'	07°13.2	11.7'	54.1'
6	273°41.5	S09°35.3	144°33.3	16.2'	S07°01.4	11.8'	54.1'
7	288°41.6	36.2	159°08.5	16.2'	06°49.7	11.8'	54.1'
8	303°41.7	37.1	173°43.7	16.2'	06°37.9	11.8'	54.1'
9	318°41.8	· · 38.1	188°18.9	16.2'	06°26.0	11.8'	54.1'
10	333°42.0	39.0	202°54.1	16.2'	06°14.2	11.9'	54.1'
11	348°42.1	39.9	217°29.4	16.3'	06°02.3	11.9'	54.1'
12	3°42.2	S09°40.8	232°04.7	16.3'	S05°50.4	11.9'	54.1'
13	18°42.3	41.7	246°40.0	16.3'	05°38.5	11.9'	54.1'
14	33°42.4	42.6	261°15.3	16.3'	05°26.5	12.0'	54.1'
15	48°42.6	· · 43.5	275°50.6	16.3'	05°14.6	12.0'	54.1'
16	63°42.7	44.4	290°25.9	16.3'	05°02.6	12.0'	54.1'
17	78°42.8	45.3	305°01.3	16.4'	04°50.6	12.0'	54.1'
18	93°42.9	S09°46.2	319°36.7	16.4'	S04°38.6	12.0'	54.1'
19	108°43.0	47.1	334°12.1	16.4'	04°26.5	12.0'	54.1'
20	123°43.2	48.0	348°47.5	16.4'	04°14.5	12.1'	54.1'
21	138°43.3	· · 48.9	3°22.9	16.4'	04°02.4	12.1'	54.1'
22	153°43.4	49.8	17°58.3	16.4'	03°50.3	12.1'	54.1'
23	168°43.5	50.7	32°33.7	16.4'	03°38.2	12.1'	54.1'
	SD.=16.0	d=-0.9	S.D.=14.7				

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

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

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 9-11 65-82%
16	14:18	14:24	11:46	19:23	07:01	
17	14:31	14:37	11:45	20:05	07:44	
18	14:43	14:49	11:45	20:46	08:26	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	27°21.9	171°14.3	S21°56.5	156°28.5	S19°03.4	31°16.8	S03°24.0	197°22.2	S01°56.0
1	42°24.4	186°17.7	56.1	171°29.1	03.8	46°19.5	24.1	212°24.4	56.1
2	57°26.8	201°21.2	55.6	186°29.8	04.3	61°22.2	24.1	227°26.6	56.3
3	72°29.3	216°24.7	·· 55.1	201°30.4	·· 04.8	76°24.9	·· 24.2	242°28.8	·· 56.4
4	87°31.8	231°28.2	54.6	216°31.1	05.2	91°27.6	24.3	257°30.9	56.5
5	102°34.2	246°31.7	54.2	231°31.8	05.7	106°30.3	24.4	272°33.1	56.6
6	117°36.7	261°35.1	S21°53.7	246°32.4	S19°06.2	121°32.9	S03°24.5	287°35.3	S01°56.7
7	132°39.2	276°38.6	53.2	261°33.1	06.6	136°35.6	24.6	302°37.5	56.8
8	147°41.6	291°42.1	52.7	276°33.7	07.1	151°38.3	24.7	317°39.7	56.9
9	162°44.1	306°45.6	·· 52.2	291°34.4	·· 07.5	166°41.0	·· 24.8	332°41.9	·· 57.1
10	177°46.5	321°49.1	51.8	306°35.1	08.0	181°43.7	24.9	347°44.1	57.2
11	192°49.0	336°52.6	51.3	321°35.7	08.5	196°46.4	24.9	2°46.2	57.3
12	207°51.5	351°56.1	S21°50.8	336°36.4	S19°08.9	211°49.1	S03°25.0	17°48.4	S01°57.4
13	222°53.9	6°59.6	50.3	351°37.0	09.4	226°51.7	25.1	32°50.6	57.5
14	237°56.4	22°03.2	49.8	6°37.7	09.9	241°54.4	25.2	47°52.8	57.6
15	252°58.9	37°06.7	·· 49.3	21°38.4	·· 10.3	256°57.1	·· 25.3	62°55.0	·· 57.7
16	268°01.3	52°10.2	48.8	36°39.0	10.8	271°59.8	25.4	77°57.2	57.9
17	283°03.8	67°13.7	48.3	51°39.7	11.3	287°02.5	25.5	92°59.4	58.0
18	298°06.3	82°17.2	S21°47.8	66°40.3	S19°11.7	302°05.2	S03°25.6	108°01.6	S01°58.1
19	313°08.7	97°20.8	47.3	81°41.0	12.2	317°07.9	25.7	123°03.7	58.2
20	328°11.2	112°24.3	46.8	96°41.7	12.6	332°10.5	25.7	138°05.9	58.3
21	343°13.7	127°27.8	·· 46.2	111°42.3	·· 13.1	347°13.2	·· 25.8	153°08.1	·· 58.4
22	358°16.1	142°31.4	45.7	126°43.0	13.6	2°15.9	25.9	168°10.3	58.5
23	13°18.6	157°34.9	45.2	141°43.6	14.0	17°18.6	26.0	183°12.5	58.7
Mer.pass.:22:07		v3.5 d0.5 m-4.1		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	28°21.0	172°38.4	S21°44.7	156°44.3	S19°14.5	32°21.3	S03°26.1	198°14.7	S01°58.8
1	43°23.5	187°42.0	44.2	171°44.9	14.9	47°24.0	26.2	213°16.9	58.9
2	58°26.0	202°45.5	43.6	186°45.6	15.4	62°26.6	26.3	228°19.0	59.0
3	73°28.4	217°49.1	·· 43.1	201°46.2	·· 15.9	77°29.3	·· 26.3	243°21.2	·· 59.1
4	88°30.9	232°52.6	42.6	216°46.9	16.3	92°32.0	26.4	258°23.4	59.2
5	103°33.4	247°56.2	42.0	231°47.6	16.8	107°34.7	26.5	273°25.6	59.3
6	118°35.8	262°59.7	S21°41.5	246°48.2	S19°17.2	122°37.4	S03°26.6	288°27.8	S01°59.5
7	133°38.3	278°03.3	41.0	261°48.9	17.7	137°40.1	26.7	303°30.0	59.6
8	148°40.8	293°06.9	40.4	276°49.5	18.2	152°42.7	26.8	318°32.2	59.7
9	163°43.2	308°10.4	·· 39.9	291°50.2	·· 18.6	167°45.4	·· 26.9	333°34.4	·· 59.8
10	178°45.7	323°14.0	39.3	306°50.8	19.1	182°48.1	27.0	348°36.5	01°59.9
11	193°48.1	338°17.6	38.8	321°51.5	19.5	197°50.8	27.0	3°38.7	02°00.0
12	208°50.6	353°21.1	S21°38.2	336°52.1	S19°20.0	212°53.5	S03°27.1	18°40.9	S02°00.1
13	223°53.1	8°24.7	37.7	351°52.8	20.4	227°56.1	27.2	33°43.1	00.3
14	238°55.5	23°28.3	37.1	6°53.4	20.9	242°58.8	27.3	48°45.3	00.4
15	253°58.0	38°31.9	·· 36.6	21°54.1	·· 21.4	258°01.5	·· 27.4	63°47.5	·· 00.5
16	269°00.5	53°35.5	36.0	36°54.7	21.8	273°04.2	27.5	78°49.7	00.6
17	284°02.9	68°39.0	35.5	51°55.4	22.3	288°06.9	27.6	93°51.8	00.7
18	299°05.4	83°42.6	S21°34.9	66°56.0	S19°22.7	303°09.5	S03°27.6	108°54.0	S02°00.8
19	314°07.9	98°46.2	34.3	81°56.7	23.2	318°12.2	27.7	123°56.2	00.9
20	329°10.3	113°49.8	33.8	96°57.3	23.6	333°14.9	27.8	138°58.4	01.1
21	344°12.8	128°53.4	·· 33.2	111°58.0	·· 24.1	348°17.6	·· 27.9	154°00.6	·· 01.2
22	359°15.3	143°57.0	32.6	126°58.6	24.5	3°20.3	28.0	169°02.8	01.3
23	14°17.7	159°00.6	32.0	141°59.3	25.0	18°22.9	28.1	184°05.0	01.4
Mer.pass.:22:03		v3.5 d0.5 m-4.1		v0.7 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	29°20.2	174°04.2	S21°31.4	156°59.9	S19°25.4	33°25.6	S03°28.1	199°07.2	S02°01.5
1	44°22.6	189°07.8	30.9	172°00.6	25.9	48°28.3	28.2	214°09.3	01.6
2	59°25.1	204°11.4	30.3	187°01.2	26.4	63°31.0	28.3	229°11.5	01.7
3	74°27.6	219°15.1	·· 29.7	202°01.9	·· 26.8	78°33.6	·· 28.4	244°13.7	·· 01.9
4	89°30.0	234°18.7	29.1	217°02.5	27.3	93°36.3	28.5	259°15.9	02.0
5	104°32.5	249°22.3	28.5	232°03.2	27.7	108°39.0	28.6	274°18.1	02.1
6	119°35.0	264°25.9	S21°27.9	247°03.8	S19°28.2	123°41.7	S03°28.6	289°20.3	S02°02.2
7	134°37.4	279°29.5	27.3	262°04.5	28.6	138°44.4	28.7	304°22.5	02.3
8	149°39.9	294°33.1	26.7	277°05.1	29.1	153°47.0	28.8	319°24.7	02.4
9	164°42.4	309°36.8	·· 26.1	292°05.8	·· 29.5	168°49.7	·· 28.9	334°26.8	·· 02.5
10	179°44.8	324°40.4	25.5	307°06.4	30.0	183°52.4	29.0	349°29.0	02.7
11	194°47.3	339°44.0	24.9	322°07.1	30.4	198°55.1	29.1	4°31.2	02.8
12	209°49.7	354°47.7	S21°24.3	337°07.7	S19°30.9	213°57.7	S03°29.1	19°33.4	S02°02.9
13	224°52.2	9°51.3	23.7	352°08.3	31.3	229°00.4	29.2	34°35.6	03.0
14	239°54.7	24°54.9	23.1	7°09.0	31.8	244°03.1	29.3	49°37.8	03.1
15	254°57.1	39°58.6	·· 22.5	22°09.6	·· 32.2	259°05.8	·· 29.4	64°40.0	·· 03.2
16	269°59.6	55°02.2	21.8	37°10.3	32.7	274°08.4	29.5	79°42.2	03.3
17	285°02.1	70°05.9	21.2	52°10.9	33.1	289°11.1	29.6	94°44.3	03.4
18	300°04.5	85°09.5	S21°20.6	67°11.6	S19°33.6	304°13.8	S03°29.6	109°46.5	S02°03.6
19	315°07.0	100°13.2	20.0	82°12.2	34.0	319°16.4	29.7	124°48.7	03.7
20	330°09.5	115°16.8	19.3	97°12.9	34.5	334°19.1	29.8	139°50.9	03.8
21	345°11.9	130°20.5	·· 18.7	112°13.5	·· 34.9	349°21.8	·· 29.9	154°53.1	·· 03.9
22	0°14.4	145°24.1	18.1	127°14.1	35.4	4°24.5	30.0	169°55.3	04.0
23	15°16.9	160°27.8	17.5	142°14.8	35.8	19°27.1	30.1	184°57.5	04.1
Mer.pass.:21:59		v3.6 d0.6 m-4.0		v0.6 d-0.5 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.0
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°18.4	89°18.7
Acamar	315°19.3	-40°15.5
Menkar	314°16.8	4°08.1
Mirfak	308°42.7	49°54.0
Aldebaran	290°51.3	16°31.9
Rigel	281°13.7	-8°11.2
Capella	280°37.0	46°00.4
Bellatrix	278°33.9	6°21.7
Elnath	278°14.8	28°37.0
Alnilam	275°48.1	-1°11.6
Betelgeuse	271°03.2	7°24.6
Canopus	263°56.8	-52°41.8
Sirius	258°35.3	-16°43.7
Adhara	255°14.0	-28°59.0
Procyon	245°01.7	5°11.9
Pollux	243°30.0	27°59.9
Avior	234°19.0	-59°32.4
Suhail	222°54.1	-43°28.4
Miaplacidus	221°40.6	-69°45.4
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°54.4	61°41.3
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.1
Acrux	173°12.3	-63°09.5
Gacrux	172°03.8	-57°10.4
Alioth	166°22.8	55°54.0
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.5
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.8	74°06.7
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.8
Antares	112°28.9	-26°27.4
Atria	107°32.9	-69°03.0
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.3	51°29.5
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.4	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.1	8°54.0
Peacock	53°22.1	-56°42.1
Deneb	49°32.8	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 19 Tue	**SHA**	**Mer.pass**
Venus	143°52.4	12:32
Mars	129°06.6	13:34
Jupiter	3°54.9	21:51
Saturn	170°00.3	10:49

Oct 20 Wed	**SHA**	**Mer.pass**
Venus	144°17.4	12:26
Mars	128°23.2	13:32
Jupiter	4°00.2	21:47
Saturn	169°53.6	10:45

Oct 21 Thu	**SHA**	**Mer.pass**
Venus	144°44.0	12:21
Mars	127°39.8	13:31
Jupiter	4°05.4	21:42
Saturn	169°47.0	10:42

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°43.6	S09°51.6	47°09.1	16.4'	S03°26.1	12.1'	54.1'
1	198°43.7	52.6	61°44.6	16.4'	03°14.0	12.1'	54.1'
2	213°43.9	53.5	76°20.0	16.5'	03°01.8	12.2'	54.1'
3	228°44.0	· · 54.4	90°55.5	16.5'	02°49.7	12.2'	54.1'
4	243°44.1	55.3	105°30.9	16.5'	02°37.5	12.2'	54.1'
5	258°44.2	56.2	120°06.4	16.5'	02°25.3	12.2'	54.1'
6	273°44.3	S09°57.1	134°41.9	16.5'	S02°13.1	12.2'	54.1'
7	288°44.4	58.0	149°17.3	16.5'	02°00.9	12.2'	54.1'
8	303°44.6	58.9	163°52.8	16.5'	01°48.7	12.2'	54.1'
9	318°44.7	09°59.8	178°28.3	16.5'	01°36.5	12.2'	54.1'
10	333°44.8	10°00.7	193°03.8	16.5'	01°24.3	12.2'	54.1'
11	348°44.9	01.6	207°39.2	16.5'	01°12.0	12.2'	54.1'
12	3°45.0	S10°02.5	222°14.7	16.5'	S00°59.8	12.2'	54.1'
13	18°45.1	03.4	236°50.2	16.5'	00°47.5	12.3'	54.1'
14	33°45.3	04.3	251°25.6	16.5'	00°35.3	12.3'	54.1'
15	48°45.4	· · 05.2	266°01.1	16.5'	00°23.0	12.3'	54.1'
16	63°45.5	06.1	280°36.5	16.4'	S00°10.8	12.3'	54.1'
17	78°45.6	07.0	295°12.0	16.4'	N00°01.5	12.3'	54.1'
18	93°45.7	S10°07.9	309°47.4	16.4'	N00°13.8	12.3'	54.1'
19	108°45.8	08.8	324°22.8	16.4'	00°26.1	12.3'	54.1'
20	123°45.9	09.7	338°58.2	16.4'	00°38.3	12.3'	54.1'
21	138°46.0	· · 10.6	353°33.7	16.4'	00°50.6	12.3'	54.2'
22	153°46.2	11.5	8°09.1	16.4'	01°02.9	12.3'	54.2'
23	168°46.3	12.4	22°44.4	16.4'	01°15.2	12.3'	54.2'
	SD.=16.0	d=-0.9	S.D.=14.7				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°46.4	S10°13.3	37°19.8	16.4'	N01°27.4	12.3'	54.2'
1	198°46.5	14.2	51°55.2	16.4'	01°39.7	12.3'	54.2'
2	213°46.6	15.1	66°30.5	16.3'	01°52.0	12.3'	54.2'
3	228°46.7	· · 16.0	81°05.8	16.3'	02°04.2	12.3'	54.2'
4	243°46.8	16.9	95°41.1	16.3'	02°16.5	12.3'	54.2'
5	258°46.9	17.8	110°16.4	16.3'	02°28.8	12.3'	54.2'
6	273°47.0	S10°18.7	124°51.7	16.3'	N02°41.0	12.3'	54.2'
7	288°47.2	19.6	139°27.0	16.2'	02°53.3	12.2'	54.2'
8	303°47.3	20.5	154°02.2	16.2'	03°05.5	12.2'	54.2'
9	318°47.4	· · 21.4	168°37.4	16.2'	03°17.7	12.2'	54.2'
10	333°47.5	22.2	183°12.6	16.2'	03°30.0	12.2'	54.2'
11	348°47.6	23.1	197°47.8	16.2'	03°42.2	12.2'	54.3'
12	3°47.7	S10°24.0	212°22.9	16.1'	N03°54.4	12.2'	54.3'
13	18°47.8	24.9	226°58.1	16.1'	04°06.6	12.2'	54.3'
14	33°47.9	25.8	241°33.2	16.1'	04°18.8	12.2'	54.3'
15	48°48.0	· · 26.7	256°08.2	16.1'	04°30.9	12.2'	54.3'
16	63°48.1	27.6	270°43.3	16.0'	04°43.1	12.2'	54.3'
17	78°48.2	28.5	285°18.3	16.0'	04°55.3	12.1'	54.3'
18	93°48.3	S10°29.4	299°53.3	16.0'	N05°07.4	12.1'	54.3'
19	108°48.5	30.3	314°28.3	15.9'	05°19.5	12.1'	54.3'
20	123°48.6	31.2	329°03.2	15.9'	05°31.6	12.1'	54.3'
21	138°48.7	· · 32.1	343°38.1	15.9'	05°43.7	12.1'	54.3'
22	153°48.8	33.0	358°13.0	15.9'	05°55.8	12.1'	54.4'
23	168°48.9	33.9	12°47.8	15.8'	06°07.8	12.0'	54.4'
	SD.=16.1	d=-0.9	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°49.0	S10°34.8	27°22.6	15.8'	N06°19.8	12.0'	54.4'
1	198°49.1	35.7	41°57.4	15.8'	06°31.9	12.0'	54.4'
2	213°49.2	36.5	56°32.1	15.7'	06°43.9	12.0'	54.4'
3	228°49.3	· · 37.4	71°06.8	15.7'	06°55.8	12.0'	54.4'
4	243°49.4	38.3	85°41.5	15.6'	07°07.8	11.9'	54.4'
5	258°49.5	39.2	100°16.1	15.6'	07°19.7	11.9'	54.4'
6	273°49.6	S10°40.1	114°50.7	15.6'	N07°31.6	11.9'	54.4'
7	288°49.7	41.0	129°25.3	15.5'	07°43.5	11.9'	54.5'
8	303°49.8	41.9	143°59.8	15.5'	07°55.3	11.8'	54.5'
9	318°49.9	· · 42.8	158°34.2	15.4'	08°07.2	11.8'	54.5'
10	333°50.0	43.7	173°08.7	15.4'	08°19.0	11.8'	54.5'
11	348°50.1	44.6	187°43.0	15.4'	08°30.8	11.8'	54.5'
12	3°50.2	S10°45.4	202°17.4	15.3'	N08°42.5	11.7'	54.5'
13	18°50.3	46.3	216°51.7	15.3'	08°54.2	11.7'	54.5'
14	33°50.4	47.2	231°25.9	15.2'	09°05.9	11.7'	54.5'
15	48°50.5	· · 48.1	246°00.2	15.2'	09°17.6	11.6'	54.6'
16	63°50.6	49.0	260°34.3	15.1'	09°29.2	11.6'	54.6'
17	78°50.7	49.9	275°08.4	15.1'	09°40.8	11.6'	54.6'
18	93°50.8	S10°50.8	289°42.5	15.0'	N09°52.4	11.5'	54.6'
19	108°50.9	51.7	304°16.5	15.0'	10°03.9	11.5'	54.6'
20	123°51.0	52.5	318°50.5	14.9'	10°15.4	11.5'	54.6'
21	138°51.1	· · 53.4	333°24.4	14.9'	10°26.8	11.4'	54.6'
22	153°51.2	54.3	347°58.3	14.8'	10°38.3	11.4'	54.6'
23	168°51.3	55.2	2°32.1	14.8'	10°49.6	11.4'	54.7'
	SD.=16.1	d=-0.9	S.D.=14.9				

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

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

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 88-97%
19	14:55	15:00	11:45	21:26	09:06	
20	15:06	15:11	11:45	22:07	09:47	
21	15:16	15:21	11:45	22:50	10:28	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	30°19.3	175°31.5	S21°16.8	157°15.4	S19°36.3	34°29.8	S03°30.1	199°59.7	S02°04.2
1	45°21.8	190°35.1	16.2	172°16.1	36.7	49°32.5	30.2	215°01.8	04.4
2	60°24.2	205°38.8	15.5	187°16.7	37.1	64°35.1	30.3	230°04.0	04.5
3	75°26.7	220°42.4	·· 14.9	202°17.4	·· 37.6	79°37.8	·· 30.4	245°06.2	·· 04.6
4	90°29.2	235°46.1	14.2	217°18.0	38.0	94°40.5	30.5	260°08.4	04.7
5	105°31.6	250°49.8	13.6	232°18.6	38.5	109°43.2	30.5	275°10.6	04.8
6	120°34.1	265°53.5	S21°12.9	247°19.3	S19°38.9	124°45.8	S03°30.6	290°12.8	S02°04.9
7	135°36.6	280°57.1	12.3	262°19.9	39.4	139°48.5	30.7	305°15.0	05.0
8	150°39.0	296°00.8	11.6	277°20.6	39.8	154°51.2	30.8	320°17.2	05.1
9	165°41.5	311°04.5	·· 11.0	292°21.2	·· 40.3	169°53.8	·· 30.9	335°19.4	·· 05.3
10	180°44.0	326°08.2	10.3	307°21.8	40.7	184°56.5	30.9	350°21.5	05.4
11	195°46.4	341°11.9	09.7	322°22.5	41.2	199°59.2	31.0	5°23.7	05.5
12	210°48.9	356°15.5	S21°09.0	337°23.1	S19°41.6	215°01.8	S03°31.1	20°25.9	S02°05.6
13	225°51.3	11°19.2	08.3	352°23.7	42.0	230°04.5	31.2	35°28.1	05.7
14	240°53.8	26°22.9	07.6	7°24.4	42.5	245°07.2	31.3	50°30.3	05.8
15	255°56.3	41°26.6	·· 07.0	22°25.0	·· 42.9	260°09.9	·· 31.3	65°32.5	·· 05.9
16	270°58.7	56°30.3	06.3	37°25.7	43.4	275°12.5	31.4	80°34.7	06.0
17	286°01.2	71°34.0	05.6	52°26.3	43.8	290°15.2	31.5	95°36.9	06.2
18	301°03.7	86°37.7	S21°04.9	67°26.9	S19°44.3	305°17.9	S03°31.6	110°39.1	S02°06.3
19	316°06.1	101°41.4	04.3	82°27.6	44.7	320°20.5	31.7	125°41.2	06.4
20	331°08.6	116°45.1	03.6	97°28.2	45.1	335°23.2	31.7	140°43.4	06.5
21	346°11.1	131°48.8	·· 02.9	112°28.8	·· 45.6	350°25.9	·· 31.8	155°45.6	·· 06.6
22	1°13.5	146°52.5	02.2	127°29.5	46.0	5°28.5	31.9	170°47.8	06.7
23	16°16.0	161°56.2	01.5	142°30.1	46.5	20°31.2	32.0	185°50.0	06.8
Mer.pass.:21:55		v3.7 d0.6 m-4.0		v0.6 d-0.4 m1.5		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	31°18.5	176°59.9	S21°00.8	157°30.8	S19°46.9	35°33.9	S03°32.1	200°52.2	S02°07.0
1	46°20.9	192°03.6	21°00.1	172°31.4	47.3	50°36.5	32.1	215°54.4	07.1
2	61°23.4	207°07.4	20°59.4	187°32.0	47.8	65°39.2	32.2	230°56.6	07.2
3	76°25.8	222°11.1	·· 58.7	202°32.7	·· 48.2	80°41.8	·· 32.3	245°58.8	·· 07.3
4	91°28.3	237°14.8	58.0	217°33.3	48.7	95°44.5	32.4	261°00.9	07.4
5	106°30.8	252°18.5	57.3	232°33.9	49.1	110°47.2	32.4	276°03.1	07.5
6	121°33.2	267°22.2	S20°56.6	247°34.6	S19°49.5	125°49.8	S03°32.5	291°05.3	S02°07.6
7	136°35.7	282°26.0	55.9	262°35.2	50.0	140°52.5	32.6	306°07.5	07.7
8	151°38.2	297°29.7	55.2	277°35.8	50.4	155°55.2	32.7	321°09.7	07.9
9	166°40.6	312°33.4	·· 54.5	292°36.5	·· 50.9	170°57.8	·· 32.8	336°11.9	·· 08.0
10	181°43.1	327°37.1	53.8	307°37.1	51.3	186°00.5	32.8	351°14.1	08.1
11	196°45.6	342°40.9	53.1	322°37.7	51.7	201°03.2	32.9	6°16.3	08.2
12	211°48.0	357°44.6	S20°52.3	337°38.4	S19°52.2	216°05.8	S03°33.0	21°18.5	S02°08.3
13	226°50.5	12°48.3	51.6	352°39.0	52.6	231°08.5	33.1	36°20.6	08.4
14	241°53.0	27°52.1	50.9	7°39.6	53.0	246°11.1	33.1	51°22.8	08.5
15	256°55.4	42°55.8	·· 50.2	22°40.3	·· 53.5	261°13.8	·· 33.2	66°25.0	·· 08.6
16	271°57.9	57°59.5	49.4	37°40.9	53.9	276°16.5	33.3	81°27.2	08.8
17	287°00.3	73°03.3	48.7	52°41.5	54.3	291°19.1	33.4	96°29.4	08.9
18	302°02.8	88°07.0	S20°48.0	67°42.1	S19°54.8	306°21.8	S03°33.5	111°31.6	S02°09.0
19	317°05.3	103°10.7	47.2	82°42.8	55.2	321°24.4	33.5	126°33.8	09.1
20	332°07.7	118°14.5	46.5	97°43.4	55.7	336°27.1	33.6	141°36.0	09.2
21	347°10.2	133°18.2	·· 45.8	112°44.0	·· 56.1	351°29.8	·· 33.7	156°38.2	·· 09.3
22	2°12.7	148°22.0	45.0	127°44.7	56.5	6°32.4	33.8	171°40.4	09.4
23	17°15.1	163°25.7	44.3	142°45.3	57.0	21°35.1	33.8	186°42.5	09.5
Mer.pass.:21:51		v3.7 d0.7 m-3.9		v0.6 d-0.4 m1.4		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	32°17.6	178°29.5	S20°43.5	157°45.9	S19°57.4	36°37.7	S03°33.9	201°44.7	S02°09.7
1	47°20.1	193°33.2	42.8	172°46.6	57.8	51°40.4	34.0	216°46.9	09.8
2	62°22.5	208°37.0	42.0	187°47.2	58.3	66°43.1	34.1	231°49.1	09.9
3	77°25.0	223°40.7	·· 41.3	202°47.8	·· 58.7	81°45.7	·· 34.1	246°51.3	·· 10.0
4	92°27.4	238°44.5	40.5	217°48.4	59.1	96°48.4	34.2	261°53.5	10.1
5	107°29.9	253°48.2	39.8	232°49.1	19°59.6	111°51.0	34.3	276°55.7	10.2
6	122°32.4	268°52.0	S20°39.0	247°49.7	S20°00.0	126°53.7	S03°34.4	291°57.9	S02°10.3
7	137°34.8	283°55.8	38.3	262°50.3	00.4	141°56.4	34.4	307°00.1	10.4
8	152°37.3	298°59.5	37.5	277°50.9	00.8	156°59.0	34.5	322°02.3	10.5
9	167°39.8	314°03.3	·· 36.7	292°51.6	·· 01.3	172°01.7	·· 34.6	337°04.4	·· 10.7
10	182°42.2	329°07.0	36.0	307°52.2	01.7	187°04.3	34.7	352°06.6	10.8
11	197°44.7	344°10.8	35.2	322°52.8	02.1	202°07.0	34.7	7°08.8	10.9
12	212°47.2	359°14.6	S20°34.4	337°53.4	S20°02.6	217°09.6	S03°34.8	22°11.0	S02°11.0
13	227°49.6	14°18.3	33.7	352°54.1	03.0	232°12.3	34.9	37°13.2	11.1
14	242°52.1	29°22.1	32.9	7°54.7	03.4	247°15.0	35.0	52°15.4	11.2
15	257°54.6	44°25.9	·· 32.1	22°55.3	·· 03.9	262°17.6	·· 35.0	67°17.6	·· 11.3
16	272°57.0	59°29.7	31.3	37°55.9	04.3	277°20.3	35.1	82°19.8	11.4
17	287°59.5	74°33.4	30.5	52°56.6	04.7	292°22.9	35.2	97°22.0	11.6
18	303°01.9	89°37.2	S20°29.8	67°57.2	S20°05.1	307°25.6	S03°35.2	112°24.2	S02°11.7
19	318°04.4	104°41.0	29.0	82°57.8	05.6	322°28.2	35.3	127°26.3	11.8
20	333°06.9	119°44.7	28.2	97°58.4	06.0	337°30.9	35.4	142°28.5	11.9
21	348°09.3	134°48.5	·· 27.4	112°59.1	·· 06.4	352°33.5	·· 35.5	157°30.7	·· 12.0
22	3°11.8	149°52.3	26.6	127°59.7	06.9	7°36.2	35.5	172°32.9	12.1
23	18°14.3	164°56.1	25.8	143°00.3	07.3	22°38.8	35.6	187°35.1	12.2
Mer.pass.:21:47		v3.8 d0.7 m-3.8		v0.6 d-0.4 m1.4		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.7
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°17.9	89°18.7
Acamar	315°19.3	-40°15.5
Menkar	314°16.8	4°08.1
Mirfak	308°42.7	49°54.0
Aldebaran	290°51.3	16°31.9
Rigel	281°13.7	-8°11.2
Capella	280°37.0	46°00.4
Bellatrix	278°33.9	6°21.6
Elnath	278°14.8	28°37.0
Alnilam	275°48.1	-1°11.6
Betelgeuse	271°03.2	7°24.6
Canopus	263°56.8	-52°41.8
Sirius	258°35.3	-16°43.7
Adhara	255°13.9	-28°59.0
Procyon	245°01.7	5°11.9
Pollux	243°30.0	27°59.9
Avior	234°18.9	-59°32.4
Suhail	222°54.0	-43°28.4
Miaplacidus	221°40.5	-69°45.4
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°54.3	61°41.3
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.1
Acrux	173°12.3	-63°09.5
Gacrux	172°03.7	-57°10.3
Alioth	166°22.8	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.5
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.9	74°06.7
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.8
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°03.0
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.4	12°33.3
Eltanin	90°47.3	51°29.5
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.4	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.1	-56°42.1
Deneb	49°32.8	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.0	15°16.1

Oct 22 Fri	**SHA**	**Mer.pass**
Venus	145°12.1	12:15
Mars	126°56.1	13:30
Jupiter	4°10.5	21:38
Saturn	169°40.3	10:38

Oct 23 Sat	**SHA**	**Mer.pass**
Venus	145°41.5	12:09
Mars	126°12.3	13:29
Jupiter	4°15.4	21:34
Saturn	169°33.7	10:35

Oct 24 Sun	**SHA**	**Mer.pass**
Venus	146°11.9	12:03
Mars	125°28.3	13:28
Jupiter	4°20.2	21:30
Saturn	169°27.1	10:31

Horizontal parallax	
Venus:	0.5
Mars:	0.1

DUT1 = UT1-UTC = -0.0811 sec ΔT = TT-UT1 = +66.2651 sec

2010 October 22 to Oct. 24 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°51.4	S10°56.1	17°05.9	14.7'	N11°01.0	11.3'	54.7'
1	198°51.5	57.0	31°39.6	14.7'	11°12.3	11.3'	54.7'
2	213°51.6	57.9	46°13.3	14.6'	11°23.6	11.2'	54.7'
3	228°51.7	·· 58.7	60°46.9	14.6'	11°34.8	11.2'	54.7'
4	243°51.8	10°59.6	75°20.4	14.5'	11°46.0	11.2'	54.7'
5	258°51.9	11°00.5	89°53.9	14.5'	11°57.1	11.1'	54.7'
6	273°52.0	S11°01.4	104°27.4	14.4'	N12°08.2	11.1'	54.8'
7	288°52.1	02.3	119°00.8	14.4'	12°19.2	11.0'	54.8'
8	303°52.2	03.2	133°34.1	14.3'	12°30.2	11.0'	54.8'
9	318°52.3	·· 04.0	148°07.4	14.2'	12°41.2	10.9'	54.8'
10	333°52.4	04.9	162°40.6	14.2'	12°52.1	10.9'	54.8'
11	348°52.5	05.8	177°13.7	14.1'	13°03.0	10.8'	54.8'
12	3°52.6	S11°06.7	191°46.8	14.1'	N13°13.8	10.8'	54.8'
13	18°52.7	07.6	206°19.9	14.0'	13°24.6	10.7'	54.9'
14	33°52.8	08.4	220°52.8	13.9'	13°35.3	10.7'	54.9'
15	48°52.9	·· 09.3	235°25.7	13.9'	13°45.9	10.6'	54.9'
16	63°53.0	10.2	249°58.6	13.8'	13°56.5	10.6'	54.9'
17	78°53.0	11.1	264°31.4	13.8'	14°07.1	10.5'	54.9'
18	93°53.1	S11°12.0	279°04.1	13.7'	N14°17.6	10.5'	54.9'
19	108°53.2	12.9	293°36.8	13.6'	14°28.0	10.4'	55.0'
20	123°53.3	13.7	308°09.4	13.6'	14°38.4	10.4'	55.0'
21	138°53.4	·· 14.6	322°41.9	13.5'	14°48.7	10.3'	55.0'
22	153°53.5	15.5	337°14.4	13.4'	14°59.0	10.2'	55.0'
23	168°53.6	16.4	351°46.8	13.4'	15°09.2	10.2'	55.0'
	SD.=16.1	d=-0.9	S.D.=14.9				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°53.7	S11°17.2	6°19.1	13.3'	N15°19.4	10.1'	55.0'
1	198°53.8	18.1	20°51.4	13.2'	15°29.4	10.1'	55.0'
2	213°53.9	19.0	35°23.6	13.2'	15°39.5	10.0'	55.1'
3	228°54.0	·· 19.9	49°55.7	13.1'	15°49.4	9.9'	55.1'
4	243°54.1	20.8	64°27.8	13.0'	15°59.3	9.9'	55.1'
5	258°54.1	21.6	78°59.8	13.0'	16°09.1	9.8'	55.1'
6	273°54.2	S11°22.5	93°31.7	12.9'	N16°18.9	9.7'	55.1'
7	288°54.3	23.4	108°03.6	12.8'	16°28.6	9.7'	55.1'
8	303°54.4	24.3	122°35.3	12.8'	16°38.2	9.6'	55.2'
9	318°54.5	·· 25.1	137°07.1	12.7'	16°47.8	9.5'	55.2'
10	333°54.6	26.0	151°38.7	12.6'	16°57.3	9.4'	55.2'
11	348°54.7	26.9	166°10.3	12.5'	17°06.7	9.4'	55.2'
12	3°54.8	S11°27.8	180°41.8	12.5'	N17°16.0	9.3'	55.2'
13	18°54.8	28.6	195°13.2	12.4'	17°25.3	9.2'	55.3'
14	33°54.9	29.5	209°44.6	12.3'	17°34.5	9.2'	55.3'
15	48°55.0	·· 30.4	224°15.9	12.3'	17°43.6	9.1'	55.3'
16	63°55.1	31.3	238°47.1	12.2'	17°52.6	9.0'	55.3'
17	78°55.2	32.1	253°18.3	12.1'	18°01.6	8.9'	55.3'
18	93°55.3	S11°33.0	267°49.4	12.0'	N18°10.5	8.8'	55.3'
19	108°55.4	33.9	282°20.4	12.0'	18°19.3	8.8'	55.4'
20	123°55.5	34.8	296°51.3	11.9'	18°28.0	8.7'	55.4'
21	138°55.5	·· 35.6	311°22.2	11.8'	18°36.6	8.6'	55.4'
22	153°55.6	36.5	325°52.9	11.8'	18°45.2	8.5'	55.4'
23	168°55.7	37.4	340°23.7	11.7'	18°53.6	8.4'	55.4'
	SD.=16.1	d=-0.9	S.D.=15.1				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°55.8	S11°38.2	354°54.3	11.6'	N19°02.0	8.3'	55.4'
1	198°55.9	39.1	9°24.9	11.5'	19°10.3	8.3'	55.5'
2	213°56.0	40.0	23°55.4	11.5'	19°18.5	8.2'	55.5'
3	228°56.0	·· 40.9	38°25.8	11.4'	19°26.6	8.1'	55.5'
4	243°56.1	41.7	52°56.1	11.3'	19°34.7	8.0'	55.5'
5	258°56.2	42.6	67°26.4	11.2'	19°42.6	7.9'	55.5'
6	273°56.3	S11°43.5	81°56.6	11.2'	N19°50.5	7.8'	55.6'
7	288°56.4	44.3	96°26.7	11.1'	19°58.2	7.7'	55.6'
8	303°56.5	45.2	110°56.8	11.0'	20°05.9	7.6'	55.6'
9	318°56.5	·· 46.1	125°26.8	10.9'	20°13.5	7.5'	55.6'
10	333°56.6	46.9	139°56.7	10.9'	20°20.9	7.4'	55.6'
11	348°56.7	47.8	154°26.5	10.8'	20°28.3	7.3'	55.6'
12	3°56.8	S11°48.7	168°56.3	10.7'	N20°35.6	7.2'	55.7'
13	18°56.9	49.5	183°26.0	10.7'	20°42.8	7.1'	55.7'
14	33°56.9	50.4	197°55.6	10.6'	20°49.9	7.0'	55.7'
15	48°57.0	·· 51.3	212°25.1	10.5'	20°56.9	6.9'	55.7'
16	63°57.1	52.1	226°54.6	10.4'	21°03.7	6.8'	55.7'
17	78°57.2	53.0	241°24.0	10.4'	21°10.5	6.7'	55.8'
18	93°57.2	S11°53.9	255°53.4	10.3'	N21°17.2	6.6'	55.8'
19	108°57.3	54.7	270°22.6	10.2'	21°23.8	6.5'	55.8'
20	123°57.4	55.6	284°51.8	10.2'	21°30.2	6.4'	55.8'
21	138°57.5	·· 56.5	299°20.9	10.1'	21°36.6	6.3'	55.8'
22	153°57.6	57.3	313°50.0	10.0'	21°42.8	6.2'	55.9'
23	168°57.6	58.2	328°19.0	9.9'	21°49.0	6.1'	55.9'
	SD.=16.1	d=-0.9	S.D.=15.2				

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

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

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 15-17 100-98%
22	15:26	15:30	11:44	23:34	11:11	○
23	15:35	15:39	11:44	–:–	11:57	
24	15:43	15:47	11:44	00:21	12:46	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	33°16.7	179°59.9	S20°25.0	158°00.9	S20°07.7	37°41.5	S03°35.7	202°37.3	S02°12.3
1	48°19.2	195°03.6	24.2	173°01.5	08.1	52°44.1	35.8	217°39.5	12.5
2	63°21.7	210°07.4	23.4	188°02.2	08.6	67°46.8	35.8	232°41.7	12.6
3	78°24.1	225°11.2	·· 22.6	203°02.8	·· 09.0	82°49.5	·· 35.9	247°43.9	·· 12.7
4	93°26.6	240°15.0	21.8	218°03.4	09.4	97°52.1	36.0	262°46.1	12.8
5	108°29.1	255°18.8	21.0	233°04.0	09.8	112°54.8	36.0	277°48.3	12.9
6	123°31.5	270°22.6	S20°20.2	248°04.7	S20°10.3	127°57.4	S03°36.1	292°50.4	S02°13.0
7	138°34.0	285°26.4	19.4	263°05.3	10.7	143°00.1	36.2	307°52.6	13.1
8	153°36.4	300°30.1	18.6	278°05.9	11.1	158°02.7	36.3	322°54.8	13.2
9	168°38.9	315°33.9	·· 17.8	293°06.5	·· 11.5	173°05.4	·· 36.3	337°57.0	·· 13.3
10	183°41.4	330°37.7	17.0	308°07.1	12.0	188°08.0	36.4	352°59.2	13.5
11	198°43.8	345°41.5	16.1	323°07.7	12.4	203°10.7	36.5	8°01.4	13.6
12	213°46.3	0°45.3	S20°15.3	338°08.4	S20°12.8	218°13.3	S03°36.6	23°03.6	S02°13.7
13	228°48.8	15°49.1	14.5	353°09.0	13.2	233°16.0	36.6	38°05.8	13.8
14	243°51.2	30°52.9	13.7	8°09.6	13.7	248°18.6	36.7	53°08.0	13.9
15	258°53.7	45°56.7	·· 12.8	23°10.2	·· 14.1	263°21.3	·· 36.8	68°10.2	·· 14.0
16	273°56.2	61°00.5	12.0	38°10.8	14.5	278°23.9	36.8	83°12.4	14.1
17	288°58.6	76°04.3	11.2	53°11.5	14.9	293°26.6	36.9	98°14.5	14.2
18	304°01.1	91°08.1	S20°10.4	68°12.1	S20°15.3	308°29.2	S03°37.0	113°16.7	S02°14.3
19	319°03.5	106°11.9	09.5	83°12.7	15.8	323°31.9	37.0	128°18.9	14.5
20	334°06.0	121°15.7	08.7	98°13.3	16.2	338°34.5	37.1	143°21.1	14.6
21	349°08.5	136°19.5	·· 07.9	113°13.9	·· 16.6	353°37.1	·· 37.2	158°23.3	·· 14.7
22	4°10.9	151°23.3	07.0	128°14.5	17.0	8°39.8	37.3	173°25.5	14.8
23	19°13.4	166°27.1	06.2	143°15.2	17.4	23°42.4	37.3	188°27.7	14.9
Mer.pass.:21:43		v3.8 d0.8 m-3.7		v0.6 d-0.4 m1.4		v2.7 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	34°15.9	181°30.9	S20°05.3	158°15.8	S20°17.9	38°45.1	S03°37.4	203°29.9	S02°15.0
1	49°18.3	196°34.7	04.5	173°16.4	18.3	53°47.7	37.5	218°32.1	15.1
2	64°20.8	211°38.5	03.6	188°17.0	18.7	68°50.4	37.5	233°34.3	15.2
3	79°23.3	226°42.3	·· 02.8	203°17.6	·· 19.1	83°53.0	·· 37.6	248°36.5	·· 15.3
4	94°25.7	241°46.1	01.9	218°18.2	19.5	98°55.7	37.7	263°38.7	15.5
5	109°28.2	256°49.9	01.1	233°18.8	20.0	113°58.3	37.7	278°40.8	15.6
6	124°30.7	271°53.7	S20°00.2	248°19.5	S20°20.4	129°01.0	S03°37.8	293°43.0	S02°15.7
7	139°33.1	286°57.5	19°59.4	263°20.1	20.8	144°03.6	37.9	308°45.2	15.8
8	154°35.6	302°01.3	58.5	278°20.7	21.2	159°06.3	37.9	323°47.4	15.9
9	169°38.0	317°05.1	·· 57.7	293°21.3	·· 21.6	174°08.9	·· 38.0	338°49.6	·· 16.0
10	184°40.5	332°08.9	56.8	308°21.9	22.0	189°11.5	38.1	353°51.8	16.1
11	199°43.0	347°12.7	56.0	323°22.5	22.5	204°14.2	38.2	8°54.0	16.2
12	214°45.4	2°16.5	S19°55.1	338°23.1	S20°22.9	219°16.8	S03°38.2	23°56.2	S02°16.3
13	229°47.9	17°20.3	54.2	353°23.7	23.3	234°19.5	38.3	38°58.4	16.5
14	244°50.4	32°24.1	53.4	8°24.3	23.7	249°22.1	38.4	54°00.6	16.6
15	259°52.8	47°28.0	·· 52.5	23°25.0	·· 24.1	264°24.8	·· 38.4	69°02.8	·· 16.7
16	274°55.3	62°31.8	51.6	38°25.6	24.5	279°27.4	38.5	84°05.0	16.8
17	289°57.8	77°35.6	50.7	53°26.2	25.0	294°30.0	38.6	99°07.2	16.9
18	305°00.2	92°39.4	S19°49.9	68°26.8	S20°25.4	309°32.7	S03°38.6	114°09.3	S02°17.0
19	320°02.7	107°43.2	49.0	83°27.4	25.8	324°35.3	38.7	129°11.5	17.1
20	335°05.2	122°47.0	48.1	98°28.0	26.2	339°38.0	38.8	144°13.7	17.2
21	350°07.6	137°50.8	·· 47.2	113°28.6	·· 26.6	354°40.6	·· 38.8	159°15.9	·· 17.3
22	5°10.1	152°54.6	46.4	128°29.2	27.0	9°43.2	38.9	174°18.1	17.4
23	20°12.5	167°58.4	45.5	143°29.8	27.4	24°45.9	39.0	189°20.3	17.6
Mer.pass.:21:39		v3.8 d0.8 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.7		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	35°15.0	183°02.3	S19°44.6	158°30.4	S20°27.9	39°48.5	S03°39.0	204°22.5	S02°17.7
1	50°17.5	198°06.1	43.7	173°31.1	28.3	54°51.2	39.1	219°24.7	17.8
2	65°19.9	213°09.9	42.8	188°31.7	28.7	69°53.8	39.2	234°26.9	17.9
3	80°22.4	228°13.7	·· 41.9	203°32.3	·· 29.1	84°56.4	·· 39.2	249°29.1	·· 18.0
4	95°24.9	243°17.5	41.0	218°32.9	29.5	99°59.1	39.3	264°31.3	18.1
5	110°27.3	258°21.3	40.1	233°33.5	29.9	115°01.7	39.4	279°33.5	18.2
6	125°29.8	273°25.1	S19°39.2	248°34.1	S20°30.3	130°04.4	S03°39.4	294°35.7	S02°18.3
7	140°32.3	288°29.0	38.4	263°34.7	30.7	145°07.0	39.5	309°37.9	18.4
8	155°34.7	303°32.8	37.5	278°35.3	31.1	160°09.6	39.6	324°40.0	18.6
9	170°37.2	318°36.6	·· 36.6	293°35.9	·· 31.6	175°12.3	·· 39.6	339°42.2	·· 18.7
10	185°39.7	333°40.4	35.7	308°36.5	32.0	190°14.9	39.7	354°44.4	18.8
11	200°42.1	348°44.2	34.8	323°37.1	32.4	205°17.5	39.8	9°46.6	18.9
12	215°44.6	3°48.0	S19°33.8	338°37.7	S20°32.8	220°20.2	S03°39.8	24°48.8	S02°19.0
13	230°47.0	18°51.8	32.9	353°38.3	33.2	235°22.8	39.9	39°51.0	19.1
14	245°49.5	33°55.7	32.0	8°38.9	33.6	250°25.5	40.0	54°53.2	19.2
15	260°52.0	48°59.5	·· 31.1	23°39.5	·· 34.0	265°28.1	·· 40.0	69°55.4	·· 19.3
16	275°54.4	64°03.3	30.2	38°40.1	34.4	280°30.7	40.1	84°57.6	19.4
17	290°56.9	79°07.1	29.3	53°40.7	34.8	295°33.4	40.1	99°59.8	19.5
18	305°59.4	94°10.9	S19°28.4	68°41.3	S20°35.2	310°36.0	S03°40.2	115°02.0	S02°19.7
19	321°01.8	109°14.7	27.5	83°41.9	35.6	325°38.6	40.3	130°04.2	19.8
20	336°04.3	124°18.5	26.6	98°42.5	36.0	340°41.3	40.3	145°06.4	19.9
21	351°06.8	139°22.4	·· 25.6	113°43.2	·· 36.4	355°43.9	·· 40.4	160°08.6	·· 20.0
22	6°09.2	154°26.2	24.7	128°43.8	36.9	10°46.5	40.5	175°10.8	20.1
23	21°11.7	169°30.0	23.8	143°44.4	37.3	25°49.2	40.5	190°12.9	20.2
Mer.pass.:21:35		v3.8 d0.9 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.8
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°17.2	89°18.7
Acamar	315°19.3	-40°15.5
Menkar	314°16.7	4°08.1
Mirfak	308°42.7	49°54.0
Aldebaran	290°51.3	16°31.9
Rigel	281°13.7	-8°11.2
Capella	280°37.0	46°00.4
Bellatrix	278°33.8	6°21.6
Elnath	278°14.8	28°37.0
Alnilam	275°48.1	-1°11.6
Betelgeuse	271°03.2	7°24.6
Canopus	263°56.7	-52°41.8
Sirius	258°35.3	-16°43.7
Adhara	255°13.9	-28°59.0
Procyon	245°01.7	5°11.8
Pollux	243°30.0	27°59.9
Avior	234°18.9	-59°32.4
Suhail	222°54.0	-43°28.4
Miaplacidus	221°40.5	-69°45.4
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°54.3	61°41.3
Denebola	182°35.9	14°30.7
Gienah	175°54.6	-17°36.1
Acrux	173°12.3	-63°09.4
Gacrux	172°03.7	-57°10.3
Alioth	166°22.8	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.5
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.9	74°06.7
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°13.0	26°40.8
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°03.0
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.3	51°29.5
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.2	-56°42.1
Deneb	49°32.8	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.0	28°08.8
Markab	13°40.1	15°16.1

Oct 25 Mon	**SHA**	**Mer.pass**
Venus	146°43.1	11:57
Mars	124°44.2	13:27
Jupiter	4°24.8	21:25
Saturn	169°20.6	10:28

Oct 26 Tue	**SHA**	**Mer.pass**
Venus	147°15.0	11:51
Mars	123°59.9	13:26
Jupiter	4°29.2	21:21
Saturn	169°14.0	10:24

Oct 27 Wed	**SHA**	**Mer.pass**
Venus	147°47.3	11:45
Mars	123°15.4	13:25
Jupiter	4°33.5	21:17
Saturn	169°07.5	10:21

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°57.7	S11°59.1	342°47.9	9.9′	N21°55.0	6.0′	55.9′
1	198°57.8	11°59.9	357°16.7	9.8′	22°00.9	5.9′	55.9′
2	213°57.9	12°00.8	11°45.5	9.7′	22°06.7	5.8′	55.9′
3	228°57.9	·· 01.6	26°14.2	9.7′	22°12.4	5.6′	56.0′
4	243°58.0	02.5	40°42.9	9.6′	22°18.0	5.5′	56.0′
5	258°58.1	03.4	55°11.4	9.5′	22°23.5	5.4′	56.0′
6	273°58.2	S12°04.2	69°39.9	9.5′	N22°28.9	5.3′	56.0′
7	288°58.2	05.1	84°08.4	9.4′	22°34.1	5.2′	56.0′
8	303°58.3	06.0	98°36.8	9.3′	22°39.2	5.1′	56.1′
9	318°58.4	·· 06.8	113°05.1	9.3′	22°44.2	5.0′	56.1′
10	333°58.5	07.7	127°33.3	9.2′	22°49.1	4.8′	56.1′
11	348°58.5	08.5	142°01.5	9.2′	22°53.9	4.7′	56.1′
12	3°58.6	S12°09.4	156°29.7	9.1′	N22°58.6	4.6′	56.1′
13	18°58.7	10.3	170°57.7	9.0′	23°03.1	4.5′	56.2′
14	33°58.8	11.1	185°25.7	9.0′	23°07.5	4.3′	56.2′
15	48°58.8	·· 12.0	199°53.7	8.9′	23°11.8	4.2′	56.2′
16	63°58.9	12.8	214°21.6	8.9′	23°16.0	4.1′	56.2′
17	78°59.0	13.7	228°49.4	8.8′	23°20.0	4.0′	56.2′
18	93°59.0	S12°14.6	243°17.2	8.7′	N23°23.9	3.9′	56.3′
19	108°59.1	15.4	257°44.9	8.7′	23°27.7	3.7′	56.3′
20	123°59.2	16.3	272°12.6	8.6′	23°31.4	3.6′	56.3′
21	138°59.3	·· 17.1	286°40.2	8.6′	23°34.9	3.5′	56.3′
22	153°59.3	18.0	301°07.7	8.5′	23°38.3	3.3′	56.3′
23	168°59.4	18.8	315°35.2	8.5′	23°41.6	3.2′	56.4′
	SD.=16.1	d=-0.9	S.D.=15.3				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°59.5	S12°19.7	330°02.7	8.4′	N23°44.7	3.1′	56.4′
1	198°59.5	20.6	344°30.1	8.4′	23°47.7	3.0′	56.4′
2	213°59.6	21.4	358°57.4	8.3′	23°50.6	2.8′	56.4′
3	228°59.7	·· 22.3	13°24.7	8.3′	23°53.4	2.7′	56.4′
4	243°59.7	23.1	27°52.0	8.2′	23°56.0	2.6′	56.5′
5	258°59.8	24.0	42°19.2	8.2′	23°58.5	2.4′	56.5′
6	273°59.9	S12°24.8	56°46.4	8.1′	N24°00.9	2.3′	56.5′
7	288°59.9	25.7	71°13.5	8.1′	24°03.1	2.2′	56.5′
8	304°00.0	26.5	85°40.5	8.1′	24°05.2	2.0′	56.5′
9	319°00.1	·· 27.4	100°07.6	8.0′	24°07.1	1.9′	56.6′
10	334°00.1	28.2	114°34.6	8.0′	24°09.0	1.8′	56.6′
11	349°00.2	29.1	129°01.5	7.9′	24°10.7	1.6′	56.6′
12	4°00.3	S12°29.9	143°28.4	7.9′	N24°12.2	1.5′	56.6′
13	19°00.3	30.8	157°55.3	7.9′	24°13.6	1.3′	56.6′
14	34°00.4	31.6	172°22.2	7.8′	24°14.9	1.2′	56.7′
15	49°00.5	·· 32.5	186°49.0	7.8′	24°16.0	1.1′	56.7′
16	64°00.5	33.3	201°15.7	7.8′	24°17.0	0.9′	56.7′
17	79°00.6	34.2	215°42.5	7.7′	24°17.9	0.8′	56.7′
18	94°00.6	S12°35.0	230°09.2	7.7′	N24°18.6	0.7′	56.8′
19	109°00.7	35.9	244°35.9	7.7′	24°19.2	0.5′	56.8′
20	124°00.8	36.7	259°02.5	7.6′	24°19.6	0.4′	56.8′
21	139°00.8	·· 37.6	273°29.1	7.6′	24°19.9	0.2′	56.8′
22	154°00.9	38.4	287°55.7	7.6′	24°20.1	0.1′	56.8′
23	169°01.0	39.3	302°22.3	7.6′	24°20.1	-0.1′	56.9′
	SD.=16.1	d=-0.9	S.D.=15.4				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°01.0	S12°40.1	316°48.9	7.5′	N24°20.0	-0.2′	56.9′
1	199°01.1	41.0	331°15.4	7.5′	24°19.7	-0.3′	56.9′
2	214°01.1	41.8	345°41.9	7.5′	24°19.3	-0.5′	56.9′
3	229°01.2	·· 42.7	0°08.4	7.5′	24°18.8	-0.6′	56.9′
4	244°01.3	43.5	14°34.8	7.5′	24°18.1	-0.8′	57.0′
5	259°01.3	44.4	29°01.3	7.4′	24°17.3	-0.9′	57.0′
6	274°01.4	S12°45.2	43°27.7	7.4′	N24°16.3	-1.0′	57.0′
7	289°01.4	46.1	57°54.1	7.4′	24°15.2	-1.2′	57.0′
8	304°01.5	46.9	72°20.5	7.4′	24°13.9	-1.3′	57.1′
9	319°01.6	·· 47.8	86°46.9	7.4′	24°12.5	-1.5′	57.1′
10	334°01.6	48.6	101°13.3	7.4′	24°11.0	-1.6′	57.1′
11	349°01.7	49.5	115°39.7	7.4′	24°09.3	-1.8′	57.1′
12	4°01.7	S12°50.3	130°06.0	7.4′	N24°07.5	-1.9′	57.1′
13	19°01.8	51.1	144°32.4	7.4′	24°05.5	-2.0′	57.2′
14	34°01.8	52.0	158°58.7	7.3′	24°03.4	-2.2′	57.2′
15	49°01.9	·· 52.8	173°25.1	7.3′	24°01.1	-2.3′	57.2′
16	64°02.0	53.7	187°51.4	7.3′	23°58.7	-2.5′	57.2′
17	79°02.0	54.5	202°17.8	7.3′	23°56.2	-2.6′	57.3′
18	94°02.1	S12°55.4	216°44.1	7.3′	N23°53.5	-2.8′	57.3′
19	109°02.1	56.2	231°10.4	7.3′	23°50.6	-2.9′	57.3′
20	124°02.2	57.0	245°36.8	7.3′	23°47.7	-3.0′	57.3′
21	139°02.2	·· 57.9	260°03.1	7.3′	23°44.5	-3.2′	57.3′
22	154°02.3	58.7	274°29.5	7.4′	23°41.3	-3.3′	57.4′
23	169°02.3	59.6	288°55.8	7.4′	23°37.9	-3.5′	57.4′
	SD.=16.1	d=-0.8	S.D.=15.6				

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

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

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 18-20 94-81%
25	15:51	15:54	11:44	01:11	13:37	
26	15:58	16:01	11:44	02:04	14:32	
27	16:04	16:07	11:44	02:59	15:27	

October 28, 29, 30 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	36°14.2	184°33.8	S19°22.9	158°45.0	S20°37.7	40°51.8	S03°40.6	205°15.1	S02°20.3
1	51°16.6	199°37.6	22.0	173°45.6	38.1	55°54.4	40.7	220°17.3	20.4
2	66°19.1	214°41.4	21.0	188°46.2	38.5	70°57.1	40.7	235°19.5	20.5
3	81°21.5	229°45.2	·· 20.1	203°46.8	·· 38.9	85°59.7	·· 40.8	250°21.7	·· 20.6
4	96°24.0	244°49.1	19.2	218°47.4	39.3	101°02.3	40.8	265°23.9	20.8
5	111°26.5	259°52.9	18.2	233°48.0	39.7	116°05.0	40.9	280°26.1	20.9
6	126°28.9	274°56.7	S19°17.3	248°48.6	S20°40.1	131°07.6	S03°41.0	295°28.3	S02°21.0
7	141°31.4	290°00.5	16.4	263°49.2	40.5	146°10.2	41.0	310°30.5	21.1
8	156°33.9	305°04.3	15.4	278°49.8	40.9	161°12.9	41.1	325°32.7	21.2
9	171°36.3	320°08.1	·· 14.5	293°50.4	·· 41.3	176°15.5	·· 41.2	340°34.9	·· 21.3
10	186°38.8	335°11.9	13.6	308°51.0	41.7	191°18.1	41.2	355°37.1	21.4
11	201°41.3	350°15.7	12.6	323°51.6	42.1	206°20.7	41.3	10°39.3	21.5
12	216°43.7	5°19.6	S19°11.7	338°52.2	S20°42.5	221°23.4	S03°41.3	25°41.5	S02°21.6
13	231°46.2	20°23.4	10.8	353°52.8	42.9	236°26.0	41.4	40°43.7	21.7
14	246°48.6	35°27.2	09.8	8°53.3	43.3	251°28.6	41.5	55°45.9	21.9
15	261°51.1	50°31.0	·· 08.9	23°53.9	·· 43.7	266°31.3	·· 41.5	70°48.0	·· 22.0
16	276°53.6	65°34.8	07.9	38°54.5	44.1	281°33.9	41.6	85°50.2	22.1
17	291°56.0	80°38.6	07.0	53°55.1	44.5	296°36.5	41.7	100°52.4	22.2
18	306°58.5	95°42.4	S19°06.0	68°55.7	S20°44.9	311°39.1	S03°41.7	115°54.6	S02°22.3
19	322°01.0	110°46.2	05.1	83°56.3	45.3	326°41.8	41.8	130°56.8	22.4
20	337°03.4	125°50.0	04.1	98°56.9	45.7	341°44.4	41.8	145°59.0	22.5
21	352°05.9	140°53.8	·· 03.2	113°57.5	·· 46.1	356°47.0	·· 41.9	161°01.2	·· 22.6
22	7°08.4	155°57.6	02.2	128°58.1	46.5	11°49.7	42.0	176°03.4	22.7
23	22°10.8	171°01.4	01.3	143°58.7	46.9	26°52.3	42.0	191°05.6	22.8
Mer.pass.:21:32		v3.8 d0.9 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	37°13.3	186°05.3	S19°00.3	158°59.3	S20°47.3	41°54.9	S03°42.1	206°07.8	S02°22.9
1	52°15.8	201°09.1	18°59.4	173°59.9	47.7	56°57.5	42.1	221°10.0	23.1
2	67°18.2	216°12.9	58.4	189°00.5	48.1	72°00.2	42.2	236°12.2	23.2
3	82°20.7	231°16.7	·· 57.5	204°01.1	·· 48.5	87°02.8	·· 42.3	251°14.4	·· 23.3
4	97°23.1	246°20.5	56.5	219°01.7	48.9	102°05.4	42.3	266°16.6	23.4
5	112°25.6	261°24.3	55.5	234°02.3	49.3	117°08.0	42.4	281°18.8	23.5
6	127°28.1	276°28.1	S18°54.6	249°02.9	S20°49.7	132°10.7	S03°42.4	296°21.0	S02°23.6
7	142°30.5	291°31.9	53.6	264°03.5	50.1	147°13.3	42.5	311°23.2	23.7
8	157°33.0	306°35.7	52.6	279°04.1	50.5	162°15.9	42.6	326°25.4	23.8
9	172°35.5	321°39.5	·· 51.7	294°04.6	·· 50.9	177°18.5	·· 42.6	341°27.6	·· 23.9
10	187°37.9	336°43.3	50.7	309°05.2	51.3	192°21.2	42.7	356°29.8	24.0
11	202°40.4	351°47.1	49.7	324°05.8	51.7	207°23.8	42.7	11°31.9	24.1
12	217°42.9	6°50.9	S18°48.8	339°06.4	S20°52.1	222°26.4	S03°42.8	26°34.1	S02°24.3
13	232°45.3	21°54.7	47.8	354°07.0	52.4	237°29.0	42.9	41°36.3	24.4
14	247°47.8	36°58.5	46.8	9°07.6	52.8	252°31.7	42.9	56°38.5	24.5
15	262°50.3	52°02.3	·· 45.9	24°08.2	·· 53.2	267°34.3	·· 43.0	71°40.7	·· 24.6
16	277°52.7	67°06.1	44.9	39°08.8	53.6	282°36.9	43.0	86°42.9	24.7
17	292°55.2	82°09.9	43.9	54°09.4	54.0	297°39.5	43.1	101°45.1	24.8
18	307°57.6	97°13.6	S18°42.9	69°10.0	S20°54.4	312°42.1	S03°43.1	116°47.3	S02°24.9
19	323°00.1	112°17.4	41.9	84°10.6	54.8	327°44.8	43.2	131°49.5	25.0
20	338°02.6	127°21.2	41.0	99°11.1	55.2	342°47.4	43.3	146°51.7	25.1
21	353°05.0	142°25.0	·· 40.0	114°11.7	·· 55.6	357°50.0	·· 43.3	161°53.9	·· 25.2
22	8°07.5	157°28.8	39.0	129°12.3	56.0	12°52.6	43.4	176°56.1	25.3
23	23°10.0	172°32.6	38.0	144°12.9	56.4	27°55.2	43.4	191°58.3	25.4
Mer.pass.:21:28		v3.8 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	38°12.4	187°36.4	S18°37.0	159°13.5	S20°56.8	42°57.9	S03°43.5	207°00.5	S02°25.6
1	53°14.9	202°40.2	36.1	174°14.1	57.1	58°00.5	43.5	222°02.7	25.7
2	68°17.4	217°44.0	35.1	189°14.7	57.5	73°03.1	43.6	237°04.9	25.8
3	83°19.8	232°47.7	·· 34.1	204°15.3	·· 57.9	88°05.7	·· 43.7	252°07.1	·· 25.9
4	98°22.3	247°51.5	33.1	219°15.8	58.3	103°08.3	43.7	267°09.3	26.0
5	113°24.8	262°55.3	32.1	234°16.4	58.7	118°11.0	43.8	282°11.5	26.1
6	128°27.2	277°59.1	S18°31.1	249°17.0	S20°59.1	133°13.6	S03°43.8	297°13.7	S02°26.2
7	143°29.7	293°02.9	30.1	264°17.6	59.5	148°16.2	43.9	312°15.9	26.3
8	158°32.1	308°06.6	29.1	279°18.2	20°59.9	163°18.8	43.9	327°18.1	26.4
9	173°34.6	323°10.4	·· 28.2	294°18.8	21°00.3	178°21.4	·· 44.0	342°20.3	·· 26.5
10	188°37.1	338°14.2	27.2	309°19.4	00.6	193°24.0	44.1	357°22.5	26.6
11	203°39.5	353°18.0	26.2	324°19.9	01.0	208°26.7	44.1	12°24.6	26.7
12	218°42.0	8°21.8	S18°25.2	339°20.5	S21°01.4	223°29.3	S03°44.2	27°26.8	S02°26.9
13	233°44.5	23°25.5	24.2	354°21.1	01.8	238°31.9	44.2	42°29.0	27.0
14	248°46.9	38°29.3	23.2	9°21.7	02.2	253°34.5	44.3	57°31.2	27.1
15	263°49.4	53°33.1	·· 22.2	24°22.3	·· 02.6	268°37.1	·· 44.3	72°33.4	·· 27.2
16	278°51.9	68°36.8	21.2	39°22.9	03.0	283°39.7	44.4	87°35.6	27.3
17	293°54.3	83°40.6	20.2	54°23.4	03.3	298°42.3	44.4	102°37.8	27.4
18	308°56.8	98°44.4	S18°19.2	69°24.0	S21°03.7	313°45.0	S03°44.5	117°40.0	S02°27.5
19	323°59.2	113°48.1	18.2	84°24.6	04.1	328°47.6	44.6	132°42.2	27.6
20	339°01.7	128°51.9	17.2	99°25.2	04.5	343°50.2	44.6	147°44.4	27.7
21	354°04.2	143°55.7	·· 16.2	114°25.8	·· 04.9	358°52.8	·· 44.7	162°46.6	·· 27.8
22	9°06.6	158°59.4	15.2	129°26.4	05.3	13°55.4	44.7	177°48.8	27.9
23	24°09.1	174°03.2	14.2	144°26.9	05.7	28°58.0	44.8	192°51.0	28.0
Mer.pass.:21:24		v3.8 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.8
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°16.6	89°18.7
Acamar	315°19.3	-40°15.5
Menkar	314°16.7	4°08.1
Mirfak	308°42.7	49°54.0
Aldebaran	290°51.3	16°31.9
Rigel	281°13.6	-8°11.2
Capella	280°36.9	46°00.4
Bellatrix	278°33.8	6°21.6
Elnath	278°14.8	28°37.0
Alnilam	275°48.1	-1°11.6
Betelgeuse	271°03.2	7°24.6
Canopus	263°56.7	-52°41.8
Sirius	258°35.2	-16°43.7
Adhara	255°13.9	-28°59.0
Procyon	245°01.6	5°11.8
Pollux	243°30.0	27°59.9
Avior	234°18.9	-59°32.4
Suhail	222°54.0	-43°28.4
Miaplacidus	221°40.4	-69°45.4
Alphard	217°58.1	-8°42.3
Regulus	207°45.7	11°54.8
Dubhe	193°54.3	61°41.3
Denebola	182°35.8	14°30.6
Gienah	175°54.6	-17°36.1
Acrux	173°12.3	-63°09.4
Gacrux	172°03.7	-57°10.3
Alioth	166°22.8	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.5
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.4
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.8
Kochab	137°20.9	74°06.6
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°13.0	26°40.8
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.4	51°29.5
Kaus Aust.	83°46.5	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.2	-56°42.1
Deneb	49°32.8	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.8	-46°54.5
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Oct 28 Thu	**SHA**	**Mer.pass**
Venus	148°19.7	11:39
Mars	122°30.8	13:24
Jupiter	4°37.6	21:13
Saturn	169°01.0	10:17

Oct 29 Fri	**SHA**	**Mer.pass**
Venus	148°52.0	11:33
Mars	121°46.0	13:24
Jupiter	4°41.6	21:09
Saturn	168°54.5	10:14

Oct 30 Sat	**SHA**	**Mer.pass**
Venus	149°24.0	11:27
Mars	121°01.1	13:23
Jupiter	4°45.4	21:04
Saturn	168°48.1	10:10

Horizontal parallax	
Venus:	0.5
Mars:	0.1

DUT1 = UT1-UTC = -0.0871 sec ΔT = TT-UT1 = +66.2711 sec

2010 October 28 to Oct. 30 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°02.4	**S**13°00.4	303°22.2	7.4'	**N**23°34.4	-3.6'	57.4'
1	199°02.4	01.2	317°48.6	7.4'	23°30.7	-3.8'	57.4'
2	214°02.5	02.1	332°14.9	7.4'	23°26.8	-3.9'	57.5'
3	229°02.6	·· 02.9	346°41.3	7.4'	23°22.9	-4.0'	57.5'
4	244°02.6	03.8	1°07.7	7.4'	23°18.8	-4.2'	57.5'
5	259°02.7	04.6	15°34.1	7.4'	23°14.5	-4.3'	57.5'
6	274°02.7	**S**13°05.4	30°00.5	7.4'	**N**23°10.1	-4.5'	57.5'
7	289°02.8	06.3	44°27.0	7.4'	23°05.6	-4.6'	57.6'
8	304°02.8	07.1	58°53.4	7.5'	23°00.9	-4.7'	57.6'
9	319°02.9	·· 07.9	73°19.9	7.5'	22°56.1	-4.9'	57.6'
10	334°02.9	08.8	87°46.4	7.5'	22°51.2	-5.0'	57.6'
11	349°03.0	09.6	102°12.9	7.5'	22°46.1	-5.2'	57.7'
12	4°03.0	**S**13°10.4	116°39.4	7.5'	**N**22°40.9	-5.3'	57.7'
13	19°03.1	11.3	131°06.0	7.6'	22°35.5	-5.4'	57.7'
14	34°03.1	12.1	145°32.5	7.6'	22°30.0	-5.6'	57.7'
15	49°03.2	·· 13.0	159°59.1	7.6'	22°24.4	-5.7'	57.8'
16	64°03.2	13.8	174°25.7	7.6'	22°18.6	-5.8'	57.8'
17	79°03.2	14.6	188°52.3	7.6'	22°12.7	-6.0'	57.8'
18	94°03.3	**S**13°15.5	203°19.0	7.7'	**N**22°06.7	-6.1'	57.8'
19	109°03.3	16.3	217°45.7	7.7'	22°00.5	-6.2'	57.8'
20	124°03.4	17.1	232°12.4	7.7'	21°54.2	-6.4'	57.9'
21	139°03.4	·· 18.0	246°39.1	7.7'	21°47.7	-6.5'	57.9'
22	154°03.5	18.8	261°05.9	7.8'	21°41.2	-6.6'	57.9'
23	169°03.5	19.6	275°32.7	7.8'	21°34.4	-6.8'	57.9'
	SD.=16.1	d=-0.8			S.D.=15.7		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°03.6	**S**13°20.5	289°59.5	7.8'	**N**21°27.6	-6.9'	58.0'
1	199°03.6	21.3	304°26.4	7.9'	21°20.6	-7.0'	58.0'
2	214°03.7	22.1	318°53.2	7.9'	21°13.5	-7.2'	58.0'
3	229°03.7	·· 22.9	333°20.1	7.9'	21°06.3	-7.3'	58.0'
4	244°03.8	23.8	347°47.1	8.0'	20°58.9	-7.4'	58.0'
5	259°03.8	24.6	2°14.1	8.0'	20°51.5	-7.6'	58.1'
6	274°03.8	**S**13°25.4	16°41.1	8.0'	**N**20°43.8	-7.7'	58.1'
7	289°03.9	26.3	31°08.1	8.1'	20°36.1	-7.8'	58.1'
8	304°03.9	27.1	45°35.2	8.1'	20°28.2	-7.9'	58.1'
9	319°04.0	·· 27.9	60°02.3	8.1'	20°20.2	-8.1'	58.2'
10	334°04.0	28.7	74°29.5	8.2'	20°12.1	-8.2'	58.2'
11	349°04.1	29.6	88°56.6	8.2'	20°03.9	-8.3'	58.2'
12	4°04.1	**S**13°30.4	103°23.9	8.2'	**N**19°55.5	-8.4'	58.2'
13	19°04.1	31.2	117°51.1	8.3'	19°47.0	-8.5'	58.3'
14	34°04.2	32.1	132°18.4	8.3'	19°38.4	-8.7'	58.3'
15	49°04.2	·· 32.9	146°45.7	8.3'	19°29.7	-8.8'	58.3'
16	64°04.3	33.7	161°13.1	8.4'	19°20.8	-8.9'	58.3'
17	79°04.3	34.5	175°40.5	8.4'	19°11.9	-9.0'	58.3'
18	94°04.3	**S**13°35.4	190°07.9	8.5'	**N**19°02.8	-9.1'	58.4'
19	109°04.4	36.2	204°35.4	8.5'	18°53.6	-9.3'	58.4'
20	124°04.4	37.0	219°02.9	8.5'	18°44.3	-9.4'	58.4'
21	139°04.4	·· 37.8	233°30.5	8.6'	18°34.8	-9.5'	58.4'
22	154°04.5	38.6	247°58.1	8.6'	18°25.3	-9.6'	58.5'
23	169°04.5	39.5	262°25.7	8.6'	18°15.6	-9.7'	58.5'
	SD.=16.1	d=-0.8			S.D.=15.9		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°04.6	**S**13°40.3	276°53.4	8.7'	**N**18°05.9	-9.8'	58.5'
1	199°04.6	41.1	291°21.1	8.7'	17°56.0	-9.9'	58.5'
2	214°04.6	41.9	305°48.8	8.8'	17°46.0	-10.0'	58.6'
3	229°04.7	·· 42.8	320°16.6	8.8'	17°35.9	-10.2'	58.6'
4	244°04.7	43.6	334°44.4	8.8'	17°25.7	-10.3'	58.6'
5	259°04.7	44.4	349°12.3	8.9'	17°15.3	-10.4'	58.6'
6	274°04.8	**S**13°45.2	3°40.2	8.9'	**N**17°04.9	-10.5'	58.6'
7	289°04.8	46.0	18°08.1	9.0'	16°54.4	-10.6'	58.7'
8	304°04.8	46.9	32°36.1	9.0'	16°43.7	-10.7'	58.7'
9	319°04.9	·· 47.7	47°04.1	9.0'	16°33.0	-10.8'	58.7'
10	334°04.9	48.5	61°32.2	9.1'	16°22.2	-10.9'	58.7'
11	349°04.9	49.3	76°00.3	9.1'	16°11.2	-11.0'	58.8'
12	4°05.0	**S**13°50.1	90°28.4	9.1'	**N**16°00.2	-11.1'	58.8'
13	19°05.0	51.0	104°56.6	9.2'	15°49.0	-11.2'	58.8'
14	34°05.0	51.8	119°24.8	9.2'	15°37.8	-11.3'	58.8'
15	49°05.1	·· 52.6	133°53.0	9.3'	15°26.5	-11.4'	58.8'
16	64°05.1	53.4	148°21.3	9.3'	15°15.0	-11.5'	58.9'
17	79°05.1	54.2	162°49.6	9.3'	15°03.5	-11.6'	58.9'
18	94°05.2	**S**13°55.0	177°18.0	9.4'	**N**14°51.9	-11.7'	58.9'
19	109°05.2	55.9	191°46.3	9.4'	14°40.2	-11.8'	58.9'
20	124°05.2	56.7	206°14.8	9.4'	14°28.3	-11.9'	59.0'
21	139°05.3	·· 57.5	220°43.2	9.5'	14°16.4	-11.9'	59.0'
22	154°05.3	58.3	235°11.7	9.5'	14°04.5	-12.0'	59.0'
23	169°05.3	59.1	249°40.2	9.5'	13°52.4	-12.1'	59.0'
	SD.=16.1	d=-0.8			S.D.=16.0		

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 21-23 72-50%
28	16:10	16:12	11:44	03:55	16:23	
29	16:14	16:16	11:44	04:51	17:18	
30	16:18	16:20	11:44	05:45	18:11	

October 31, 01, 02 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	39°11.6	189°07.0	S18°13.2	159°27.5	S21°06.0	44°00.6	S03°44.8	207°53.2	S02°28.2
1	54°14.0	204°10.7	12.2	174°28.1	06.4	59°03.3	44.9	222°55.4	28.3
2	69°16.5	219°14.5	11.2	189°28.7	06.8	74°05.9	44.9	237°57.6	28.4
3	84°19.0	234°18.2	·· 10.2	204°29.3	·· 07.2	89°08.5	·· 45.0	252°59.8	·· 28.5
4	99°21.4	249°22.0	09.1	219°29.8	07.6	104°11.1	45.0	268°02.0	28.6
5	114°23.9	264°25.7	08.1	234°30.4	07.9	119°13.7	45.1	283°04.2	28.7
6	129°26.4	279°29.5	S18°07.1	249°31.0	S21°08.3	134°16.3	S03°45.1	298°06.4	S02°28.8
7	144°28.8	294°33.2	06.1	264°31.6	08.7	149°18.9	45.2	313°08.6	28.9
8	159°31.3	309°37.0	05.1	279°32.2	09.1	164°21.5	45.3	328°10.8	29.0
9	174°33.7	324°40.7	·· 04.1	294°32.7	·· 09.5	179°24.1	·· 45.3	343°13.0	·· 29.1
10	189°36.2	339°44.5	03.1	309°33.3	09.8	194°26.7	45.4	358°15.2	29.2
11	204°38.7	354°48.2	02.1	324°33.9	10.2	209°29.4	45.4	13°17.4	29.3
12	219°41.1	9°52.0	S18°01.1	339°34.5	S21°10.6	224°32.0	S03°45.5	28°19.6	S02°29.4
13	234°43.6	24°55.7	18°00.0	354°35.1	11.0	239°34.6	45.5	43°21.8	29.6
14	249°46.1	39°59.4	17°59.0	9°35.6	11.4	254°37.2	45.6	58°24.0	29.7
15	264°48.5	55°03.2	·· 58.0	24°36.2	·· 11.7	269°39.8	·· 45.6	73°26.2	·· 29.8
16	279°51.0	70°06.9	57.0	39°36.8	12.1	284°42.4	45.7	88°28.4	29.9
17	294°53.5	85°10.7	56.0	54°37.4	12.5	299°45.0	45.7	103°30.6	30.0
18	309°55.9	100°14.4	S17°55.0	69°37.9	S21°12.9	314°47.6	S03°45.8	118°32.8	S02°30.1
19	324°58.4	115°18.1	53.9	84°38.5	13.2	329°50.2	45.8	133°35.0	30.2
20	340°00.9	130°21.8	52.9	99°39.1	13.6	344°52.8	45.9	148°37.2	30.3
21	355°03.3	145°25.6	·· 51.9	114°39.7	·· 14.0	359°55.4	·· 45.9	163°39.4	·· 30.4
22	10°05.8	160°29.3	50.9	129°40.2	14.4	14°58.0	46.0	178°41.6	30.5
23	25°08.2	175°33.0	49.9	144°40.8	14.8	30°00.6	46.0	193°43.8	30.6
Mer.pass.:21:20		v3.8 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	40°10.7	190°36.8	S17°48.8	159°41.4	S21°15.1	45°03.2	S03°46.1	208°46.0	S02°30.7
1	55°13.2	205°40.5	47.8	174°42.0	15.5	60°05.9	46.1	223°48.2	30.8
2	70°15.6	220°44.2	46.8	189°42.5	15.9	75°08.5	46.2	238°50.4	30.9
3	85°18.1	235°47.9	·· 45.8	204°43.1	·· 16.3	90°11.1	·· 46.2	253°52.6	·· 31.1
4	100°20.6	250°51.6	44.8	219°43.7	16.6	105°13.7	46.3	268°54.7	31.2
5	115°23.0	265°55.3	43.7	234°44.3	17.0	120°16.3	46.3	283°56.9	31.3
6	130°25.5	280°59.1	S17°42.7	249°44.8	S21°17.4	135°18.9	S03°46.4	298°59.1	S02°31.4
7	145°28.0	296°02.8	41.7	264°45.4	17.7	150°21.5	46.4	314°01.3	31.5
8	160°30.4	311°06.5	40.7	279°46.0	18.1	165°24.1	46.5	329°03.5	31.6
9	175°32.9	326°10.2	·· 39.6	294°46.5	·· 18.5	180°26.7	·· 46.5	344°05.7	·· 31.7
10	190°35.3	341°13.9	38.6	309°47.1	18.9	195°29.3	46.6	359°07.9	31.8
11	205°37.8	356°17.6	37.6	324°47.7	19.2	210°31.9	46.6	14°10.1	31.9
12	220°40.3	11°21.3	S17°36.6	339°48.3	S21°19.6	225°34.5	S03°46.7	29°12.3	S02°32.0
13	235°42.7	26°25.0	35.5	354°48.8	20.0	240°37.1	46.7	44°14.5	32.1
14	250°45.2	41°28.7	34.5	9°49.4	20.3	255°39.7	46.8	59°16.7	32.2
15	265°47.7	56°32.4	·· 33.5	24°50.0	·· 20.7	270°42.3	·· 46.8	74°18.9	·· 32.3
16	280°50.1	71°36.1	32.4	39°50.5	21.1	285°44.9	46.9	89°21.1	32.4
17	295°52.6	86°39.8	31.4	54°51.1	21.5	300°47.5	46.9	104°23.3	32.5
18	310°55.1	101°43.5	S17°30.4	69°51.7	S21°21.8	315°50.1	S03°47.0	119°25.5	S02°32.7
19	325°57.5	116°47.1	29.4	84°52.2	22.2	330°52.7	47.0	134°27.7	32.8
20	341°00.0	131°50.8	28.3	99°52.8	22.6	345°55.3	47.1	149°29.9	32.9
21	356°02.5	146°54.5	·· 27.3	114°53.4	·· 22.9	0°57.9	·· 47.1	164°32.1	·· 33.0
22	11°04.9	161°58.2	26.3	129°54.0	23.3	16°00.5	47.2	179°34.3	33.1
23	26°07.4	177°01.9	25.2	144°54.5	23.7	31°03.1	47.2	194°36.5	33.2
Mer.pass.:21:16		v3.7 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.1 m-2.6		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	41°09.8	192°05.6	S17°24.2	159°55.1	S21°24.0	46°05.7	S03°47.3	209°38.7	S02°33.3
1	56°12.3	207°09.2	23.2	174°55.7	24.4	61°08.3	47.3	224°40.9	33.4
2	71°14.8	222°12.9	22.1	189°56.2	24.8	76°10.9	47.4	239°43.1	33.5
3	86°17.2	237°16.6	·· 21.1	204°56.8	·· 25.1	91°13.5	·· 47.4	254°45.3	·· 33.6
4	101°19.7	252°20.2	20.1	219°57.4	25.5	106°16.1	47.4	269°47.5	33.7
5	116°22.2	267°23.9	19.0	234°57.9	25.9	121°18.7	47.5	284°49.7	33.8
6	131°24.6	282°27.6	S17°18.0	249°58.5	S21°26.2	136°21.3	S03°47.5	299°51.9	S02°33.9
7	146°27.1	297°31.2	17.0	264°59.1	26.6	151°23.9	47.6	314°54.1	34.0
8	161°29.6	312°34.9	16.0	279°59.6	27.0	166°26.5	47.6	329°56.3	34.1
9	176°32.0	327°38.6	·· 14.9	295°00.2	·· 27.3	181°29.1	·· 47.7	344°58.5	·· 34.2
10	191°34.5	342°42.2	13.9	310°00.8	27.7	196°31.7	47.7	0°00.7	34.4
11	206°36.9	357°45.9	12.8	325°01.3	28.0	211°34.2	47.8	15°02.9	34.5
12	221°39.4	12°49.5	S17°11.8	340°01.9	S21°28.4	226°36.8	S03°47.8	30°05.1	S02°34.6
13	236°41.9	27°53.2	10.8	355°02.4	28.8	241°39.4	47.9	45°07.3	34.7
14	251°44.3	42°56.8	09.7	10°03.0	29.1	256°42.0	47.9	60°09.5	34.8
15	266°46.8	58°00.5	·· 08.7	25°03.6	·· 29.5	271°44.6	·· 48.0	75°11.7	·· 34.9
16	281°49.3	73°04.1	07.7	40°04.1	29.9	286°47.2	48.0	90°13.9	35.0
17	296°51.7	88°07.8	06.6	55°04.7	30.2	301°49.8	48.0	105°16.1	35.1
18	311°54.2	103°11.4	S17°05.6	70°05.3	S21°30.6	316°52.4	S03°48.1	120°18.3	S02°35.2
19	326°56.7	118°15.0	04.6	85°05.8	30.9	331°55.0	48.1	135°20.5	35.3
20	341°59.1	133°18.7	03.5	100°06.4	31.3	346°57.6	48.2	150°22.7	35.4
21	357°01.6	148°22.3	·· 02.5	115°06.9	·· 31.7	2°00.2	·· 48.2	165°24.9	·· 35.5
22	12°04.1	163°25.9	01.5	130°07.5	32.0	17°02.8	48.3	180°27.1	35.6
23	27°06.5	178°29.6	00.4	145°08.1	32.4	32°05.4	48.3	195°29.3	35.7
Mer.pass.:21:12		v3.7 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.8
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.8
Hamal	328°02.6	23°31.0
Polaris	318°16.4	89°18.7
Acamar	315°19.3	-40°15.5
Menkar	314°16.7	4°08.1
Mirfak	308°42.7	49°54.0
Aldebaran	290°51.3	16°31.9
Rigel	281°13.6	-8°11.2
Capella	280°36.9	46°00.4
Bellatrix	278°33.8	6°21.6
Elnath	278°14.8	28°37.0
Alnilam	275°48.1	-1°11.6
Betelgeuse	271°03.1	7°24.6
Canopus	263°56.7	-52°41.8
Sirius	258°35.2	-16°43.7
Adhara	255°13.9	-28°59.0
Procyon	245°01.6	5°11.8
Pollux	243°29.9	27°59.9
Avior	234°18.8	-59°32.4
Suhail	222°54.0	-43°28.4
Miaplacidus	221°40.4	-69°45.4
Alphard	217°58.0	-8°42.3
Regulus	207°45.6	11°54.8
Dubhe	193°54.2	61°41.3
Denebola	182°35.8	14°30.6
Gienah	175°54.6	-17°36.1
Acrux	173°12.2	-63°09.4
Gacrux	172°03.7	-57°10.3
Alioth	166°22.7	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.5
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.3
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.7
Kochab	137°20.9	74°06.6
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°13.0	26°40.8
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.4	51°29.5
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.2	-56°42.1
Deneb	49°32.8	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.9	-46°54.6
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Oct 31 Sun	**SHA**	**Mer.pass**
Venus	149°55.4	11:21
Mars	120°16.0	13:22
Jupiter	4°49.1	21:00
Saturn	168°41.6	10:07

Nov 01 Mon	**SHA**	**Mer.pass**
Venus	150°26.0	11:15
Mars	119°30.7	13:21
Jupiter	4°52.5	20:56
Saturn	168°35.2	10:03

Nov 02 Tue	**SHA**	**Mer.pass**
Venus	150°55.7	11:09
Mars	118°45.2	13:20
Jupiter	4°55.8	20:52
Saturn	168°28.9	10:00

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.3	S13°59.9	264°08.8	9.6'	N13°40.2	-12.2'	59.0'
1	199°05.4	14°00.7	278°37.4	9.6'	13°28.0	-12.3'	59.1'
2	214°05.4	01.6	293°06.0	9.6'	13°15.6	-12.4'	59.1'
3	229°05.4	·· 02.4	307°34.7	9.7'	13°03.2	-12.5'	59.1'
4	244°05.5	03.2	322°03.4	9.7'	12°50.7	-12.5'	59.1'
5	259°05.5	04.0	336°32.1	9.7'	12°38.2	-12.6'	59.1'
6	274°05.5	S14°04.8	351°00.8	9.8'	N12°25.5	-12.7'	59.2'
7	289°05.5	05.6	5°29.6	9.8'	12°12.8	-12.8'	59.2'
8	304°05.6	06.4	19°58.4	9.8'	12°00.0	-12.9'	59.2'
9	319°05.6	·· 07.2	34°27.3	9.9'	11°47.1	-12.9'	59.2'
10	334°05.6	08.0	48°56.1	9.9'	11°34.1	-13.0'	59.3'
11	349°05.6	08.8	63°25.0	9.9'	11°21.1	-13.1'	59.3'
12	4°05.7	S14°09.7	77°54.0	9.9'	N11°07.9	-13.1'	59.3'
13	19°05.7	10.5	92°22.9	10.0'	10°54.8	-13.2'	59.3'
14	34°05.7	11.3	106°51.9	10.0'	10°41.5	-13.3'	59.3'
15	49°05.7	·· 12.1	121°20.9	10.0'	10°28.2	-13.4'	59.4'
16	64°05.8	12.9	135°49.9	10.0'	10°14.8	-13.4'	59.4'
17	79°05.8	13.7	150°19.0	10.1'	10°01.4	-13.5'	59.4'
18	94°05.8	S14°14.5	164°48.0	10.1'	N09°47.8	-13.6'	59.4'
19	109°05.8	15.3	179°17.1	10.1'	09°34.2	-13.6'	59.4'
20	124°05.8	16.1	193°46.3	10.1'	09°20.6	-13.7'	59.4'
21	139°05.9	·· 16.9	208°15.4	10.1'	09°06.9	-13.7'	59.5'
22	154°05.9	17.7	222°44.6	10.2'	08°53.1	-13.8'	59.5'
23	169°05.9	18.5	237°13.7	10.2'	08°39.3	-13.9'	59.5'
	SD.=16.1	d=-0.8	S.D.=16.2				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.9	S14°19.3	251°42.9	10.2'	N08°25.4	-13.9'	59.5'
1	199°06.0	20.1	266°12.1	10.2'	08°11.5	-14.0'	59.5'
2	214°06.0	20.9	280°41.4	10.2'	07°57.5	-14.0'	59.6'
3	229°06.0	·· 21.7	295°10.6	10.3'	07°43.4	-14.1'	59.6'
4	244°06.0	22.5	309°39.9	10.3'	07°29.4	-14.1'	59.6'
5	259°06.0	23.3	324°09.2	10.3'	07°15.2	-14.2'	59.6'
6	274°06.0	S14°24.2	338°38.4	10.3'	N07°01.0	-14.2'	59.6'
7	289°06.1	25.0	353°07.7	10.3'	06°46.8	-14.3'	59.6'
8	304°06.1	25.8	7°37.1	10.3'	06°32.5	-14.3'	59.7'
9	319°06.1	·· 26.6	22°06.4	10.3'	06°18.1	-14.4'	59.7'
10	334°06.1	27.4	36°35.7	10.3'	06°03.8	-14.4'	59.7'
11	349°06.1	28.2	51°05.1	10.3'	05°49.3	-14.4'	59.7'
12	4°06.1	S14°29.0	65°34.4	10.4'	N05°34.9	-14.5'	59.7'
13	19°06.2	29.8	80°03.8	10.4'	05°20.4	-14.5'	59.7'
14	34°06.2	30.5	94°33.1	10.4'	05°05.8	-14.6'	59.8'
15	49°06.2	·· 31.3	109°02.5	10.4'	04°51.3	-14.6'	59.8'
16	64°06.2	32.1	123°31.9	10.4'	04°36.7	-14.6'	59.8'
17	79°06.2	32.9	138°01.3	10.4'	04°22.0	-14.7'	59.8'
18	94°06.2	S14°33.7	152°30.7	10.4'	N04°07.3	-14.7'	59.8'
19	109°06.3	34.5	167°00.0	10.4'	03°52.6	-14.7'	59.8'
20	124°06.3	35.3	181°29.4	10.4'	03°37.9	-14.8'	59.9'
21	139°06.3	·· 36.1	195°58.8	10.4'	03°23.1	-14.8'	59.9'
22	154°06.3	36.9	210°28.2	10.4'	03°08.3	-14.8'	59.9'
23	169°06.3	37.7	224°57.6	10.4'	02°53.5	-14.8'	59.9'
	SD.=16.1	d=-0.8	S.D.=16.3				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.3	S14°38.5	239°26.9	10.4'	N02°38.7	-14.9'	59.9'
1	199°06.3	39.3	253°56.3	10.4'	02°23.8	-14.9'	59.9'
2	214°06.3	40.1	268°25.7	10.4'	02°08.9	-14.9'	59.9'
3	229°06.3	·· 40.9	282°55.1	10.4'	01°54.0	-14.9'	59.9'
4	244°06.4	41.7	297°24.4	10.4'	01°39.1	-14.9'	60.0'
5	259°06.4	42.5	311°53.8	10.3'	01°24.2	-14.9'	60.0'
6	274°06.4	S14°43.3	326°23.1	10.3'	N01°09.2	-15.0'	60.0'
7	289°06.4	44.1	340°52.4	10.3'	00°54.3	-15.0'	60.0'
8	304°06.4	44.9	355°21.8	10.3'	00°39.3	-15.0'	60.0'
9	319°06.4	·· 45.6	9°51.1	10.3'	00°24.3	-15.0'	60.0'
10	334°06.4	46.4	24°20.4	10.3'	N00°09.3	-15.0'	60.0'
11	349°06.4	47.2	38°49.6	10.3'	S00°05.7	-15.0'	60.0'
12	4°06.4	S14°48.0	53°18.9	10.3'	S00°20.7	-15.0'	60.0'
13	19°06.4	48.8	67°48.2	10.2'	00°35.7	-15.0'	60.1'
14	34°06.4	49.6	82°17.4	10.2'	00°50.7	-15.0'	60.1'
15	49°06.4	·· 50.4	96°46.6	10.2'	01°05.8	-15.0'	60.1'
16	64°06.5	51.2	111°15.8	10.2'	01°20.8	-15.0'	60.1'
17	79°06.5	52.0	125°45.0	10.2'	01°35.8	-15.0'	60.1'
18	94°06.5	S14°52.7	140°14.2	10.2'	S01°50.8	-15.0'	60.1'
19	109°06.5	53.5	154°43.3	10.1'	02°05.8	-15.0'	60.1'
20	124°06.5	54.3	169°12.4	10.1'	02°20.8	-15.0'	60.1'
21	139°06.5	·· 55.1	183°41.5	10.1'	02°35.8	-15.0'	60.1'
22	154°06.5	55.9	198°10.6	10.1'	02°50.7	-15.0'	60.1'
23	169°06.5	56.7	212°39.6	10.0'	03°05.7	-15.0'	60.1'
	SD.=16.1	d=-0.8	S.D.=16.4				

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

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

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 24-26 39-18%
31	16:21	16:23	11:44	06:37	19:03	
01	16:24	16:25	11:44	07:28	19:54	
02	16:25	16:26	11:44	08:19	20:45	

November 03, 04, 05 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	42°09.0	193°33.2	S16°59.4	160°08.6	S21°32.7	47°07.9	S03°48.4	210°31.5	S02°35.8
1	57°11.4	208°36.8	58.4	175°09.2	33.1	62°10.5	48.4	225°33.7	35.9
2	72°13.9	223°40.4	57.3	190°09.8	33.5	77°13.1	48.4	240°35.9	36.0
3	87°16.4	238°44.0	·· 56.3	205°10.3	·· 33.8	92°15.7	·· 48.5	255°38.1	·· 36.2
4	102°18.8	253°47.7	55.3	220°10.9	34.2	107°18.3	48.5	270°40.3	36.3
5	117°21.3	268°51.3	54.2	235°11.4	34.5	122°20.9	48.6	285°42.5	36.4
6	132°23.8	283°54.9	S16°53.2	250°12.0	S21°34.9	137°23.5	S03°48.6	300°44.7	S02°36.5
7	147°26.2	298°58.5	52.1	265°12.6	35.2	152°26.1	48.7	315°46.9	36.6
8	162°28.7	314°02.1	51.1	280°13.1	35.6	167°28.7	48.7	330°49.1	36.7
9	177°31.2	329°05.7	·· 50.1	295°13.7	·· 36.0	182°31.3	·· 48.8	345°51.3	·· 36.8
10	192°33.6	344°09.3	49.0	310°14.2	36.3	197°33.8	48.8	0°53.6	36.9
11	207°36.1	359°12.9	48.0	325°14.8	36.7	212°36.4	48.8	15°55.8	37.0
12	222°38.6	14°16.5	S16°47.0	340°15.3	S21°37.0	227°39.0	S03°48.9	30°58.0	S02°37.1
13	237°41.0	29°20.1	45.9	355°15.9	37.4	242°41.6	48.9	46°00.2	37.2
14	252°43.5	44°23.7	44.9	10°16.5	37.7	257°44.2	49.0	61°02.4	37.3
15	267°45.9	59°27.3	·· 43.9	25°17.0	·· 38.1	272°46.8	·· 49.0	76°04.6	·· 37.4
16	282°48.4	74°30.8	42.8	40°17.6	38.4	287°49.4	49.0	91°06.8	37.5
17	297°50.9	89°34.4	41.8	55°18.1	38.8	302°51.9	49.1	106°09.0	37.6
18	312°53.3	104°38.0	S16°40.8	70°18.7	S21°39.2	317°54.5	S03°49.1	121°11.2	S02°37.7
19	327°55.8	119°41.6	39.7	85°19.2	39.5	332°57.1	49.2	136°13.4	37.8
20	342°58.3	134°45.2	38.7	100°19.8	39.9	347°59.7	49.2	151°15.6	37.9
21	358°00.7	149°48.7	·· 37.7	115°20.4	·· 40.2	3°02.3	·· 49.3	166°17.8	·· 38.0
22	13°03.2	164°52.3	36.6	130°20.9	40.6	18°04.9	49.3	181°20.0	38.1
23	28°05.7	179°55.9	35.6	145°21.5	40.9	33°07.5	49.3	196°22.2	38.3
Mer.pass.:21:08		v3.6 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	43°08.1	194°59.4	S16°34.6	160°22.0	S21°41.3	48°10.0	S03°49.4	211°24.4	S02°38.4
1	58°10.6	210°03.0	33.5	175°22.6	41.6	63°12.6	49.4	226°26.6	38.5
2	73°13.0	225°06.6	32.5	190°23.1	42.0	78°15.2	49.5	241°28.8	38.6
3	88°15.5	240°10.1	·· 31.5	205°23.7	·· 42.3	93°17.8	·· 49.5	256°31.0	·· 38.7
4	103°18.0	255°13.7	30.4	220°24.2	42.7	108°20.4	49.5	271°33.2	38.8
5	118°20.4	270°17.2	29.4	235°24.8	43.0	123°22.9	49.6	286°35.4	38.9
6	133°22.9	285°20.8	S16°28.4	250°25.3	S21°43.4	138°25.5	S03°49.6	301°37.6	S02°39.0
7	148°25.4	300°24.3	27.3	265°25.9	43.7	153°28.1	49.7	316°39.8	39.1
8	163°27.8	315°27.9	26.3	280°26.4	44.1	168°30.7	49.7	331°42.0	39.2
9	178°30.3	330°31.4	·· 25.3	295°27.0	·· 44.4	183°33.3	·· 49.7	346°44.2	·· 39.3
10	193°32.8	345°34.9	24.2	310°27.5	44.8	198°35.9	49.8	1°46.4	39.4
11	208°35.2	0°38.5	23.2	325°28.1	45.1	213°38.4	49.8	16°48.6	39.5
12	223°37.7	15°42.0	S16°22.2	340°28.6	S21°45.4	228°41.0	S03°49.9	31°50.8	S02°39.6
13	238°40.2	30°45.5	21.1	355°29.2	45.8	243°43.6	49.9	46°53.0	39.7
14	253°42.6	45°49.1	20.1	10°29.7	46.1	258°46.2	49.9	61°55.2	39.8
15	268°45.1	60°52.6	·· 19.1	25°30.3	·· 46.5	273°48.7	·· 50.0	76°57.4	·· 39.9
16	283°47.5	75°56.1	18.0	40°30.8	46.8	288°51.3	50.0	91°59.6	40.0
17	298°50.0	90°59.6	17.0	55°31.4	47.2	303°53.9	50.1	107°01.8	40.1
18	313°52.5	106°03.1	S16°16.0	70°31.9	S21°47.5	318°56.5	S03°50.1	122°04.0	S02°40.2
19	328°54.9	121°06.6	15.0	85°32.5	47.9	333°59.1	50.1	137°06.2	40.3
20	343°57.4	136°10.1	13.9	100°33.0	48.2	349°01.6	50.2	152°08.4	40.4
21	358°59.9	151°13.7	·· 12.9	115°33.6	·· 48.6	4°04.2	·· 50.2	167°10.6	·· 40.6
22	14°02.3	166°17.2	11.9	130°34.1	48.9	19°06.8	50.2	182°12.8	40.7
23	29°04.8	181°20.7	10.8	145°34.7	49.2	34°09.4	50.3	197°15.0	40.8
Mer.pass.:21:04		v3.6 d1.0 m-3.7		v0.6 d-0.4 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	44°07.3	196°24.2	S16°09.8	160°35.2	S21°49.6	49°11.9	S03°50.3	212°17.3	S02°40.9
1	59°09.7	211°27.6	08.8	175°35.8	49.9	64°14.5	50.4	227°19.5	41.0
2	74°12.2	226°31.1	07.8	190°36.3	50.3	79°17.1	50.4	242°21.7	41.1
3	89°14.6	241°34.6	·· 06.7	205°36.9	·· 50.6	94°19.7	·· 50.4	257°23.9	·· 41.2
4	104°17.1	256°38.1	05.7	220°37.4	51.0	109°22.2	50.5	272°26.1	41.3
5	119°19.6	271°41.6	04.7	235°38.0	51.3	124°24.8	50.5	287°28.3	41.4
6	134°22.0	286°45.1	S16°03.7	250°38.5	S21°51.6	139°27.4	S03°50.5	302°30.5	S02°41.5
7	149°24.5	301°48.6	02.6	265°39.1	52.0	154°30.0	50.6	317°32.7	41.6
8	164°27.0	316°52.0	01.6	280°39.6	52.3	169°32.5	50.6	332°34.9	41.7
9	179°29.4	331°55.5	16°00.6	295°40.2	·· 52.7	184°35.1	·· 50.6	347°37.1	·· 41.8
10	194°31.9	346°59.0	15°59.6	310°40.7	53.0	199°37.7	50.7	2°39.3	41.9
11	209°34.4	2°02.4	58.5	325°41.3	53.3	214°40.3	50.7	17°41.5	42.0
12	224°36.8	17°05.9	S15°57.5	340°41.8	S21°53.7	229°42.8	S03°50.8	32°43.7	S02°42.1
13	239°39.3	32°09.4	56.5	355°42.3	54.0	244°45.4	50.8	47°45.9	42.2
14	254°41.8	47°12.8	55.5	10°42.9	54.3	259°48.0	50.8	62°48.1	42.3
15	269°44.2	62°16.3	·· 54.5	25°43.4	·· 54.7	274°50.5	·· 50.9	77°50.3	·· 42.4
16	284°46.7	77°19.7	53.4	40°44.0	55.0	289°53.1	50.9	92°52.5	42.5
17	299°49.1	92°23.2	52.4	55°44.5	55.4	304°55.7	50.9	107°54.7	42.6
18	314°51.6	107°26.6	S15°51.4	70°45.1	S21°55.7	319°58.3	S03°51.0	122°56.9	S02°42.7
19	329°54.1	122°30.0	50.4	85°45.6	56.0	335°00.8	51.0	137°59.1	42.8
20	344°56.5	137°33.5	49.4	100°46.1	56.4	350°03.4	51.0	153°01.3	42.9
21	359°59.0	152°36.9	·· 48.4	115°46.7	·· 56.7	5°06.0	·· 51.1	168°03.5	·· 43.0
22	15°01.5	167°40.3	47.3	130°47.2	57.0	20°08.5	51.1	183°05.7	43.1
23	30°03.9	182°43.8	46.3	145°47.8	57.4	35°11.1	51.1	198°08.0	43.2
Mer.pass.:21:00		v3.5 d1.0 m-3.7		v0.5 d-0.3 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.8
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°16.1	89°18.7
Acamar	315°19.3	-40°15.5
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.3	16°31.9
Rigel	281°13.6	-8°11.2
Capella	280°36.9	46°00.5
Bellatrix	278°33.8	6°21.6
Elnath	278°14.7	28°37.0
Alnilam	275°48.0	-1°11.6
Betelgeuse	271°03.1	7°24.6
Canopus	263°56.7	-52°41.8
Sirius	258°35.2	-16°43.7
Adhara	255°13.8	-28°59.0
Procyon	245°01.6	5°11.8
Pollux	243°29.9	27°59.9
Avior	234°18.8	-59°32.4
Suhail	222°53.9	-43°28.4
Miaplacidus	221°40.3	-69°45.4
Alphard	217°58.0	-8°42.3
Regulus	207°45.6	11°54.8
Dubhe	193°54.2	61°41.2
Denebola	182°35.8	14°30.6
Gienah	175°54.5	-17°36.1
Acrux	173°12.2	-63°09.4
Gacrux	172°03.7	-57°10.3
Alioth	166°22.7	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.5
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.3
Arcturus	145°57.8	19°07.6
Rigil Kent.	139°55.1	-60°52.7
Kochab	137°20.9	74°06.6
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°13.0	26°40.8
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.4	51°29.5
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.8	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.2	-56°42.1
Deneb	49°32.9	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.9	-46°54.6
Fomalhaut	15°25.8	-29°33.8
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 03 Wed	**SHA**	**Mer.pass**
Venus	151°24.2	11:03
Mars	117°59.6	13:19
Jupiter	4°59.0	20:48
Saturn	168°22.6	09:56

Nov 04 Thu	**SHA**	**Mer.pass**
Venus	151°51.3	10:57
Mars	117°13.9	13:18
Jupiter	5°01.9	20:44
Saturn	168°16.3	09:53

Nov 05 Fri	**SHA**	**Mer.pass**
Venus	152°16.9	10:52
Mars	116°28.0	13:17
Jupiter	5°04.7	20:40
Saturn	168°10.0	09:49

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.5	S14°57.5	227°08.7	10.0'	S03°20.7	-14.9'	60.1'
1	199°06.5	58.2	241°37.7	10.0'	03°35.6	-14.9'	60.2'
2	214°06.5	59.0	256°06.6	10.0'	03°50.5	-14.9'	60.2'
3	229°06.5	14°59.8	270°35.6	9.9'	04°05.4	-14.9'	60.2'
4	244°06.5	15°00.6	285°04.5	9.9'	04°20.3	-14.9'	60.2'
5	259°06.5	01.4	299°33.4	9.9'	04°35.2	-14.8'	60.2'
6	274°06.5	S15°02.2	314°02.2	9.8'	S04°50.0	-14.8'	60.2'
7	289°06.5	02.9	328°31.0	9.8'	05°04.8	-14.8'	60.2'
8	304°06.5	03.7	342°59.8	9.8'	05°19.6	-14.8'	60.2'
9	319°06.5	· · 04.5	357°28.6	9.7'	05°34.3	-14.7'	60.2'
10	334°06.5	05.3	11°57.3	9.7'	05°49.1	-14.7'	60.2'
11	349°06.5	06.1	26°26.0	9.7'	06°03.8	-14.7'	60.2'
12	4°06.5	S15°06.8	40°54.6	9.6'	S06°18.4	-14.6'	60.2'
13	19°06.5	07.6	55°23.2	9.6'	06°33.1	-14.6'	60.2'
14	34°06.5	08.4	69°51.8	9.6'	06°47.7	-14.6'	60.2'
15	49°06.5	· · 09.2	84°20.3	9.5'	07°02.2	-14.5'	60.2'
16	64°06.5	10.0	98°48.8	9.5'	07°16.7	-14.5'	60.2'
17	79°06.5	10.7	113°17.3	9.4'	07°31.2	-14.5'	60.2'
18	94°06.5	S15°11.5	127°45.7	9.4'	S07°45.6	-14.4'	60.2'
19	109°06.5	12.3	142°14.1	9.4'	08°00.0	-14.4'	60.2'
20	124°06.5	13.1	156°42.4	9.3'	08°14.4	-14.3'	60.2'
21	139°06.5	· · 13.8	171°10.7	9.3'	08°28.6	-14.3'	60.2'
22	154°06.5	14.6	185°38.9	9.2'	08°42.9	-14.2'	60.2'
23	169°06.5	15.4	200°07.1	9.2'	08°57.1	-14.2'	60.2'
	SD.=16.1	d=-0.8	S.D.=16.4				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.5	S15°16.2	214°35.3	9.1'	S09°11.2	-14.1'	60.2'
1	199°06.5	16.9	229°03.4	9.1'	09°25.3	-14.1'	60.2'
2	214°06.4	17.7	243°31.5	9.0'	09°39.3	-14.0'	60.2'
3	229°06.4	· · 18.5	257°59.5	9.0'	09°53.3	-13.9'	60.2'
4	244°06.4	19.2	272°27.5	9.0'	10°07.2	-13.9'	60.2'
5	259°06.4	20.0	286°55.4	8.9'	10°21.1	-13.8'	60.2'
6	274°06.4	S15°20.8	301°23.3	8.9'	S10°34.8	-13.8'	60.2'
7	289°06.4	21.6	315°51.1	8.8'	10°48.6	-13.7'	60.2'
8	304°06.4	22.3	330°18.9	8.8'	11°02.2	-13.6'	60.2'
9	319°06.4	· · 23.1	344°46.6	8.7'	11°15.8	-13.6'	60.2'
10	334°06.4	23.9	359°14.3	8.7'	11°29.3	-13.5'	60.1'
11	349°06.4	24.6	13°41.9	8.6'	11°42.8	-13.4'	60.1'
12	4°06.4	S15°25.4	28°09.5	8.6'	S11°56.1	-13.3'	60.1'
13	19°06.4	26.2	42°37.0	8.5'	12°09.4	-13.3'	60.1'
14	34°06.3	26.9	57°04.5	8.5'	12°22.7	-13.2'	60.1'
15	49°06.3	· · 27.7	71°32.0	8.4'	12°35.8	-13.1'	60.1'
16	64°06.3	28.5	85°59.3	8.4'	12°48.9	-13.0'	60.1'
17	79°06.3	29.3	100°26.7	8.3'	13°01.9	-12.9'	60.1'
18	94°06.3	S15°30.0	114°53.9	8.2'	S13°14.8	-12.9'	60.1'
19	109°06.3	30.8	129°21.2	8.2'	13°27.6	-12.8'	60.1'
20	124°06.3	31.5	143°48.3	8.1'	13°40.3	-12.7'	60.1'
21	139°06.3	· · 32.3	158°15.4	8.1'	13°52.9	-12.6'	60.1'
22	154°06.2	33.1	172°42.5	8.0'	14°05.5	-12.5'	60.0'
23	169°06.2	33.8	187°09.5	8.0'	14°18.0	-12.4'	60.0'
	SD.=16.1	d=-0.8	S.D.=16.4				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.2	S15°34.6	201°36.5	7.9'	S14°30.3	-12.3'	60.0'
1	199°06.2	35.4	216°03.4	7.9'	14°42.6	-12.2'	60.0'
2	214°06.2	36.1	230°30.2	7.8'	14°54.8	-12.1'	60.0'
3	229°06.2	· · 36.9	244°57.0	7.8'	15°06.9	-12.0'	60.0'
4	244°06.2	37.7	259°23.8	7.7'	15°18.9	-11.9'	60.0'
5	259°06.1	38.4	273°50.4	7.7'	15°30.8	-11.8'	60.0'
6	274°06.1	S15°39.2	288°17.1	7.6'	S15°42.5	-11.7'	59.9'
7	289°06.1	39.9	302°43.7	7.6'	15°54.2	-11.6'	59.9'
8	304°06.1	40.7	317°10.2	7.5'	16°05.8	-11.5'	59.9'
9	319°06.1	· · 41.5	331°36.7	7.5'	16°17.3	-11.4'	59.9'
10	334°06.1	42.2	346°03.1	7.4'	16°28.6	-11.3'	59.9'
11	349°06.0	43.0	0°29.5	7.3'	16°39.9	-11.2'	59.9'
12	4°06.0	S15°43.7	14°55.8	7.3'	S16°51.0	-11.1'	59.8'
13	19°06.0	44.5	29°22.1	7.2'	17°02.1	-11.0'	59.8'
14	34°06.0	45.3	43°48.3	7.2'	17°13.0	-10.9'	59.8'
15	49°06.0	· · 46.0	58°14.5	7.1'	17°23.8	-10.7'	59.8'
16	64°05.9	46.8	72°40.6	7.1'	17°34.5	-10.6'	59.8'
17	79°05.9	47.5	87°06.6	7.0'	17°45.0	-10.5'	59.8'
18	94°05.9	S15°48.3	101°32.7	7.0'	S17°55.5	-10.4'	59.7'
19	109°05.9	49.0	115°58.6	6.9'	18°05.8	-10.3'	59.7'
20	124°05.9	49.8	130°24.5	6.9'	18°16.0	-10.2'	59.7'
21	139°05.8	· · 50.5	144°50.4	6.8'	18°26.1	-10.0'	59.7'
22	154°05.8	51.3	159°16.2	6.8'	18°36.1	-9.9'	59.7'
23	169°05.8	52.0	173°42.0	6.8'	18°45.9	-9.8'	59.6'
	SD.=16.1	d=-0.8	S.D.=16.3				

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

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

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 10-1%
03	16:26	16:26	11:44	09:10	21:37	
04	16:26	16:25	11:44	10:03	22:30	
05	16:25	16:24	11:44	10:58	23:26	

November 06, 07, 08 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	45°06.4	197°47.2	S15°45.3	160°48.3	S21°57.7	50°13.7	S03°51.2	213°10.2	S02°43.4
1	60°08.9	212°50.6	44.3	175°48.9	58.0	65°16.2	51.2	228°12.4	43.5
2	75°11.3	227°54.0	43.3	190°49.4	58.4	80°18.8	51.2	243°14.6	43.6
3	90°13.8	242°57.5	·· 42.3	205°49.9	·· 58.7	95°21.4	·· 51.3	258°16.8	·· 43.7
4	105°16.3	258°00.9	41.3	220°50.5	59.0	110°23.9	51.3	273°19.0	43.8
5	120°18.7	273°04.3	40.3	235°51.0	59.4	125°26.5	51.3	288°21.2	43.9
6	135°21.2	288°07.7	S15°39.2	250°51.6	S21°59.7	140°29.1	S03°51.4	303°23.4	S02°44.0
7	150°23.6	303°11.1	38.2	265°52.1	22°00.0	155°31.6	51.4	318°25.6	44.1
8	165°26.1	318°14.5	37.2	280°52.6	00.4	170°34.2	51.4	333°27.8	44.2
9	180°28.6	333°17.9	·· 36.2	295°53.2	·· 00.7	185°36.8	·· 51.5	348°30.0	·· 44.3
10	195°31.0	348°21.3	35.2	310°53.7	01.0	200°39.3	51.5	3°32.2	44.4
11	210°33.5	3°24.7	34.2	325°54.3	01.4	215°41.9	51.5	18°34.4	44.5
12	225°36.0	18°28.0	S15°33.2	340°54.8	S22°01.7	230°44.5	S03°51.6	33°36.6	S02°44.6
13	240°38.4	33°31.4	32.2	355°55.3	02.0	245°47.0	51.6	48°38.8	44.7
14	255°40.9	48°34.8	31.2	10°55.9	02.4	260°49.6	51.6	63°41.0	44.8
15	270°43.4	63°38.2	·· 30.2	25°56.4	·· 02.7	275°52.2	·· 51.7	78°43.2	·· 44.9
16	285°45.8	78°41.6	29.2	40°56.9	03.0	290°54.7	51.7	93°45.4	45.0
17	300°48.3	93°44.9	28.2	55°57.5	03.3	305°57.3	51.7	108°47.7	45.1
18	315°50.8	108°48.3	S15°27.2	70°58.0	S22°03.7	320°59.8	S03°51.8	123°49.9	S02°45.2
19	330°53.2	123°51.7	26.2	85°58.6	04.0	336°02.4	51.8	138°52.1	45.3
20	345°55.7	138°55.0	25.2	100°59.1	04.3	351°05.0	51.8	153°54.3	45.4
21	0°58.1	153°58.4	·· 24.2	115°59.6	·· 04.7	6°07.5	·· 51.9	168°56.5	·· 45.5
22	16°00.6	169°01.7	23.2	131°00.2	05.0	21°10.1	51.9	183°58.7	45.6
23	31°03.1	184°05.1	22.2	146°00.7	05.3	36°12.7	51.9	199°00.9	45.7
Mer.pass.:20:56		v3.4 d1.0 m-3.8		v0.5 d-0.3 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	46°05.5	199°08.4	S15°21.2	161°01.2	S22°05.6	51°15.2	S03°51.9	214°03.1	S02°45.8
1	61°08.0	214°11.8	20.2	176°01.8	06.0	66°17.8	52.0	229°05.3	45.9
2	76°10.5	229°15.1	19.2	191°02.3	06.3	81°20.3	52.0	244°07.5	46.0
3	91°12.9	244°18.5	·· 18.2	206°02.8	·· 06.6	96°22.9	·· 52.0	259°09.7	·· 46.1
4	106°15.4	259°21.8	17.2	221°03.4	06.9	111°25.5	52.1	274°11.9	46.2
5	121°17.9	274°25.1	16.2	236°03.9	07.3	126°28.0	52.1	289°14.1	46.3
6	136°20.3	289°28.4	S15°15.2	251°04.4	S22°07.6	141°30.6	S03°52.1	304°16.3	S02°46.4
7	151°22.8	304°31.8	14.2	266°05.0	07.9	156°33.1	52.2	319°18.6	46.5
8	166°25.2	319°35.1	13.2	281°05.5	08.2	171°35.7	52.2	334°20.8	46.6
9	181°27.7	334°38.4	·· 12.3	296°06.0	·· 08.5	186°38.2	·· 52.2	349°23.0	·· 46.7
10	196°30.2	349°41.7	11.3	311°06.6	08.9	201°40.8	52.2	4°25.2	46.8
11	211°32.6	4°45.0	10.3	326°07.1	09.2	216°43.4	52.3	19°27.4	46.9
12	226°35.1	19°48.3	S15°09.3	341°07.6	S22°09.5	231°45.9	S03°52.3	34°29.6	S02°47.0
13	241°37.6	34°51.6	08.3	356°08.2	09.8	246°48.5	52.3	49°31.8	47.1
14	256°40.0	49°54.9	07.3	11°08.7	10.2	261°51.0	52.4	64°34.0	47.3
15	271°42.5	64°58.2	·· 06.3	26°09.2	·· 10.5	276°53.6	·· 52.4	79°36.2	·· 47.4
16	286°45.0	80°01.5	05.4	41°09.8	10.8	291°56.1	52.4	94°38.4	47.5
17	301°47.4	95°04.8	04.4	56°10.3	11.1	306°58.7	52.4	109°40.6	47.6
18	316°49.9	110°08.1	S15°03.4	71°10.8	S22°11.4	322°01.2	S03°52.5	124°42.8	S02°47.7
19	331°52.4	125°11.4	02.4	86°11.3	11.8	337°03.8	52.5	139°45.0	47.8
20	346°54.8	140°14.7	01.4	101°11.9	12.1	352°06.4	52.5	154°47.2	47.9
21	1°57.3	155°17.9	15°00.5	116°12.4	·· 12.4	7°08.9	·· 52.6	169°49.5	·· 48.0
22	16°59.7	170°21.2	14°59.5	131°12.9	12.7	22°11.5	52.6	184°51.7	48.1
23	32°02.2	185°24.5	58.5	146°13.5	13.0	37°14.0	52.6	199°53.9	48.2
Mer.pass.:20:52		v3.3 d1.0 m-3.9		v0.5 d-0.3 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	47°04.7	200°27.7	S14°57.5	161°14.0	S22°13.3	52°16.6	S03°52.6	214°56.1	S02°48.3
1	62°07.1	215°31.0	56.6	176°14.5	13.7	67°19.1	52.7	229°58.3	48.4
2	77°09.6	230°34.3	55.6	191°15.1	14.0	82°21.7	52.7	245°00.5	48.5
3	92°12.1	245°37.5	·· 54.6	206°15.6	·· 14.3	97°24.2	·· 52.7	260°02.7	·· 48.6
4	107°14.5	260°40.8	53.7	221°16.1	14.6	112°26.8	52.7	275°04.9	48.7
5	122°17.0	275°44.0	52.7	236°16.6	14.9	127°29.3	52.8	290°07.1	48.8
6	137°19.5	290°47.3	S14°51.7	251°17.2	S22°15.2	142°31.9	S03°52.8	305°09.3	S02°48.9
7	152°21.9	305°50.5	50.8	266°17.7	15.6	157°34.4	52.8	320°11.5	49.0
8	167°24.4	320°53.7	49.8	281°18.2	15.9	172°37.0	52.9	335°13.8	49.1
9	182°26.9	335°57.0	·· 48.8	296°18.7	·· 16.2	187°39.5	·· 52.9	350°16.0	·· 49.2
10	197°29.3	351°00.2	47.9	311°19.3	16.5	202°42.1	52.9	5°18.2	49.3
11	212°31.8	6°03.4	46.9	326°19.8	16.8	217°44.6	52.9	20°20.4	49.4
12	227°34.2	21°06.6	S14°45.9	341°20.3	S22°17.1	232°47.2	S03°53.0	35°22.6	S02°49.5
13	242°36.7	36°09.9	45.0	356°20.8	17.4	247°49.7	53.0	50°24.8	49.6
14	257°39.2	51°13.1	44.0	11°21.4	17.8	262°52.3	53.0	65°27.0	49.7
15	272°41.6	66°16.3	·· 43.1	26°21.9	·· 18.1	277°54.8	·· 53.0	80°29.2	·· 49.8
16	287°44.1	81°19.5	42.1	41°22.4	18.4	292°57.4	53.1	95°31.4	49.9
17	302°46.6	96°22.7	41.2	56°22.9	18.7	307°59.9	53.1	110°33.6	50.0
18	317°49.0	111°25.9	S14°40.2	71°23.5	S22°19.0	323°02.5	S03°53.1	125°35.8	S02°50.1
19	332°51.5	126°29.1	39.3	86°24.0	19.3	338°05.0	53.1	140°38.1	50.2
20	347°54.0	141°32.3	38.3	101°24.5	19.6	353°07.6	53.2	155°40.3	50.3
21	2°56.4	156°35.5	·· 37.4	116°25.0	·· 19.9	8°10.1	·· 53.2	170°42.5	·· 50.4
22	17°58.9	171°38.7	36.4	131°25.6	20.2	23°12.7	53.2	185°44.7	50.5
23	33°01.4	186°41.9	35.5	146°26.1	20.6	38°15.2	53.2	200°46.9	50.6
Mer.pass.:20:48		v3.3 d1.0 m-4.0		v0.5 d-0.3 m1.4		v2.6 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.1	-42°14.8
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°15.7	89°18.8
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.6	-8°11.2
Capella	280°36.9	46°00.5
Bellatrix	278°33.8	6°21.6
Elnath	278°14.7	28°37.0
Alnilam	275°48.0	-1°11.6
Betelgeuse	271°03.1	7°24.6
Canopus	263°56.6	-52°41.9
Sirius	258°35.2	-16°43.7
Adhara	255°13.8	-28°59.0
Procyon	245°01.6	5°11.8
Pollux	243°29.9	27°59.9
Avior	234°18.7	-59°32.4
Suhail	222°53.9	-43°28.4
Miaplacidus	221°40.3	-69°45.4
Alphard	217°58.0	-8°42.3
Regulus	207°45.6	11°54.8
Dubhe	193°54.2	61°41.2
Denebola	182°35.8	14°30.6
Gienah	175°54.5	-17°36.1
Acrux	173°12.2	-63°09.4
Gacrux	172°03.6	-57°10.3
Alioth	166°22.7	55°53.9
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.4
Hadar	148°51.4	-60°25.5
Menkent	148°10.3	-36°25.3
Arcturus	145°57.8	19°07.5
Rigil Kent.	139°55.1	-60°52.7
Kochab	137°20.9	74°06.6
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°13.0	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.4	51°29.5
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.9	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.3	-56°42.1
Deneb	49°32.9	45°19.5
Enif	33°48.9	9°55.7
Al Na'ir	27°45.9	-46°54.6
Fomalhaut	15°25.9	-29°33.8
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 06 Sat	**SHA**	**Mer.pass**
Venus	152°40.8	10:46
Mars	115°41.9	13:16
Jupiter	5°07.3	20:36
Saturn	168°03.8	09:46

Nov 07 Sun	**SHA**	**Mer.pass**
Venus	153°02.9	10:41
Mars	114°55.7	13:15
Jupiter	5°09.7	20:31
Saturn	167°57.6	09:42

Nov 08 Mon	**SHA**	**Mer.pass**
Venus	153°23.1	10:36
Mars	114°09.3	13:15
Jupiter	5°11.9	20:27
Saturn	167°51.4	09:39

Horizontal parallax	
Venus:	0.5
Mars:	0.1

DUT1 = UT1-UTC = -0.0962 sec ΔT = TT-UT1 = +66.2802 sec

2010 November 06 to Nov. 08 UT

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.8	S15°52.8	188°07.8	6.7'	S18°55.7	-9.6'	59.6'
1	199°05.8	53.6	202°33.4	6.7'	19°05.2	-9.5'	59.6'
2	214°05.7	54.3	216°59.1	6.6'	19°14.7	-9.4'	59.6'
3	229°05.7	·· 55.1	231°24.7	6.6'	19°24.0	-9.3'	59.6'
4	244°05.7	55.8	245°50.2	6.5'	19°33.2	-9.1'	59.5'
5	259°05.7	56.6	260°15.8	6.5'	19°42.3	-9.0'	59.5'
6	274°05.6	S15°57.3	274°41.2	6.5'	S19°51.2	-8.9'	59.5'
7	289°05.6	58.1	289°06.7	6.4'	20°00.0	-8.7'	59.5'
8	304°05.6	58.8	303°32.1	6.4'	20°08.7	-8.6'	59.4'
9	319°05.6	15°59.6	317°57.4	6.3'	20°17.2	-8.5'	59.4'
10	334°05.5	16°00.3	332°22.7	6.3'	20°25.6	-8.3'	59.4'
11	349°05.5	01.1	346°48.0	6.3'	20°33.8	-8.2'	59.4'
12	4°05.5	S16°01.8	1°13.3	6.2'	S20°41.9	-8.0'	59.3'
13	19°05.4	02.5	15°38.5	6.2'	20°49.9	-7.9'	59.3'
14	34°05.4	03.3	30°03.6	6.2'	20°57.7	-7.8'	59.3'
15	49°05.4	·· 04.0	44°28.8	6.1'	21°05.4	-7.6'	59.3'
16	64°05.4	04.8	58°53.9	6.1'	21°12.9	-7.5'	59.2'
17	79°05.3	05.5	73°19.0	6.1'	21°20.3	-7.3'	59.2'
18	94°05.3	S16°06.3	87°44.0	6.0'	S21°27.6	-7.2'	59.2'
19	109°05.3	07.0	102°09.1	6.0'	21°34.7	-7.0'	59.2'
20	124°05.2	07.8	116°34.1	6.0'	21°41.7	-6.9'	59.1'
21	139°05.2	·· 08.5	130°59.1	6.0'	21°48.5	-6.7'	59.1'
22	154°05.2	09.2	145°24.0	5.9'	21°55.1	-6.6'	59.1'
23	169°05.1	10.0	159°49.0	5.9'	22°01.6	-6.4'	59.0'
	SD.=16.1	d=-0.8	S.D.=16.2				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.1	S16°10.7	174°13.9	5.9'	S22°08.0	-6.3'	59.0'
1	199°05.1	11.5	188°38.8	5.9'	22°14.2	-6.1'	59.0'
2	214°05.1	12.2	203°03.6	5.9'	22°20.3	-6.0'	59.0'
3	229°05.0	·· 13.0	217°28.5	5.9'	22°26.2	-5.8'	58.9'
4	244°05.0	13.7	231°53.4	5.8'	22°32.0	-5.7'	58.9'
5	259°05.0	14.4	246°18.2	5.8'	22°37.6	-5.5'	58.9'
6	274°04.9	S16°15.2	260°43.0	5.8'	S22°43.0	-5.4'	58.8'
7	289°04.9	15.9	275°07.8	5.8'	22°48.3	-5.2'	58.8'
8	304°04.9	16.6	289°32.6	5.8'	22°53.5	-5.1'	58.8'
9	319°04.8	·· 17.4	303°57.4	5.8'	22°58.5	-4.9'	58.8'
10	334°04.8	18.1	318°22.2	5.8'	23°03.3	-4.8'	58.7'
11	349°04.7	18.9	332°47.0	5.8'	23°08.0	-4.6'	58.7'
12	4°04.7	S16°19.6	347°11.8	5.8'	S23°12.6	-4.5'	58.7'
13	19°04.7	20.3	1°36.6	5.8'	23°17.0	-4.3'	58.6'
14	34°04.6	21.1	16°01.4	5.8'	23°21.2	-4.1'	58.6'
15	49°04.6	·· 21.8	30°26.1	5.8'	23°25.3	-4.0'	58.6'
16	64°04.6	22.5	44°50.9	5.8'	23°29.2	-3.8'	58.5'
17	79°04.5	23.3	59°15.7	5.8'	23°32.9	-3.7'	58.5'
18	94°04.5	S16°24.0	73°40.5	5.8'	S23°36.5	-3.5'	58.5'
19	109°04.4	24.7	88°05.4	5.8'	23°40.0	-3.4'	58.4'
20	124°04.4	25.5	102°30.2	5.8'	23°43.3	-3.2'	58.4'
21	139°04.4	·· 26.2	116°55.0	5.8'	23°46.4	-3.1'	58.4'
22	154°04.3	26.9	131°19.9	5.9'	23°49.4	-2.9'	58.3'
23	169°04.3	27.7	145°44.7	5.9'	23°52.2	-2.7'	58.3'
	SD.=16.1	d=-0.7	S.D.=16.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.3	S16°28.4	160°09.6	5.9'	S23°54.9	-2.6'	58.3'
1	199°04.2	29.1	174°34.5	5.9'	23°57.4	-2.4'	58.2'
2	214°04.2	29.8	188°59.5	5.9'	23°59.8	-2.3'	58.2'
3	229°04.1	·· 30.6	203°24.4	6.0'	24°02.0	-2.1'	58.2'
4	244°04.1	31.3	217°49.4	6.0'	24°04.0	-2.0'	58.1'
5	259°04.0	32.0	232°14.4	6.0'	24°05.9	-1.8'	58.1'
6	274°04.0	S16°32.8	246°39.4	6.0'	S24°07.7	-1.7'	58.1'
7	289°04.0	33.5	261°04.5	6.1'	24°09.2	-1.5'	58.0'
8	304°03.9	34.2	275°29.6	6.1'	24°10.7	-1.4'	58.0'
9	319°03.9	·· 34.9	289°54.7	6.1'	24°12.0	-1.2'	58.0'
10	334°03.8	35.7	304°19.9	6.2'	24°13.1	-1.0'	57.9'
11	349°03.8	36.4	318°45.0	6.2'	24°14.1	-0.9'	57.9'
12	4°03.7	S16°37.1	333°10.3	6.2'	S24°14.9	-0.7'	57.9'
13	19°03.7	37.8	347°35.5	6.3'	24°15.5	-0.6'	57.8'
14	34°03.7	38.6	2°00.9	6.3'	24°16.1	-0.4'	57.8'
15	49°03.6	·· 39.3	16°26.2	6.4'	24°16.4	-0.3'	57.8'
16	64°03.6	40.0	30°51.6	6.4'	24°16.6	-0.1'	57.7'
17	79°03.5	40.7	45°17.1	6.5'	24°16.7	0.0'	57.7'
18	94°03.5	S16°41.5	59°42.5	6.5'	S24°16.6	0.2'	57.7'
19	109°03.4	42.2	74°08.1	6.6'	24°16.4	0.3'	57.6'
20	124°03.4	42.9	88°33.7	6.6'	24°16.0	0.5'	57.6'
21	139°03.3	·· 43.6	102°59.3	6.7'	24°15.5	0.6'	57.6'
22	154°03.3	44.3	117°25.0	6.7'	24°14.8	0.8'	57.5'
23	169°03.2	45.1	131°50.7	6.8'	24°14.0	0.9'	57.5'
	SD.=16.1	d=-0.7	S.D.=15.8				

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

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	10:27	▬	▬	13:10	▬	▬
66°	09:39	11:54	▬	13:59	13:46	▬
64°	09:08	10:56	12:22	14:30	14:44	15:21
62°	08:45	10:23	11:40	14:54	15:18	16:02
60°	08:27	09:58	11:12	15:13	15:43	16:30
N 58°	08:12	09:39	10:51	15:29	16:03	16:52
56°	07:59	09:23	10:33	15:42	16:19	17:10
54°	07:48	09:09	10:18	15:54	16:33	17:25
52°	07:38	08:57	10:05	16:04	16:46	17:38
50°	07:29	08:46	09:53	16:13	16:57	17:50
45°	07:10	08:24	09:29	16:33	17:19	18:14
N 40°	06:55	08:06	09:10	16:49	17:38	18:33
35°	06:43	07:51	08:54	17:02	17:53	18:49
30°	06:32	07:38	08:40	17:14	18:06	19:03
20°	06:13	07:16	08:17	17:35	18:29	19:26
N 10°	05:56	06:57	07:57	17:52	18:49	19:46
0°	05:41	06:39	07:38	18:09	19:07	20:05
S 10°	05:26	06:22	07:19	18:25	19:26	20:24
20°	05:10	06:03	06:59	18:43	19:46	20:45
30°	04:52	05:41	06:35	19:04	20:08	21:08
35°	04:41	05:29	06:22	19:16	20:22	21:22
40°	04:29	05:14	06:06	19:29	20:37	21:38
45°	04:15	04:57	05:47	19:46	20:56	21:56
S 50°	03:58	04:36	05:24	20:06	21:19	22:20
52°	03:49	04:26	05:13	20:16	21:30	22:31
54°	03:40	04:15	05:00	20:27	21:42	22:44
56°	03:30	04:02	04:46	20:39	21:57	22:59
58°	03:19	03:47	04:29	20:53	22:14	23:16
S 60°	03:06	03:30	04:08	21:10	22:34	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 0-7%
06	16:23	16:22	11:44	11:55	–:–	●
07	16:20	16:19	11:44	12:53	00:24	
08	16:17	16:15	11:44	13:52	01:23	

November 09, 10, 11 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	48°03.8	201°45.0	S14°34.5	161°26.6	S22°20.9	53°17.7	S03°53.3	215°49.1	S02°50.7
1	63°06.3	216°48.2	33.6	176°27.1	21.2	68°20.3	53.3	230°51.3	50.8
2	78°08.7	231°51.4	32.6	191°27.7	21.5	83°22.8	53.3	245°53.5	50.9
3	93°11.2	246°54.5	·· 31.7	206°28.2	·· 21.8	98°25.4	·· 53.3	260°55.7	·· 51.0
4	108°13.7	261°57.7	30.7	221°28.7	22.1	113°27.9	53.3	275°57.9	51.1
5	123°16.1	277°00.9	29.8	236°29.2	22.4	128°30.5	53.4	291°00.2	51.2
6	138°18.6	292°04.0	S14°28.9	251°29.7	S22°22.7	143°33.0	S03°53.4	306°02.4	S02°51.3
7	153°21.1	307°07.2	27.9	266°30.3	23.0	158°35.6	53.4	321°04.6	51.4
8	168°23.5	322°10.3	27.0	281°30.8	23.3	173°38.1	53.4	336°06.8	51.5
9	183°26.0	337°13.5	·· 26.0	296°31.3	·· 23.6	188°40.6	·· 53.5	351°09.0	·· 51.6
10	198°28.5	352°16.6	25.1	311°31.8	23.9	203°43.2	53.5	6°11.2	51.7
11	213°30.9	7°19.8	24.2	326°32.3	24.2	218°45.7	53.5	21°13.4	51.8
12	228°33.4	22°22.9	S14°23.2	341°32.9	S22°24.5	233°48.3	S03°53.5	36°15.6	S02°51.9
13	243°35.9	37°26.0	22.3	356°33.4	24.8	248°50.8	53.5	51°17.8	52.0
14	258°38.3	52°29.2	21.4	11°33.9	25.1	263°53.3	53.6	66°20.0	52.1
15	273°40.8	67°32.3	·· 20.5	26°34.4	·· 25.4	278°55.9	·· 53.6	81°22.3	·· 52.2
16	288°43.2	82°35.4	19.5	41°34.9	25.8	293°58.4	53.6	96°24.5	52.3
17	303°45.7	97°38.5	18.6	56°35.5	26.1	309°01.0	53.6	111°26.7	52.4
18	318°48.2	112°41.6	S14°17.7	71°36.0	S22°26.4	324°03.5	S03°53.7	126°28.9	S02°52.5
19	333°50.6	127°44.7	16.8	86°36.5	26.7	339°06.0	53.7	141°31.1	52.6
20	348°53.1	142°47.8	15.8	101°37.0	27.0	354°08.6	53.7	156°33.3	52.7
21	3°55.6	157°50.9	·· 14.9	116°37.5	·· 27.3	9°11.1	·· 53.7	171°35.5	·· 52.8
22	18°58.0	172°54.0	14.0	131°38.0	27.6	24°13.7	53.7	186°37.7	52.9
23	34°00.5	187°57.1	13.1	146°38.6	27.9	39°16.2	53.8	201°39.9	53.0
Mer.pass.:20:44		v3.2 d0.9 m-4.0		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	49°03.0	203°00.2	S14°12.2	161°39.1	S22°28.2	54°18.7	S03°53.8	216°42.2	S02°53.1
1	64°05.4	218°03.3	11.3	176°39.6	28.5	69°21.3	53.8	231°44.4	53.2
2	79°07.9	233°06.4	10.3	191°40.1	28.8	84°23.8	53.8	246°46.6	53.3
3	94°10.3	248°09.5	·· 09.4	206°40.6	·· 29.1	99°26.3	·· 53.8	261°48.8	·· 53.4
4	109°12.8	263°12.5	08.5	221°41.1	29.4	114°28.9	53.9	276°51.0	53.5
5	124°15.3	278°15.6	07.6	236°41.7	29.7	129°31.4	53.9	291°53.2	53.6
6	139°17.7	293°18.7	S14°06.7	251°42.2	S22°30.0	144°33.9	S03°53.9	306°55.4	S02°53.7
7	154°20.2	308°21.8	05.8	266°42.7	30.3	159°36.5	53.9	321°57.6	53.8
8	169°22.7	323°24.8	04.9	281°43.2	30.5	174°39.0	53.9	336°59.9	53.9
9	184°25.1	338°27.9	·· 04.0	296°43.7	·· 30.8	189°41.6	·· 54.0	352°02.1	·· 54.0
10	199°27.6	353°30.9	03.1	311°44.2	31.1	204°44.1	54.0	7°04.3	54.1
11	214°30.1	8°34.0	02.2	326°44.7	31.4	219°46.6	54.0	22°06.5	54.2
12	229°32.5	23°37.0	S14°01.3	341°45.3	S22°31.7	234°49.2	S03°54.0	37°08.7	S02°54.3
13	244°35.0	38°40.1	14°00.4	356°45.8	32.0	249°51.7	54.0	52°10.9	54.4
14	259°37.5	53°43.1	13°59.5	11°46.3	32.3	264°54.2	54.0	67°13.1	54.5
15	274°39.9	68°46.1	·· 58.6	26°46.8	·· 32.6	279°56.8	·· 54.1	82°15.3	·· 54.6
16	289°42.4	83°49.2	57.7	41°47.3	32.9	294°59.3	54.1	97°17.6	54.7
17	304°44.8	98°52.2	56.8	56°47.8	33.2	310°01.8	54.1	112°19.8	54.8
18	319°47.3	113°55.2	S13°55.9	71°48.3	S22°33.5	325°04.3	S03°54.1	127°22.0	S02°54.9
19	334°49.8	128°58.2	55.0	86°48.9	33.8	340°06.9	54.1	142°24.2	55.0
20	349°52.2	144°01.2	54.2	101°49.4	34.1	355°09.4	54.2	157°26.4	55.1
21	4°54.7	159°04.2	·· 53.3	116°49.9	·· 34.4	10°11.9	·· 54.2	172°28.6	·· 55.2
22	19°57.2	174°07.3	52.4	131°50.4	34.7	25°14.5	54.2	187°30.8	55.3
23	34°59.6	189°10.3	51.5	146°50.9	35.0	40°17.0	54.2	202°33.0	55.4
Mer.pass.:20:40		v3.1 d0.9 m-4.1		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.6		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	50°02.1	204°13.3	S13°50.6	161°51.4	S22°35.2	55°19.5	S03°54.2	217°35.3	S02°55.5
1	65°04.6	219°16.2	49.7	176°51.9	35.5	70°22.1	54.2	232°37.5	55.6
2	80°07.0	234°19.2	48.9	191°52.4	35.8	85°24.6	54.3	247°39.7	55.7
3	95°09.5	249°22.2	·· 48.0	206°52.9	·· 36.1	100°27.1	·· 54.3	262°41.9	·· 55.8
4	110°12.0	264°25.2	47.1	221°53.4	36.4	115°29.6	54.3	277°44.1	55.9
5	125°14.4	279°28.2	46.2	236°54.0	36.7	130°32.2	54.3	292°46.3	56.0
6	140°16.9	294°31.2	S13°45.4	251°54.5	S22°37.0	145°34.7	S03°54.3	307°48.5	S02°56.1
7	155°19.3	309°34.1	44.5	266°55.0	37.3	160°37.2	54.3	322°50.8	56.2
8	170°21.8	324°37.1	43.6	281°55.5	37.6	175°39.8	54.3	337°53.0	56.3
9	185°24.3	339°40.1	·· 42.8	296°56.0	·· 37.9	190°42.3	·· 54.4	352°55.2	·· 56.4
10	200°26.7	354°43.0	41.9	311°56.5	38.1	205°44.8	54.4	7°57.4	56.5
11	215°29.2	9°46.0	41.0	326°57.0	38.4	220°47.3	54.4	22°59.6	56.6
12	230°31.7	24°48.9	S13°40.2	341°57.5	S22°38.7	235°49.9	S03°54.4	38°01.8	S02°56.7
13	245°34.1	39°51.9	39.3	356°58.0	39.0	250°52.4	54.4	53°04.0	56.8
14	260°36.6	54°54.8	38.5	11°58.5	39.3	265°54.9	54.4	68°06.3	56.9
15	275°39.1	69°57.8	·· 37.6	26°59.0	·· 39.6	280°57.4	·· 54.5	83°08.5	·· 57.0
16	290°41.5	85°00.7	36.7	41°59.5	39.9	296°00.0	54.5	98°10.7	57.1
17	305°44.0	100°03.6	35.9	57°00.1	40.1	311°02.5	54.5	113°12.9	57.2
18	320°46.5	115°06.6	S13°35.0	72°00.6	S22°40.4	326°05.0	S03°54.5	128°15.1	S02°57.3
19	335°48.9	130°09.5	34.2	87°01.1	40.7	341°07.5	54.5	143°17.3	57.4
20	350°51.4	145°12.4	33.3	102°01.6	41.0	356°10.1	54.5	158°19.5	57.5
21	5°53.8	160°15.3	·· 32.5	117°02.1	·· 41.3	11°12.6	·· 54.5	173°21.8	·· 57.6
22	20°56.3	175°18.3	31.6	132°02.6	41.6	26°15.1	54.6	188°24.0	57.7
23	35°58.8	190°21.2	30.8	147°03.1	41.8	41°17.6	54.6	203°26.2	57.8
Mer.pass.:20:36		v3.0 d0.9 m-4.1		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.5		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.2	29°09.3
Ankaa	353°17.2	-42°14.8
Schedar	349°42.3	56°36.1
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°15.4	89°18.8
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.6	-8°11.2
Capella	280°36.8	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.7	28°37.0
Alnilam	275°48.0	-1°11.6
Betelgeuse	271°03.1	7°24.6
Canopus	263°56.6	-52°41.9
Sirius	258°35.2	-16°43.8
Adhara	255°13.8	-28°59.1
Procyon	245°01.5	5°11.8
Pollux	243°29.9	27°59.9
Avior	234°18.7	-59°32.4
Suhail	222°53.9	-43°28.4
Miaplacidus	221°40.2	-69°45.4
Alphard	217°58.0	-8°42.3
Regulus	207°45.6	11°54.8
Dubhe	193°54.1	61°41.2
Denebola	182°35.8	14°30.6
Gienah	175°54.5	-17°36.1
Acrux	173°12.1	-63°09.4
Gacrux	172°03.6	-57°10.3
Alioth	166°22.7	55°53.8
Spica	158°33.6	-11°13.0
Alkaid	153°00.8	49°15.4
Hadar	148°51.3	-60°25.4
Menkent	148°10.2	-36°25.3
Arcturus	145°57.8	19°07.5
Rigil Kent.	139°55.0	-60°52.7
Kochab	137°20.9	74°06.6
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°13.0	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.4	51°29.5
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.9	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.3	-56°42.1
Deneb	49°32.9	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°45.9	-46°54.6
Fomalhaut	15°25.9	-29°33.8
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 09 Tue	**SHA**	**Mer.pass**
Venus	153°41.2	10:31
Mars	113°22.8	13:14
Jupiter	5°13.9	20:23
Saturn	167°45.3	09:35

Nov 10 Wed	**SHA**	**Mer.pass**
Venus	153°57.3	10:26
Mars	112°36.1	13:13
Jupiter	5°15.8	20:19
Saturn	167°39.2	09:32

Nov 11 Thu	**SHA**	**Mer.pass**
Venus	154°11.2	10:21
Mars	111°49.3	13:12
Jupiter	5°17.4	20:15
Saturn	167°33.2	09:28

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	184°03.2	S16°45.8	146°16.5	6.8'	S24°13.0	1.0'	57.5'
1	199°03.1	46.5	160°42.4	6.9'	24°11.9	1.2'	57.4'
2	214°03.1	47.2	175°08.3	6.9'	24°10.6	1.3'	57.4'
3	229°03.0	· · 47.9	189°34.3	7.0'	24°09.2	1.5'	57.4'
4	244°03.0	48.6	204°00.3	7.1'	24°07.7	1.6'	57.3'
5	259°02.9	49.4	218°26.4	7.1'	24°06.0	1.8'	57.3'
6	274°02.9	S16°50.1	232°52.6	7.2'	S24°04.1	1.9'	57.3'
7	289°02.8	50.8	247°18.8	7.3'	24°02.2	2.0'	57.2'
8	304°02.8	51.5	261°45.1	7.3'	24°00.1	2.2'	57.2'
9	319°02.7	· · 52.2	276°11.5	7.4'	23°57.8	2.3'	57.2'
10	334°02.7	52.9	290°37.9	7.5'	23°55.4	2.5'	57.1'
11	349°02.6	53.6	305°04.4	7.5'	23°52.9	2.6'	57.1'
12	4°02.6	S16°54.4	319°31.0	7.6'	S23°50.3	2.7'	57.0'
13	19°02.5	55.1	333°57.6	7.7'	23°47.5	2.9'	57.0'
14	34°02.5	55.8	348°24.3	7.7'	23°44.5	3.0'	57.0'
15	49°02.4	· · 56.5	2°51.1	7.8'	23°41.5	3.1'	56.9'
16	64°02.3	57.2	17°17.9	7.9'	23°38.3	3.3'	56.9'
17	79°02.3	57.9	31°44.9	8.0'	23°35.0	3.4'	56.9'
18	94°02.2	S16°58.6	46°11.9	8.0'	S23°31.5	3.5'	56.8'
19	109°02.2	16°59.3	60°39.0	8.1'	23°27.9	3.6'	56.8'
20	124°02.1	17°00.0	75°06.1	8.2'	23°24.2	3.8'	56.8'
21	139°02.1	· · 00.7	89°33.4	8.3'	23°20.4	3.9'	56.7'
22	154°02.0	01.5	104°00.7	8.4'	23°16.4	4.0'	56.7'
23	169°02.0	02.2	118°28.1	8.4'	23°12.3	4.2'	56.7'
	SD.=16.1	d=-0.7	S.D.=15.5				

Wed	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	184°01.9	S17°02.9	132°55.6	8.5'	S23°08.1	4.3'	56.6'
1	199°01.8	03.6	147°23.1	8.6'	23°03.8	4.4'	56.6'
2	214°01.8	04.3	161°50.8	8.7'	22°59.3	4.5'	56.6'
3	229°01.7	· · 05.0	176°18.5	8.8'	22°54.7	4.6'	56.5'
4	244°01.7	05.7	190°46.3	8.9'	22°50.0	4.8'	56.5'
5	259°01.6	06.4	205°14.2	8.9'	22°45.2	4.9'	56.5'
6	274°01.5	S17°07.1	219°42.2	9.0'	S22°40.3	5.0'	56.4'
7	289°01.5	07.8	234°10.3	9.1'	22°35.2	5.1'	56.4'
8	304°01.4	08.5	248°38.4	9.2'	22°30.0	5.2'	56.4'
9	319°01.4	· · 09.2	263°06.7	9.3'	22°24.8	5.3'	56.3'
10	334°01.3	09.9	277°35.0	9.4'	22°19.4	5.5'	56.3'
11	349°01.2	10.6	292°03.4	9.4'	22°13.9	5.6'	56.3'
12	4°01.2	S17°11.3	306°31.9	9.5'	S22°08.2	5.7'	56.2'
13	19°01.1	12.0	321°00.5	9.6'	22°02.5	5.8'	56.2'
14	34°01.1	12.7	335°29.1	9.7'	21°56.7	5.9'	56.2'
15	49°01.0	· · 13.4	349°57.9	9.8'	21°50.7	6.0'	56.2'
16	64°00.9	14.1	4°26.7	9.9'	21°44.7	6.1'	56.1'
17	79°00.9	14.8	18°55.6	10.0'	21°38.5	6.2'	56.1'
18	94°00.8	S17°15.5	33°24.7	10.1'	S21°32.2	6.3'	56.1'
19	109°00.7	16.2	47°53.8	10.1'	21°25.9	6.4'	56.0'
20	124°00.7	16.9	62°23.0	10.2'	21°19.4	6.5'	56.0'
21	139°00.6	· · 17.6	76°52.2	10.3'	21°12.8	6.6'	56.0'
22	154°00.5	18.3	91°21.6	10.4'	21°06.1	6.7'	55.9'
23	169°00.5	19.0	105°51.1	10.5'	20°59.4	6.8'	55.9'
	SD.=16.1	d=-0.7	S.D.=15.3				

Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	184°00.4	S17°19.7	120°20.6	10.6'	S20°52.5	6.9'	55.9'
1	199°00.3	20.4	134°50.2	10.7'	20°45.5	7.0'	55.8'
2	214°00.3	21.1	149°20.0	10.8'	20°38.5	7.1'	55.8'
3	229°00.2	· · 21.8	163°49.8	10.9'	20°31.3	7.2'	55.8'
4	244°00.1	22.4	178°19.7	10.9'	20°24.1	7.3'	55.8'
5	259°00.1	23.1	192°49.7	11.0'	20°16.7	7.4'	55.7'
6	274°00.0	S17°23.8	207°19.7	11.1'	S20°09.3	7.5'	55.7'
7	288°59.9	24.5	221°49.9	11.2'	20°01.8	7.6'	55.7'
8	303°59.9	25.2	236°20.1	11.3'	19°54.1	7.7'	55.6'
9	318°59.8	· · 25.9	250°50.5	11.4'	19°46.4	7.7'	55.6'
10	333°59.7	26.6	265°20.9	11.5'	19°38.6	7.8'	55.6'
11	348°59.7	27.3	279°51.4	11.5'	19°30.8	7.9'	55.6'
12	3°59.6	S17°28.0	294°22.0	11.6'	S19°22.8	8.0'	55.5'
13	18°59.5	28.7	308°52.7	11.7'	19°14.8	8.1'	55.5'
14	33°59.4	29.3	323°23.4	11.8'	19°06.6	8.2'	55.5'
15	48°59.4	· · 30.0	337°54.3	11.9'	18°58.4	8.3'	55.5'
16	63°59.3	30.7	352°25.2	12.0'	18°50.1	8.3'	55.4'
17	78°59.2	31.4	6°56.2	12.1'	18°41.8	8.4'	55.4'
18	93°59.2	S17°32.1	21°27.3	12.1'	S18°33.3	8.5'	55.4'
19	108°59.1	32.8	35°58.5	12.2'	18°24.8	8.6'	55.3'
20	123°59.0	33.4	50°29.8	12.3'	18°16.2	8.6'	55.3'
21	138°58.9	· · 34.1	65°01.1	12.4'	18°07.5	8.7'	55.3'
22	153°58.9	34.8	79°32.6	12.5'	17°58.7	8.8'	55.3'
23	168°58.8	35.5	94°04.1	12.6'	17°49.9	8.9'	55.2'
	SD.=16.1	d=-0.7	S.D.=15.1				

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

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

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 3-5 13-29%
09	16:13	16:10	11:44	14:48	02:20	
10	16:08	16:05	11:44	15:42	03:15	
11	16:02	15:58	11:44	16:31	04:07	

November 12, 13, 14 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	51°01.2	205°24.1	S13°30.0	162°03.6	S22°42.1	56°20.1	S03°54.6	218°28.4	S02°57.9
1	66°03.7	220°27.0	29.1	177°04.1	42.4	71°22.7	54.6	233°30.6	57.9
2	81°06.2	235°29.9	28.3	192°04.6	42.7	86°25.2	54.6	248°32.8	58.0
3	96°08.6	250°32.8	·· 27.4	207°05.1	·· 43.0	101°27.7	·· 54.6	263°35.0	·· 58.1
4	111°11.1	265°35.7	26.6	222°05.6	43.2	116°30.2	54.6	278°37.3	58.2
5	126°13.6	280°38.5	25.8	237°06.1	43.5	131°32.7	54.6	293°39.5	58.3
6	141°16.0	295°41.4	S13°24.9	252°06.6	S22°43.8	146°35.3	S03°54.7	308°41.7	S02°58.4
7	156°18.5	310°44.3	24.1	267°07.1	44.1	161°37.8	54.7	323°43.9	58.5
8	171°20.9	325°47.2	23.3	282°07.6	44.4	176°40.3	54.7	338°46.1	58.6
9	186°23.4	340°50.1	·· 22.4	297°08.1	·· 44.6	191°42.8	·· 54.7	353°48.3	·· 58.7
10	201°25.9	355°52.9	21.6	312°08.6	44.9	206°45.3	54.7	8°50.6	58.8
11	216°28.3	10°55.8	20.8	327°09.1	45.2	221°47.9	54.7	23°52.8	58.9
12	231°30.8	25°58.6	S13°20.0	342°09.6	S22°45.5	236°50.4	S03°54.7	38°55.0	S02°59.0
13	246°33.3	41°01.5	19.1	357°10.1	45.8	251°52.9	54.7	53°57.2	59.1
14	261°35.7	56°04.3	18.3	12°10.6	46.0	266°55.4	54.7	68°59.4	59.2
15	276°38.2	71°07.2	·· 17.5	27°11.1	·· 46.3	281°57.9	·· 54.8	84°01.6	·· 59.3
16	291°40.7	86°10.0	16.7	42°11.6	46.6	297°00.4	54.8	99°03.8	59.4
17	306°43.1	101°12.9	15.9	57°12.1	46.9	312°03.0	54.8	114°06.1	59.5
18	321°45.6	116°15.7	S13°15.1	72°12.6	S22°47.1	327°05.5	S03°54.8	129°08.3	S02°59.6
19	336°48.1	131°18.5	14.3	87°13.1	47.4	342°08.0	54.8	144°10.5	59.7
20	351°50.5	146°21.4	13.4	102°13.6	47.7	357°10.5	54.8	159°12.7	59.8
21	6°53.0	161°24.2	·· 12.6	117°14.1	·· 48.0	12°13.0	·· 54.8	174°14.9	02°59.9
22	21°55.4	176°27.0	11.8	132°14.6	48.2	27°15.5	54.8	189°17.1	03°00.0
23	36°57.9	191°29.8	11.0	147°15.1	48.5	42°18.0	54.8	204°19.4	00.1
Mer.pass.:20:33		v2.9 d0.8 m-4.1		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.5		v2.2 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	52°00.4	206°32.6	S13°10.2	162°15.6	S22°48.8	57°20.6	S03°54.9	219°21.6	S03°00.2
1	67°02.8	221°35.5	09.4	177°16.1	49.1	72°23.1	54.9	234°23.8	00.3
2	82°05.3	236°38.3	08.6	192°16.6	49.3	87°25.6	54.9	249°26.0	00.4
3	97°07.8	251°41.1	·· 07.8	207°17.1	·· 49.6	102°28.1	·· 54.9	264°28.2	·· 00.5
4	112°10.2	266°43.9	07.0	222°17.6	49.9	117°30.6	54.9	279°30.4	00.6
5	127°12.7	281°46.6	06.2	237°18.1	50.1	132°33.1	54.9	294°32.7	00.7
6	142°15.2	296°49.4	S13°05.5	252°18.6	S22°50.4	147°35.6	S03°54.9	309°34.9	S03°00.8
7	157°17.6	311°52.2	04.7	267°19.1	50.7	162°38.1	54.9	324°37.1	00.9
8	172°20.1	326°55.0	03.9	282°19.6	50.9	177°40.7	54.9	339°39.3	01.0
9	187°22.6	341°57.8	·· 03.1	297°20.1	·· 51.2	192°43.2	·· 54.9	354°41.5	·· 01.1
10	202°25.0	357°00.5	02.3	312°20.6	51.5	207°45.7	54.9	9°43.8	01.2
11	217°27.5	12°03.3	01.5	327°21.1	51.8	222°48.2	55.0	24°46.0	01.3
12	232°29.9	27°06.1	S13°00.7	342°21.6	S22°52.0	237°50.7	S03°55.0	39°48.2	S03°01.4
13	247°32.4	42°08.8	13°00.0	357°22.1	52.3	252°53.2	55.0	54°50.4	01.4
14	262°34.9	57°11.6	12°59.2	12°22.6	52.6	267°55.7	55.0	69°52.6	01.5
15	277°37.3	72°14.3	·· 58.4	27°23.1	·· 52.8	282°58.2	·· 55.0	84°54.8	·· 01.6
16	292°39.8	87°17.1	57.6	42°23.6	53.1	298°00.7	55.0	99°57.1	01.7
17	307°42.3	102°19.8	56.9	57°24.1	53.4	313°03.2	55.0	114°59.3	01.8
18	322°44.7	117°22.6	S12°56.1	72°24.6	S22°53.6	328°05.8	S03°55.0	130°01.5	S03°01.9
19	337°47.2	132°25.3	55.3	87°25.1	53.9	343°08.3	55.0	145°03.7	02.0
20	352°49.7	147°28.1	54.6	102°25.6	54.2	358°10.8	55.0	160°05.9	02.1
21	7°52.1	162°30.8	·· 53.8	117°26.1	·· 54.4	13°13.3	·· 55.0	175°08.2	·· 02.2
22	22°54.6	177°33.5	53.0	132°26.6	54.7	28°15.8	55.0	190°10.4	02.3
23	37°57.0	192°36.2	52.3	147°27.0	55.0	43°18.3	55.0	205°12.6	02.4
Mer.pass.:20:29		v2.8 d0.8 m-4.2		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.5		v2.2 d-0.1 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	52°59.5	207°38.9	S12°51.5	162°27.5	S22°55.2	58°20.8	S03°55.0	220°14.8	S03°02.5
1	68°02.0	222°41.7	50.8	177°28.0	55.5	73°23.3	55.1	235°17.0	02.6
2	83°04.4	237°44.4	50.0	192°28.5	55.7	88°25.8	55.1	250°19.2	02.7
3	98°06.9	252°47.1	·· 49.3	207°29.0	·· 56.0	103°28.3	·· 55.1	265°21.5	·· 02.8
4	113°09.4	267°49.8	48.5	222°29.5	56.3	118°30.8	55.1	280°23.7	02.9
5	128°11.8	282°52.5	47.7	237°30.0	56.5	133°33.3	55.1	295°25.9	03.0
6	143°14.3	297°55.2	S12°47.0	252°30.5	S22°56.8	148°35.8	S03°55.1	310°28.1	S03°03.1
7	158°16.8	312°57.9	46.3	267°31.0	57.0	163°38.3	55.1	325°30.3	03.2
8	173°19.2	328°00.5	45.5	282°31.5	57.3	178°40.8	55.1	340°32.6	03.3
9	188°21.7	343°03.2	·· 44.8	297°32.0	·· 57.6	193°43.3	·· 55.1	355°34.8	·· 03.4
10	203°24.2	358°05.9	44.0	312°32.5	57.8	208°45.8	55.1	10°37.0	03.5
11	218°26.6	13°08.6	43.3	327°32.9	58.1	223°48.3	55.1	25°39.2	03.6
12	233°29.1	28°11.2	S12°42.6	342°33.4	S22°58.3	238°50.8	S03°55.1	40°41.4	S03°03.7
13	248°31.5	43°13.9	41.8	357°33.9	58.6	253°53.3	55.1	55°43.7	03.8
14	263°34.0	58°16.6	41.1	12°34.4	58.9	268°55.8	55.1	70°45.9	03.8
15	278°36.5	73°19.2	·· 40.4	27°34.9	·· 59.1	283°58.3	·· 55.1	85°48.1	·· 03.9
16	293°38.9	88°21.9	39.6	42°35.4	59.4	299°00.8	55.1	100°50.3	04.0
17	308°41.4	103°24.5	38.9	57°35.9	59.6	314°03.3	55.1	115°52.5	04.1
18	323°43.9	118°27.2	S12°38.2	72°36.4	S22°59.9	329°05.8	S03°55.1	130°54.8	S03°04.2
19	338°46.3	133°29.8	37.5	87°36.9	23°00.2	344°08.3	55.1	145°57.0	04.3
20	353°48.8	148°32.5	36.7	102°37.4	00.4	359°10.8	55.1	160°59.2	04.4
21	8°51.3	163°35.1	·· 36.0	117°37.8	·· 00.7	14°13.3	·· 55.1	176°01.4	·· 04.5
22	23°53.7	178°37.7	35.3	132°38.3	00.9	29°15.8	55.2	191°03.6	04.6
23	38°56.2	193°40.3	34.6	147°38.8	01.2	44°18.3	55.2	206°05.9	04.7
Mer.pass.:20:25		v2.7 d0.8 m-4.2		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.5		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.8
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°15.3	89°18.8
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.6	-8°11.3
Capella	280°36.8	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.7	28°37.0
Alnilam	275°48.0	-1°11.6
Betelgeuse	271°03.1	7°24.6
Canopus	263°56.6	-52°41.9
Sirius	258°35.1	-16°43.8
Adhara	255°13.8	-28°59.1
Procyon	245°01.5	5°11.8
Pollux	243°29.8	27°59.8
Avior	234°18.7	-59°32.4
Suhail	222°53.8	-43°28.4
Miaplacidus	221°40.1	-69°45.5
Alphard	217°57.9	-8°42.3
Regulus	207°45.5	11°54.8
Dubhe	193°54.1	61°41.2
Denebola	182°35.7	14°30.6
Gienah	175°54.5	-17°36.1
Acrux	173°12.1	-63°09.4
Gacrux	172°03.6	-57°10.3
Alioth	166°22.7	55°53.8
Spica	158°33.5	-11°13.0
Alkaid	153°00.7	49°15.4
Hadar	148°51.3	-60°25.4
Menkent	148°10.2	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°55.0	-60°52.7
Kochab	137°20.9	74°06.5
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.4	51°29.5
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.5	38°47.9
Nunki	76°00.9	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.3	-56°42.1
Deneb	49°32.9	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°45.9	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 12 Fri	**SHA**	**Mer.pass**
Venus	154°22.8	10:16
Mars	111°02.4	13:11
Jupiter	5°18.9	20:11
Saturn	167°27.2	09:25

Nov 13 Sat	**SHA**	**Mer.pass**
Venus	154°32.3	10:12
Mars	110°15.3	13:11
Jupiter	5°20.2	20:07
Saturn	167°21.2	09:21

Nov 14 Sun	**SHA**	**Mer.pass**
Venus	154°39.4	10:08
Mars	109°28.0	13:10
Jupiter	5°21.3	20:03
Saturn	167°15.3	09:18

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°58.7	S17°36.2	108°35.7	12.6'	S17°41.0	8.9'	55.2'
1	198°58.6	36.9	123°07.3	12.7'	17°32.0	9.0'	55.2'
2	213°58.6	37.5	137°39.1	12.8'	17°23.0	9.1'	55.2'
3	228°58.5	·· 38.2	152°10.9	12.9'	17°13.9	9.1'	55.2'
4	243°58.4	38.9	166°42.8	12.9'	17°04.7	9.2'	55.1'
5	258°58.3	39.6	181°14.8	13.0'	16°55.4	9.3'	55.1'
6	273°58.3	S17°40.3	195°46.9	13.1'	S16°46.1	9.4'	55.1'
7	288°58.2	40.9	210°19.0	13.2'	16°36.7	9.4'	55.1'
8	303°58.1	41.6	224°51.2	13.3'	16°27.3	9.5'	55.0'
9	318°58.0	·· 42.3	239°23.5	13.3'	16°17.8	9.5'	55.0'
10	333°57.9	43.0	253°55.9	13.4'	16°08.2	9.6'	55.0'
11	348°57.9	43.6	268°28.3	13.5'	15°58.6	9.7'	55.0'
12	3°57.8	S17°44.3	283°00.8	13.5'	S15°48.9	9.7'	54.9'
13	18°57.7	45.0	297°33.4	13.6'	15°39.1	9.8'	54.9'
14	33°57.6	45.7	312°06.1	13.7'	15°29.3	9.8'	54.9'
15	48°57.5	·· 46.3	326°38.8	13.8'	15°19.4	9.9'	54.9'
16	63°57.5	47.0	341°11.6	13.8'	15°09.5	10.0'	54.9'
17	78°57.4	47.7	355°44.5	13.9'	14°59.5	10.0'	54.8'
18	93°57.3	S17°48.4	10°17.4	14.0'	S14°49.4	10.1'	54.8'
19	108°57.2	49.0	24°50.4	14.0'	14°39.3	10.1'	54.8'
20	123°57.1	49.7	39°23.5	14.1'	14°29.2	10.2'	54.8'
21	138°57.1	·· 50.4	53°56.6	14.2'	14°19.0	10.2'	54.8'
22	153°57.0	51.0	68°29.8	14.2'	14°08.7	10.3'	54.7'
23	168°56.9	51.7	83°03.1	14.3'	13°58.4	10.3'	54.7'
	SD.=16.1	d=-0.7	S.D.=15.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°56.8	S17°52.4	97°36.4	14.4'	S13°48.0	10.4'	54.7'
1	198°56.7	53.0	112°09.8	14.4'	13°37.6	10.4'	54.7'
2	213°56.6	53.7	126°43.3	14.5'	13°27.1	10.5'	54.7'
3	228°56.6	·· 54.4	141°16.8	14.5'	13°16.6	10.5'	54.7'
4	243°56.5	55.1	155°50.4	14.6'	13°06.1	10.6'	54.6'
5	258°56.4	55.7	170°24.0	14.7'	12°55.5	10.6'	54.6'
6	273°56.3	S17°56.4	184°57.7	14.7'	S12°44.8	10.7'	54.6'
7	288°56.2	57.0	199°31.5	14.8'	12°34.1	10.7'	54.6'
8	303°56.1	57.7	214°05.3	14.8'	12°23.4	10.8'	54.6'
9	318°56.0	·· 58.4	228°39.1	14.9'	12°12.6	10.8'	54.6'
10	333°55.9	59.0	243°13.1	14.9'	12°01.7	10.9'	54.5'
11	348°55.9	17°59.7	257°47.0	15.0'	11°50.9	10.9'	54.5'
12	3°55.8	S18°00.4	272°21.1	15.1'	S11°39.9	10.9'	54.5'
13	18°55.7	01.0	286°55.2	15.1'	11°29.0	11.0'	54.5'
14	33°55.6	01.7	301°29.3	15.2'	11°18.0	11.0'	54.5'
15	48°55.5	·· 02.3	316°03.5	15.2'	11°07.0	11.1'	54.5'
16	63°55.4	03.0	330°37.7	15.3'	10°55.9	11.1'	54.5'
17	78°55.3	03.7	345°12.0	15.3'	10°44.8	11.1'	54.5'
18	93°55.2	S18°04.3	359°46.3	15.4'	S10°33.6	11.2'	54.4'
19	108°55.1	05.0	14°20.7	15.4'	10°22.5	11.2'	54.4'
20	123°55.1	05.6	28°55.1	15.4'	10°11.2	11.2'	54.4'
21	138°55.0	·· 06.3	43°29.6	15.5'	10°00.0	11.3'	54.4'
22	153°54.9	07.0	58°04.1	15.5'	09°48.7	11.3'	54.4'
23	168°54.8	07.6	72°38.7	15.6'	09°37.4	11.3'	54.4'
	SD.=16.2	d=-0.7	S.D.=14.9				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°54.7	S18°08.3	87°13.3	15.6'	S09°26.0	11.4'	54.4'
1	198°54.6	08.9	101°47.9	15.7'	09°14.6	11.4'	54.4'
2	213°54.5	09.6	116°22.6	15.7'	09°03.2	11.4'	54.3'
3	228°54.4	·· 10.2	130°57.3	15.7'	08°51.8	11.5'	54.3'
4	243°54.3	10.9	145°32.0	15.8'	08°40.3	11.5'	54.3'
5	258°54.2	11.5	160°06.8	15.8'	08°28.8	11.5'	54.3'
6	273°54.1	S18°12.2	174°41.7	15.8'	S08°17.2	11.6'	54.3'
7	288°54.0	12.8	189°16.5	15.9'	08°05.7	11.6'	54.3'
8	303°53.9	13.5	203°51.4	15.9'	07°54.1	11.6'	54.3'
9	318°53.8	·· 14.1	218°26.4	16.0'	07°42.5	11.6'	54.3'
10	333°53.7	14.8	233°01.3	16.0'	07°30.8	11.7'	54.3'
11	348°53.7	15.4	247°36.3	16.0'	07°19.1	11.7'	54.3'
12	3°53.6	S18°16.1	262°11.4	16.0'	S07°07.5	11.7'	54.3'
13	18°53.5	16.7	276°46.4	16.1'	06°55.7	11.7'	54.3'
14	33°53.4	17.4	291°21.5	16.1'	06°44.0	11.8'	54.2'
15	48°53.3	·· 18.0	305°56.6	16.1'	06°32.2	11.8'	54.2'
16	63°53.2	18.7	320°31.8	16.2'	06°20.4	11.8'	54.2'
17	78°53.1	19.3	335°07.0	16.2'	06°08.6	11.8'	54.2'
18	93°53.0	S18°20.0	349°42.2	16.2'	S05°56.8	11.8'	54.2'
19	108°52.9	20.6	4°17.4	16.2'	05°44.9	11.9'	54.2'
20	123°52.8	21.3	18°52.6	16.3'	05°33.1	11.9'	54.2'
21	138°52.7	·· 21.9	33°27.9	16.3'	05°21.2	11.9'	54.2'
22	153°52.6	22.6	48°03.2	16.3'	05°09.3	11.9'	54.2'
23	168°52.5	23.2	62°38.5	16.3'	04°57.4	11.9'	54.2'
	SD.=16.2	d=-0.7	S.D.=14.8				

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

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

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 6-8 39-58%
12	15:55	15:51	11:44	17:18	04:55	
13	15:47	15:43	11:44	18:01	05:40	
14	15:39	15:34	11:44	18:42	06:22	

November 15, 16, 17 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	53°58.7	208°43.0	S12°33.9	162°39.3	S23°01.4	59°20.8	S03°55.2	221°08.1	S03°04.8
1	69°01.1	223°45.6	33.2	177°39.8	01.7	74°23.3	55.2	236°10.3	04.9
2	84°03.6	238°48.2	32.4	192°40.3	01.9	89°25.8	55.2	251°12.5	05.0
3	99°06.0	253°50.8	·· 31.7	207°40.8	·· 02.2	104°28.3	·· 55.2	266°14.7	·· 05.1
4	114°08.5	268°53.4	31.0	222°41.3	02.4	119°30.8	55.2	281°17.0	05.2
5	129°11.0	283°56.0	30.3	237°41.7	02.7	134°33.3	55.2	296°19.2	05.3
6	144°13.4	298°58.6	S12°29.6	252°42.2	S23°02.9	149°35.8	S03°55.2	311°21.4	S03°05.4
7	159°15.9	314°01.2	28.9	267°42.7	03.2	164°38.3	55.2	326°23.6	05.5
8	174°18.4	329°03.8	28.2	282°43.2	03.4	179°40.8	55.2	341°25.8	05.6
9	189°20.8	344°06.4	·· 27.5	297°43.7	·· 03.7	194°43.3	·· 55.2	356°28.1	·· 05.7
10	204°23.3	359°09.0	26.8	312°44.2	03.9	209°45.8	55.2	11°30.3	05.7
11	219°25.8	14°11.6	26.1	327°44.7	04.2	224°48.3	55.2	26°32.5	05.8
12	234°28.2	29°14.1	S12°25.4	342°45.1	S23°04.4	239°50.8	S03°55.2	41°34.7	S03°05.9
13	249°30.7	44°16.7	24.8	357°45.6	04.7	254°53.3	55.2	56°37.0	06.0
14	264°33.1	59°19.3	24.1	12°46.1	04.9	269°55.8	55.2	71°39.2	06.1
15	279°35.6	74°21.8	·· 23.4	27°46.6	·· 05.2	284°58.3	·· 55.2	86°41.4	·· 06.2
16	294°38.1	89°24.4	22.7	42°47.1	05.4	300°00.8	55.2	101°43.6	06.3
17	309°40.5	104°26.9	22.0	57°47.6	05.7	315°03.3	55.2	116°45.8	06.4
18	324°43.0	119°29.5	S12°21.3	72°48.0	S23°05.9	330°05.7	S03°55.2	131°48.1	S03°06.5
19	339°45.5	134°32.0	20.7	87°48.5	06.2	345°08.2	55.2	146°50.3	06.6
20	354°47.9	149°34.6	20.0	102°49.0	06.4	0°10.7	55.2	161°52.5	06.7
21	9°50.4	164°37.1	·· 19.3	117°49.5	·· 06.7	15°13.2	·· 55.2	176°54.7	·· 06.8
22	24°52.9	179°39.7	18.6	132°50.0	06.9	30°15.7	55.2	191°57.0	06.9
23	39°55.3	194°42.2	18.0	147°50.5	07.2	45°18.2	55.2	206°59.2	07.0
Mer.pass.:20:21		v2.6 d0.7 m-4.2		v0.5 d-0.3 m1.4		v2.5 d-0.0 m-2.5		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	54°57.8	209°44.7	S12°17.3	162°50.9	S23°07.4	60°20.7	S03°55.2	222°01.4	S03°07.1
1	70°00.3	224°47.2	16.6	177°51.4	07.7	75°23.2	55.2	237°03.6	07.2
2	85°02.7	239°49.8	16.0	192°51.9	07.9	90°25.7	55.2	252°05.8	07.3
3	100°05.2	254°52.3	·· 15.3	207°52.4	·· 08.1	105°28.2	·· 55.2	267°08.1	·· 07.4
4	115°07.6	269°54.8	14.7	222°52.9	08.4	120°30.6	55.2	282°10.3	07.4
5	130°10.1	284°57.3	14.0	237°53.4	08.6	135°33.1	55.2	297°12.5	07.5
6	145°12.6	299°59.8	S12°13.4	252°53.8	S23°08.9	150°35.6	S03°55.2	312°14.7	S03°07.6
7	160°15.0	315°02.3	12.7	267°54.3	09.1	165°38.1	55.2	327°17.0	07.7
8	175°17.5	330°04.8	12.0	282°54.8	09.4	180°40.6	55.2	342°19.2	07.8
9	190°20.0	345°07.3	·· 11.4	297°55.3	·· 09.6	195°43.1	·· 55.2	357°21.4	·· 07.9
10	205°22.4	0°09.8	10.7	312°55.8	09.8	210°45.6	55.2	12°23.6	08.0
11	220°24.9	15°12.3	10.1	327°56.2	10.1	225°48.1	55.2	27°25.9	08.1
12	235°27.4	30°14.7	S12°09.5	342°56.7	S23°10.3	240°50.5	S03°55.2	42°28.1	S03°08.2
13	250°29.8	45°17.2	08.8	357°57.2	10.6	255°53.0	55.2	57°30.3	08.3
14	265°32.3	60°19.7	08.2	12°57.7	10.8	270°55.5	55.2	72°32.5	08.4
15	280°34.8	75°22.2	·· 07.5	27°58.1	·· 11.0	285°58.0	·· 55.2	87°34.7	·· 08.5
16	295°37.2	90°24.6	06.9	42°58.6	11.3	301°00.5	55.2	102°37.0	08.6
17	310°39.7	105°27.1	06.3	57°59.1	11.5	316°03.0	55.2	117°39.2	08.7
18	325°42.1	120°29.5	S12°05.6	72°59.6	S23°11.8	331°05.5	S03°55.1	132°41.4	S03°08.8
19	340°44.6	135°32.0	05.0	88°00.1	12.0	346°07.9	55.1	147°43.6	08.9
20	355°47.1	150°34.4	04.4	103°00.5	12.2	1°10.4	55.1	162°45.9	08.9
21	10°49.5	165°36.9	·· 03.8	118°01.0	·· 12.5	16°12.9	·· 55.1	177°48.1	·· 09.0
22	25°52.0	180°39.3	03.1	133°01.5	12.7	31°15.4	55.1	192°50.3	09.1
23	40°54.5	195°41.8	02.5	148°02.0	12.9	46°17.9	55.1	207°52.5	09.2
Mer.pass.:20:17		v2.5 d0.7 m-4.3		v0.5 d-0.2 m1.4		v2.5 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	55°56.9	210°44.2	S12°01.9	163°02.4	S23°13.2	61°20.3	S03°55.1	222°54.8	S03°09.3
1	70°59.4	225°46.6	01.3	178°02.9	13.4	76°22.8	55.1	237°57.0	09.4
2	86°01.9	240°49.1	00.7	193°03.4	13.6	91°25.3	55.1	252°59.2	09.5
3	101°04.3	255°51.5	12°00.0	208°03.9	·· 13.9	106°27.8	·· 55.1	268°01.4	·· 09.6
4	116°06.8	270°53.9	11°59.4	223°04.4	14.1	121°30.3	55.1	283°03.7	09.7
5	131°09.2	285°56.3	58.8	238°04.8	14.3	136°32.8	55.1	298°05.9	09.8
6	146°11.7	300°58.7	S11°58.2	253°05.3	S23°14.6	151°35.2	S03°55.1	313°08.1	S03°09.9
7	161°14.2	316°01.1	57.6	268°05.8	14.8	166°37.7	55.1	328°10.3	10.0
8	176°16.6	331°03.5	57.0	283°06.3	15.0	181°40.2	55.1	343°12.6	10.1
9	191°19.1	346°05.9	·· 56.4	298°06.7	·· 15.3	196°42.7	·· 55.1	358°14.8	·· 10.2
10	206°21.6	1°08.3	55.8	313°07.2	15.5	211°45.2	55.1	13°17.0	10.2
11	221°24.0	16°10.7	55.2	328°07.7	15.7	226°47.6	55.1	28°19.2	10.3
12	236°26.5	31°13.1	S11°54.6	343°08.2	S23°16.0	241°50.1	S03°55.1	43°21.5	S03°10.4
13	251°29.0	46°15.5	54.0	358°08.6	16.2	256°52.6	55.1	58°23.7	10.5
14	266°31.4	61°17.9	53.4	13°09.1	16.4	271°55.1	55.1	73°25.9	10.6
15	281°33.9	76°20.2	·· 52.8	28°09.6	·· 16.7	286°57.5	·· 55.1	88°28.1	·· 10.7
16	296°36.4	91°22.6	52.3	43°10.0	16.9	302°00.0	55.0	103°30.4	10.8
17	311°38.8	106°25.0	51.7	58°10.5	17.1	317°02.5	55.0	118°32.6	10.9
18	326°41.3	121°27.3	S11°51.1	73°11.0	S23°17.3	332°05.0	S03°55.0	133°34.8	S03°11.0
19	341°43.7	136°29.7	50.5	88°11.5	17.6	347°07.4	55.0	148°37.0	11.1
20	356°46.2	151°32.0	49.9	103°11.9	17.8	2°09.9	55.0	163°39.3	11.2
21	11°48.7	166°34.4	·· 49.4	118°12.4	·· 18.0	17°12.4	·· 55.0	178°41.5	·· 11.3
22	26°51.1	181°36.7	48.8	133°12.9	18.2	32°14.9	55.0	193°43.7	11.4
23	41°53.6	196°39.1	48.2	148°13.4	18.5	47°17.3	55.0	208°45.9	11.4
Mer.pass.:20:13		v2.4 d0.6 m-4.3		v0.5 d-0.2 m1.4		v2.5 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.8
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°15.5	89°18.8
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.8	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.7	28°37.0
Alnilam	275°48.0	-1°11.6
Betelgeuse	271°03.0	7°24.6
Canopus	263°56.6	-52°41.9
Sirius	258°35.1	-16°43.8
Adhara	255°13.8	-28°59.1
Procyon	245°01.5	5°11.8
Pollux	243°29.8	27°59.8
Avior	234°18.6	-59°32.4
Suhail	222°53.8	-43°28.4
Miaplacidus	221°40.1	-69°45.5
Alphard	217°57.9	-8°42.3
Regulus	207°45.5	11°54.7
Dubhe	193°54.1	61°41.2
Denebola	182°35.7	14°30.6
Gienah	175°54.5	-17°36.1
Acrux	173°12.1	-63°09.4
Gacrux	172°03.5	-57°10.3
Alioth	166°22.6	55°53.8
Spica	158°33.5	-11°13.1
Alkaid	153°00.7	49°15.4
Hadar	148°51.3	-60°25.4
Menkent	148°10.2	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°55.0	-60°52.7
Kochab	137°20.9	74°06.5
Zuben'ubi	137°07.9	-16°05.2
Alphecca	126°12.9	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.3
Eltanin	90°47.5	51°29.5
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.6	38°47.9
Nunki	76°00.9	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.3	-56°42.1
Deneb	49°32.9	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°45.9	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 15 Mon	**SHA**	**Mer.pass**
Venus	154°44.3	10:03
Mars	108°40.7	13:09
Jupiter	5°22.2	19:59
Saturn	167°09.4	09:14

Nov 16 Tue	**SHA**	**Mer.pass**
Venus	154°46.9	09:59
Mars	107°53.2	13:08
Jupiter	5°22.9	19:55
Saturn	167°03.6	09:11

Nov 17 Wed	**SHA**	**Mer.pass**
Venus	154°47.3	09:55
Mars	107°05.5	13:07
Jupiter	5°23.4	19:51
Saturn	166°57.8	09:07

Horizontal parallax	
Venus:	0.5
Mars:	0.1

DUT1 = UT1-UTC = -0.1052 sec ΔT = TT-UT1 = +66.2892 sec

2010 November 15 to Nov. 17 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°52.4	**S**18°23.8	77°13.8	16.3'	**S**04°45.4	12.0'	54.2'
1	198°52.3	24.5	91°49.1	16.3'	04°33.5	12.0'	54.2'
2	213°52.2	25.1	106°24.5	16.4'	04°21.5	12.0'	54.2'
3	228°52.1	· · 25.8	120°59.9	16.4'	04°09.5	12.0'	54.2'
4	243°52.0	26.4	135°35.2	16.4'	03°57.5	12.0'	54.2'
5	258°51.9	27.0	150°10.6	16.4'	03°45.5	12.0'	54.2'
6	273°51.8	**S**18°27.7	164°46.1	16.4'	**S**03°33.4	12.0'	54.2'
7	288°51.7	28.3	179°21.5	16.4'	03°21.4	12.1'	54.2'
8	303°51.5	29.0	193°56.9	16.4'	03°09.3	12.1'	54.2'
9	318°51.4	· · 29.6	208°32.4	16.5'	02°57.2	12.1'	54.2'
10	333°51.3	30.2	223°07.8	16.5'	02°45.2	12.1'	54.2'
11	348°51.2	30.9	237°43.3	16.5'	02°33.1	12.1'	54.2'
12	3°51.1	**S**18°31.5	252°18.8	16.5'	**S**02°21.0	12.1'	54.2'
13	18°51.0	32.1	266°54.2	16.5'	02°08.9	12.1'	54.2'
14	33°50.9	32.8	281°29.7	16.5'	01°56.7	12.1'	54.2'
15	48°50.8	· · 33.4	296°05.2	16.5'	01°44.6	12.1'	54.2'
16	63°50.7	34.0	310°40.7	16.5'	01°32.5	12.1'	54.2'
17	78°50.6	34.7	325°16.2	16.5'	01°20.3	12.1'	54.2'
18	93°50.5	**S**18°35.3	339°51.7	16.5'	**S**01°08.2	12.2'	54.2'
19	108°50.4	35.9	354°27.2	16.5'	00°56.0	12.2'	54.2'
20	123°50.3	36.6	9°02.7	16.5'	00°43.9	12.2'	54.2'
21	138°50.2	· · 37.2	23°38.2	16.5'	00°31.7	12.2'	54.2'
22	153°50.1	37.8	38°13.7	16.5'	00°19.5	12.2'	54.2'
23	168°50.0	38.5	52°49.2	16.5'	00°07.4	12.2'	54.2'
	SD.=16.2	d=-0.6	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°49.8	**S**18°39.1	67°24.6	16.5'	**N**00°04.8	12.2'	54.2'
1	198°49.7	39.7	82°00.1	16.5'	00°17.0	12.2'	54.2'
2	213°49.6	40.3	96°35.6	16.5'	00°29.2	12.2'	54.2'
3	228°49.5	· · 41.0	111°11.0	16.5'	00°41.3	12.2'	54.2'
4	243°49.4	41.6	125°46.5	16.4'	00°53.5	12.2'	54.2'
5	258°49.3	42.2	140°21.9	16.4'	01°05.7	12.2'	54.2'
6	273°49.2	**S**18°42.9	154°57.4	16.4'	**N**01°17.9	12.2'	54.2'
7	288°49.1	43.5	169°32.8	16.4'	01°30.0	12.2'	54.2'
8	303°49.0	44.1	184°08.2	16.4'	01°42.2	12.2'	54.2'
9	318°48.8	· · 44.7	198°43.6	16.4'	01°54.4	12.2'	54.2'
10	333°48.7	45.3	213°19.0	16.4'	02°06.6	12.2'	54.2'
11	348°48.6	46.0	227°54.3	16.4'	02°18.7	12.2'	54.3'
12	3°48.5	**S**18°46.6	242°29.7	16.3'	**N**02°30.9	12.2'	54.3'
13	18°48.4	47.2	257°05.0	16.3'	02°43.0	12.1'	54.3'
14	33°48.3	47.8	271°40.3	16.3'	02°55.2	12.1'	54.3'
15	48°48.2	· · 48.5	286°15.6	16.3'	03°07.3	12.1'	54.3'
16	63°48.0	49.1	300°50.9	16.3'	03°19.4	12.1'	54.3'
17	78°47.9	49.7	315°26.1	16.2'	03°31.6	12.1'	54.3'
18	93°47.8	**S**18°50.3	330°01.4	16.2'	**N**03°43.7	12.1'	54.3'
19	108°47.7	50.9	344°36.6	16.2'	03°55.8	12.1'	54.3'
20	123°47.6	51.5	359°11.8	16.2'	04°07.9	12.1'	54.3'
21	138°47.5	· · 52.2	13°46.9	16.1'	04°20.0	12.1'	54.3'
22	153°47.3	52.8	28°22.1	16.1'	04°32.0	12.1'	54.3'
23	168°47.2	53.4	42°57.2	16.1'	04°44.1	12.1'	54.4'
	SD.=16.2	d=-0.6	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°47.1	**S**18°54.0	57°32.2	16.1'	**N**04°56.1	12.0'	54.4'
1	198°47.0	54.6	72°07.3	16.0'	05°08.2	12.0'	54.4'
2	213°46.9	55.2	86°42.3	16.0'	05°20.2	12.0'	54.4'
3	228°46.8	· · 55.9	101°17.3	16.0'	05°32.2	12.0'	54.4'
4	243°46.6	56.5	115°52.2	15.9'	05°44.2	12.0'	54.4'
5	258°46.5	57.1	130°27.2	15.9'	05°56.2	12.0'	54.4'
6	273°46.4	**S**18°57.7	145°02.1	15.9'	**N**06°08.1	11.9'	54.4'
7	288°46.3	58.3	159°36.9	15.8'	06°20.0	11.9'	54.4'
8	303°46.2	58.9	174°11.7	15.8'	06°32.0	11.9'	54.4'
9	318°46.0	18°59.5	188°46.5	15.8'	06°43.9	11.9'	54.5'
10	333°45.9	19°00.1	203°21.3	15.7'	06°55.7	11.9'	54.5'
11	348°45.8	00.7	217°56.0	15.7'	07°07.6	11.8'	54.5'
12	3°45.7	**S**19°01.3	232°30.6	15.6'	**N**07°19.4	11.8'	54.5'
13	18°45.5	02.0	247°05.3	15.6'	07°31.3	11.8'	54.5'
14	33°45.4	02.6	261°39.8	15.6'	07°43.1	11.8'	54.5'
15	48°45.3	· · 03.2	276°14.4	15.5'	07°54.8	11.8'	54.5'
16	63°45.2	03.8	290°48.9	15.5'	08°06.6	11.7'	54.5'
17	78°45.0	04.4	305°23.4	15.4'	08°18.3	11.7'	54.6'
18	93°44.9	**S**19°05.0	319°57.8	15.4'	**N**08°30.0	11.7'	54.6'
19	108°44.8	05.6	334°32.1	15.3'	08°41.6	11.7'	54.6'
20	123°44.7	06.2	349°06.5	15.3'	08°53.3	11.6'	54.6'
21	138°44.5	· · 06.8	3°40.7	15.3'	09°04.9	11.6'	54.6'
22	153°44.4	07.4	18°15.0	15.2'	09°16.5	11.6'	54.6'
23	168°44.3	08.0	32°49.2	15.2'	09°28.0	11.5'	54.6'
	SD.=16.2	d=-0.6	S.D.=14.9				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 9-11 67-83%
15	15:29	15:25	11:45	19:23	07:03	
16	15:19	15:14	11:45	20:03	07:43	
17	15:08	15:03	11:45	20:45	08:24	

November 18, 19, 20 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	56°56.1	211°41.4	S11°47.6	163°13.8	S23°18.7	62°19.8	S03°55.0	223°48.2	S03°11.5
1	71°58.5	226°43.8	47.1	178°14.3	18.9	77°22.3	55.0	238°50.4	11.6
2	87°01.0	241°46.1	46.5	193°14.8	19.2	92°24.8	55.0	253°52.6	11.7
3	102°03.5	256°48.4	·· 45.9	208°15.2	·· 19.4	107°27.2	·· 55.0	268°54.9	·· 11.8
4	117°05.9	271°50.8	45.4	223°15.7	19.6	122°29.7	55.0	283°57.1	11.9
5	132°08.4	286°53.1	44.8	238°16.2	19.8	137°32.2	54.9	298°59.3	12.0
6	147°10.8	301°55.4	S11°44.3	253°16.7	S23°20.0	152°34.7	S03°54.9	314°01.5	S03°12.1
7	162°13.3	316°57.7	43.7	268°17.1	20.3	167°37.1	54.9	329°03.8	12.2
8	177°15.8	332°00.0	43.1	283°17.6	20.5	182°39.6	54.9	344°06.0	12.3
9	192°18.2	347°02.3	·· 42.6	298°18.1	·· 20.7	197°42.1	·· 54.9	359°08.2	·· 12.4
10	207°20.7	2°04.6	42.0	313°18.5	20.9	212°44.5	54.9	14°10.4	12.5
11	222°23.2	17°06.9	41.5	328°19.0	21.2	227°47.0	54.9	29°12.7	12.5
12	237°25.6	32°09.2	S11°40.9	343°19.5	S23°21.4	242°49.5	S03°54.9	44°14.9	S03°12.6
13	252°28.1	47°11.5	40.4	358°19.9	21.6	257°52.0	54.9	59°17.1	12.7
14	267°30.6	62°13.8	39.9	13°20.4	21.8	272°54.4	54.9	74°19.4	12.8
15	282°33.0	77°16.1	·· 39.3	28°20.9	·· 22.0	287°56.9	·· 54.9	89°21.6	·· 12.9
16	297°35.5	92°18.4	38.8	43°21.3	22.3	302°59.4	54.8	104°23.8	13.0
17	312°38.0	107°20.6	38.2	58°21.8	22.5	318°01.8	54.8	119°26.0	13.1
18	327°40.4	122°22.9	S11°37.7	73°22.3	S23°22.7	333°04.3	S03°54.8	134°28.3	S03°13.2
19	342°42.9	137°25.2	37.2	88°22.7	22.9	348°06.8	54.8	149°30.5	13.3
20	357°45.3	152°27.4	36.6	103°23.2	23.1	3°09.2	54.8	164°32.7	13.4
21	12°47.8	167°29.7	·· 36.1	118°23.7	·· 23.3	18°11.7	·· 54.8	179°34.9	·· 13.5
22	27°50.3	182°32.0	35.6	133°24.1	23.6	33°14.2	54.8	194°37.2	13.6
23	42°52.7	197°34.2	35.1	148°24.6	23.8	48°16.6	54.8	209°39.4	13.6
Mer.pass.:20:09		v2.3 d0.6 m-4.3		v0.5 d-0.2 m1.4		v2.5 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	57°55.2	212°36.5	S11°34.5	163°25.1	S23°24.0	63°19.1	S03°54.8	224°41.6	S03°13.7
1	72°57.7	227°38.7	34.0	178°25.5	24.2	78°21.6	54.8	239°43.9	13.8
2	88°00.1	242°40.9	33.5	193°26.0	24.4	93°24.0	54.7	254°46.1	13.9
3	103°02.6	257°43.2	·· 33.0	208°26.5	·· 24.6	108°26.5	·· 54.7	269°48.3	·· 14.0
4	118°05.1	272°45.4	32.5	223°26.9	24.9	123°29.0	54.7	284°50.5	14.1
5	133°07.5	287°47.6	32.0	238°27.4	25.1	138°31.4	54.7	299°52.8	14.2
6	148°10.0	302°49.9	S11°31.5	253°27.9	S23°25.3	153°33.9	S03°54.7	314°55.0	S03°14.3
7	163°12.5	317°52.1	30.9	268°28.3	25.5	168°36.4	54.7	329°57.2	14.4
8	178°14.9	332°54.3	30.4	283°28.8	25.7	183°38.8	54.7	344°59.5	14.5
9	193°17.4	347°56.5	·· 29.9	298°29.3	·· 25.9	198°41.3	·· 54.7	0°01.7	·· 14.6
10	208°19.8	2°58.7	29.4	313°29.7	26.1	213°43.7	54.6	15°03.9	14.6
11	223°22.3	18°00.9	28.9	328°30.2	26.3	228°46.2	54.6	30°06.2	14.7
12	238°24.8	33°03.1	S11°28.4	343°30.7	S23°26.6	243°48.7	S03°54.6	45°08.4	S03°14.8
13	253°27.2	48°05.3	27.9	358°31.1	26.8	258°51.1	54.6	60°10.6	14.9
14	268°29.7	63°07.5	27.5	13°31.6	27.0	273°53.6	54.6	75°12.8	15.0
15	283°32.2	78°09.7	·· 27.0	28°32.0	·· 27.2	288°56.1	·· 54.6	90°15.1	·· 15.1
16	298°34.6	93°11.9	26.5	43°32.5	27.4	303°58.5	54.6	105°17.3	15.2
17	313°37.1	108°14.1	26.0	58°33.0	27.6	319°01.0	54.6	120°19.5	15.3
18	328°39.6	123°16.3	S11°25.5	73°33.4	S23°27.8	334°03.4	S03°54.5	135°21.8	S03°15.4
19	343°42.0	138°18.5	25.0	88°33.9	28.0	349°05.9	54.5	150°24.0	15.5
20	358°44.5	153°20.6	24.5	103°34.4	28.2	4°08.4	54.5	165°26.2	15.5
21	13°46.9	168°22.8	·· 24.1	118°34.8	·· 28.4	19°10.8	·· 54.5	180°28.5	·· 15.6
22	28°49.4	183°25.0	23.6	133°35.3	28.6	34°13.3	54.5	195°30.7	15.7
23	43°51.9	198°27.1	23.1	148°35.7	28.9	49°15.7	54.5	210°32.9	15.8
Mer.pass.:20:05		v2.2 d0.5 m-4.3		v0.5 d-0.2 m1.4		v2.5 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	58°54.3	213°29.3	S11°22.6	163°36.2	S23°29.1	64°18.2	S03°54.5	225°35.1	S03°15.9
1	73°56.8	228°31.4	22.2	178°36.7	29.3	79°20.6	54.4	240°37.4	16.0
2	88°59.3	243°33.6	21.7	193°37.1	29.5	94°23.1	54.4	255°39.6	16.1
3	104°01.7	258°35.7	·· 21.2	208°37.6	·· 29.7	109°25.6	·· 54.4	270°41.8	·· 16.2
4	119°04.2	273°37.9	20.8	223°38.0	29.9	124°28.0	54.4	285°44.1	16.3
5	134°06.7	288°40.0	20.3	238°38.5	30.1	139°30.5	54.4	300°46.3	16.4
6	149°09.1	303°42.2	S11°19.8	253°39.0	S23°30.3	154°32.9	S03°54.4	315°48.5	S03°16.4
7	164°11.6	318°44.3	19.4	268°39.4	30.5	169°35.4	54.4	330°50.8	16.5
8	179°14.1	333°46.4	18.9	283°39.9	30.7	184°37.8	54.3	345°53.0	16.6
9	194°16.5	348°48.5	·· 18.5	298°40.3	·· 30.9	199°40.3	·· 54.3	0°55.2	·· 16.7
10	209°19.0	3°50.7	18.0	313°40.8	31.1	214°42.8	54.3	15°57.5	16.8
11	224°21.4	18°52.8	17.6	328°41.3	31.3	229°45.2	54.3	30°59.7	16.9
12	239°23.9	33°54.9	S11°17.1	343°41.7	S23°31.5	244°47.7	S03°54.3	46°01.9	S03°17.0
13	254°26.4	48°57.0	16.7	358°42.2	31.7	259°50.1	54.3	61°04.2	17.1
14	269°28.8	63°59.1	16.2	13°42.6	31.9	274°52.6	54.2	76°06.4	17.2
15	284°31.3	79°01.2	·· 15.8	28°43.1	·· 32.1	289°55.0	·· 54.2	91°08.6	·· 17.3
16	299°33.8	94°03.3	15.3	43°43.6	32.3	304°57.5	54.2	106°10.8	17.3
17	314°36.2	109°05.4	14.9	58°44.0	32.5	319°59.9	54.2	121°13.1	17.4
18	329°38.7	124°07.5	S11°14.5	73°44.5	S23°32.7	335°02.4	S03°54.2	136°15.3	S03°17.5
19	344°41.2	139°09.6	14.0	88°44.9	32.9	350°04.8	54.2	151°17.5	17.6
20	359°43.6	154°11.7	13.6	103°45.4	33.1	5°07.3	54.1	166°19.8	17.7
21	14°46.1	169°13.8	·· 13.2	118°45.8	·· 33.3	20°09.7	·· 54.1	181°22.0	·· 17.8
22	29°48.6	184°15.8	12.8	133°46.3	33.5	35°12.2	54.1	196°24.2	17.9
23	44°51.0	199°17.9	12.3	148°46.8	33.7	50°14.6	54.1	211°26.5	18.0
Mer.pass.:20:01		v2.2 d0.5 m-4.3		v0.5 d-0.2 m1.4		v2.5 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.8
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.5
Achernar	335°27.5	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°15.5	89°18.8
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.8	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.6	28°37.0
Alnilam	275°48.0	-1°11.6
Betelgeuse	271°03.0	7°24.6
Canopus	263°56.5	-52°41.9
Sirius	258°35.1	-16°43.8
Adhara	255°13.7	-28°59.1
Procyon	245°01.5	5°11.8
Pollux	243°29.8	27°59.8
Avior	234°18.6	-59°32.4
Suhail	222°53.8	-43°28.4
Miaplacidus	221°40.0	-69°45.5
Alphard	217°57.9	-8°42.3
Regulus	207°45.5	11°54.7
Dubhe	193°54.0	61°41.2
Denebola	182°35.7	14°30.6
Gienah	175°54.5	-17°36.1
Acrux	173°12.0	-63°09.4
Gacrux	172°03.5	-57°10.3
Alioth	166°22.6	55°53.8
Spica	158°33.5	-11°13.1
Alkaid	153°00.7	49°15.4
Hadar	148°51.3	-60°25.4
Menkent	148°10.2	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°55.0	-60°52.7
Kochab	137°20.9	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.9	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.9
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.6	38°47.9
Nunki	76°00.9	-26°17.0
Altair	62°10.2	8°54.0
Peacock	53°22.3	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.0	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 18 Thu	**SHA**	**Mer.pass**
Venus	154°45.4	09:52
Mars	106°17.8	13:07
Jupiter	5°23.8	19:47
Saturn	166°52.1	09:03

Nov 19 Fri	**SHA**	**Mer.pass**
Venus	154°41.2	09:48
Mars	105°29.9	13:06
Jupiter	5°23.9	19:43
Saturn	166°46.4	09:00

Nov 20 Sat	**SHA**	**Mer.pass**
Venus	154°34.9	09:45
Mars	104°41.9	13:05
Jupiter	5°23.9	19:40
Saturn	166°40.8	08:56

Horizontal parallax	
Venus:	0.4
Mars:	0.1

DUT1 = UT1-UTC = -0.1083 sec ΔT = TT-UT1 = +66.2923 sec

2010 November 18 to Nov. 20 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°44.2	**S**19°08.6	47°23.3	15.1'	**N**09°39.6	11.5'	54.7'
1	198°44.0	09.2	61°57.4	15.1'	09°51.0	11.5'	54.7'
2	213°43.9	09.8	76°31.4	15.0'	10°02.5	11.4'	54.7'
3	228°43.8	· · 10.4	91°05.4	15.0'	10°13.9	11.4'	54.7'
4	243°43.7	11.0	105°39.3	14.9'	10°25.3	11.4'	54.7'
5	258°43.5	11.6	120°13.2	14.8'	10°36.7	11.3'	54.7'
6	273°43.4	**S**19°12.2	134°47.0	14.8'	**N**10°48.0	11.3'	54.8'
7	288°43.3	12.8	149°20.7	14.7'	10°59.3	11.3'	54.8'
8	303°43.1	13.4	163°54.4	14.7'	11°10.5	11.2'	54.8'
9	318°43.0	· · 14.0	178°28.1	14.6'	11°21.7	11.2'	54.8'
10	333°42.9	14.6	193°01.7	14.6'	11°32.9	11.1'	54.8'
11	348°42.8	15.2	207°35.2	14.5'	11°44.0	11.1'	54.8'
12	3°42.6	**S**19°15.8	222°08.7	14.4'	**N**11°55.1	11.1'	54.9'
13	18°42.5	16.3	236°42.1	14.4'	12°06.1	11.0'	54.9'
14	33°42.4	16.9	251°15.4	14.3'	12°17.2	11.0'	54.9'
15	48°42.2	· · 17.5	265°48.7	14.3'	12°28.1	10.9'	54.9'
16	63°42.1	18.1	280°21.9	14.2'	12°39.0	10.9'	54.9'
17	78°42.0	18.7	294°55.1	14.1'	12°49.9	10.8'	54.9'
18	93°41.8	**S**19°19.3	309°28.2	14.1'	**N**13°00.7	10.8'	55.0'
19	108°41.7	19.9	324°01.2	14.0'	13°11.5	10.8'	55.0'
20	123°41.6	20.5	338°34.2	13.9'	13°22.2	10.7'	55.0'
21	138°41.4	· · 21.1	353°07.1	13.9'	13°32.9	10.7'	55.0'
22	153°41.3	21.7	7°39.9	13.8'	13°43.5	10.6'	55.0'
23	168°41.2	22.2	22°12.7	13.7'	13°54.1	10.5'	55.1'
	SD.=16.2	d=-0.6	S.D.=14.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°41.0	**S**19°22.8	36°45.4	13.7'	**N**14°04.6	10.5'	55.1'
1	198°40.9	23.4	51°18.0	13.6'	14°15.1	10.4'	55.1'
2	213°40.8	24.0	65°50.6	13.5'	14°25.5	10.4'	55.1'
3	228°40.6	· · 24.6	80°23.1	13.5'	14°35.9	10.3'	55.1'
4	243°40.5	25.2	94°55.5	13.4'	14°46.2	10.3'	55.1'
5	258°40.3	25.8	109°27.9	13.3'	14°56.4	10.2'	55.2'
6	273°40.2	**S**19°26.3	124°00.1	13.2'	**N**15°06.6	10.2'	55.2'
7	288°40.1	26.9	138°32.3	13.2'	15°16.7	10.1'	55.2'
8	303°39.9	27.5	153°04.5	13.1'	15°26.8	10.0'	55.2'
9	318°39.8	· · 28.1	167°36.5	13.0'	15°36.8	10.0'	55.2'
10	333°39.7	28.7	182°08.5	12.9'	15°46.8	9.9'	55.3'
11	348°39.5	29.2	196°40.4	12.9'	15°56.7	9.9'	55.3'
12	3°39.4	**S**19°29.8	211°12.3	12.8'	**N**16°06.5	9.8'	55.3'
13	18°39.2	30.4	225°44.0	12.7'	16°16.2	9.7'	55.3'
14	33°39.1	31.0	240°15.7	12.6'	16°25.9	9.7'	55.4'
15	48°39.0	· · 31.6	254°47.3	12.6'	16°35.5	9.6'	55.4'
16	63°38.8	32.1	269°18.9	12.5'	16°45.1	9.5'	55.4'
17	78°38.7	32.7	283°50.3	12.4'	16°54.6	9.4'	55.4'
18	93°38.5	**S**19°33.3	298°21.7	12.3'	**N**17°04.0	9.4'	55.4'
19	108°38.4	33.9	312°53.0	12.3'	17°13.3	9.3'	55.5'
20	123°38.2	34.4	327°24.2	12.2'	17°22.6	9.2'	55.5'
21	138°38.1	· · 35.0	341°55.4	12.1'	17°31.8	9.2'	55.5'
22	153°38.0	35.6	356°26.4	12.0'	17°40.9	9.1'	55.5'
23	168°37.8	36.1	10°57.4	11.9'	17°50.0	9.0'	55.5'
	SD.=16.2	d=-0.6	S.D.=15.1				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°37.7	**S**19°36.7	25°28.3	11.9'	**N**17°58.9	8.9'	55.6'
1	198°37.5	37.3	39°59.1	11.8'	18°07.8	8.9'	55.6'
2	213°37.4	37.9	54°29.9	11.7'	18°16.6	8.8'	55.6'
3	228°37.2	· · 38.4	69°00.6	11.6'	18°25.4	8.7'	55.6'
4	243°37.1	39.0	83°31.1	11.5'	18°34.0	8.6'	55.6'
5	258°37.0	39.6	98°01.7	11.5'	18°42.6	8.5'	55.7'
6	273°36.8	**S**19°40.1	112°32.1	11.4'	**N**18°51.1	8.4'	55.7'
7	288°36.7	40.7	127°02.4	11.3'	18°59.5	8.4'	55.7'
8	303°36.5	41.3	141°32.7	11.2'	19°07.8	8.3'	55.7'
9	318°36.4	· · 41.8	156°02.9	11.1'	19°16.0	8.2'	55.8'
10	333°36.2	42.4	170°33.0	11.1'	19°24.1	8.1'	55.8'
11	348°36.1	43.0	185°03.0	11.0'	19°32.2	8.0'	55.8'
12	3°35.9	**S**19°43.5	199°32.9	10.9'	**N**19°40.1	7.9'	55.8'
13	18°35.8	44.1	214°02.8	10.8'	19°48.0	7.8'	55.8'
14	33°35.6	44.7	228°32.6	10.7'	19°55.8	7.7'	55.9'
15	48°35.5	· · 45.2	243°02.3	10.7'	20°03.5	7.6'	55.9'
16	63°35.3	45.8	257°31.9	10.6'	20°11.1	7.5'	55.9'
17	78°35.2	46.3	272°01.4	10.5'	20°18.5	7.4'	55.9'
18	93°35.0	**S**19°46.9	286°30.9	10.4'	**N**20°25.9	7.3'	56.0'
19	108°34.9	47.5	301°00.2	10.3'	20°33.2	7.2'	56.0'
20	123°34.7	48.0	315°29.5	10.3'	20°40.4	7.1'	56.0'
21	138°34.6	· · 48.6	329°58.7	10.2'	20°47.5	7.0'	56.0'
22	153°34.4	49.1	344°27.9	10.1'	20°54.5	6.9'	56.1'
23	168°34.3	49.7	358°56.9	10.0'	21°01.4	6.8'	56.1'
	SD.=16.2	d=-0.6	S.D.=15.2				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 12-14 90-98%
18	14:57	14:50	11:45	21:28	09:06	
19	14:44	14:38	11:45	22:15	09:51	
20	14:31	14:24	11:46	23:04	10:39	

November 21, 22, 23 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	59°53.5	214°20.0	S11°11.9	163°47.2	S23°33.9	65°17.1	S03°54.1	226°28.7	S03°18.1
1	74°55.9	229°22.0	11.5	178°47.7	34.1	80°19.5	54.1	241°30.9	18.1
2	89°58.4	244°24.1	11.1	193°48.1	34.3	95°22.0	54.0	256°33.2	18.2
3	105°00.9	259°26.2	· · 10.6	208°48.6	· · 34.5	110°24.4	· · 54.0	271°35.4	· · 18.3
4	120°03.3	274°28.2	10.2	223°49.0	34.7	125°26.9	54.0	286°37.6	18.4
5	135°05.8	289°30.3	09.8	238°49.5	34.9	140°29.3	54.0	301°39.9	18.5
6	150°08.3	304°32.3	S11°09.4	253°49.9	S23°35.1	155°31.8	S03°54.0	316°42.1	S03°18.6
7	165°10.7	319°34.4	09.0	268°50.4	35.2	170°34.2	53.9	331°44.3	18.7
8	180°13.2	334°36.4	08.6	283°50.9	35.4	185°36.7	53.9	346°46.6	18.8
9	195°15.7	349°38.4	· · 08.2	298°51.3	· · 35.6	200°39.1	· · 53.9	1°48.8	· · 18.9
10	210°18.1	4°40.5	07.8	313°51.8	35.8	215°41.6	53.9	16°51.0	18.9
11	225°20.6	19°42.5	07.4	328°52.2	36.0	230°44.0	53.9	31°53.3	19.0
12	240°23.1	34°44.5	S11°07.0	343°52.7	S23°36.2	245°46.5	S03°53.8	46°55.5	S03°19.1
13	255°25.5	49°46.6	06.6	358°53.1	36.4	260°48.9	53.8	61°57.7	19.2
14	270°28.0	64°48.6	06.2	13°53.6	36.6	275°51.4	53.8	77°00.0	19.3
15	285°30.4	79°50.6	· · 05.8	28°54.0	· · 36.8	290°53.8	· · 53.8	92°02.2	· · 19.4
16	300°32.9	94°52.6	05.4	43°54.5	37.0	305°56.3	53.8	107°04.4	19.5
17	315°35.4	109°54.6	05.0	58°54.9	37.2	320°58.7	53.7	122°06.7	19.6
18	330°37.8	124°56.6	S11°04.6	73°55.4	S23°37.3	336°01.1	S03°53.7	137°08.9	S03°19.6
19	345°40.3	139°58.6	04.2	88°55.8	37.5	351°03.6	53.7	152°11.1	19.7
20	0°42.8	155°00.6	03.9	103°56.3	37.7	6°06.0	53.7	167°13.4	19.8
21	15°45.2	170°02.6	· · 03.5	118°56.7	· · 37.9	21°08.5	· · 53.7	182°15.6	· · 19.9
22	30°47.7	185°04.6	03.1	133°57.2	38.1	36°10.9	53.6	197°17.8	20.0
23	45°50.2	200°06.6	02.7	148°57.6	38.3	51°13.4	53.6	212°20.1	20.1
Mer.pass.:19:57		v2.1 d0.4 m-4.4		v0.5 d-0.2 m1.4		v2.5 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	60°52.6	215°08.6	S11°02.3	163°58.1	S23°38.5	66°15.8	S03°53.6	227°22.3	S03°20.2
1	75°55.1	230°10.5	02.0	178°58.5	38.7	81°18.2	53.6	242°24.6	20.3
2	90°57.5	245°12.5	01.6	193°59.0	38.8	96°20.7	53.6	257°26.8	20.4
3	106°00.0	260°14.5	· · 01.2	208°59.5	· · 39.0	111°23.1	· · 53.5	272°29.0	· · 20.4
4	121°02.5	275°16.5	00.9	223°59.9	39.2	126°25.6	53.5	287°31.3	20.5
5	136°04.9	290°18.4	00.5	239°00.4	39.4	141°28.0	53.5	302°33.5	20.6
6	151°07.4	305°20.4	S11°00.1	254°00.8	S23°39.6	156°30.5	S03°53.5	317°35.7	S03°20.7
7	166°09.9	320°22.3	10°59.8	269°01.3	39.8	171°32.9	53.4	332°38.0	20.8
8	181°12.3	335°24.3	59.4	284°01.7	39.9	186°35.3	53.4	347°40.2	20.9
9	196°14.8	350°26.3	· · 59.1	299°02.2	· · 40.1	201°37.8	· · 53.4	2°42.4	· · 21.0
10	211°17.3	5°28.2	58.7	314°02.6	40.3	216°40.2	53.4	17°44.7	21.1
11	226°19.7	20°30.1	58.4	329°03.0	40.5	231°42.6	53.4	32°46.9	21.1
12	241°22.2	35°32.1	S10°58.0	344°03.5	S23°40.7	246°45.1	S03°53.3	47°49.1	S03°21.2
13	256°24.7	50°34.0	57.7	359°03.9	40.9	261°47.5	53.3	62°51.4	21.3
14	271°27.1	65°36.0	57.3	14°04.4	41.0	276°50.0	53.3	77°53.6	21.4
15	286°29.6	80°37.9	· · 57.0	29°04.8	· · 41.2	291°52.4	· · 53.3	92°55.9	· · 21.5
16	301°32.0	95°39.8	56.6	44°05.3	41.4	306°54.8	53.2	107°58.1	21.6
17	316°34.5	110°41.7	56.3	59°05.7	41.6	321°57.3	53.2	123°00.3	21.7
18	331°37.0	125°43.7	S10°55.9	74°06.2	S23°41.8	336°59.7	S03°53.2	138°02.6	S03°21.7
19	346°39.4	140°45.6	55.6	89°06.6	41.9	352°02.1	53.2	153°04.8	21.8
20	1°41.9	155°47.5	55.3	104°07.1	42.1	7°04.6	53.1	168°07.0	21.9
21	16°44.4	170°49.4	· · 54.9	119°07.5	· · 42.3	22°07.0	· · 53.1	183°09.3	· · 22.0
22	31°46.8	185°51.3	54.6	134°08.0	42.5	37°09.5	53.1	198°11.5	22.1
23	46°49.3	200°53.2	54.3	149°08.4	42.6	52°11.9	53.1	213°13.7	22.2
Mer.pass.:19:53		v2.0 d0.4 m-4.4		v0.5 d-0.2 m1.4		v2.4 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	61°51.8	215°55.1	S10°54.0	164°08.9	S23°42.8	67°14.3	S03°53.0	228°16.0	S03°22.3
1	76°54.2	230°57.0	53.6	179°09.3	43.0	82°16.8	53.0	243°18.2	22.4
2	91°56.7	245°58.9	53.3	194°09.8	43.2	97°19.2	53.0	258°20.5	22.4
3	106°59.2	261°00.8	· · 53.0	209°10.2	· · 43.3	112°21.6	· · 53.0	273°22.7	· · 22.5
4	122°01.6	276°02.7	52.7	224°10.7	43.5	127°24.1	52.9	288°24.9	22.6
5	137°04.1	291°04.5	52.3	239°11.1	43.7	142°26.5	52.9	303°27.2	22.7
6	152°06.5	306°06.4	S10°52.0	254°11.5	S23°43.9	157°28.9	S03°52.9	318°29.4	S03°22.8
7	167°09.0	321°08.3	51.7	269°12.0	44.0	172°31.4	52.9	333°31.6	22.9
8	182°11.5	336°10.2	51.4	284°12.4	44.2	187°33.8	52.8	348°33.9	23.0
9	197°13.9	351°12.0	· · 51.1	299°12.9	· · 44.4	202°36.2	· · 52.8	3°36.1	· · 23.0
10	212°16.4	6°13.9	50.8	314°13.3	44.6	217°38.7	52.8	18°38.4	23.1
11	227°18.9	21°15.8	50.5	329°13.8	44.7	232°41.1	52.8	33°40.6	23.2
12	242°21.3	36°17.6	S10°50.2	344°14.2	S23°44.9	247°43.5	S03°52.7	48°42.8	S03°23.3
13	257°23.8	51°19.5	49.9	359°14.7	45.1	262°45.9	52.7	63°45.1	23.4
14	272°26.3	66°21.3	49.6	14°15.1	45.2	277°48.4	52.7	78°47.3	23.5
15	287°28.7	81°23.2	· · 49.3	29°15.5	· · 45.4	292°50.8	· · 52.7	93°49.6	· · 23.6
16	302°31.2	96°25.0	49.0	44°16.0	45.6	307°53.2	52.6	108°51.8	23.7
17	317°33.7	111°26.9	48.7	59°16.4	45.8	322°55.7	52.6	123°54.0	23.7
18	332°36.1	126°28.7	S10°48.4	74°16.9	S23°45.9	337°58.1	S03°52.6	138°56.3	S03°23.8
19	347°38.6	141°30.5	48.1	89°17.3	46.1	353°00.5	52.5	153°58.5	23.9
20	2°41.0	156°32.4	47.8	104°17.8	46.3	8°02.9	52.5	169°00.7	24.0
21	17°43.5	171°34.2	· · 47.5	119°18.2	· · 46.4	23°05.4	· · 52.5	184°03.0	· · 24.1
22	32°46.0	186°36.0	47.3	134°18.6	46.6	38°07.8	52.5	199°05.2	24.2
23	47°48.4	201°37.8	47.0	149°19.1	46.8	53°10.2	52.4	214°07.5	24.3
Mer.pass.:19:49		v1.9 d0.3 m-4.4		v0.4 d-0.2 m1.4		v2.4 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.8
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.5
Achernar	335°27.6	-57°10.9
Hamal	328°02.6	23°31.0
Polaris	318°15.4	89°18.9
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.8	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.6	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°03.0	7°24.6
Canopus	263°56.5	-52°41.9
Sirius	258°35.1	-16°43.8
Adhara	255°13.7	-28°59.1
Procyon	245°01.5	5°11.8
Pollux	243°29.8	27°59.8
Avior	234°18.6	-59°32.4
Suhail	222°53.7	-43°28.4
Miaplacidus	221°40.0	-69°45.5
Alphard	217°57.9	-8°42.3
Regulus	207°45.5	11°54.7
Dubhe	193°54.0	61°41.2
Denebola	182°35.7	14°30.6
Gienah	175°54.4	-17°36.1
Acrux	173°12.0	-63°09.4
Gacrux	172°03.5	-57°10.3
Alioth	166°22.6	55°53.8
Spica	158°33.5	-11°13.1
Alkaid	153°00.7	49°15.3
Hadar	148°51.2	-60°25.4
Menkent	148°10.2	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°55.0	-60°52.7
Kochab	137°20.9	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.9	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.8
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.0	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 21 Sun	**SHA**	**Mer.pass**
Venus	154°26.5	09:41
Mars	103°53.7	13:04
Jupiter	5°23.6	19:36
Saturn	166°35.2	08:53

Nov 22 Mon	**SHA**	**Mer.pass**
Venus	154°15.9	09:38
Mars	103°05.5	13:04
Jupiter	5°23.2	19:32
Saturn	166°29.7	08:49

Nov 23 Tue	**SHA**	**Mer.pass**
Venus	154°03.3	09:35
Mars	102°17.1	13:03
Jupiter	5°22.6	19:28
Saturn	166°24.2	08:46

Horizontal parallax	
Venus:	0.4
Mars:	0.1

DUT1 = UT1-UTC = -0.1113 sec ΔT = TT-UT1 = +66.2953 sec

2010 November 21 to Nov. 23 UT

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°34.1	S19°50.3	13°25.9	9.9′	N21°08.2	6.7′	56.1′
1	198°34.0	50.8	27°54.8	9.9′	21°14.9	6.6′	56.1′
2	213°33.8	51.4	42°23.6	9.8′	21°21.5	6.5′	56.1′
3	228°33.7	· · 51.9	56°52.3	9.7′	21°27.9	6.4′	56.2′
4	243°33.5	52.5	71°21.0	9.6′	21°34.3	6.3′	56.2′
5	258°33.4	53.0	85°49.6	9.5′	21°40.5	6.2′	56.2′
6	273°33.2	S19°53.6	100°18.1	9.5′	N21°46.7	6.1′	56.2′
7	288°33.1	54.1	114°46.5	9.4′	21°52.7	6.0′	56.3′
8	303°32.9	54.7	129°14.9	9.3′	21°58.6	5.9′	56.3′
9	318°32.7	· · 55.2	143°43.2	9.2′	22°04.5	5.8′	56.3′
10	333°32.6	55.8	158°11.4	9.2′	22°10.1	5.6′	56.3′
11	348°32.4	56.3	172°39.5	9.1′	22°15.7	5.5′	56.3′
12	3°32.3	S19°56.9	187°07.5	9.0′	N22°21.2	5.4′	56.4′
13	18°32.1	57.4	201°35.5	8.9′	22°26.5	5.3′	56.4′
14	33°32.0	58.0	216°03.4	8.9′	22°31.8	5.2′	56.4′
15	48°31.8	· · 58.5	230°31.3	8.8′	22°36.9	5.0′	56.4′
16	63°31.7	59.1	244°59.1	8.7′	22°41.9	4.9′	56.5′
17	78°31.5	19°59.6	259°26.8	8.7′	22°46.7	4.8′	56.5′
18	93°31.3	S20°00.2	273°54.4	8.6′	N22°51.5	4.7′	56.5′
19	108°31.2	00.7	288°22.0	8.5′	22°56.1	4.6′	56.5′
20	123°31.0	01.3	302°49.4	8.5′	23°00.6	4.4′	56.6′
21	138°30.9	· · 01.8	317°16.9	8.4′	23°05.0	4.3′	56.6′
22	153°30.7	02.3	331°44.2	8.3′	23°09.2	4.2′	56.6′
23	168°30.5	02.9	346°11.5	8.3′	23°13.3	4.1′	56.6′
	SD.=16.2	d=-0.6	S.D.=15.4				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°30.4	S20°03.4	0°38.8	8.2′	N23°17.3	3.9′	56.6′
1	198°30.2	04.0	15°06.0	8.1′	23°21.2	3.8′	56.7′
2	213°30.1	04.5	29°33.1	8.1′	23°24.9	3.7′	56.7′
3	228°29.9	· · 05.1	44°00.1	8.0′	23°28.5	3.5′	56.7′
4	243°29.7	05.6	58°27.1	8.0′	23°32.0	3.4′	56.7′
5	258°29.6	06.1	72°54.1	7.9′	23°35.3	3.3′	56.8′
6	273°29.4	S20°06.7	87°20.9	7.9′	N23°38.5	3.1′	56.8′
7	288°29.2	07.2	101°47.8	7.8′	23°41.6	3.0′	56.8′
8	303°29.1	07.7	116°14.5	7.7′	23°44.5	2.9′	56.8′
9	318°28.9	· · 08.3	130°41.2	7.7′	23°47.4	2.7′	56.8′
10	333°28.8	08.8	145°07.9	7.6′	23°50.0	2.6′	56.9′
11	348°28.6	09.3	159°34.5	7.6′	23°52.6	2.5′	56.9′
12	3°28.4	S20°09.9	174°01.1	7.5′	N23°55.0	2.3′	56.9′
13	18°28.3	10.4	188°27.6	7.5′	23°57.2	2.2′	56.9′
14	33°28.1	10.9	202°54.0	7.4′	23°59.3	2.1′	57.0′
15	48°27.9	· · 11.5	217°20.5	7.4′	24°01.3	1.9′	57.0′
16	63°27.8	12.0	231°46.8	7.4′	24°03.2	1.8′	57.0′
17	78°27.6	12.5	246°13.2	7.3′	24°04.9	1.6′	57.0′
18	93°27.4	S20°13.1	260°39.5	7.3′	N24°06.4	1.5′	57.0′
19	108°27.3	13.6	275°05.7	7.2′	24°07.8	1.3′	57.1′
20	123°27.1	14.1	289°31.9	7.2′	24°09.1	1.2′	57.1′
21	138°26.9	· · 14.7	303°58.1	7.2′	24°10.3	1.1′	57.1′
22	153°26.8	15.2	318°24.2	7.1′	24°11.3	0.9′	57.1′
23	168°26.6	15.7	332°50.3	7.1′	24°12.1	0.8′	57.2′
	SD.=16.2	d=-0.5	S.D.=15.5				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°26.4	S20°16.2	347°16.4	7.1′	N24°12.8	0.6′	57.2′
1	198°26.3	16.8	1°42.5	7.0′	24°13.4	0.5′	57.2′
2	213°26.1	17.3	16°08.5	7.0′	24°13.8	0.3′	57.2′
3	228°25.9	· · 17.8	30°34.5	7.0′	24°14.1	0.2′	57.2′
4	243°25.8	18.3	45°00.4	6.9′	24°14.2	0.1′	57.3′
5	258°25.6	18.9	59°26.3	6.9′	24°14.2	-0.1′	57.3′
6	273°25.4	S20°19.4	73°52.2	6.9′	N24°14.0	-0.2′	57.3′
7	288°25.2	19.9	88°18.1	6.9′	24°13.7	-0.4′	57.3′
8	303°25.1	20.4	102°44.0	6.9′	24°13.2	-0.5′	57.3′
9	318°24.9	· · 21.0	117°09.8	6.8′	24°12.6	-0.7′	57.4′
10	333°24.7	21.5	131°35.6	6.8′	24°11.9	-0.8′	57.4′
11	348°24.6	22.0	146°01.5	6.8′	24°11.0	-1.0′	57.4′
12	3°24.4	S20°22.5	160°27.2	6.8′	N24°10.0	-1.1′	57.4′
13	18°24.2	23.0	174°53.0	6.8′	24°08.8	-1.3′	57.4′
14	33°24.0	23.5	189°18.8	6.8′	24°07.4	-1.4′	57.5′
15	48°23.9	· · 24.1	203°44.6	6.8′	24°05.9	-1.6′	57.5′
16	63°23.7	24.6	218°10.3	6.7′	24°04.3	-1.7′	57.5′
17	78°23.5	25.1	232°36.0	6.7′	24°02.5	-1.9′	57.5′
18	93°23.3	S20°25.6	247°01.8	6.7′	N24°00.6	-2.0′	57.5′
19	108°23.2	26.1	261°27.5	6.7′	23°58.5	-2.1′	57.6′
20	123°23.0	26.6	275°53.3	6.7′	23°56.3	-2.3′	57.6′
21	138°22.8	· · 27.1	290°19.0	6.7′	23°53.9	-2.4′	57.6′
22	153°22.6	27.7	304°44.7	6.7′	23°51.4	-2.6′	57.6′
23	168°22.5	28.2	319°10.4	6.7′	23°48.8	-2.7′	57.6′
	SD.=16.2	d=-0.5	S.D.=15.6				

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

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

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 15-17 100-97%
21	14:17	14:09	11:46	23:57	11:30	○
22	14:02	13:54	11:46	–:–	12:25	
23	13:46	13:38	11:46	00:53	13:21	

November 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	62°50.9	216°39.6	S10°46.7	164°19.5	S23°46.9	68°12.7	S03°52.4	229°09.7	S03°24.3
1	77°53.4	231°41.5	46.4	179°20.0	47.1	83°15.1	52.4	244°11.9	24.4
2	92°55.8	246°43.3	46.2	194°20.4	47.3	98°17.5	52.4	259°14.2	24.5
3	107°58.3	261°45.1	·· 45.9	209°20.9	·· 47.4	113°19.9	·· 52.3	274°16.4	·· 24.6
4	123°00.8	276°46.9	45.6	224°21.3	47.6	128°22.4	52.3	289°18.7	24.7
5	138°03.2	291°48.7	45.3	239°21.7	47.7	143°24.8	52.3	304°20.9	24.8
6	153°05.7	306°50.5	S10°45.1	254°22.2	S23°47.9	158°27.2	S03°52.2	319°23.1	S03°24.9
7	168°08.2	321°52.3	44.8	269°22.6	48.1	173°29.6	52.2	334°25.4	24.9
8	183°10.6	336°54.0	44.5	284°23.1	48.2	188°32.1	52.2	349°27.6	25.0
9	198°13.1	351°55.8	·· 44.3	299°23.5	·· 48.4	203°34.5	·· 52.1	4°29.9	·· 25.1
10	213°15.5	6°57.6	44.0	314°23.9	48.6	218°36.9	52.1	19°32.1	25.2
11	228°18.0	21°59.4	43.8	329°24.4	48.7	233°39.3	52.1	34°34.3	25.3
12	243°20.5	37°01.2	S10°43.5	344°24.8	S23°48.9	248°41.8	S03°52.1	49°36.6	S03°25.4
13	258°22.9	52°02.9	43.3	359°25.3	49.0	263°44.2	52.0	64°38.8	25.4
14	273°25.4	67°04.7	43.0	14°25.7	49.2	278°46.6	52.0	79°41.1	25.5
15	288°27.9	82°06.5	·· 42.7	29°26.1	·· 49.4	293°49.0	·· 52.0	94°43.3	·· 25.6
16	303°30.3	97°08.2	42.5	44°26.6	49.5	308°51.4	51.9	109°45.5	25.7
17	318°32.8	112°10.0	42.3	59°27.0	49.7	323°53.9	51.9	124°47.8	25.8
18	333°35.3	127°11.8	S10°42.0	74°27.4	S23°49.8	338°56.3	S03°51.9	139°50.0	S03°25.9
19	348°37.7	142°13.5	41.8	89°27.9	50.0	353°58.7	51.8	154°52.3	26.0
20	3°40.2	157°15.3	41.5	104°28.3	50.2	9°01.1	51.8	169°54.5	26.0
21	18°42.7	172°17.0	·· 41.3	119°28.8	·· 50.3	24°03.5	·· 51.8	184°56.8	·· 26.1
22	33°45.1	187°18.8	41.1	134°29.2	50.5	39°06.0	51.8	199°59.0	26.2
23	48°47.6	202°20.5	40.8	149°29.6	50.6	54°08.4	51.7	215°01.2	26.3
Mer.pass.:19:45		v1.8 d0.3 m-4.4		v0.4 d-0.2 m1.4		v2.4 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	63°50.0	217°22.2	S10°40.6	164°30.1	S23°50.8	69°10.8	S03°51.7	230°03.5	S03°26.4
1	78°52.5	232°24.0	40.4	179°30.5	50.9	84°13.2	51.7	245°05.7	26.5
2	93°55.0	247°25.7	40.1	194°30.9	51.1	99°15.6	51.6	260°08.0	26.6
3	108°57.4	262°27.4	·· 39.9	209°31.4	·· 51.2	114°18.1	·· 51.6	275°10.2	·· 26.6
4	123°59.9	277°29.1	39.7	224°31.8	51.4	129°20.5	51.6	290°12.4	26.7
5	139°02.4	292°30.9	39.4	239°32.3	51.6	144°22.9	51.5	305°14.7	26.8
6	154°04.8	307°32.6	S10°39.2	254°32.7	S23°51.7	159°25.3	S03°51.5	320°16.9	S03°26.9
7	169°07.3	322°34.3	39.0	269°33.1	51.9	174°27.7	51.5	335°19.2	27.0
8	184°09.8	337°36.0	38.8	284°33.6	52.0	189°30.1	51.4	350°21.4	27.1
9	199°12.2	352°37.7	·· 38.6	299°34.0	·· 52.2	204°32.6	·· 51.4	5°23.7	·· 27.1
10	214°14.7	7°39.4	38.4	314°34.4	52.3	219°35.0	51.4	20°25.9	27.2
11	229°17.1	22°41.1	38.2	329°34.9	52.5	234°37.4	51.3	35°28.1	27.3
12	244°19.6	37°42.8	S10°37.9	344°35.3	S23°52.6	249°39.8	S03°51.3	50°30.4	S03°27.4
13	259°22.1	52°44.5	37.7	359°35.7	52.8	264°42.2	51.3	65°32.6	27.5
14	274°24.5	67°46.2	37.5	14°36.2	52.9	279°44.6	51.2	80°34.9	27.6
15	289°27.0	82°47.9	·· 37.3	29°36.6	·· 53.1	294°47.0	·· 51.2	95°37.1	·· 27.6
16	304°29.5	97°49.6	37.1	44°37.0	53.2	309°49.5	51.2	110°39.4	27.7
17	319°31.9	112°51.2	36.9	59°37.5	53.4	324°51.9	51.1	125°41.6	27.8
18	334°34.4	127°52.9	S10°36.7	74°37.9	S23°53.5	339°54.3	S03°51.1	140°43.8	S03°27.9
19	349°36.9	142°54.6	36.5	89°38.3	53.7	354°56.7	51.1	155°46.1	28.0
20	4°39.3	157°56.3	36.3	104°38.8	53.8	9°59.1	51.0	170°48.3	28.1
21	19°41.8	172°57.9	·· 36.1	119°39.2	·· 54.0	25°01.5	·· 51.0	185°50.6	·· 28.1
22	34°44.3	187°59.6	35.9	134°39.6	54.1	40°03.9	51.0	200°52.8	28.2
23	49°46.7	203°01.3	35.8	149°40.1	54.2	55°06.3	50.9	215°55.1	28.3
Mer.pass.:19:41		v1.7 d0.2 m-4.4		v0.4 d-0.2 m1.4		v2.4 d0.0 m-2.5		v2.2 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	64°49.2	218°02.9	S10°35.6	164°40.5	S23°54.4	70°08.8	S03°50.9	230°57.3	S03°28.4
1	79°51.6	233°04.6	35.4	179°40.9	54.5	85°11.2	50.9	245°59.6	28.5
2	94°54.1	248°06.2	35.2	194°41.4	54.7	100°13.6	50.8	261°01.8	28.6
3	109°56.6	263°07.9	·· 35.0	209°41.8	·· 54.8	115°16.0	·· 50.8	276°04.0	·· 28.6
4	124°59.0	278°09.5	34.8	224°42.2	55.0	130°18.4	50.8	291°06.3	28.7
5	140°01.5	293°11.2	34.7	239°42.7	55.1	145°20.8	50.7	306°08.5	28.8
6	155°04.0	308°12.8	S10°34.5	254°43.1	S23°55.3	160°23.2	S03°50.7	321°10.8	S03°28.9
7	170°06.4	323°14.4	34.3	269°43.5	55.4	175°25.6	50.6	336°13.0	29.0
8	185°08.9	338°16.1	34.1	284°44.0	55.5	190°28.0	50.6	351°15.3	29.1
9	200°11.4	353°17.7	·· 34.0	299°44.4	·· 55.7	205°30.4	·· 50.6	6°17.5	·· 29.1
10	215°13.8	8°19.3	33.8	314°44.8	55.8	220°32.9	50.5	21°19.8	29.2
11	230°16.3	23°21.0	33.6	329°45.3	56.0	235°35.3	50.5	36°22.0	29.3
12	245°18.8	38°22.6	S10°33.5	344°45.7	S23°56.1	250°37.7	S03°50.5	51°24.2	S03°29.4
13	260°21.2	53°24.2	33.3	359°46.1	56.2	265°40.1	50.4	66°26.5	29.5
14	275°23.7	68°25.8	33.1	14°46.6	56.4	280°42.5	50.4	81°28.7	29.6
15	290°26.1	83°27.4	·· 33.0	29°47.0	·· 56.5	295°44.9	·· 50.4	96°31.0	·· 29.6
16	305°28.6	98°29.0	32.8	44°47.4	56.7	310°47.3	50.3	111°33.2	29.7
17	320°31.1	113°30.6	32.7	59°47.8	56.8	325°49.7	50.3	126°35.5	29.8
18	335°33.5	128°32.2	S10°32.5	74°48.3	S23°56.9	340°52.1	S03°50.2	141°37.7	S03°29.9
19	350°36.0	143°33.8	32.4	89°48.7	57.1	355°54.5	50.2	156°40.0	30.0
20	5°38.5	158°35.4	32.2	104°49.1	57.2	10°56.9	50.2	171°42.2	30.1
21	20°40.9	173°37.0	·· 32.1	119°49.6	·· 57.4	25°59.3	·· 50.1	186°44.5	·· 30.1
22	35°43.4	188°38.6	31.9	134°50.0	57.5	41°01.7	50.1	201°46.7	30.2
23	50°45.9	203°40.2	31.8	149°50.4	57.6	56°04.1	50.1	216°48.9	30.3
Mer.pass.:19:37		v1.7 d0.2 m-4.4		v0.4 d-0.1 m1.4		v2.4 d0.0 m-2.4		v2.2 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.9
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.5
Achernar	335°27.6	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°15.5	89°18.9
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.6	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.7	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.6	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°03.0	7°24.5
Canopus	263°56.5	-52°41.9
Sirius	258°35.1	-16°43.8
Adhara	255°13.7	-28°59.1
Procyon	245°01.4	5°11.8
Pollux	243°29.7	27°59.8
Avior	234°18.5	-59°32.5
Suhail	222°53.7	-43°28.4
Miaplacidus	221°39.9	-69°45.5
Alphard	217°57.8	-8°42.3
Regulus	207°45.5	11°54.7
Dubhe	193°53.9	61°41.2
Denebola	182°35.7	14°30.5
Gienah	175°54.4	-17°36.1
Acrux	173°12.0	-63°09.4
Gacrux	172°03.4	-57°10.3
Alioth	166°22.6	55°53.8
Spica	158°33.5	-11°13.1
Alkaid	153°00.7	49°15.3
Hadar	148°51.2	-60°25.4
Menkent	148°10.2	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.9	-60°52.7
Kochab	137°20.9	74°06.5
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.9	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.8
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.0	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.1	28°08.8
Markab	13°40.1	15°16.1

Nov 24 Wed	**SHA**	**Mer.pass**
Venus	153°48.7	09:32
Mars	101°28.6	13:02
Jupiter	5°21.8	19:24
Saturn	166°18.8	08:42

Nov 25 Thu	**SHA**	**Mer.pass**
Venus	153°32.2	09:29
Mars	100°40.0	13:02
Jupiter	5°20.8	19:20
Saturn	166°13.4	08:38

Nov 26 Fri	**SHA**	**Mer.pass**
Venus	153°13.7	09:27
Mars	99°51.3	13:01
Jupiter	5°19.6	19:16
Saturn	166°08.1	08:35

Horizontal parallax	
Venus:	0.4
Mars:	0.1

DUT1 = UT1-UTC = -0.1143 sec ΔT = TT-UT1 = +66.2983 sec

2010 November 24 to Nov. 26 UT

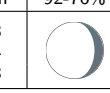
h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°22.3	S20°28.7	333°36.2	6.7'	N23°46.0	-2.9'	57.7'
1	198°22.1	29.2	348°01.9	6.7'	23°43.0	-3.0'	57.7'
2	213°21.9	29.7	2°27.7	6.8'	23°39.9	-3.2'	57.7'
3	228°21.8	· · 30.2	16°53.4	6.8'	23°36.7	-3.3'	57.7'
4	243°21.6	30.7	31°19.2	6.8'	23°33.3	-3.5'	57.7'
5	258°21.4	31.2	45°45.0	6.8'	23°29.7	-3.6'	57.8'
6	273°21.2	S20°31.7	60°10.8	6.8'	N23°26.0	-3.8'	57.8'
7	288°21.0	32.2	74°36.6	6.8'	23°22.2	-3.9'	57.8'
8	303°20.9	32.7	89°02.4	6.8'	23°18.2	-4.0'	57.8'
9	318°20.7	· · 33.2	103°28.2	6.8'	23°14.1	-4.2'	57.8'
10	333°20.5	33.8	117°54.1	6.9'	23°09.9	-4.3'	57.8'
11	348°20.3	34.3	132°20.0	6.9'	23°05.4	-4.5'	57.9'
12	3°20.1	S20°34.8	146°45.8	6.9'	N23°00.9	-4.6'	57.9'
13	18°20.0	35.3	161°11.8	6.9'	22°56.2	-4.8'	57.9'
14	33°19.8	35.8	175°37.7	7.0'	22°51.4	-4.9'	57.9'
15	48°19.6	· · 36.3	190°03.7	7.0'	22°46.4	-5.0'	57.9'
16	63°19.4	36.8	204°29.7	7.0'	22°41.3	-5.2'	58.0'
17	78°19.2	37.3	218°55.7	7.0'	22°36.0	-5.3'	58.0'
18	93°19.0	S20°37.8	233°21.7	7.1'	N22°30.6	-5.5'	58.0'
19	108°18.9	38.3	247°47.8	7.1'	22°25.1	-5.6'	58.0'
20	123°18.7	38.8	262°13.9	7.1'	22°19.4	-5.7'	58.0'
21	138°18.5	· · 39.3	276°40.0	7.2'	22°13.6	-5.9'	58.0'
22	153°18.3	39.8	291°06.2	7.2'	22°07.6	-6.0'	58.1'
23	168°18.1	40.2	305°32.4	7.2'	22°01.6	-6.2'	58.1'
	SD.=16.2	d=-0.5	S.D.=15.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°17.9	S20°40.7	319°58.6	7.3'	N21°55.3	-6.3'	58.1'
1	198°17.8	41.2	334°24.9	7.3'	21°49.0	-6.4'	58.1'
2	213°17.6	41.7	348°51.2	7.3'	21°42.5	-6.6'	58.1'
3	228°17.4	· · 42.2	3°17.5	7.4'	21°35.8	-6.7'	58.1'
4	243°17.2	42.7	17°43.9	7.4'	21°29.1	-6.8'	58.2'
5	258°17.0	43.2	32°10.3	7.4'	21°22.2	-7.0'	58.2'
6	273°16.8	S20°43.7	46°36.8	7.5'	N21°15.2	-7.1'	58.2'
7	288°16.6	44.2	61°03.3	7.5'	21°08.0	-7.2'	58.2'
8	303°16.5	44.7	75°29.9	7.6'	21°00.7	-7.4'	58.2'
9	318°16.3	· · 45.2	89°56.4	7.6'	20°53.3	-7.5'	58.2'
10	333°16.1	45.7	104°23.1	7.7'	20°45.8	-7.6'	58.3'
11	348°15.9	46.1	118°49.7	7.7'	20°38.1	-7.7'	58.3'
12	3°15.7	S20°46.6	133°16.5	7.7'	N20°30.3	-7.9'	58.3'
13	18°15.5	47.1	147°43.2	7.8'	20°22.4	-8.0'	58.3'
14	33°15.3	47.6	162°10.0	7.8'	20°14.3	-8.1'	58.3'
15	48°15.1	· · 48.1	176°36.9	7.9'	20°06.1	-8.2'	58.3'
16	63°14.9	48.6	191°03.8	7.9'	19°57.9	-8.4'	58.3'
17	78°14.7	49.1	205°30.7	8.0'	19°49.4	-8.5'	58.4'
18	93°14.6	S20°49.5	219°57.7	8.0'	N19°40.9	-8.6'	58.4'
19	108°14.4	50.0	234°24.8	8.1'	19°32.2	-8.7'	58.4'
20	123°14.2	50.5	248°51.9	8.1'	19°23.5	-8.8'	58.4'
21	138°14.0	· · 51.0	263°19.0	8.2'	19°14.6	-9.0'	58.4'
22	153°13.8	51.5	277°46.2	8.2'	19°05.6	-9.1'	58.4'
23	168°13.6	51.9	292°13.4	8.3'	18°56.4	-9.2'	58.4'
	SD.=16.2	d=-0.5	S.D.=15.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°13.4	S20°52.4	306°40.7	8.3'	N18°47.2	-9.3'	58.5'
1	198°13.2	52.9	321°08.1	8.4'	18°37.9	-9.4'	58.5'
2	213°13.0	53.4	335°35.5	8.4'	18°28.4	-9.5'	58.5'
3	228°12.8	· · 53.9	350°02.9	8.5'	18°18.8	-9.6'	58.5'
4	243°12.6	54.3	4°30.4	8.5'	18°09.1	-9.7'	58.5'
5	258°12.4	54.8	18°58.0	8.6'	17°59.3	-9.8'	58.5'
6	273°12.2	S20°55.3	33°25.5	8.6'	N17°49.4	-10.0'	58.5'
7	288°12.0	55.8	47°53.2	8.7'	17°39.4	-10.1'	58.6'
8	303°11.9	56.2	62°20.9	8.7'	17°29.3	-10.2'	58.6'
9	318°11.7	· · 56.7	76°48.6	8.8'	17°19.1	-10.3'	58.6'
10	333°11.5	57.2	91°16.5	8.8'	17°08.8	-10.4'	58.6'
11	348°11.3	57.6	105°44.3	8.9'	16°58.3	-10.5'	58.6'
12	3°11.1	S20°58.1	120°12.2	8.9'	N16°47.8	-10.6'	58.6'
13	18°10.9	58.6	134°40.2	9.0'	16°37.2	-10.7'	58.6'
14	33°10.7	59.1	149°08.2	9.0'	16°26.4	-10.8'	58.6'
15	48°10.5	20°59.5	163°36.2	9.1'	16°15.6	-10.9'	58.7'
16	63°10.3	21°00.0	178°04.4	9.1'	16°04.7	-11.0'	58.7'
17	78°10.1	00.5	192°32.5	9.2'	15°53.7	-11.1'	58.7'
18	93°09.9	S21°00.9	207°00.7	9.2'	N15°42.6	-11.2'	58.7'
19	108°09.7	01.4	221°29.0	9.3'	15°31.4	-11.2'	58.7'
20	123°09.5	01.9	235°57.3	9.3'	15°20.1	-11.3'	58.7'
21	138°09.3	· · 02.3	250°25.7	9.4'	15°08.7	-11.4'	58.7'
22	153°09.1	02.8	264°54.1	9.4'	14°57.2	-11.5'	58.7'
23	168°08.9	03.2	279°22.5	9.5'	14°45.6	-11.6'	58.8'
	SD.=16.2	d=-0.5	S.D.=16.0				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 18-20 92-76%
24	13:29	13:21	11:47	01:50	14:18	
25	13:12	13:03	11:47	02:46	15:14	
26	12:54	12:44	11:47	03:41	16:08	

November 27, 28, 29 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	65°48.3	218°41.8	S10°31.6	164°50.8	S23°57.8	71°06.5	S03°50.0	231°51.2	S03°30.4
1	80°50.8	233°43.4	31.5	179°51.3	57.9	86°08.9	50.0	246°53.4	30.5
2	95°53.3	248°44.9	31.4	194°51.7	58.0	101°11.3	49.9	261°55.7	30.5
3	110°55.7	263°46.5	·· 31.2	209°52.1	·· 58.2	116°13.7	·· 49.9	276°57.9	·· 30.6
4	125°58.2	278°48.1	31.1	224°52.6	58.3	131°16.1	49.9	292°00.2	30.7
5	141°00.6	293°49.6	30.9	239°53.0	58.4	146°18.5	49.8	307°02.4	30.8
6	156°03.1	308°51.2	S10°30.8	254°53.4	S23°58.6	161°20.9	S03°49.8	322°04.7	S03°30.9
7	171°05.6	323°52.8	30.7	269°53.8	58.7	176°23.3	49.7	337°06.9	31.0
8	186°08.0	338°54.3	30.6	284°54.3	58.8	191°25.7	49.7	352°09.2	31.0
9	201°10.5	353°55.9	·· 30.4	299°54.7	·· 59.0	206°28.1	·· 49.7	7°11.4	·· 31.1
10	216°13.0	8°57.4	30.3	314°55.1	59.1	221°30.5	49.6	22°13.7	31.2
11	231°15.4	23°59.0	30.2	329°55.5	59.2	236°32.9	49.6	37°15.9	31.3
12	246°17.9	39°00.5	S10°30.1	344°56.0	S23°59.3	251°35.3	S03°49.5	52°18.2	S03°31.4
13	261°20.4	54°02.1	29.9	359°56.4	59.5	266°37.7	49.5	67°20.4	31.4
14	276°22.8	69°03.6	29.8	14°56.8	59.6	281°40.1	49.5	82°22.7	31.5
15	291°25.3	84°05.2	·· 29.7	29°57.2	·· 59.7	296°42.5	·· 49.4	97°24.9	·· 31.6
16	306°27.7	99°06.7	29.6	44°57.7	23°59.9	311°44.9	49.4	112°27.2	31.7
17	321°30.2	114°08.2	29.5	59°58.1	24°00.0	326°47.3	49.3	127°29.4	31.8
18	336°32.7	129°09.8	S10°29.4	74°58.5	S24°00.1	341°49.7	S03°49.3	142°31.6	S03°31.9
19	351°35.1	144°11.3	29.3	89°59.0	00.2	356°52.1	49.3	157°33.9	31.9
20	6°37.6	159°12.8	29.2	104°59.4	00.4	11°54.5	49.2	172°36.1	32.0
21	21°40.1	174°14.3	·· 29.0	119°59.8	·· 00.5	26°56.9	·· 49.2	187°38.4	·· 32.1
22	36°42.5	189°15.8	28.9	135°00.2	00.6	41°59.3	49.1	202°40.6	32.2
23	51°45.0	204°17.3	28.8	150°00.6	00.7	57°01.7	49.1	217°42.9	32.3
Mer.pass.:19:34		v1.6 d0.1 m-4.4		v0.4 d-0.1 m1.4		v2.4 d0.0 m-2.4		v2.2 d-0.1 m0.9	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	66°47.5	219°18.9	S10°28.7	165°01.1	S24°00.9	72°04.1	S03°49.1	232°45.1	S03°32.3
1	81°49.9	234°20.4	28.6	180°01.5	01.0	87°06.5	49.0	247°47.4	32.4
2	96°52.4	249°21.9	28.5	195°01.9	01.1	102°08.9	49.0	262°49.6	32.5
3	111°54.9	264°23.4	·· 28.5	210°02.3	·· 01.2	117°11.3	·· 48.9	277°51.9	·· 32.6
4	126°57.3	279°24.9	28.4	225°02.8	01.4	132°13.7	48.9	292°54.1	32.7
5	141°59.8	294°26.4	28.3	240°03.2	01.5	147°16.1	48.8	307°56.4	32.7
6	157°02.2	309°27.9	S10°28.2	255°03.6	S24°01.6	162°18.5	S03°48.8	322°58.6	S03°32.8
7	172°04.7	324°29.3	28.1	270°04.0	01.7	177°20.9	48.8	338°00.9	32.9
8	187°07.2	339°30.8	28.0	285°04.5	01.9	192°23.3	48.7	353°03.1	33.0
9	202°09.6	354°32.3	·· 27.9	300°04.9	·· 02.0	207°25.7	·· 48.7	8°05.4	·· 33.1
10	217°12.1	9°33.8	27.8	315°05.3	02.1	222°28.0	48.6	23°07.6	33.1
11	232°14.6	24°35.3	27.8	330°05.7	02.2	237°30.4	48.6	38°09.9	33.2
12	247°17.0	39°36.7	S10°27.7	345°06.2	S24°02.3	252°32.8	S03°48.5	53°12.1	S03°33.3
13	262°19.5	54°38.2	27.6	0°06.6	02.5	267°35.2	48.5	68°14.4	33.4
14	277°22.0	69°39.7	27.5	15°07.0	02.6	282°37.6	48.5	83°16.6	33.5
15	292°24.4	84°41.2	·· 27.5	30°07.4	·· 02.7	297°40.0	·· 48.4	98°18.9	·· 33.6
16	307°26.9	99°42.6	27.4	45°07.8	02.8	312°42.4	48.4	113°21.1	33.6
17	322°29.4	114°44.1	27.3	60°08.3	02.9	327°44.8	48.3	128°23.4	33.7
18	337°31.8	129°45.5	S10°27.2	75°08.7	S24°03.0	342°47.2	S03°48.3	143°25.6	S03°33.8
19	352°34.3	144°47.0	27.2	90°09.1	03.2	357°49.6	48.2	158°27.9	33.9
20	7°36.7	159°48.4	27.1	105°09.5	03.3	12°51.9	48.2	173°30.1	34.0
21	22°39.2	174°49.9	·· 27.0	120°09.9	·· 03.4	27°54.3	·· 48.1	188°32.4	·· 34.0
22	37°41.7	189°51.3	27.0	135°10.4	03.5	42°56.7	48.1	203°34.6	34.1
23	52°44.1	204°52.8	26.9	150°10.8	03.6	57°59.1	48.1	218°36.9	34.2
Mer.pass.:19:30		v1.5 d0.1 m-4.4		v0.4 d-0.1 m1.4		v2.4 d0.0 m-2.4		v2.2 d-0.1 m0.9	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	67°46.6	219°54.2	S10°26.9	165°11.2	S24°03.7	73°01.5	S03°48.0	233°39.1	S03°34.3
1	82°49.1	234°55.7	26.8	180°11.6	03.8	88°03.9	48.0	248°41.4	34.3
2	97°51.5	249°57.1	26.8	195°12.0	04.0	103°06.3	47.9	263°43.6	34.4
3	112°54.0	264°58.5	·· 26.7	210°12.5	·· 04.1	118°08.7	·· 47.9	278°45.9	·· 34.5
4	127°56.5	279°59.9	26.6	225°12.9	04.2	133°11.0	47.8	293°48.2	34.6
5	142°58.9	295°01.4	26.6	240°13.3	04.3	148°13.4	47.8	308°50.4	34.7
6	158°01.4	310°02.8	S10°26.6	255°13.7	S24°04.4	163°15.8	S03°47.7	323°52.7	S03°34.7
7	173°03.8	325°04.2	26.5	270°14.1	04.5	178°18.2	47.7	338°54.9	34.8
8	188°06.3	340°05.6	26.5	285°14.6	04.6	193°20.6	47.6	353°57.2	34.9
9	203°08.8	355°07.0	·· 26.4	300°15.0	·· 04.7	208°23.0	·· 47.6	8°59.4	·· 35.0
10	218°11.2	10°08.5	26.4	315°15.4	04.8	223°25.4	47.6	24°01.7	35.1
11	233°13.7	25°09.9	26.3	330°15.8	05.0	238°27.7	47.5	39°03.9	35.1
12	248°16.2	40°11.3	S10°26.3	345°16.2	S24°05.1	253°30.1	S03°47.5	54°06.2	S03°35.2
13	263°18.6	55°12.7	26.3	0°16.7	05.2	268°32.5	47.4	69°08.4	35.3
14	278°21.1	70°14.1	26.2	15°17.1	05.3	283°34.9	47.4	84°10.7	35.4
15	293°23.6	85°15.5	·· 26.2	30°17.5	·· 05.4	298°37.3	·· 47.3	99°12.9	·· 35.5
16	308°26.0	100°16.9	26.2	45°17.9	05.5	313°39.7	47.3	114°15.2	35.5
17	323°28.5	115°18.3	26.1	60°18.3	05.6	328°42.0	47.2	129°17.4	35.6
18	338°31.0	130°19.6	S10°26.1	75°18.7	S24°05.7	343°44.4	S03°47.2	144°19.7	S03°35.7
19	353°33.4	145°21.0	26.1	90°19.2	05.8	358°46.8	47.1	159°21.9	35.8
20	8°35.9	160°22.4	26.1	105°19.6	05.9	13°49.2	47.1	174°24.2	35.9
21	23°38.3	175°23.8	·· 26.0	120°20.0	·· 06.0	28°51.6	·· 47.0	189°26.4	·· 35.9
22	38°40.8	190°25.2	26.0	135°20.4	06.1	43°54.0	47.0	204°28.7	36.0
23	53°43.3	205°26.5	26.0	150°20.8	06.2	58°56.3	46.9	219°31.0	36.1
Mer.pass.:19:26		v1.4 d0.1 m-4.4		v0.4 d-0.1 m1.4		v2.4 d0.0 m-2.4		v2.3 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.9
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.5
Achernar	335°27.6	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°15.9	89°18.9
Acamar	315°19.3	-40°15.6
Menkar	314°16.7	4°08.1
Mirfak	308°42.5	49°54.1
Aldebaran	290°51.2	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.7	46°00.5
Bellatrix	278°33.7	6°21.6
Elnath	278°14.6	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°03.0	7°24.5
Canopus	263°56.5	-52°42.0
Sirius	258°35.0	-16°43.8
Adhara	255°13.7	-28°59.1
Procyon	245°01.4	5°11.8
Pollux	243°29.7	27°59.8
Avior	234°18.5	-59°32.5
Suhail	222°53.7	-43°28.4
Miaplacidus	221°39.9	-69°45.5
Alphard	217°57.8	-8°42.4
Regulus	207°45.4	11°54.7
Dubhe	193°53.9	61°41.1
Denebola	182°35.6	14°30.5
Gienah	175°54.4	-17°36.1
Acrux	173°11.9	-63°09.4
Gacrux	172°03.4	-57°10.3
Alioth	166°22.5	55°53.7
Spica	158°33.4	-11°13.1
Alkaid	153°00.7	49°15.3
Hadar	148°51.2	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.7	19°07.5
Rigil Kent.	139°54.9	-60°52.7
Kochab	137°20.9	74°06.4
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.9	26°40.7
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.8
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.8
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.0	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.1	15°16.1

Nov 27 Sat	**SHA**	**Mer.pass**
Venus	152°53.5	09:24
Mars	99°02.5	13:00
Jupiter	5°18.2	19:12
Saturn	166°02.9	08:31

Nov 28 Sun	**SHA**	**Mer.pass**
Venus	152°31.4	09:22
Mars	98°13.6	13:00
Jupiter	5°16.6	19:09
Saturn	165°57.7	08:28

Nov 29 Mon	**SHA**	**Mer.pass**
Venus	152°07.6	09:20
Mars	97°24.6	12:59
Jupiter	5°14.9	19:05
Saturn	165°52.5	08:24

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°08.7	**S**21°03.7	293°51.1	9.5'	**N**14°34.0	-11.7'	58.8'
1	198°08.5	04.2	308°19.6	9.6'	14°22.3	-11.8'	58.8'
2	213°08.3	04.6	322°48.2	9.6'	14°10.4	-11.9'	58.8'
3	228°08.1	· · 05.1	337°16.9	9.7'	13°58.5	-11.9'	58.8'
4	243°07.9	05.5	351°45.6	9.7'	13°46.6	-12.0'	58.8'
5	258°07.7	06.0	6°14.3	9.8'	13°34.5	-12.1'	58.8'
6	273°07.5	**S**21°06.5	20°43.1	9.8'	**N**13°22.4	-12.2'	58.8'
7	288°07.3	06.9	35°12.0	9.9'	13°10.1	-12.3'	58.8'
8	303°07.1	07.4	49°40.9	9.9'	12°57.8	-12.3'	58.9'
9	318°06.9	· · 07.8	64°09.8	10.0'	12°45.5	-12.4'	58.9'
10	333°06.7	08.3	78°38.8	10.0'	12°33.0	-12.5'	58.9'
11	348°06.5	08.7	93°07.8	10.0'	12°20.5	-12.6'	58.9'
12	3°06.2	**S**21°09.2	107°36.8	10.1'	**N**12°07.9	-12.6'	58.9'
13	18°06.0	09.7	122°06.0	10.1'	11°55.2	-12.7'	58.9'
14	33°05.8	10.1	136°35.1	10.2'	11°42.5	-12.8'	58.9'
15	48°05.6	· · 10.6	151°04.3	10.2'	11°29.7	-12.8'	58.9'
16	63°05.4	11.0	165°33.5	10.2'	11°16.8	-12.9'	58.9'
17	78°05.2	11.5	180°02.8	10.3'	11°03.9	-13.0'	59.0'
18	93°05.0	**S**21°11.9	194°32.1	10.3'	**N**10°50.9	-13.0'	59.0'
19	108°04.8	12.4	209°01.4	10.4'	10°37.8	-13.1'	59.0'
20	123°04.6	12.8	223°30.8	10.4'	10°24.7	-13.2'	59.0'
21	138°04.4	· · 13.3	238°00.3	10.4'	10°11.5	-13.2'	59.0'
22	153°04.2	13.7	252°29.7	10.5'	09°58.3	-13.3'	59.0'
23	168°04.0	14.2	266°59.2	10.5'	09°45.0	-13.3'	59.0'
	SD.=16.2	d=-0.5	S.D.=16.1				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°03.8	**S**21°14.6	281°28.7	10.5'	**N**09°31.6	-13.4'	59.0'
1	198°03.6	15.0	295°58.3	10.6'	09°18.2	-13.4'	59.0'
2	213°03.3	15.5	310°27.9	10.6'	09°04.8	-13.5'	59.0'
3	228°03.1	· · 15.9	324°57.5	10.6'	08°51.2	-13.5'	59.0'
4	243°02.9	16.4	339°27.2	10.7'	08°37.7	-13.6'	59.1'
5	258°02.7	16.8	353°56.9	10.7'	08°24.1	-13.6'	59.1'
6	273°02.5	**S**21°17.3	8°26.6	10.7'	**N**08°10.4	-13.7'	59.1'
7	288°02.3	17.7	22°56.3	10.8'	07°56.7	-13.7'	59.1'
8	303°02.1	18.1	37°26.1	10.8'	07°42.9	-13.8'	59.1'
9	318°01.9	· · 18.6	51°55.9	10.8'	07°29.1	-13.8'	59.1'
10	333°01.7	19.0	66°25.7	10.8'	07°15.2	-13.9'	59.1'
11	348°01.5	19.5	80°55.6	10.9'	07°01.4	-13.9'	59.1'
12	3°01.2	**S**21°19.9	95°25.5	10.9'	**N**06°47.4	-14.0'	59.1'
13	18°01.0	20.3	109°55.4	10.9'	06°33.4	-14.0'	59.1'
14	33°00.8	20.8	124°25.3	10.9'	06°19.4	-14.0'	59.1'
15	48°00.6	· · 21.2	138°55.2	11.0'	06°05.4	-14.1'	59.1'
16	63°00.4	21.6	153°25.2	11.0'	05°51.3	-14.1'	59.2'
17	78°00.2	22.1	167°55.2	11.0'	05°37.2	-14.1'	59.2'
18	93°00.0	**S**21°22.5	182°25.2	11.0'	**N**05°23.0	-14.2'	59.2'
19	107°59.7	22.9	196°55.2	11.0'	05°08.8	-14.2'	59.2'
20	122°59.5	23.4	211°25.3	11.0'	04°54.6	-14.2'	59.2'
21	137°59.3	· · 23.8	225°55.3	11.1'	04°40.4	-14.3'	59.2'
22	152°59.1	24.2	240°25.4	11.1'	04°26.1	-14.3'	59.2'
23	167°58.9	24.7	254°55.5	11.1'	04°11.8	-14.3'	59.2'
	SD.=16.2	d=-0.4	S.D.=16.1				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°58.7	**S**21°25.1	269°25.6	11.1'	**N**03°57.5	-14.3'	59.2'
1	197°58.5	25.5	283°55.7	11.1'	03°43.1	-14.4'	59.2'
2	212°58.2	25.9	298°25.8	11.1'	03°28.8	-14.4'	59.2'
3	227°58.0	· · 26.4	312°55.9	11.1'	03°14.4	-14.4'	59.2'
4	242°57.8	26.8	327°26.0	11.1'	03°00.0	-14.4'	59.2'
5	257°57.6	27.2	341°56.2	11.1'	02°45.5	-14.4'	59.2'
6	272°57.4	**S**21°27.7	356°26.3	11.2'	**N**02°31.1	-14.5'	59.2'
7	287°57.2	28.1	10°56.5	11.2'	02°16.6	-14.5'	59.2'
8	302°56.9	28.5	25°26.7	11.2'	02°02.1	-14.5'	59.3'
9	317°56.7	· · 28.9	39°56.8	11.2'	01°47.6	-14.5'	59.3'
10	332°56.5	29.3	54°27.0	11.2'	01°33.1	-14.5'	59.3'
11	347°56.3	29.8	68°57.1	11.2'	01°18.6	-14.5'	59.3'
12	2°56.1	**S**21°30.2	83°27.3	11.2'	**N**01°04.1	-14.5'	59.3'
13	17°55.8	30.6	97°57.5	11.2'	00°49.6	-14.5'	59.3'
14	32°55.6	31.0	112°27.6	11.2'	00°35.0	-14.5'	59.3'
15	47°55.4	· · 31.4	126°57.8	11.2'	00°20.5	-14.6'	59.3'
16	62°55.2	31.9	141°27.9	11.2'	**N**00°05.9	-14.6'	59.3'
17	77°55.0	32.3	155°58.1	11.1'	**S**00°08.6	-14.6'	59.3'
18	92°54.7	**S**21°32.7	170°28.2	11.1'	**S**00°23.2	-14.6'	59.3'
19	107°54.5	33.1	184°58.4	11.1'	00°37.8	-14.6'	59.3'
20	122°54.3	33.5	199°28.5	11.1'	00°52.3	-14.6'	59.3'
21	137°54.1	· · 33.9	213°58.6	11.1'	01°06.9	-14.6'	59.3'
22	152°53.8	34.4	228°28.7	11.1'	01°21.4	-14.5'	59.3'
23	167°53.6	34.8	242°58.8	11.1'	01°36.0	-14.5'	59.3'
	SD.=16.2	d=-0.4	S.D.=16.2				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** 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	10:18	13:17	15:00	16:21
66°	07:04	08:15	09:36	14:00	15:20	16:31
64°	06:55	08:00	09:07	14:28	15:36	16:40
62°	06:48	07:46	08:46	14:50	15:49	16:48
60°	06:41	07:35	08:28	15:07	16:00	16:55
N 58°	06:35	07:25	08:14	15:22	16:10	17:01
56°	06:29	07:17	08:01	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	07:32	16:03	16:40	17:21
45°	06:05	06:41	07:14	16:21	16:54	17:31
N 40°	05:56	06:29	06:59	16:36	17:06	17:40
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°	05:11	05:37	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	18:07	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	19:41	20:21
45°	02:49	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	21:47
54°	01:23	02:41	03:31	20:06	20:56	22:15
56°	00:39	02:24	03:19	20:18	21:14	23:03
58°	▭	02:02	03:05	20:32	21:36	▭
S 60°	▭	01:32	02:48	20:49	22:06	▭

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 21-23 65-43%
27	12:35	12:25	11:48	04:34	17:00	
28	12:15	12:05	11:48	05:25	17:50	
29	11:55	11:44	11:48	06:15	18:39	

November 30, 01, 02 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	68°45.7	220°27.9	S10°26.0	165°21.2	S24°06.3	73°58.7	S03°46.9	234°33.2	S03°36.2
1	83°48.2	235°29.3	26.0	180°21.7	06.4	89°01.1	46.8	249°35.5	36.2
2	98°50.7	250°30.6	25.9	195°22.1	06.5	104°03.5	46.8	264°37.7	36.3
3	113°53.1	265°32.0	·· 25.9	210°22.5	·· 06.6	119°05.8	·· 46.7	279°40.0	·· 36.4
4	128°55.6	280°33.4	25.9	225°22.9	06.7	134°08.2	46.7	294°42.2	36.5
5	143°58.1	295°34.7	25.9	240°23.3	06.8	149°10.6	46.6	309°44.5	36.6
6	159°00.5	310°36.1	S10°25.9	255°23.7	S24°06.9	164°13.0	S03°46.6	324°46.7	S03°36.6
7	174°03.0	325°37.4	25.9	270°24.1	07.0	179°15.4	46.5	339°49.0	36.7
8	189°05.5	340°38.8	25.9	285°24.6	07.1	194°17.7	46.5	354°51.2	36.8
9	204°07.9	355°40.1	·· 25.9	300°25.0	·· 07.2	209°20.1	·· 46.5	9°53.5	·· 36.9
10	219°10.4	10°41.5	25.9	315°25.4	07.3	224°22.5	46.4	24°55.8	37.0
11	234°12.8	25°42.8	25.9	330°25.8	07.4	239°24.9	46.4	39°58.0	37.0
12	249°15.3	40°44.2	S10°25.9	345°26.2	S24°07.5	254°27.2	S03°46.3	55°00.3	S03°37.1
13	264°17.8	55°45.5	25.9	0°26.6	07.6	269°29.6	46.3	70°02.5	37.2
14	279°20.2	70°46.8	25.9	15°27.0	07.7	284°32.0	46.2	85°04.8	37.3
15	294°22.7	85°48.2	·· 25.9	30°27.5	·· 07.8	299°34.4	·· 46.2	100°07.0	·· 37.3
16	309°25.2	100°49.5	25.9	45°27.9	07.9	314°36.7	46.1	115°09.3	37.4
17	324°27.6	115°50.8	25.9	60°28.3	08.0	329°39.1	46.0	130°11.5	37.5
18	339°30.1	130°52.1	S10°25.9	75°28.7	S24°08.1	344°41.5	S03°46.0	145°13.8	S03°37.6
19	354°32.6	145°53.5	25.9	90°29.1	08.2	359°43.9	45.9	160°16.1	37.7
20	9°35.0	160°54.8	26.0	105°29.5	08.3	14°46.2	45.9	175°18.3	37.7
21	24°37.5	175°56.1	·· 26.0	120°29.9	·· 08.4	29°48.6	·· 45.8	190°20.6	·· 37.8
22	39°39.9	190°57.4	26.0	135°30.4	08.5	44°51.0	45.8	205°22.8	37.9
23	54°42.4	205°58.7	26.0	150°30.8	08.6	59°53.4	45.7	220°25.1	38.0
Mer.pass.:19:22		v1.4 d0.0 m-4.4		v0.4 d-0.1 m1.3		v2.4 d0.0 m-2.4		v2.3 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	69°44.9	221°00.0	S10°26.0	165°31.2	S24°08.7	74°55.7	S03°45.7	235°27.3	S03°38.0
1	84°47.3	236°01.3	26.1	180°31.6	08.8	89°58.1	45.6	250°29.6	38.1
2	99°49.8	251°02.6	26.1	195°32.0	08.9	105°00.5	45.6	265°31.8	38.2
3	114°52.3	266°03.9	·· 26.1	210°32.4	·· 09.0	120°02.8	·· 45.5	280°34.1	·· 38.3
4	129°54.7	281°05.2	26.1	225°32.8	09.1	135°05.2	45.5	295°36.4	38.3
5	144°57.2	296°06.5	26.2	240°33.2	09.1	150°07.6	45.4	310°38.6	38.4
6	159°59.7	311°07.8	S10°26.2	255°33.6	S24°09.2	165°10.0	S03°45.4	325°40.9	S03°38.5
7	175°02.1	326°09.1	26.2	270°34.1	09.3	180°12.3	45.3	340°43.1	38.6
8	190°04.6	341°10.4	26.3	285°34.5	09.4	195°14.7	45.3	355°45.4	38.7
9	205°07.1	356°11.6	·· 26.3	300°34.9	·· 09.5	210°17.1	·· 45.2	10°47.6	·· 38.7
10	220°09.5	11°12.9	26.3	315°35.3	09.6	225°19.4	45.2	25°49.9	38.8
11	235°12.0	26°14.2	26.4	330°35.7	09.7	240°21.8	45.1	40°52.2	38.9
12	250°14.4	41°15.5	S10°26.4	345°36.1	S24°09.8	255°24.2	S03°45.1	55°54.4	S03°39.0
13	265°16.9	56°16.7	26.4	0°36.5	09.9	270°26.5	45.0	70°56.7	39.0
14	280°19.4	71°18.0	26.5	15°36.9	09.9	285°28.9	45.0	85°58.9	39.1
15	295°21.8	86°19.3	·· 26.5	30°37.3	·· 10.0	300°31.3	·· 44.9	101°01.2	·· 39.2
16	310°24.3	101°20.5	26.6	45°37.8	10.1	315°33.6	44.8	116°03.5	39.3
17	325°26.8	116°21.8	26.6	60°38.2	10.2	330°36.0	44.8	131°05.7	39.3
18	340°29.2	131°23.1	S10°26.7	75°38.6	S24°10.3	345°38.4	S03°44.7	146°08.0	S03°39.4
19	355°31.7	146°24.3	26.7	90°39.0	10.4	0°40.7	44.7	161°10.2	39.5
20	10°34.2	161°25.6	26.8	105°39.4	10.4	15°43.1	44.6	176°12.5	39.6
21	25°36.6	176°26.8	·· 26.8	120°39.8	·· 10.5	30°45.5	·· 44.6	191°14.7	·· 39.7
22	40°39.1	191°28.1	26.9	135°40.2	10.6	45°47.8	44.5	206°17.0	39.7
23	55°41.6	206°29.3	26.9	150°40.6	10.7	60°50.2	44.5	221°19.3	39.8
Mer.pass.:19:18		v1.3 d-0.0 m-4.4		v0.4 d-0.1 m1.3		v2.4 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	70°44.0	221°30.6	S10°27.0	165°41.0	S24°10.8	75°52.6	S03°44.4	236°21.5	S03°39.9
1	85°46.5	236°31.8	27.1	180°41.4	10.9	90°54.9	44.4	251°23.8	40.0
2	100°48.9	251°33.0	27.1	195°41.8	10.9	105°57.3	44.3	266°26.0	40.0
3	115°51.4	266°34.3	·· 27.2	210°42.3	·· 11.0	120°59.7	·· 44.2	281°28.3	·· 40.1
4	130°53.9	281°35.5	27.2	225°42.7	11.1	136°02.0	44.2	296°30.6	40.2
5	145°56.3	296°36.7	27.3	240°43.1	11.2	151°04.4	44.1	311°32.8	40.3
6	160°58.8	311°38.0	S10°27.4	255°43.5	S24°11.3	166°06.8	S03°44.1	326°35.1	S03°40.3
7	176°01.3	326°39.2	27.4	270°43.9	11.3	181°09.1	44.0	341°37.3	40.4
8	191°03.7	341°40.4	27.5	285°44.3	11.4	196°11.5	44.0	356°39.6	40.5
9	206°06.2	356°41.6	·· 27.6	300°44.7	·· 11.5	211°13.8	·· 43.9	11°41.9	·· 40.6
10	221°08.7	11°42.8	27.7	315°45.1	11.6	226°16.2	43.9	26°44.1	40.6
11	236°11.1	26°44.1	27.7	330°45.5	11.7	241°18.6	43.8	41°46.4	40.7
12	251°13.6	41°45.3	S10°27.8	345°45.9	S24°11.7	256°20.9	S03°43.7	56°48.6	S03°40.8
13	266°16.0	56°46.5	27.9	0°46.3	11.8	271°23.3	43.7	71°50.9	40.9
14	281°18.5	71°47.7	28.0	15°46.7	11.9	286°25.6	43.6	86°53.2	40.9
15	296°21.0	86°48.9	·· 28.1	30°47.1	·· 12.0	301°28.0	·· 43.6	101°55.4	·· 41.0
16	311°23.4	101°50.1	28.1	45°47.5	12.0	316°30.4	43.5	116°57.7	41.1
17	326°25.9	116°51.3	28.2	60°48.0	12.1	331°32.7	43.5	131°59.9	41.2
18	341°28.4	131°52.5	S10°28.3	75°48.4	S24°12.2	346°35.1	S03°43.4	147°02.2	S03°41.2
19	356°30.8	146°53.7	28.4	90°48.8	12.3	1°37.4	43.3	162°04.5	41.3
20	11°33.3	161°54.9	28.5	105°49.2	12.3	16°39.8	43.3	177°06.7	41.4
21	26°35.8	176°56.1	·· 28.6	120°49.6	·· 12.4	31°42.2	·· 43.2	192°09.0	·· 41.5
22	41°38.2	191°57.2	28.7	135°50.0	12.5	46°44.5	43.2	207°11.3	41.5
23	56°40.7	206°58.4	28.8	150°50.4	12.5	61°46.9	43.1	222°13.5	41.6
Mer.pass.:19:14		v1.2 d-0.1 m-4.5		v0.4 d-0.1 m1.3		v2.4 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.9
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.6
Achernar	335°27.6	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°16.3	89°18.9
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.1
Mirfak	308°42.5	49°54.1
Aldebaran	290°51.1	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.7	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.6	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°03.0	7°24.5
Canopus	263°56.5	-52°42.0
Sirius	258°35.0	-16°43.8
Adhara	255°13.7	-28°59.1
Procyon	245°01.4	5°11.8
Pollux	243°29.7	27°59.8
Avior	234°18.5	-59°32.5
Suhail	222°53.7	-43°28.4
Miaplacidus	221°39.8	-69°45.5
Alphard	217°57.8	-8°42.4
Regulus	207°45.4	11°54.7
Dubhe	193°53.9	61°41.1
Denebola	182°35.6	14°30.5
Gienah	175°54.4	-17°36.1
Acrux	173°11.9	-63°09.4
Gacrux	172°03.4	-57°10.3
Alioth	166°22.5	55°53.7
Spica	158°33.4	-11°13.1
Alkaid	153°00.6	49°15.3
Hadar	148°51.2	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.7	19°07.4
Rigil Kent.	139°54.9	-60°52.6
Kochab	137°20.8	74°06.4
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.9	26°40.6
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.8
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.0	-46°54.6
Fomalhaut	15°25.9	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Nov 30 Tue	**SHA**	**Mer.pass**
Venus	151°42.2	09:17
Mars	96°35.5	12:58
Jupiter	5°13.0	19:01
Saturn	165°47.5	08:21

Dec 01 Wed	**SHA**	**Mer.pass**
Venus	151°15.1	09:15
Mars	95°46.3	12:58
Jupiter	5°10.9	18:57
Saturn	165°42.5	08:17

Dec 02 Thu	**SHA**	**Mer.pass**
Venus	150°46.5	09:13
Mars	94°57.0	12:57
Jupiter	5°08.6	18:54
Saturn	165°37.5	08:13

Horizontal parallax	
Venus:	0.4
Mars:	0.1

DUT1 = UT1-UTC = -0.1204 sec ΔT = TT-UT1 = +66.3044 sec

2010 November 30 to Dec. 02 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°53.4	S21°35.2	257°28.9	11.1'	S01°50.5	-14.5'	59.3'
1	197°53.2	35.6	271°59.0	11.1'	02°05.0	-14.5'	59.3'
2	212°52.9	36.0	286°29.1	11.0'	02°19.6	-14.5'	59.3'
3	227°52.7	·· 36.4	300°59.1	11.0'	02°34.1	-14.5'	59.3'
4	242°52.5	36.8	315°29.1	11.0'	02°48.6	-14.5'	59.3'
5	257°52.3	37.2	329°59.1	11.0'	03°03.1	-14.5'	59.3'
6	272°52.0	S21°37.6	344°29.1	11.0'	S03°17.5	-14.5'	59.3'
7	287°51.8	38.0	358°59.1	11.0'	03°32.0	-14.4'	59.3'
8	302°51.6	38.5	13°29.0	10.9'	03°46.4	-14.4'	59.3'
9	317°51.4	·· 38.9	27°59.0	10.9'	04°00.8	-14.4'	59.3'
10	332°51.1	39.3	42°28.9	10.9'	04°15.2	-14.4'	59.3'
11	347°50.9	39.7	56°58.7	10.9'	04°29.6	-14.4'	59.3'
12	2°50.7	S21°40.1	71°28.6	10.8'	S04°44.0	-14.3'	59.3'
13	17°50.5	40.5	85°58.4	10.8'	04°58.3	-14.3'	59.3'
14	32°50.2	40.9	100°28.2	10.8'	05°12.6	-14.3'	59.3'
15	47°50.0	·· 41.3	114°58.0	10.8'	05°26.9	-14.3'	59.3'
16	62°49.8	41.7	129°27.8	10.7'	05°41.2	-14.2'	59.3'
17	77°49.6	42.1	143°57.5	10.7'	05°55.4	-14.2'	59.3'
18	92°49.3	S21°42.5	158°27.2	10.7'	S06°09.6	-14.2'	59.4'
19	107°49.1	42.9	172°56.8	10.6'	06°23.7	-14.1'	59.4'
20	122°48.9	43.3	187°26.4	10.6'	06°37.8	-14.1'	59.4'
21	137°48.6	·· 43.7	201°56.0	10.6'	06°51.9	-14.1'	59.3'
22	152°48.4	44.1	216°25.6	10.5'	07°06.0	-14.0'	59.3'
23	167°48.2	44.5	230°55.1	10.5'	07°20.0	-14.0'	59.3'
	SD.=16.2	d=-0.4	S.D.=16.2				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°47.9	S21°44.9	245°24.6	10.5'	S07°34.0	-14.0'	59.3'
1	197°47.7	45.3	259°54.1	10.4'	07°47.9	-13.9'	59.3'
2	212°47.5	45.6	274°23.5	10.4'	08°01.8	-13.9'	59.3'
3	227°47.3	·· 46.0	288°52.8	10.4'	08°15.6	-13.8'	59.3'
4	242°47.0	46.4	303°22.2	10.3'	08°29.4	-13.8'	59.3'
5	257°46.8	46.8	317°51.5	10.3'	08°43.2	-13.7'	59.3'
6	272°46.6	S21°47.2	332°20.7	10.2'	S08°56.9	-13.7'	59.3'
7	287°46.3	47.6	346°49.9	10.2'	09°10.6	-13.6'	59.3'
8	302°46.1	48.0	1°19.1	10.1'	09°24.2	-13.6'	59.3'
9	317°45.9	·· 48.4	15°48.2	10.1'	09°37.7	-13.5'	59.3'
10	332°45.6	48.8	30°17.3	10.1'	09°51.2	-13.5'	59.3'
11	347°45.4	49.2	44°46.4	10.0'	10°04.7	-13.4'	59.3'
12	2°45.2	S21°49.5	59°15.3	10.0'	S10°18.1	-13.4'	59.3'
13	17°44.9	49.9	73°44.3	9.9'	10°31.4	-13.3'	59.3'
14	32°44.7	50.3	88°13.2	9.9'	10°44.7	-13.2'	59.3'
15	47°44.5	·· 50.7	102°42.0	9.8'	10°57.9	-13.2'	59.3'
16	62°44.2	51.1	117°10.8	9.8'	11°11.0	-13.1'	59.3'
17	77°44.0	51.5	131°39.6	9.7'	11°24.1	-13.1'	59.3'
18	92°43.7	S21°51.8	146°08.3	9.7'	S11°37.1	-13.0'	59.3'
19	107°43.5	52.2	160°37.0	9.6'	11°50.1	-12.9'	59.3'
20	122°43.3	52.6	175°05.6	9.6'	12°03.0	-12.9'	59.3'
21	137°43.0	·· 53.0	189°34.1	9.5'	12°15.8	-12.8'	59.3'
22	152°42.8	53.4	204°02.6	9.5'	12°28.5	-12.7'	59.3'
23	167°42.6	53.7	218°31.1	9.4'	12°41.2	-12.6'	59.3'
	SD.=16.2	d=-0.4	S.D.=16.2				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°42.3	S21°54.1	232°59.5	9.4'	S12°53.8	-12.6'	59.3'
1	197°42.1	54.5	247°27.8	9.3'	13°06.3	-12.5'	59.3'
2	212°41.9	54.9	261°56.1	9.3'	13°18.8	-12.4'	59.3'
3	227°41.6	·· 55.2	276°24.3	9.2'	13°31.1	-12.3'	59.3'
4	242°41.4	55.6	290°52.5	9.2'	13°43.4	-12.2'	59.2'
5	257°41.1	56.0	305°20.6	9.1'	13°55.6	-12.2'	59.2'
6	272°40.9	S21°56.4	319°48.7	9.0'	S14°07.8	-12.1'	59.2'
7	287°40.7	56.7	334°16.7	9.0'	14°19.8	-12.0'	59.2'
8	302°40.4	57.1	348°44.7	8.9'	14°31.8	-11.9'	59.2'
9	317°40.2	·· 57.5	3°12.6	8.9'	14°43.6	-11.8'	59.2'
10	332°39.9	57.9	17°40.4	8.8'	14°55.4	-11.7'	59.2'
11	347°39.7	58.2	32°08.2	8.8'	15°07.1	-11.6'	59.2'
12	2°39.5	S21°58.6	46°36.0	8.7'	S15°18.7	-11.6'	59.2'
13	17°39.2	59.0	61°03.7	8.7'	15°30.2	-11.5'	59.2'
14	32°39.0	59.3	75°31.3	8.6'	15°41.6	-11.4'	59.2'
15	47°38.7	21°59.7	89°58.8	8.5'	15°53.0	-11.3'	59.2'
16	62°38.5	22°00.1	104°26.3	8.5'	16°04.2	-11.2'	59.1'
17	77°38.2	00.4	118°53.8	8.4'	16°15.3	-11.1'	59.1'
18	92°38.0	S22°00.8	133°21.2	8.4'	S16°26.3	-11.0'	59.1'
19	107°37.8	01.2	147°48.5	8.3'	16°37.3	-10.9'	59.1'
20	122°37.5	01.5	162°15.8	8.3'	16°48.1	-10.8'	59.1'
21	137°37.3	·· 01.9	176°43.0	8.2'	16°58.8	-10.7'	59.1'
22	152°37.0	02.2	191°10.2	8.1'	17°09.4	-10.6'	59.1'
23	167°36.8	02.6	205°37.3	8.1'	17°20.0	-10.5'	59.1'
	SD.=16.2	d=-0.4	S.D.=16.1				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 24-26 32-13%
30	11:34	11:23	11:49	07:04	19:29	
01	11:12	11:01	11:49	07:55	20:20	
02	10:49	10:38	11:49	08:47	21:14	

December 03, 04, 05 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°43.2	221°59.6	S10°28.8	165°50.8	S24°12.6	76°49.2	S03°43.1	237°15.8	S03°41.7
1	86°45.6	237°00.8	28.9	180°51.2	12.7	91°51.6	43.0	252°18.0	41.8
2	101°48.1	252°02.0	29.0	195°51.6	12.8	106°53.9	42.9	267°20.3	41.8
3	116°50.5	267°03.1	·· 29.1	210°52.0	·· 12.8	121°56.3	·· 42.9	282°22.6	·· 41.9
4	131°53.0	282°04.3	29.2	225°52.4	12.9	136°58.6	42.8	297°24.8	42.0
5	146°55.5	297°05.5	29.3	240°52.8	13.0	152°01.0	42.8	312°27.1	42.1
6	161°57.9	312°06.6	S10°29.4	255°53.2	S24°13.0	167°03.4	S03°42.7	327°29.4	S03°42.1
7	177°00.4	327°07.8	29.5	270°53.6	13.1	182°05.7	42.6	342°31.6	42.2
8	192°02.9	342°09.0	29.6	285°54.0	13.2	197°08.1	42.6	357°33.9	42.3
9	207°05.3	357°10.1	·· 29.8	300°54.4	·· 13.2	212°10.4	·· 42.5	12°36.1	·· 42.4
10	222°07.8	12°11.3	29.9	315°54.8	13.3	227°12.8	42.5	27°38.4	42.4
11	237°10.3	27°12.4	30.0	330°55.2	13.4	242°15.1	42.4	42°40.7	42.5
12	252°12.7	42°13.6	S10°30.1	345°55.6	S24°13.4	257°17.5	S03°42.3	57°42.9	S03°42.6
13	267°15.2	57°14.7	30.2	0°56.0	13.5	272°19.8	42.3	72°45.2	42.7
14	282°17.7	72°15.9	30.3	15°56.5	13.6	287°22.2	42.2	87°47.5	42.7
15	297°20.1	87°17.0	·· 30.4	30°56.9	·· 13.6	302°24.5	·· 42.2	102°49.7	·· 42.8
16	312°22.6	102°18.2	30.5	45°57.3	13.7	317°26.9	42.1	117°52.0	42.9
17	327°25.0	117°19.3	30.7	60°57.7	13.8	332°29.2	42.0	132°54.2	43.0
18	342°27.5	132°20.5	S10°30.8	75°58.1	S24°13.8	347°31.6	S03°42.0	147°56.5	S03°43.0
19	357°30.0	147°21.6	30.9	90°58.5	13.9	2°33.9	41.9	162°58.8	43.1
20	12°32.4	162°22.7	31.0	105°58.9	13.9	17°36.3	41.9	178°01.0	43.2
21	27°34.9	177°23.9	·· 31.2	120°59.3	·· 14.0	32°38.6	·· 41.8	193°03.3	·· 43.2
22	42°37.4	192°25.0	31.3	135°59.7	14.1	47°41.0	41.7	208°05.6	43.3
23	57°39.8	207°26.1	31.4	151°00.1	14.1	62°43.3	41.7	223°07.8	43.4
Mer.pass.:19:10		v1.2 d-0.1 m-4.5		v0.4 d-0.1 m1.3		v2.4 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	72°42.3	222°27.2	S10°31.5	166°00.5	S24°14.2	77°45.7	S03°41.6	238°10.1	S03°43.5
1	87°44.8	237°28.3	31.7	181°00.9	14.2	92°48.0	41.5	253°12.4	43.5
2	102°47.2	252°29.5	31.8	196°01.3	14.3	107°50.4	41.5	268°14.6	43.6
3	117°49.7	267°30.6	·· 31.9	211°01.7	·· 14.4	122°52.7	·· 41.4	283°16.9	·· 43.7
4	132°52.1	282°31.7	32.1	226°02.1	14.4	137°55.1	41.4	298°19.2	43.8
5	147°54.6	297°32.8	32.2	241°02.5	14.5	152°57.4	41.3	313°21.4	43.8
6	162°57.1	312°33.9	S10°32.3	256°02.9	S24°14.5	167°59.8	S03°41.2	328°23.7	S03°43.9
7	177°59.5	327°35.0	32.5	271°03.3	14.6	183°02.1	41.2	343°26.0	44.0
8	193°02.0	342°36.1	32.6	286°03.7	14.6	198°04.5	41.1	358°28.2	44.1
9	208°04.5	357°37.2	·· 32.8	301°04.1	·· 14.7	213°06.8	·· 41.1	13°30.5	·· 44.1
10	223°06.9	12°38.3	32.9	316°04.5	14.8	228°09.2	41.0	28°32.7	44.2
11	238°09.4	27°39.4	33.0	331°04.9	14.8	243°11.5	40.9	43°35.0	44.3
12	253°11.9	42°40.5	S10°33.2	346°05.3	S24°14.9	258°13.9	S03°40.9	58°37.3	S03°44.3
13	268°14.3	57°41.6	33.3	1°05.7	14.9	273°16.2	40.8	73°39.5	44.4
14	283°16.8	72°42.7	33.5	16°06.1	15.0	288°18.5	40.7	88°41.8	44.5
15	298°19.3	87°43.8	·· 33.6	31°06.5	·· 15.0	303°20.9	·· 40.7	103°44.1	·· 44.6
16	313°21.7	102°44.9	33.8	46°06.9	15.1	318°23.2	40.6	118°46.3	44.6
17	328°24.2	117°46.0	33.9	61°07.3	15.1	333°25.6	40.5	133°48.6	44.7
18	343°26.6	132°47.0	S10°34.1	76°07.7	S24°15.2	348°27.9	S03°40.5	148°50.9	S03°44.8
19	358°29.1	147°48.1	34.2	91°08.1	15.2	3°30.3	40.4	163°53.1	44.9
20	13°31.6	162°49.2	34.4	106°08.5	15.3	18°32.6	40.4	178°55.4	44.9
21	28°34.0	177°50.3	·· 34.6	121°08.9	·· 15.3	33°35.0	·· 40.3	193°57.7	·· 45.0
22	43°36.5	192°51.3	34.7	136°09.3	15.4	48°37.3	40.2	208°59.9	45.1
23	58°39.0	207°52.4	34.9	151°09.7	15.4	63°39.6	40.2	224°02.2	45.1
Mer.pass.:19:06		v1.1 d-0.1 m-4.5		v0.4 d-0.1 m1.3		v2.3 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	73°41.4	222°53.5	S10°35.0	166°10.1	S24°15.5	78°42.0	S03°40.1	239°04.5	S03°45.2
1	88°43.9	237°54.5	35.2	181°10.5	15.5	93°44.3	40.0	254°06.7	45.3
2	103°46.4	252°55.6	35.4	196°10.9	15.6	108°46.7	40.0	269°09.0	45.4
3	118°48.8	267°56.6	·· 35.5	211°11.3	·· 15.6	123°49.0	·· 39.9	284°11.3	·· 45.4
4	133°51.3	282°57.7	35.7	226°11.7	15.7	138°51.3	39.8	299°13.5	45.5
5	148°53.8	297°58.8	35.9	241°12.1	15.7	153°53.7	39.8	314°15.8	45.6
6	163°56.2	312°59.8	S10°36.0	256°12.5	S24°15.8	168°56.0	S03°39.7	329°18.1	S03°45.6
7	178°58.7	328°00.9	36.2	271°12.9	15.8	183°58.4	39.6	344°20.4	45.7
8	194°01.1	343°01.9	36.4	286°13.3	15.9	199°00.7	39.6	359°22.6	45.8
9	209°03.6	358°03.0	·· 36.5	301°13.7	·· 15.9	214°03.0	·· 39.5	14°24.9	·· 45.9
10	224°06.1	13°04.0	36.7	316°14.1	16.0	229°05.4	39.4	29°27.2	45.9
11	239°08.5	28°05.0	36.9	331°14.5	16.0	244°07.7	39.4	44°29.4	46.0
12	254°11.0	43°06.1	S10°37.1	346°14.9	S24°16.1	259°10.1	S03°39.3	59°31.7	S03°46.1
13	269°13.5	58°07.1	37.2	1°15.3	16.1	274°12.4	39.2	74°34.0	46.1
14	284°15.9	73°08.1	37.4	16°15.6	16.1	289°14.7	39.2	89°36.2	46.2
15	299°18.4	88°09.2	·· 37.6	31°16.0	·· 16.2	304°17.1	·· 39.1	104°38.5	·· 46.3
16	314°20.9	103°10.2	37.8	46°16.4	16.2	319°19.4	39.0	119°40.8	46.4
17	329°23.3	118°11.2	38.0	61°16.8	16.3	334°21.7	39.0	134°43.0	46.4
18	344°25.8	133°12.3	S10°38.2	76°17.2	S24°16.3	349°24.1	S03°38.9	149°45.3	S03°46.5
19	359°28.3	148°13.3	38.3	91°17.6	16.3	4°26.4	38.8	164°47.6	46.6
20	14°30.7	163°14.3	38.5	106°18.0	16.4	19°28.7	38.8	179°49.8	46.6
21	29°33.2	178°15.3	·· 38.7	121°18.4	·· 16.4	34°31.1	·· 38.7	194°52.1	·· 46.7
22	44°35.6	193°16.3	38.9	136°18.8	16.5	49°33.4	38.6	209°54.4	46.8
23	59°38.1	208°17.4	39.1	151°19.2	16.5	64°35.8	38.6	224°56.7	46.9
Mer.pass.:19:02		v1.1 d-0.2 m-4.5		v0.4 d-0.0 m1.3		v2.3 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Stars

	SHA	Dec
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.2	-42°14.9
Schedar	349°42.4	56°36.2
Diphda	348°57.5	-17°55.6
Achernar	335°27.6	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°16.5	89°18.9
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.7	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.6	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°03.0	7°24.5
Canopus	263°56.4	-52°42.0
Sirius	258°35.0	-16°43.8
Adhara	255°13.6	-28°59.2
Procyon	245°01.4	5°11.8
Pollux	243°29.7	27°59.8
Avior	234°18.4	-59°32.5
Suhail	222°53.6	-43°28.5
Miaplacidus	221°39.8	-69°45.5
Alphard	217°57.8	-8°42.4
Regulus	207°45.4	11°54.7
Dubhe	193°53.8	61°41.1
Denebola	182°35.6	14°30.5
Gienah	175°54.3	-17°36.1
Acrux	173°11.8	-63°09.4
Gacrux	172°03.3	-57°10.3
Alioth	166°22.5	55°53.7
Spica	158°33.4	-11°13.1
Alkaid	153°00.6	49°15.3
Hadar	148°51.1	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.7	19°07.4
Rigil Kent.	139°54.9	-60°52.6
Kochab	137°20.8	74°06.4
Zuben'ubi	137°07.8	-16°05.2
Alphecca	126°12.9	26°40.6
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.8
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°17.0
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.0	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 03 Fri	SHA	Mer.pass
Venus	150°16.5	09:11
Mars	94°07.6	12:56
Jupiter	5°06.1	18:50
Saturn	165°32.6	08:10

Dec 04 Sat	SHA	Mer.pass
Venus	149°44.9	09:10
Mars	93°18.2	12:56
Jupiter	5°03.4	18:46
Saturn	165°27.8	08:06

Dec 05 Sun	SHA	Mer.pass
Venus	149°12.0	09:08
Mars	92°28.6	12:55
Jupiter	5°00.5	18:42
Saturn	165°23.0	08:02

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.1226 sec ΔT = TT-UT1 = +66.3066 sec

2010 December 03 to Dec. 05 UT

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	182°36.5	S22°03.0	220°04.4	8.0'	S17°30.4	-10.4'	59.1'
1	197°36.3	03.3	234°31.3	8.0'	17°40.7	-10.2'	59.1'
2	212°36.1	03.7	248°58.3	7.9'	17°50.9	-10.1'	59.0'
3	227°35.8	·· 04.0	263°25.2	7.9'	18°00.9	-10.0'	59.0'
4	242°35.6	04.4	277°52.0	7.8'	18°10.9	-9.9'	59.0'
5	257°35.3	04.7	292°18.8	7.7'	18°20.8	-9.8'	59.0'
6	272°35.1	S22°05.1	306°45.5	7.7'	S18°30.5	-9.7'	59.0'
7	287°34.8	05.5	321°12.1	7.6'	18°40.1	-9.6'	59.0'
8	302°34.6	05.8	335°38.7	7.6'	18°49.6	-9.4'	59.0'
9	317°34.3	·· 06.2	350°05.3	7.5'	18°59.0	-9.3'	59.0'
10	332°34.1	06.5	4°31.8	7.5'	19°08.3	-9.2'	58.9'
11	347°33.8	06.9	18°58.2	7.4'	19°17.5	-9.1'	58.9'
12	2°33.6	S22°07.2	33°24.6	7.4'	S19°26.5	-9.0'	58.9'
13	17°33.4	07.6	47°51.0	7.3'	19°35.4	-8.8'	58.9'
14	32°33.1	07.9	62°17.3	7.3'	19°44.2	-8.7'	58.9'
15	47°32.9	·· 08.3	76°43.5	7.2'	19°52.8	-8.6'	58.9'
16	62°32.6	08.6	91°09.7	7.2'	20°01.4	-8.5'	58.9'
17	77°32.4	09.0	105°35.8	7.1'	20°09.8	-8.3'	58.8'
18	92°32.1	S22°09.3	120°01.9	7.1'	S20°18.0	-8.2'	58.8'
19	107°31.9	09.7	134°28.0	7.0'	20°26.2	-8.1'	58.8'
20	122°31.6	10.0	148°54.0	7.0'	20°34.2	-8.0'	58.8'
21	137°31.4	·· 10.3	163°19.9	6.9'	20°42.1	-7.8'	58.8'
22	152°31.1	10.7	177°45.8	6.9'	20°49.8	-7.7'	58.8'
23	167°30.9	11.0	192°11.7	6.8'	20°57.5	-7.6'	58.7'
	SD.=16.2	d=-0.4	S.D.=16.1				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	182°30.6	S22°11.4	206°37.5	6.8'	S21°04.9	-7.4'	58.7'
1	197°30.4	11.7	221°03.3	6.8'	21°12.3	-7.3'	58.7'
2	212°30.1	12.1	235°29.0	6.7'	21°19.5	-7.1'	58.7'
3	227°29.9	·· 12.4	249°54.7	6.7'	21°26.6	-7.0'	58.7'
4	242°29.6	12.7	264°20.4	6.6'	21°33.5	-6.9'	58.7'
5	257°29.4	13.1	278°46.0	6.6'	21°40.3	-6.7'	58.6'
6	272°29.1	S22°13.4	293°11.6	6.6'	S21°47.0	-6.6'	58.6'
7	287°28.9	13.8	307°37.2	6.5'	21°53.5	-6.4'	58.6'
8	302°28.6	14.1	322°02.7	6.5'	21°59.9	-6.3'	58.6'
9	317°28.3	·· 14.4	336°28.2	6.5'	22°06.1	-6.2'	58.6'
10	332°28.1	14.8	350°53.6	6.4'	22°12.2	-6.0'	58.5'
11	347°27.8	15.1	5°19.0	6.4'	22°18.2	-5.9'	58.5'
12	2°27.6	S22°15.4	19°44.4	6.4'	S22°24.0	-5.7'	58.5'
13	17°27.3	15.8	34°09.8	6.3'	22°29.6	-5.6'	58.5'
14	32°27.1	16.1	48°35.1	6.3'	22°35.1	-5.4'	58.5'
15	47°26.8	·· 16.4	63°00.4	6.3'	22°40.5	-5.3'	58.4'
16	62°26.6	16.7	77°25.7	6.3'	22°45.7	-5.2'	58.4'
17	77°26.3	17.1	91°51.0	6.3'	22°50.8	-5.0'	58.4'
18	92°26.1	S22°17.4	106°16.2	6.2'	S22°55.7	-4.9'	58.4'
19	107°25.8	17.7	120°41.4	6.2'	23°00.5	-4.7'	58.4'
20	122°25.5	18.1	135°06.6	6.2'	23°05.2	-4.6'	58.3'
21	137°25.3	·· 18.4	149°31.8	6.2'	23°09.6	-4.4'	58.3'
22	152°25.0	18.7	163°57.0	6.2'	23°14.0	-4.3'	58.3'
23	167°24.8	19.0	178°22.2	6.2'	23°18.2	-4.1'	58.3'
	SD.=16.2	d=-0.3	S.D.=15.9				

Sun	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	182°24.5	S22°19.4	192°47.3	6.1'	S23°22.2	-4.0'	58.3'
1	197°24.3	19.7	207°12.5	6.1'	23°26.1	-3.8'	58.2'
2	212°24.0	20.0	221°37.6	6.1'	23°29.8	-3.7'	58.2'
3	227°23.8	·· 20.3	236°02.7	6.1'	23°33.4	-3.5'	58.2'
4	242°23.5	20.7	250°27.8	6.1'	23°36.8	-3.4'	58.2'
5	257°23.2	21.0	264°52.9	6.1'	23°40.1	-3.2'	58.1'
6	272°23.0	S22°21.3	279°18.1	6.1'	S23°43.2	-3.1'	58.1'
7	287°22.7	21.6	293°43.2	6.1'	23°46.2	-2.9'	58.1'
8	302°22.5	21.9	308°08.3	6.1'	23°49.0	-2.7'	58.1'
9	317°22.2	·· 22.2	322°33.4	6.1'	23°51.7	-2.6'	58.1'
10	332°21.9	22.6	336°58.5	6.1'	23°54.2	-2.4'	58.0'
11	347°21.7	22.9	351°23.6	6.1'	23°56.6	-2.3'	58.0'
12	2°21.4	S22°23.2	5°48.8	6.1'	S23°58.8	-2.1'	58.0'
13	17°21.2	23.5	20°13.9	6.2'	24°00.8	-2.0'	58.0'
14	32°20.9	23.8	34°39.1	6.2'	24°02.8	-1.8'	57.9'
15	47°20.6	·· 24.1	49°04.3	6.2'	24°04.5	-1.7'	57.9'
16	62°20.4	24.4	63°29.4	6.2'	24°06.1	-1.5'	57.9'
17	77°20.1	24.8	77°54.6	6.2'	24°07.6	-1.4'	57.9'
18	92°19.9	S22°25.1	92°19.9	6.2'	S24°08.9	-1.2'	57.8'
19	107°19.6	25.4	106°45.1	6.3'	24°10.0	-1.1'	57.8'
20	122°19.3	25.7	121°10.4	6.3'	24°11.0	-0.9'	57.8'
21	137°19.1	·· 26.0	135°35.7	6.3'	24°11.9	-0.8'	57.8'
22	152°18.8	26.3	150°01.0	6.3'	24°12.6	-0.6'	57.7'
23	167°18.6	26.6	164°26.3	6.4'	24°13.1	-0.5'	57.7'
	SD.=16.2	d=-0.3	S.D.=15.8				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	07:59	10:03	▬	▬	13:36	15:41
N 70°	07:41	09:20	▬	▬	14:20	15:58
68°	07:27	08:51	10:54	12:45	14:49	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	07:45	08:40	14:59	15:54	16:50
N 58°	06:43	07:35	08:25	15:15	16:05	16:57
56°	06:37	07:25	08:11	15:29	16:15	17:03
54°	06:32	07:17	08:00	15:40	16:23	17:08
52°	06:26	07:10	07:49	15:51	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°	06:01	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	18:28	18:53	19:22
30°	03:51	04:24	04:51	18:49	19:16	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°	▭	01:15	02:40	21:02	22:28	▭

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 27-0 6-0%
03	10:26	10:14	11:50	09:41	22:09	●
04	10:02	09:50	11:50	10:38	23:07	
05	09:38	09:26	11:51	11:36	–:–	

December 06, 07, 08 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	74°40.6	223°18.4	S10°39.3	166°19.6	S24°16.5	79°38.1	S03°38.5	239°58.9	S03°46.9
1	89°43.0	238°19.4	39.5	181°20.0	16.6	94°40.4	38.4	255°01.2	47.0
2	104°45.5	253°20.4	39.7	196°20.4	16.6	109°42.8	38.4	270°03.5	47.1
3	119°48.0	268°21.4	·· 39.9	211°20.8	·· 16.7	124°45.1	·· 38.3	285°05.7	·· 47.1
4	134°50.4	283°22.4	40.1	226°21.2	16.7	139°47.4	38.2	300°08.0	47.2
5	149°52.9	298°23.4	40.3	241°21.6	16.7	154°49.8	38.2	315°10.3	47.3
6	164°55.4	313°24.4	S10°40.5	256°22.0	S24°16.8	169°52.1	S03°38.1	330°12.6	S03°47.4
7	179°57.8	328°25.4	40.7	271°22.4	16.8	184°54.4	38.0	345°14.8	47.4
8	195°00.3	343°26.4	40.9	286°22.8	16.8	199°56.7	37.9	0°17.1	47.5
9	210°02.8	358°27.4	·· 41.1	301°23.2	·· 16.9	214°59.1	·· 37.9	15°19.4	·· 47.6
10	225°05.2	13°28.4	41.3	316°23.6	16.9	230°01.4	37.8	30°21.6	47.6
11	240°07.7	28°29.3	41.5	331°24.0	16.9	245°03.7	37.7	45°23.9	47.7
12	255°10.1	43°30.3	S10°41.7	346°24.4	S24°17.0	260°06.1	S03°37.7	60°26.2	S03°47.8
13	270°12.6	58°31.3	41.9	1°24.7	17.0	275°08.4	37.6	75°28.5	47.8
14	285°15.1	73°32.3	42.1	16°25.1	17.0	290°10.7	37.5	90°30.7	47.9
15	300°17.5	88°33.3	·· 42.3	31°25.5	·· 17.1	305°13.1	·· 37.5	105°33.0	·· 48.0
16	315°20.0	103°34.3	42.6	46°25.9	17.1	320°15.4	37.4	120°35.3	48.1
17	330°22.5	118°35.2	42.8	61°26.3	17.1	335°17.7	37.3	135°37.5	48.1
18	345°24.9	133°36.2	S10°43.0	76°26.7	S24°17.2	350°20.0	S03°37.2	150°39.8	S03°48.2
19	0°27.4	148°37.2	43.2	91°27.1	17.2	5°22.4	37.2	165°42.1	48.3
20	15°29.9	163°38.1	43.4	106°27.5	17.2	20°24.7	37.1	180°44.4	48.3
21	30°32.3	178°39.1	·· 43.6	121°27.9	·· 17.2	35°27.0	·· 37.0	195°46.6	·· 48.4
22	45°34.8	193°40.1	43.9	136°28.3	17.3	50°29.4	37.0	210°48.9	48.5
23	60°37.3	208°41.0	44.1	151°28.7	17.3	65°31.7	36.9	225°51.2	48.5
Mer.pass.:18:58		v1.0 d-0.2 m-4.5		v0.4 d-0.0 m1.3		v2.3 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	75°39.7	223°42.0	S10°44.3	166°29.1	S24°17.3	80°34.0	S03°36.8	240°53.4	S03°48.6
1	90°42.2	238°42.9	44.5	181°29.5	17.4	95°36.3	36.8	255°55.7	48.7
2	105°44.6	253°43.9	44.7	196°29.9	17.4	110°38.7	36.7	270°58.0	48.8
3	120°47.1	268°44.8	·· 45.0	211°30.3	·· 17.4	125°41.0	·· 36.6	286°00.3	·· 48.8
4	135°49.6	283°45.8	45.2	226°30.6	17.4	140°43.3	36.5	301°02.5	48.9
5	150°52.0	298°46.7	45.4	241°31.0	17.5	155°45.6	36.5	316°04.8	49.0
6	165°54.5	313°47.7	S10°45.7	256°31.4	S24°17.5	170°48.0	S03°36.4	331°07.1	S03°49.0
7	180°57.0	328°48.6	45.9	271°31.8	17.5	185°50.3	36.3	346°09.4	49.1
8	195°59.4	343°49.6	46.1	286°32.2	17.5	200°52.6	36.2	1°11.6	49.2
9	211°01.9	358°50.5	·· 46.4	301°32.6	·· 17.6	215°54.9	·· 36.2	16°13.9	·· 49.2
10	226°04.4	13°51.5	46.6	316°33.0	17.6	230°57.3	36.1	31°16.2	49.3
11	241°06.8	28°52.4	46.8	331°33.4	17.6	245°59.6	36.0	46°18.5	49.4
12	256°09.3	43°53.3	S10°47.1	346°33.8	S24°17.6	261°01.9	S03°36.0	61°20.7	S03°49.4
13	271°11.8	58°54.3	47.3	1°34.2	17.6	276°04.2	35.9	76°23.0	49.5
14	286°14.2	73°55.2	47.5	16°34.6	17.7	291°06.5	35.8	91°25.3	49.6
15	301°16.7	88°56.1	·· 47.8	31°35.0	·· 17.7	306°08.9	·· 35.7	106°27.6	·· 49.7
16	316°19.1	103°57.0	48.0	46°35.3	17.7	321°11.2	35.7	121°29.8	49.7
17	331°21.6	118°58.0	48.3	61°35.7	17.7	336°13.5	35.6	136°32.1	49.8
18	346°24.1	133°58.9	S10°48.5	76°36.1	S24°17.7	351°15.8	S03°35.5	151°34.4	S03°49.9
19	1°26.5	148°59.8	48.8	91°36.5	17.8	6°18.2	35.4	166°36.7	49.9
20	16°29.0	164°00.7	49.0	106°36.9	17.8	21°20.5	35.4	181°38.9	50.0
21	31°31.5	179°01.6	·· 49.3	121°37.3	·· 17.8	36°22.8	·· 35.3	196°41.2	·· 50.1
22	46°33.9	194°02.5	49.5	136°37.7	17.8	51°25.1	35.2	211°43.5	50.1
23	61°36.4	209°03.5	49.8	151°38.1	17.8	66°27.4	35.1	226°45.8	50.2
Mer.pass.:18:54		v1.0 d-0.2 m-4.5		v0.4 d-0.0 m1.3		v2.3 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	76°38.9	224°04.4	S10°50.0	166°38.5	S24°17.8	81°29.8	S03°35.1	241°48.0	S03°50.3
1	91°41.3	239°05.3	50.3	181°38.9	17.9	96°32.1	35.0	256°50.3	50.3
2	106°43.8	254°06.2	50.5	196°39.3	17.9	111°34.4	34.9	271°52.6	50.4
3	121°46.2	269°07.1	·· 50.8	211°39.6	·· 17.9	126°36.7	·· 34.9	286°54.9	·· 50.5
4	136°48.7	284°08.0	51.0	226°40.0	17.9	141°39.0	34.8	301°57.1	50.5
5	151°51.2	299°08.9	51.3	241°40.4	17.9	156°41.3	34.7	316°59.4	50.6
6	166°53.6	314°09.8	S10°51.5	256°40.8	S24°17.9	171°43.7	S03°34.6	332°01.7	S03°50.7
7	181°56.1	329°10.7	51.8	271°41.2	17.9	186°46.0	34.5	347°04.0	50.7
8	196°58.6	344°11.6	52.1	286°41.6	18.0	201°48.3	34.5	2°06.3	50.8
9	212°01.0	359°12.4	·· 52.3	301°42.0	·· 18.0	216°50.6	·· 34.4	17°08.5	·· 50.9
10	227°03.5	14°13.3	52.6	316°42.4	18.0	231°52.9	34.3	32°10.8	50.9
11	242°06.0	29°14.2	52.8	331°42.8	18.0	246°55.2	34.2	47°13.1	51.0
12	257°08.4	44°15.1	S10°53.1	346°43.2	S24°18.0	261°57.6	S03°34.2	62°15.4	S03°51.1
13	272°10.9	59°16.0	53.4	1°43.5	18.0	276°59.9	34.1	77°17.6	51.1
14	287°13.4	74°16.9	53.6	16°43.9	18.0	292°02.2	34.0	92°19.9	51.2
15	302°15.8	89°17.7	·· 53.9	31°44.3	·· 18.0	307°04.5	·· 33.9	107°22.2	·· 51.3
16	317°18.3	104°18.6	54.2	46°44.7	18.0	322°06.8	33.9	122°24.5	51.4
17	332°20.7	119°19.5	54.4	61°45.1	18.1	337°09.1	33.8	137°26.7	51.4
18	347°23.2	134°20.4	S10°54.7	76°45.5	S24°18.1	352°11.4	S03°33.7	152°29.0	S03°51.5
19	2°25.7	149°21.2	55.0	91°45.9	18.1	7°13.8	33.6	167°31.3	51.6
20	17°28.1	164°22.1	55.3	106°46.3	18.1	22°16.1	33.6	182°33.6	51.6
21	32°30.6	179°23.0	·· 55.5	121°46.6	·· 18.1	37°18.4	·· 33.5	197°35.9	·· 51.7
22	47°33.1	194°23.8	55.8	136°47.0	18.1	52°20.7	33.4	212°38.1	51.8
23	62°35.5	209°24.7	56.1	151°47.4	18.1	67°23.0	33.3	227°40.4	51.8
Mer.pass.:18:50		v0.9 d-0.3 m-4.5		v0.4 d-0.0 m1.3		v2.3 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.5	56°36.2
Diphda	348°57.5	-17°55.6
Achernar	335°27.6	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°16.8	89°18.9
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.5	-8°11.3
Capella	280°36.7	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.5	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.0
Sirius	258°35.0	-16°43.9
Adhara	255°13.6	-28°59.2
Procyon	245°01.4	5°11.7
Pollux	243°29.6	27°59.8
Avior	234°18.4	-59°32.5
Suhail	222°53.6	-43°28.5
Miaplacidus	221°39.7	-69°45.5
Alphard	217°57.7	-8°42.4
Regulus	207°45.4	11°54.7
Dubhe	193°53.8	61°41.1
Denebola	182°35.6	14°30.5
Gienah	175°54.3	-17°36.1
Acrux	173°11.8	-63°09.4
Gacrux	172°03.3	-57°10.3
Alioth	166°22.4	55°53.7
Spica	158°33.4	-11°13.1
Alkaid	153°00.6	49°15.3
Hadar	148°51.1	-60°25.4
Menkent	148°10.1	-36°25.3
Arcturus	145°57.6	19°07.4
Rigil Kent.	139°54.8	-60°52.6
Kochab	137°20.8	74°06.4
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.9	26°40.6
Antares	112°28.9	-26°27.3
Atria	107°33.0	-69°02.8
Sabik	102°15.0	-15°44.2
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.4
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.0	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 06 Mon	**SHA**	**Mer.pass**
Venus	148°37.8	09:06
Mars	91°39.0	12:54
Jupiter	4°57.5	18:39
Saturn	165°18.4	07:59

Dec 07 Tue	**SHA**	**Mer.pass**
Venus	148°02.3	09:05
Mars	90°49.4	12:54
Jupiter	4°54.3	18:35
Saturn	165°13.7	07:55

Dec 08 Wed	**SHA**	**Mer.pass**
Venus	147°25.5	09:03
Mars	89°59.6	12:53
Jupiter	4°50.9	18:31
Saturn	165°09.2	07:52

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.1245 sec ΔT = TT-UT1 = +66.3085 sec

2010 December 06 to Dec. 08 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°18.3	S22°26.9	178°51.7	6.4'	S24°13.5	-0.3'	57.7'
1	197°18.0	27.2	193°17.1	6.4'	24°13.7	-0.2'	57.7'
2	212°17.8	27.5	207°42.5	6.4'	24°13.8	-0.0'	57.6'
3	227°17.5	·· 27.8	222°08.0	6.5'	24°13.8	0.1'	57.6'
4	242°17.2	28.1	236°33.5	6.5'	24°13.6	0.3'	57.6'
5	257°17.0	28.4	250°59.0	6.6'	24°13.2	0.4'	57.6'
6	272°16.7	S22°28.7	265°24.6	6.6'	S24°12.7	0.6'	57.5'
7	287°16.5	29.0	279°50.2	6.6'	24°12.1	0.7'	57.5'
8	302°16.2	29.3	294°15.8	6.7'	24°11.3	0.9'	57.5'
9	317°15.9	·· 29.6	308°41.5	6.7'	24°10.3	1.0'	57.5'
10	332°15.7	29.9	323°07.3	6.8'	24°09.2	1.2'	57.4'
11	347°15.4	30.2	337°33.1	6.8'	24°08.0	1.3'	57.4'
12	2°15.1	S22°30.5	351°58.9	6.9'	S24°06.6	1.5'	57.4'
13	17°14.9	30.8	6°24.8	6.9'	24°05.1	1.6'	57.3'
14	32°14.6	31.1	20°50.7	7.0'	24°03.4	1.7'	57.3'
15	47°14.3	·· 31.4	35°16.7	7.0'	24°01.6	1.9'	57.3'
16	62°14.1	31.7	49°42.8	7.1'	23°59.7	2.0'	57.3'
17	77°13.8	32.0	64°08.9	7.1'	23°57.6	2.2'	57.2'
18	92°13.5	S22°32.3	78°35.0	7.2'	S23°55.3	2.3'	57.2'
19	107°13.3	32.6	93°01.2	7.2'	23°53.0	2.4'	57.2'
20	122°13.0	32.9	107°27.5	7.3'	23°50.5	2.6'	57.2'
21	137°12.7	·· 33.2	121°53.8	7.4'	23°47.8	2.7'	57.1'
22	152°12.5	33.5	136°20.2	7.4'	23°45.0	2.9'	57.1'
23	167°12.2	33.7	150°46.7	7.5'	23°42.1	3.0'	57.1'
	SD.=16.2	d=-0.3	S.D.=15.6				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°11.9	S22°34.0	165°13.2	7.6'	S23°39.0	3.1'	57.0'
1	197°11.7	34.3	179°39.8	7.6'	23°35.8	3.3'	57.0'
2	212°11.4	34.6	194°06.4	7.7'	23°32.5	3.4'	57.0'
3	227°11.1	·· 34.9	208°33.1	7.8'	23°29.1	3.5'	57.0'
4	242°10.9	35.2	222°59.9	7.8'	23°25.5	3.7'	56.9'
5	257°10.6	35.5	237°26.8	7.9'	23°21.7	3.8'	56.9'
6	272°10.3	S22°35.7	251°53.7	8.0'	S23°17.9	3.9'	56.9'
7	287°10.1	36.0	266°20.7	8.0'	23°13.9	4.0'	56.8'
8	302°09.8	36.3	280°47.8	8.1'	23°09.8	4.2'	56.8'
9	317°09.5	·· 36.6	295°14.9	8.2'	23°05.5	4.3'	56.8'
10	332°09.2	36.9	309°42.1	8.3'	23°01.2	4.4'	56.8'
11	347°09.0	37.1	324°09.4	8.3'	22°56.7	4.6'	56.7'
12	2°08.7	S22°37.4	338°36.8	8.4'	S22°52.1	4.7'	56.7'
13	17°08.4	37.7	353°04.2	8.5'	22°47.3	4.8'	56.7'
14	32°08.2	38.0	7°31.8	8.6'	22°42.5	4.9'	56.6'
15	47°07.9	·· 38.3	21°59.4	8.6'	22°37.5	5.0'	56.6'
16	62°07.6	38.5	36°27.1	8.7'	22°32.4	5.2'	56.6'
17	77°07.4	38.8	50°54.8	8.8'	22°27.2	5.3'	56.6'
18	92°07.1	S22°39.1	65°22.7	8.9'	S22°21.8	5.4'	56.5'
19	107°06.8	39.4	79°50.6	9.0'	22°16.4	5.5'	56.5'
20	122°06.5	39.6	94°18.6	9.0'	22°10.8	5.6'	56.5'
21	137°06.3	·· 39.9	108°46.7	9.1'	22°05.1	5.7'	56.5'
22	152°06.0	40.2	123°14.8	9.2'	21°59.3	5.9'	56.4'
23	167°05.7	40.4	137°43.1	9.3'	21°53.4	6.0'	56.4'
	SD.=16.2	d=-0.3	S.D.=15.5				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°05.5	S22°40.7	152°11.4	9.4'	S21°47.4	6.1'	56.4'
1	197°05.2	41.0	166°39.9	9.5'	21°41.2	6.2'	56.3'
2	212°04.9	41.2	181°08.4	9.5'	21°35.0	6.3'	56.3'
3	227°04.6	·· 41.5	195°37.0	9.6'	21°28.6	6.4'	56.3'
4	242°04.4	41.8	210°05.6	9.7'	21°22.2	6.5'	56.3'
5	257°04.1	42.0	224°34.4	9.8'	21°15.6	6.6'	56.2'
6	272°03.8	S22°42.3	239°03.2	9.9'	S21°09.0	6.7'	56.2'
7	287°03.5	42.6	253°32.2	10.0'	21°02.2	6.8'	56.2'
8	302°03.3	42.8	268°01.2	10.1'	20°55.3	6.9'	56.1'
9	317°03.0	·· 43.1	282°30.3	10.2'	20°48.3	7.0'	56.1'
10	332°02.7	43.4	296°59.5	10.2'	20°41.3	7.1'	56.1'
11	347°02.4	43.6	311°28.8	10.3'	20°34.1	7.2'	56.1'
12	2°02.2	S22°43.9	325°58.1	10.4'	S20°26.8	7.3'	56.0'
13	17°01.9	44.1	340°27.6	10.5'	20°19.4	7.4'	56.0'
14	32°01.6	44.4	354°57.1	10.6'	20°12.0	7.5'	56.0'
15	47°01.3	·· 44.7	9°26.8	10.7'	20°04.4	7.6'	56.0'
16	62°01.1	44.9	23°56.5	10.8'	19°56.8	7.7'	55.9'
17	77°00.8	45.2	38°26.3	10.8'	19°49.0	7.8'	55.9'
18	92°00.5	S22°45.4	52°56.2	10.9'	S19°41.2	7.9'	55.9'
19	107°00.2	45.7	67°26.1	11.0'	19°33.3	8.0'	55.9'
20	122°00.0	45.9	81°56.2	11.1'	19°25.3	8.1'	55.8'
21	136°59.7	·· 46.2	96°26.4	11.2'	19°17.2	8.1'	55.8'
22	151°59.4	46.4	110°56.6	11.3'	19°09.0	8.2'	55.8'
23	166°59.1	46.7	125°26.9	11.4'	19°00.7	8.3'	55.7'
	SD.=16.2	d=-0.3	S.D.=15.3				

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

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

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 1-3 1-8%
06	09:13	09:01	11:51	12:33	00:05	●
07	08:48	08:35	11:51	13:29	01:01	
08	08:22	08:09	11:52	14:21	01:55	

December 09, 10, 11 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	77°38.0	224°25.5	S10°56.4	166°47.8	S24°18.1	82°25.3	S03°33.2	242°42.7	S03°51.9
1	92°40.5	239°26.4	56.7	181°48.2	18.1	97°27.6	33.2	257°45.0	52.0
2	107°42.9	254°27.3	56.9	196°48.6	18.1	112°29.9	33.1	272°47.3	52.0
3	122°45.4	269°28.1	·· 57.2	211°49.0	·· 18.1	127°32.3	·· 33.0	287°49.5	·· 52.1
4	137°47.9	284°29.0	57.5	226°49.4	18.1	142°34.6	32.9	302°51.8	52.2
5	152°50.3	299°29.8	57.8	241°49.8	18.1	157°36.9	32.9	317°54.1	52.2
6	167°52.8	314°30.7	S10°58.1	256°50.1	S24°18.1	172°39.2	S03°32.8	332°56.4	S03°52.3
7	182°55.2	329°31.5	58.3	271°50.5	18.1	187°41.5	32.7	347°58.7	52.4
8	197°57.7	344°32.3	58.6	286°50.9	18.1	202°43.8	32.6	3°00.9	52.4
9	213°00.2	359°33.2	·· 58.9	301°51.3	·· 18.1	217°46.1	·· 32.5	18°03.2	·· 52.5
10	228°02.6	14°34.0	59.2	316°51.7	18.1	232°48.4	32.5	33°05.5	52.6
11	243°05.1	29°34.9	59.5	331°52.1	18.1	247°50.7	32.4	48°07.8	52.6
12	258°07.6	44°35.7	S10°59.8	346°52.5	S24°18.1	262°53.0	S03°32.3	63°10.1	S03°52.7
13	273°10.0	59°36.5	11°00.1	1°52.8	18.1	277°55.3	32.2	78°12.3	52.8
14	288°12.5	74°37.4	00.4	16°53.2	18.1	292°57.7	32.1	93°14.6	52.8
15	303°15.0	89°38.2	·· 00.7	31°53.6	·· 18.1	308°00.0	·· 32.1	108°16.9	·· 52.9
16	318°17.4	104°39.0	01.0	46°54.0	18.1	323°02.3	32.0	123°19.2	52.9
17	333°19.9	119°39.8	01.3	61°54.4	18.1	338°04.6	31.9	138°21.5	53.0
18	348°22.4	134°40.7	S11°01.6	76°54.8	S24°18.1	353°06.9	S03°31.8	153°23.7	S03°53.1
19	3°24.8	149°41.5	01.9	91°55.2	18.1	8°09.2	31.8	168°26.0	53.1
20	18°27.3	164°42.3	02.2	106°55.6	18.1	23°11.5	31.7	183°28.3	53.2
21	33°29.7	179°43.1	·· 02.5	121°55.9	·· 18.1	38°13.8	·· 31.6	198°30.6	·· 53.3
22	48°32.2	194°43.9	02.8	136°56.3	18.1	53°16.1	31.5	213°32.9	53.3
23	63°34.7	209°44.8	03.1	151°56.7	18.1	68°18.4	31.4	228°35.1	53.4
Mer.pass.:18:46		v0.9 d-0.3 m-4.4		v0.4 d-0.0 m1.3		v2.3 d0.1 m-2.4		v2.3 d-0.1 m0.9	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	78°37.1	224°45.6	S11°03.4	166°57.1	S24°18.1	83°20.7	S03°31.3	243°37.4	S03°53.5
1	93°39.6	239°46.4	03.7	181°57.5	18.1	98°23.0	31.3	258°39.7	53.5
2	108°42.1	254°47.2	04.0	196°57.9	18.1	113°25.3	31.2	273°42.0	53.6
3	123°44.5	269°48.0	·· 04.3	211°58.3	·· 18.1	128°27.6	·· 31.1	288°44.3	·· 53.7
4	138°47.0	284°48.8	04.6	226°58.6	18.1	143°29.9	31.0	303°46.6	53.7
5	153°49.5	299°49.6	04.9	241°59.0	18.1	158°32.2	30.9	318°48.8	53.8
6	168°51.9	314°50.4	S11°05.2	256°59.4	S24°18.0	173°34.5	S03°30.9	333°51.1	S03°53.9
7	183°54.4	329°51.2	05.5	271°59.8	18.0	188°36.8	30.8	348°53.4	53.9
8	198°56.9	344°52.0	05.8	287°00.2	18.0	203°39.1	30.7	3°55.7	54.0
9	213°59.3	359°52.8	·· 06.2	302°00.6	·· 18.0	218°41.4	·· 30.6	18°58.0	·· 54.1
10	229°01.8	14°53.6	06.5	317°00.9	18.0	233°43.7	30.5	34°00.3	54.1
11	244°04.2	29°54.4	06.8	332°01.3	18.0	248°46.0	30.5	49°02.5	54.2
12	259°06.7	44°55.2	S11°07.1	347°01.7	S24°18.0	263°48.3	S03°30.4	64°04.8	S03°54.3
13	274°09.2	59°55.9	07.4	2°02.1	18.0	278°50.6	30.3	79°07.1	54.3
14	289°11.6	74°56.7	07.7	17°02.5	18.0	293°52.9	30.2	94°09.4	54.4
15	304°14.1	89°57.5	·· 08.1	32°02.9	·· 17.9	308°55.2	·· 30.1	109°11.7	·· 54.4
16	319°16.6	104°58.3	08.4	47°03.3	17.9	323°57.5	30.0	124°14.0	54.5
17	334°19.0	119°59.1	08.7	62°03.6	17.9	338°59.8	30.0	139°16.2	54.6
18	349°21.5	134°59.8	S11°09.0	77°04.0	S24°17.9	354°02.1	S03°29.9	154°18.5	S03°54.6
19	4°24.0	150°00.6	09.3	92°04.4	17.9	9°04.4	29.8	169°20.8	54.7
20	19°26.4	165°01.4	09.7	107°04.8	17.9	24°06.7	29.7	184°23.1	54.8
21	34°28.9	180°02.2	·· 10.0	122°05.2	·· 17.9	39°09.0	·· 29.6	199°25.4	·· 54.8
22	49°31.3	195°02.9	10.3	137°05.6	17.8	54°11.3	29.5	214°27.7	54.9
23	64°33.8	210°03.7	10.6	152°05.9	17.8	69°13.6	29.5	229°29.9	55.0
Mer.pass.:18:42		v0.8 d-0.3 m-4.4		v0.4 d0.0 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.9	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	79°36.3	225°04.5	S11°11.0	167°06.3	S24°17.8	84°15.9	S03°29.4	244°32.2	S03°55.0
1	94°38.7	240°05.2	11.3	182°06.7	17.8	99°18.2	29.3	259°34.5	55.1
2	109°41.2	255°06.0	11.6	197°07.1	17.8	114°20.5	29.2	274°36.8	55.2
3	124°43.7	270°06.8	·· 12.0	212°07.5	·· 17.8	129°22.8	·· 29.1	289°39.1	·· 55.2
4	139°46.1	285°07.5	12.3	227°07.9	17.7	144°25.1	29.0	304°41.4	55.3
5	154°48.6	300°08.3	12.6	242°08.2	17.7	159°27.4	29.0	319°43.7	55.3
6	169°51.1	315°09.0	S11°13.0	257°08.6	S24°17.7	174°29.7	S03°28.9	334°45.9	S03°55.4
7	184°53.5	330°09.8	13.3	272°09.0	17.7	189°32.0	28.8	349°48.2	55.5
8	199°56.0	345°10.5	13.6	287°09.4	17.7	204°34.3	28.7	4°50.5	55.5
9	214°58.5	0°11.3	·· 14.0	302°09.8	·· 17.6	219°36.6	·· 28.6	19°52.8	·· 55.6
10	230°00.9	15°12.0	14.3	317°10.2	17.6	234°38.9	28.5	34°55.1	55.7
11	245°03.4	30°12.8	14.7	332°10.5	17.6	249°41.2	28.4	49°57.4	55.7
12	260°05.8	45°13.5	S11°15.0	347°10.9	S24°17.6	264°43.5	S03°28.4	64°59.7	S03°55.8
13	275°08.3	60°14.3	15.3	2°11.3	17.5	279°45.8	28.3	80°01.9	55.9
14	290°10.8	75°15.0	15.7	17°11.7	17.5	294°48.1	28.2	95°04.2	55.9
15	305°13.2	90°15.7	·· 16.0	32°12.1	·· 17.5	309°50.3	·· 28.1	110°06.5	·· 56.0
16	320°15.7	105°16.5	16.4	47°12.5	17.5	324°52.6	28.0	125°08.8	56.0
17	335°18.2	120°17.2	16.7	62°12.8	17.4	339°54.9	27.9	140°11.1	56.1
18	350°20.6	135°17.9	S11°17.1	77°13.2	S24°17.4	354°57.2	S03°27.8	155°13.4	S03°56.2
19	5°23.1	150°18.7	17.4	92°13.6	17.4	9°59.5	27.8	170°15.7	56.2
20	20°25.6	165°19.4	17.7	107°14.0	17.4	25°01.8	27.7	185°18.0	56.3
21	35°28.0	180°20.1	·· 18.1	122°14.4	·· 17.3	40°04.1	·· 27.6	200°20.2	·· 56.4
22	50°30.5	195°20.8	18.4	137°14.8	17.3	55°06.4	27.5	215°22.5	56.4
23	65°33.0	210°21.6	18.8	152°15.1	17.3	70°08.7	27.4	230°24.8	56.5
Mer.pass.:18:39		v0.8 d-0.3 m-4.4		v0.4 d0.0 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.9	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.5	56°36.2
Diphda	348°57.5	-17°55.6
Achernar	335°27.6	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°17.4	89°19.0
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.3
Capella	280°36.6	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.5	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.0
Sirius	258°35.0	-16°43.9
Adhara	255°13.6	-28°59.2
Procyon	245°01.3	5°11.7
Pollux	243°29.6	27°59.8
Avior	234°18.4	-59°32.5
Suhail	222°53.6	-43°28.5
Miaplacidus	221°39.7	-69°45.5
Alphard	217°57.7	-8°42.4
Regulus	207°45.3	11°54.7
Dubhe	193°53.7	61°41.1
Denebola	182°35.5	14°30.5
Gienah	175°54.3	-17°36.1
Acrux	173°11.7	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.4	55°53.7
Spica	158°33.4	-11°13.1
Alkaid	153°00.6	49°15.2
Hadar	148°51.0	-60°25.4
Menkent	148°10.0	-36°25.3
Arcturus	145°57.6	19°07.4
Rigil Kent.	139°54.8	-60°52.6
Kochab	137°20.8	74°06.4
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.9	26°40.6
Antares	112°28.9	-26°27.3
Atria	107°32.9	-69°02.8
Sabik	102°15.0	-15°44.3
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.3
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.1	45°19.5
Enif	33°49.0	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 09 Thu	**SHA**	**Mer.pass**
Venus	146°47.5	09:02
Mars	89°09.8	12:52
Jupiter	4°47.3	18:27
Saturn	165°04.7	07:48

Dec 10 Fri	**SHA**	**Mer.pass**
Venus	146°08.4	09:00
Mars	88°20.0	12:52
Jupiter	4°43.6	18:24
Saturn	165°00.3	07:44

Dec 11 Sat	**SHA**	**Mer.pass**
Venus	145°28.2	08:59
Mars	87°30.1	12:51
Jupiter	4°39.6	18:20
Saturn	164°56.0	07:41

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.1264 sec ΔT = TT-UT1 = +66.3104 sec

2010 December 09 to Dec. 11 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°58.8	S22°46.9	139°57.3	11.5'	S18°52.4	8.4'	55.7'
1	196°58.6	47.2	154°27.8	11.5'	18°43.9	8.5'	55.7'
2	211°58.3	47.4	168°58.4	11.6'	18°35.4	8.6'	55.7'
3	226°58.0	· · 47.7	183°29.1	11.7'	18°26.8	8.6'	55.6'
4	241°57.7	47.9	197°59.8	11.8'	18°18.1	8.7'	55.6'
5	256°57.5	48.2	212°30.7	11.9'	18°09.4	8.8'	55.6'
6	271°57.2	S22°48.4	227°01.6	12.0'	S18°00.5	8.9'	55.6'
7	286°56.9	48.7	241°32.6	12.0'	17°51.6	8.9'	55.5'
8	301°56.6	48.9	256°03.7	12.1'	17°42.6	9.0'	55.5'
9	316°56.3	· · 49.2	270°34.8	12.2'	17°33.6	9.1'	55.5'
10	331°56.1	49.4	285°06.1	12.3'	17°24.4	9.2'	55.5'
11	346°55.8	49.6	299°37.4	12.4'	17°15.2	9.2'	55.4'
12	1°55.5	S22°49.9	314°08.8	12.5'	S17°06.0	9.3'	55.4'
13	16°55.2	50.1	328°40.3	12.5'	16°56.6	9.4'	55.4'
14	31°54.9	50.4	343°11.9	12.6'	16°47.2	9.4'	55.4'
15	46°54.7	· · 50.6	357°43.6	12.7'	16°37.7	9.5'	55.4'
16	61°54.4	50.8	12°15.3	12.8'	16°28.2	9.6'	55.3'
17	76°54.1	51.1	26°47.1	12.9'	16°18.6	9.6'	55.3'
18	91°53.8	S22°51.3	41°19.0	12.9'	S16°08.9	9.7'	55.3'
19	106°53.5	51.6	55°51.0	13.0'	15°59.1	9.8'	55.3'
20	121°53.3	51.8	70°23.0	13.1'	15°49.3	9.8'	55.2'
21	136°53.0	· · 52.0	84°55.2	13.2'	15°39.5	9.9'	55.2'
22	151°52.7	52.3	99°27.4	13.2'	15°29.5	10.0'	55.2'
23	166°52.4	52.5	113°59.7	13.3'	15°19.6	10.0'	55.2'
	SD.=16.2	d=-0.2	S.D.=15.1				

Fri	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°52.1	S22°52.7	128°32.0	13.4'	S15°09.5	10.1'	55.1'
1	196°51.8	53.0	143°04.4	13.5'	14°59.4	10.1'	55.1'
2	211°51.6	53.2	157°36.9	13.5'	14°49.2	10.2'	55.1'
3	226°51.3	· · 53.4	172°09.5	13.6'	14°39.0	10.2'	55.1'
4	241°51.0	53.6	186°42.2	13.7'	14°28.8	10.3'	55.1'
5	256°50.7	53.9	201°14.9	13.8'	14°18.4	10.4'	55.0'
6	271°50.4	S22°54.1	215°47.7	13.8'	S14°08.1	10.4'	55.0'
7	286°50.2	54.3	230°20.5	13.9'	13°57.6	10.5'	55.0'
8	301°49.9	54.6	244°53.5	14.0'	13°47.2	10.5'	55.0'
9	316°49.6	· · 54.8	259°26.5	14.0'	13°36.6	10.6'	55.0'
10	331°49.3	55.0	273°59.5	14.1'	13°26.0	10.6'	54.9'
11	346°49.0	55.2	288°32.7	14.2'	13°15.4	10.7'	54.9'
12	1°48.7	S22°55.4	303°05.9	14.2'	S13°04.7	10.7'	54.9'
13	16°48.5	55.7	317°39.1	14.3'	12°54.0	10.7'	54.9'
14	31°48.2	55.9	332°12.5	14.4'	12°43.3	10.8'	54.9'
15	46°47.9	· · 56.1	346°45.8	14.4'	12°32.4	10.8'	54.8'
16	61°47.6	56.3	1°19.3	14.5'	12°21.6	10.9'	54.8'
17	76°47.3	56.5	15°52.8	14.5'	12°10.7	10.9'	54.8'
18	91°47.0	S22°56.8	30°26.4	14.6'	S11°59.8	11.0'	54.8'
19	106°46.7	57.0	45°00.0	14.7'	11°48.8	11.0'	54.8'
20	121°46.5	57.2	59°33.7	14.7'	11°37.7	11.0'	54.8'
21	136°46.2	· · 57.4	74°07.5	14.8'	11°26.7	11.1'	54.7'
22	151°45.9	57.6	88°41.3	14.8'	11°15.6	11.1'	54.7'
23	166°45.6	57.8	103°15.2	14.9'	11°04.4	11.2'	54.7'
	SD.=16.2	d=-0.2	S.D.=15.0				

Sat	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°45.3	S22°58.1	117°49.1	15.0'	S10°53.3	11.2'	54.7'
1	196°45.0	58.3	132°23.1	15.0'	10°42.1	11.2'	54.7'
2	211°44.7	58.5	146°57.1	15.1'	10°30.8	11.3'	54.7'
3	226°44.5	· · 58.7	161°31.2	15.1'	10°19.5	11.3'	54.6'
4	241°44.2	58.9	176°05.3	15.2'	10°08.2	11.3'	54.6'
5	256°43.9	59.1	190°39.5	15.2'	09°56.9	11.4'	54.6'
6	271°43.6	S22°59.3	205°13.8	15.3'	S09°45.5	11.4'	54.6'
7	286°43.3	59.5	219°48.1	15.3'	09°34.1	11.4'	54.6'
8	301°43.0	59.7	234°22.4	15.4'	09°22.6	11.5'	54.6'
9	316°42.7	22°59.9	248°56.8	15.4'	09°11.2	11.5'	54.5'
10	331°42.4	23°00.1	263°31.2	15.5'	08°59.7	11.5'	54.5'
11	346°42.2	00.3	278°05.7	15.5'	08°48.1	11.5'	54.5'
12	1°41.9	S23°00.5	292°40.2	15.5'	S08°36.6	11.6'	54.5'
13	16°41.6	00.8	307°14.8	15.6'	08°25.0	11.6'	54.5'
14	31°41.3	01.0	321°49.4	15.6'	08°13.4	11.6'	54.5'
15	46°41.0	· · 01.2	336°24.1	15.7'	08°01.7	11.7'	54.5'
16	61°40.7	01.4	350°58.8	15.7'	07°50.1	11.7'	54.5'
17	76°40.4	01.6	5°33.5	15.8'	07°38.4	11.7'	54.4'
18	91°40.1	S23°01.8	20°08.3	15.8'	S07°26.6	11.7'	54.4'
19	106°39.8	02.0	34°43.1	15.8'	07°14.9	11.7'	54.4'
20	121°39.6	02.2	49°17.9	15.9'	07°03.2	11.8'	54.4'
21	136°39.3	· · 02.3	63°52.8	15.9'	06°51.4	11.8'	54.4'
22	151°39.0	02.5	78°27.7	15.9'	06°39.6	11.8'	54.4'
23	166°38.7	02.7	93°02.7	16.0'	06°27.8	11.8'	54.4'
	SD.=16.2	d=-0.2	S.D.=14.9				

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

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 15-31%
09	07:55	07:42	11:52	15:09	02:46	
10	07:29	07:15	11:53	15:55	03:32	
11	07:01	06:47	11:53	16:37	04:16	

December 12, 13, 14 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	80°35.4	225°22.3	S11°19.1	167°15.5	S24°17.3	85°11.0	S03°27.3	245°27.1	S03°56.5
1	95°37.9	240°23.0	19.5	182°15.9	17.2	100°13.3	27.2	260°29.4	56.6
2	110°40.3	255°23.7	19.9	197°16.3	17.2	115°15.5	27.2	275°31.7	56.7
3	125°42.8	270°24.4	·· 20.2	212°16.7	·· 17.2	130°17.8	·· 27.1	290°34.0	·· 56.7
4	140°45.3	285°25.2	20.6	227°17.0	17.1	145°20.1	27.0	305°36.3	56.8
5	155°47.7	300°25.9	20.9	242°17.4	17.1	160°22.4	26.9	320°38.6	56.9
6	170°50.2	315°26.6	S11°21.3	257°17.8	S24°17.1	175°24.7	S03°26.8	335°40.8	S03°56.9
7	185°52.7	330°27.3	21.6	272°18.2	17.0	190°27.0	26.7	350°43.1	57.0
8	200°55.1	345°28.0	22.0	287°18.6	17.0	205°29.3	26.6	5°45.4	57.0
9	215°57.6	0°28.7	·· 22.3	302°18.9	·· 17.0	220°31.6	·· 26.5	20°47.7	·· 57.1
10	231°00.1	15°29.4	22.7	317°19.3	16.9	235°33.8	26.4	35°50.0	57.2
11	246°02.5	30°30.1	23.1	332°19.7	16.9	250°36.1	26.4	50°52.3	57.2
12	261°05.0	45°30.8	S11°23.4	347°20.1	S24°16.9	265°38.4	S03°26.3	65°54.6	S03°57.3
13	276°07.4	60°31.5	23.8	2°20.5	16.8	280°40.7	26.2	80°56.9	57.4
14	291°09.9	75°32.2	24.2	17°20.9	16.8	295°43.0	26.1	95°59.2	57.4
15	306°12.4	90°32.9	·· 24.5	32°21.2	·· 16.8	310°45.3	·· 26.0	111°01.4	·· 57.5
16	321°14.8	105°33.6	24.9	47°21.6	16.7	325°47.6	25.9	126°03.7	57.5
17	336°17.3	120°34.3	25.3	62°22.0	16.7	340°49.8	25.8	141°06.0	57.6
18	351°19.8	135°35.0	S11°25.6	77°22.4	S24°16.7	355°52.1	S03°25.7	156°08.3	S03°57.7
19	6°22.2	150°35.7	26.0	92°22.8	16.6	10°54.4	25.7	171°10.6	57.7
20	21°24.7	165°36.3	26.4	107°23.1	16.6	25°56.7	25.6	186°12.9	57.8
21	36°27.2	180°37.0	·· 26.7	122°23.5	·· 16.6	40°59.0	·· 25.5	201°15.2	·· 57.8
22	51°29.6	195°37.7	27.1	137°23.9	16.5	56°01.3	25.4	216°17.5	57.9
23	66°32.1	210°38.4	27.5	152°24.3	16.5	71°03.5	25.3	231°19.8	58.0
Mer.pass.:18:35		v0.7 d-0.4 m-4.4		v0.4 d0.0 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	81°34.6	225°39.1	S11°27.8	167°24.7	S24°16.4	86°05.8	S03°25.2	246°22.1	S03°58.0
1	96°37.0	240°39.7	28.2	182°25.0	16.4	101°08.1	25.1	261°24.4	58.1
2	111°39.5	255°40.4	28.6	197°25.4	16.4	116°10.4	25.0	276°26.6	58.1
3	126°41.9	270°41.1	·· 29.0	212°25.8	·· 16.3	131°12.7	·· 24.9	291°28.9	·· 58.2
4	141°44.4	285°41.8	29.4	227°26.2	16.3	146°15.0	24.8	306°31.2	58.3
5	156°46.9	300°42.4	29.7	242°26.6	16.2	161°17.2	24.8	321°33.5	58.3
6	171°49.3	315°43.1	S11°30.1	257°26.9	S24°16.2	176°19.5	S03°24.7	336°35.8	S03°58.4
7	186°51.8	330°43.8	30.5	272°27.3	16.2	191°21.8	24.6	351°38.1	58.5
8	201°54.3	345°44.4	30.9	287°27.7	16.1	206°24.1	24.5	6°40.4	58.5
9	216°56.7	0°45.1	·· 31.2	302°28.1	·· 16.1	221°26.4	·· 24.4	21°42.7	·· 58.6
10	231°59.2	15°45.8	31.6	317°28.5	16.0	236°28.6	24.3	36°45.0	58.6
11	247°01.7	30°46.4	32.0	332°28.8	16.0	251°30.9	24.2	51°47.3	58.7
12	262°04.1	45°47.1	S11°32.4	347°29.2	S24°15.9	266°33.2	S03°24.1	66°49.6	S03°58.8
13	277°06.6	60°47.7	32.8	2°29.6	15.9	281°35.5	24.0	81°51.9	58.8
14	292°09.1	75°48.4	33.2	17°30.0	15.8	296°37.8	23.9	96°54.2	58.9
15	307°11.5	90°49.0	·· 33.5	32°30.4	·· 15.8	311°40.0	·· 23.8	111°56.4	·· 58.9
16	322°14.0	105°49.7	33.9	47°30.7	15.7	326°42.3	23.7	126°58.7	59.0
17	337°16.4	120°50.3	34.3	62°31.1	15.7	341°44.6	23.7	142°01.0	59.1
18	352°18.9	135°51.0	S11°34.7	77°31.5	S24°15.6	356°46.9	S03°23.6	157°03.3	S03°59.1
19	7°21.4	150°51.6	35.1	92°31.9	15.6	11°49.1	23.5	172°05.6	59.2
20	22°23.8	165°52.3	35.5	107°32.2	15.6	26°51.4	23.4	187°07.9	59.2
21	37°26.3	180°52.9	·· 35.9	122°32.6	·· 15.5	41°53.7	·· 23.3	202°10.2	·· 59.3
22	52°28.8	195°53.6	36.3	137°33.0	15.5	56°56.0	23.2	217°12.5	59.4
23	67°31.2	210°54.2	36.7	152°33.4	15.4	71°58.3	23.1	232°14.8	59.4
Mer.pass.:18:31		v0.7 d-0.4 m-4.4		v0.4 d0.0 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	82°33.7	225°54.8	S11°37.1	167°33.8	S24°15.4	87°00.5	S03°23.0	247°17.1	S03°59.5
1	97°36.2	240°55.5	37.5	182°34.1	15.3	102°02.8	22.9	262°19.4	59.5
2	112°38.6	255°56.1	37.8	197°34.5	15.2	117°05.1	22.8	277°21.7	59.6
3	127°41.1	270°56.7	·· 38.2	212°34.9	·· 15.2	132°07.4	·· 22.7	292°24.0	·· 59.7
4	142°43.5	285°57.4	38.6	227°35.3	15.1	147°09.6	22.6	307°26.3	59.7
5	157°46.0	300°58.0	39.0	242°35.7	15.1	162°11.9	22.5	322°28.6	59.8
6	172°48.5	315°58.6	S11°39.4	257°36.0	S24°15.0	177°14.2	S03°22.4	337°30.9	S03°59.8
7	187°50.9	330°59.2	39.8	272°36.4	15.0	192°16.5	22.4	352°33.2	03°59.9
8	202°53.4	345°59.9	40.2	287°36.8	14.9	207°18.7	22.3	7°35.4	04°00.0
9	217°55.9	1°00.5	·· 40.6	302°37.2	·· 14.9	222°21.0	·· 22.2	22°37.7	·· 00.0
10	232°58.3	16°01.1	41.0	317°37.5	14.8	237°23.3	22.1	37°40.0	00.1
11	248°00.8	31°01.7	41.4	332°37.9	14.8	252°25.5	22.0	52°42.3	00.1
12	263°03.3	46°02.3	S11°41.8	347°38.3	S24°14.7	267°27.8	S03°21.9	67°44.6	S04°00.2
13	278°05.7	61°03.0	42.2	2°38.7	14.7	282°30.1	21.8	82°46.9	00.2
14	293°08.2	76°03.6	42.7	17°39.1	14.6	297°32.4	21.7	97°49.2	00.3
15	308°10.7	91°04.2	·· 43.1	32°39.4	·· 14.5	312°34.6	·· 21.6	112°51.5	·· 00.4
16	323°13.1	106°04.8	43.5	47°39.8	14.5	327°36.9	21.5	127°53.8	00.4
17	338°15.6	121°05.4	43.9	62°40.2	14.4	342°39.2	21.4	142°56.1	00.5
18	353°18.0	136°06.0	S11°44.3	77°40.6	S24°14.4	357°41.4	S03°21.3	157°58.4	S04°00.5
19	8°20.5	151°06.6	44.7	92°40.9	14.3	12°43.7	21.2	173°00.7	00.6
20	23°23.0	166°07.2	45.1	107°41.3	14.2	27°46.0	21.1	188°03.0	00.7
21	38°25.4	181°07.8	·· 45.5	122°41.7	·· 14.2	42°48.3	·· 21.0	203°05.3	·· 00.7
22	53°27.9	196°08.4	45.9	137°42.1	14.1	57°50.5	20.9	218°07.6	00.8
23	68°30.4	211°09.0	46.3	152°42.5	14.1	72°52.8	20.8	233°09.9	00.8
Mer.pass.:18:27		v0.6 d-0.4 m-4.4		v0.4 d0.1 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.3	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.5	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.7	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°18.2	89°19.0
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.3
Capella	280°36.6	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.5	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.1
Sirius	258°35.0	-16°43.9
Adhara	255°13.6	-28°59.2
Procyon	245°01.3	5°11.7
Pollux	243°29.6	27°59.8
Avior	234°18.3	-59°32.5
Suhail	222°53.6	-43°28.5
Miaplacidus	221°39.6	-69°45.5
Alphard	217°57.7	-8°42.4
Regulus	207°45.3	11°54.7
Dubhe	193°53.7	61°41.1
Denebola	182°35.5	14°30.5
Gienah	175°54.3	-17°36.1
Acrux	173°11.7	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.4	55°53.7
Spica	158°33.3	-11°13.1
Alkaid	153°00.5	49°15.2
Hadar	148°51.0	-60°25.4
Menkent	148°10.0	-36°25.3
Arcturus	145°57.6	19°07.4
Rigil Kent.	139°54.8	-60°52.6
Kochab	137°20.7	74°06.4
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.9	26°40.6
Antares	112°28.9	-26°27.3
Atria	107°32.9	-69°02.8
Sabik	102°15.0	-15°44.3
Shaula	96°24.8	-37°06.7
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.3
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.8
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°54.0
Peacock	53°22.4	-56°42.1
Deneb	49°33.1	45°19.5
Enif	33°49.1	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 12 Sun	**SHA**	**Mer.pass**
Venus	144°46.9	08:58
Mars	86°40.1	12:51
Jupiter	4°35.5	18:16
Saturn	164°51.7	07:37

Dec 13 Mon	**SHA**	**Mer.pass**
Venus	144°04.5	08:57
Mars	85°50.1	12:50
Jupiter	4°31.3	18:13
Saturn	164°47.5	07:33

Dec 14 Tue	**SHA**	**Mer.pass**
Venus	143°21.1	08:56
Mars	85°00.1	12:49
Jupiter	4°26.8	18:09
Saturn	164°43.4	07:30

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.1282 sec ΔT = TT-UT1 = +66.3122 sec

2010 December 12 to Dec. 14 UT

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°38.4	S23°02.9	107°37.7	16.0'	S06°15.9	11.9'	54.4'
1	196°38.1	03.1	122°12.7	16.0'	06°04.1	11.9'	54.4'
2	211°37.8	03.3	136°47.7	16.1'	05°52.2	11.9'	54.4'
3	226°37.5	· · 03.5	151°22.8	16.1'	05°40.3	11.9'	54.3'
4	241°37.2	03.7	165°57.9	16.1'	05°28.4	11.9'	54.3'
5	256°37.0	03.9	180°33.1	16.2'	05°16.4	11.9'	54.3'
6	271°36.7	S23°04.1	195°08.2	16.2'	S05°04.5	12.0'	54.3'
7	286°36.4	04.3	209°43.4	16.2'	04°52.5	12.0'	54.3'
8	301°36.1	04.5	224°18.6	16.2'	04°40.6	12.0'	54.3'
9	316°35.8	· · 04.6	238°53.9	16.3'	04°28.6	12.0'	54.3'
10	331°35.5	04.8	253°29.1	16.3'	04°16.6	12.0'	54.3'
11	346°35.2	05.0	268°04.4	16.3'	04°04.6	12.0'	54.3'
12	1°34.9	S23°05.2	282°39.7	16.3'	S03°52.5	12.0'	54.3'
13	16°34.6	05.4	297°15.1	16.3'	03°40.5	12.0'	54.3'
14	31°34.3	05.6	311°50.4	16.4'	03°28.5	12.1'	54.3'
15	46°34.0	· · 05.7	326°25.8	16.4'	03°16.4	12.1'	54.3'
16	61°33.7	05.9	341°01.2	16.4'	03°04.3	12.1'	54.3'
17	76°33.5	06.1	355°36.6	16.4'	02°52.3	12.1'	54.2'
18	91°33.2	S23°06.3	10°12.0	16.4'	S02°40.2	12.1'	54.2'
19	106°32.9	06.5	24°47.4	16.4'	02°28.1	12.1'	54.2'
20	121°32.6	06.6	39°22.8	16.4'	02°16.0	12.1'	54.2'
21	136°32.3	· · 06.8	53°58.3	16.5'	02°03.9	12.1'	54.2'
22	151°32.0	07.0	68°33.8	16.5'	01°51.8	12.1'	54.2'
23	166°31.7	07.2	83°09.2	16.5'	01°39.7	12.1'	54.2'
	SD.=16.2	d=-0.2	S.D.=14.8				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°31.4	S23°07.4	97°44.7	16.5'	S01°27.5	12.1'	54.2'
1	196°31.1	07.5	112°20.2	16.5'	01°15.4	12.1'	54.2'
2	211°30.8	07.7	126°55.7	16.5'	01°03.3	12.1'	54.2'
3	226°30.5	· · 07.9	141°31.2	16.5'	00°51.2	12.1'	54.2'
4	241°30.2	08.0	156°06.7	16.5'	00°39.0	12.1'	54.2'
5	256°29.9	08.2	170°42.2	16.5'	00°26.9	12.1'	54.2'
6	271°29.6	S23°08.4	185°17.7	16.5'	S00°14.8	12.1'	54.2'
7	286°29.3	08.6	199°53.3	16.5'	S00°02.6	12.1'	54.2'
8	301°29.1	08.7	214°28.8	16.5'	N00°09.5	12.1'	54.2'
9	316°28.8	· · 08.9	229°04.3	16.5'	00°21.7	12.1'	54.2'
10	331°28.5	09.1	243°39.8	16.5'	00°33.8	12.1'	54.2'
11	346°28.2	09.2	258°15.3	16.5'	00°45.9	12.1'	54.2'
12	1°27.9	S23°09.4	272°50.9	16.5'	N00°58.0	12.1'	54.2'
13	16°27.6	09.6	287°26.4	16.5'	01°10.2	12.1'	54.2'
14	31°27.3	09.7	302°01.9	16.5'	01°22.3	12.1'	54.2'
15	46°27.0	· · 09.9	316°37.4	16.5'	01°34.4	12.1'	54.2'
16	61°26.7	10.0	331°12.8	16.5'	01°46.5	12.1'	54.2'
17	76°26.4	10.2	345°48.3	16.5'	01°58.6	12.1'	54.2'
18	91°26.1	S23°10.4	0°23.8	16.5'	N02°10.7	12.1'	54.2'
19	106°25.8	10.5	14°59.3	16.5'	02°22.8	12.1'	54.2'
20	121°25.5	10.7	29°34.7	16.4'	02°34.9	12.1'	54.2'
21	136°25.2	· · 10.8	44°10.1	16.4'	02°47.0	12.1'	54.2'
22	151°24.9	11.0	58°45.6	16.4'	02°59.1	12.1'	54.2'
23	166°24.6	11.2	73°21.0	16.4'	03°11.1	12.1'	54.2'
	SD.=16.2	d=-0.2	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°24.3	S23°11.3	87°56.4	16.4'	N03°23.2	12.0'	54.2'
1	196°24.0	11.5	102°31.8	16.4'	03°35.2	12.0'	54.2'
2	211°23.7	11.6	117°07.1	16.4'	03°47.2	12.0'	54.3'
3	226°23.4	· · 11.8	131°42.5	16.3'	03°59.3	12.0'	54.3'
4	241°23.1	11.9	146°17.8	16.3'	04°11.3	12.0'	54.3'
5	256°22.8	12.1	160°53.1	16.3'	04°23.3	12.0'	54.3'
6	271°22.5	S23°12.2	175°28.4	16.3'	N04°35.2	12.0'	54.3'
7	286°22.2	12.4	190°03.6	16.2'	04°47.2	12.0'	54.3'
8	301°22.0	12.5	204°38.9	16.2'	04°59.2	11.9'	54.3'
9	316°21.7	· · 12.7	219°14.1	16.2'	05°11.1	11.9'	54.3'
10	331°21.4	12.8	233°49.3	16.2'	05°23.0	11.9'	54.3'
11	346°21.1	13.0	248°24.4	16.1'	05°34.9	11.9'	54.3'
12	1°20.8	S23°13.1	262°59.5	16.1'	N05°46.8	11.9'	54.3'
13	16°20.5	13.3	277°34.7	16.1'	05°58.7	11.9'	54.3'
14	31°20.2	13.4	292°09.7	16.1'	06°10.5	11.8'	54.3'
15	46°19.9	· · 13.6	306°44.8	16.0'	06°22.4	11.8'	54.4'
16	61°19.6	13.7	321°19.8	16.0'	06°34.2	11.8'	54.4'
17	76°19.3	13.8	335°54.8	16.0'	06°46.0	11.8'	54.4'
18	91°19.0	S23°14.0	350°29.7	15.9'	N06°57.7	11.8'	54.4'
19	106°18.7	14.1	5°04.6	15.9'	07°09.5	11.7'	54.4'
20	121°18.4	14.3	19°39.5	15.9'	07°21.2	11.7'	54.4'
21	136°18.1	· · 14.4	34°14.3	15.8'	07°32.9	11.7'	54.4'
22	151°17.8	14.5	48°49.1	15.8'	07°44.6	11.7'	54.4'
23	166°17.5	14.7	63°23.9	15.7'	07°56.3	11.6'	54.4'
	SD.=16.2	d=-0.2	S.D.=14.8				

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

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

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 7-9 40-59%
12	06:34	06:20	11:54	17:18	04:58	
13	06:06	05:51	11:54	17:58	05:38	
14	05:37	05:23	11:55	18:39	06:19	

December 15, 16, 17 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	83°32.8	226°09.6	S11°46.7	167°42.8	S24°14.0	87°55.1	S03°20.7	248°12.2	S04°00.9
1	98°35.3	241°10.2	47.2	182°43.2	13.9	102°57.3	20.6	263°14.5	00.9
2	113°37.8	256°10.8	47.6	197°43.6	13.9	117°59.6	20.6	278°16.8	01.0
3	128°40.2	271°11.4	·· 48.0	212°44.0	·· 13.8	133°01.9	·· 20.5	293°19.1	·· 01.1
4	143°42.7	286°12.0	48.4	227°44.3	13.7	148°04.1	20.4	308°21.4	01.1
5	158°45.1	301°12.6	48.8	242°44.7	13.7	163°06.4	20.3	323°23.7	01.2
6	173°47.6	316°13.2	S11°49.2	257°45.1	S24°13.6	178°08.7	S03°20.2	338°26.0	S04°01.2
7	188°50.1	331°13.7	49.7	272°45.5	13.5	193°10.9	20.1	353°28.3	01.3
8	203°52.5	346°14.3	50.1	287°45.8	13.5	208°13.2	20.0	8°30.6	01.4
9	218°55.0	1°14.9	·· 50.5	302°46.2	·· 13.4	223°15.5	·· 19.9	23°32.9	·· 01.4
10	233°57.5	16°15.5	50.9	317°46.6	13.3	238°17.7	19.8	38°35.2	01.5
11	248°59.9	31°16.1	51.3	332°47.0	13.3	253°20.0	19.7	53°37.5	01.5
12	264°02.4	46°16.6	S11°51.8	347°47.4	S24°13.2	268°22.3	S03°19.6	68°39.8	S04°01.6
13	279°04.9	61°17.2	52.2	2°47.7	13.1	283°24.5	19.5	83°42.1	01.6
14	294°07.3	76°17.8	52.6	17°48.1	13.1	298°26.8	19.4	98°44.4	01.7
15	309°09.8	91°18.4	·· 53.0	32°48.5	·· 13.0	313°29.1	·· 19.3	113°46.7	·· 01.8
16	324°12.3	106°18.9	53.4	47°48.9	12.9	328°31.3	19.2	128°49.0	01.8
17	339°14.7	121°19.5	53.9	62°49.2	12.9	343°33.6	19.1	143°51.3	01.9
18	354°17.2	136°20.1	S11°54.3	77°49.6	S24°12.8	358°35.8	S03°19.0	158°53.6	S04°01.9
19	9°19.6	151°20.6	54.7	92°50.0	12.7	13°38.1	18.9	173°55.9	02.0
20	24°22.1	166°21.2	55.2	107°50.4	12.7	28°40.4	18.8	188°58.2	02.0
21	39°24.6	181°21.8	·· 55.6	122°50.7	·· 12.6	43°42.6	·· 18.7	204°00.5	·· 02.1
22	54°27.0	196°22.3	56.0	137°51.1	12.5	58°44.9	18.6	219°02.8	02.2
23	69°29.5	211°22.9	56.4	152°51.5	12.4	73°47.2	18.5	234°05.1	02.2
Mer.pass.:18:23		v0.6 d-0.4 m-4.4		v0.4 d0.1 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	84°32.0	226°23.4	S11°56.9	167°51.9	S24°12.4	88°49.4	S03°18.4	249°07.4	S04°02.3
1	99°34.4	241°24.0	57.3	182°52.2	12.3	103°51.7	18.3	264°09.7	02.3
2	114°36.9	256°24.5	57.7	197°52.6	12.2	118°53.9	18.2	279°12.0	02.4
3	129°39.4	271°25.1	·· 58.2	212°53.0	·· 12.1	133°56.2	·· 18.1	294°14.3	·· 02.4
4	144°41.8	286°25.6	58.6	227°53.4	12.1	148°58.5	18.0	309°16.6	02.5
5	159°44.3	301°26.2	59.0	242°53.8	12.0	164°00.7	17.9	324°18.9	02.6
6	174°46.8	316°26.7	S11°59.5	257°54.1	S24°11.9	179°03.0	S03°17.8	339°21.2	S04°02.6
7	189°49.2	331°27.3	11°59.9	272°54.5	11.8	194°05.2	17.7	354°23.5	02.7
8	204°51.7	346°27.8	12°00.3	287°54.9	11.8	209°07.5	17.6	9°25.8	02.7
9	219°54.1	1°28.4	·· 00.8	302°55.3	·· 11.7	224°09.8	·· 17.5	24°28.1	·· 02.8
10	234°56.6	16°28.9	01.2	317°55.6	11.6	239°12.0	17.4	39°30.4	02.8
11	249°59.1	31°29.5	01.6	332°56.0	11.5	254°14.3	17.3	54°32.7	02.9
12	265°01.5	46°30.0	S12°02.1	347°56.4	S24°11.5	269°16.5	S03°17.2	69°35.0	S04°02.9
13	280°04.0	61°30.5	02.5	2°56.8	11.4	284°18.8	17.1	84°37.3	03.0
14	295°06.5	76°31.1	03.0	17°57.1	11.3	299°21.1	17.0	99°39.6	03.1
15	310°08.9	91°31.6	·· 03.4	32°57.5	·· 11.2	314°23.3	·· 16.9	114°41.9	·· 03.1
16	325°11.4	106°32.1	03.9	47°57.9	11.1	329°25.6	16.8	129°44.2	03.2
17	340°13.9	121°32.7	04.3	62°58.3	11.0	344°27.8	16.7	144°46.5	03.2
18	355°16.3	136°33.2	S12°04.7	77°58.6	S24°11.0	359°30.1	S03°16.6	159°48.8	S04°03.3
19	10°18.8	151°33.7	05.2	92°59.0	10.9	14°32.3	16.5	174°51.1	03.3
20	25°21.2	166°34.2	05.6	107°59.4	10.8	29°34.6	16.4	189°53.4	03.4
21	40°23.7	181°34.8	·· 06.1	122°59.8	·· 10.7	44°36.9	·· 16.3	204°55.7	·· 03.4
22	55°26.2	196°35.3	06.5	138°00.1	10.6	59°39.1	16.2	219°58.0	03.5
23	70°28.6	211°35.8	07.0	153°00.5	10.6	74°41.4	16.1	235°00.3	03.6
Mer.pass.:18:19		v0.6 d-0.4 m-4.4		v0.4 d0.1 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	85°31.1	226°36.3	S12°07.4	168°00.9	S24°10.5	89°43.6	S03°16.0	250°02.6	S04°03.6
1	100°33.6	241°36.8	07.9	183°01.3	10.4	104°45.9	15.9	265°04.9	03.7
2	115°36.0	256°37.4	08.3	198°01.6	10.3	119°48.1	15.8	280°07.2	03.7
3	130°38.5	271°37.9	·· 08.8	213°02.0	·· 10.2	134°50.4	·· 15.7	295°09.5	·· 03.8
4	145°41.0	286°38.4	09.2	228°02.4	10.1	149°52.6	15.6	310°11.8	03.8
5	160°43.4	301°38.9	09.7	243°02.8	10.0	164°54.9	15.5	325°14.2	03.9
6	175°45.9	316°39.4	S12°10.1	258°03.1	S24°09.9	179°57.1	S03°15.4	340°16.5	S04°03.9
7	190°48.4	331°39.9	10.6	273°03.5	09.9	194°59.4	15.3	355°18.8	04.0
8	205°50.8	346°40.4	11.0	288°03.9	09.8	210°01.6	15.2	10°21.1	04.1
9	220°53.3	1°40.9	·· 11.5	303°04.3	·· 09.7	225°03.9	·· 15.1	25°23.4	·· 04.1
10	235°55.7	16°41.4	11.9	318°04.6	09.6	240°06.2	15.0	40°25.7	04.2
11	250°58.2	31°41.9	12.4	333°05.0	09.5	255°08.4	14.9	55°28.0	04.2
12	266°00.7	46°42.4	S12°12.8	348°05.4	S24°09.4	270°10.7	S03°14.8	70°30.3	S04°04.3
13	281°03.1	61°42.9	13.3	3°05.8	09.3	285°12.9	14.7	85°32.6	04.3
14	296°05.6	76°43.4	13.7	18°06.1	09.2	300°15.2	14.6	100°34.9	04.4
15	311°08.1	91°43.9	·· 14.2	33°06.5	·· 09.1	315°17.4	·· 14.5	115°37.2	·· 04.4
16	326°10.5	106°44.4	14.6	48°06.9	09.1	330°19.7	14.4	130°39.5	04.5
17	341°13.0	121°44.9	15.1	63°07.3	09.0	345°21.9	14.3	145°41.8	04.5
18	356°15.5	136°45.4	S12°15.6	78°07.6	S24°08.9	0°24.2	S03°14.1	160°44.1	S04°04.6
19	11°17.9	151°45.9	16.0	93°08.0	08.8	15°26.4	14.0	175°46.4	04.7
20	26°20.4	166°46.4	16.5	108°08.4	08.7	30°28.7	13.9	190°48.7	04.7
21	41°22.9	181°46.9	·· 16.9	123°08.8	·· 08.6	45°30.9	·· 13.8	205°51.0	·· 04.8
22	56°25.3	196°47.4	17.4	138°09.1	08.5	60°33.2	13.7	220°53.4	04.8
23	71°27.8	211°47.8	17.9	153°09.5	08.4	75°35.4	13.6	235°55.7	04.9
Mer.pass.:18:15		v0.5 d-0.4 m-4.4		v0.4 d0.1 m1.3		v2.3 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.5	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.7	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°18.9	89°19.0
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.4
Capella	280°36.6	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.5	28°37.0
Alnilam	275°47.9	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.1
Sirius	258°35.0	-16°43.9
Adhara	255°13.6	-28°59.2
Procyon	245°01.3	5°11.7
Pollux	243°29.6	27°59.8
Avior	234°18.3	-59°32.6
Suhail	222°53.5	-43°28.5
Miaplacidus	221°39.6	-69°45.6
Alphard	217°57.7	-8°42.4
Regulus	207°45.3	11°54.6
Dubhe	193°53.6	61°41.1
Denebola	182°35.5	14°30.5
Gienah	175°54.2	-17°36.2
Acrux	173°11.6	-63°09.4
Gacrux	172°03.2	-57°10.3
Alioth	166°22.4	55°53.7
Spica	158°33.3	-11°13.1
Alkaid	153°00.5	49°15.2
Hadar	148°51.0	-60°25.4
Menkent	148°10.0	-36°25.3
Arcturus	145°57.6	19°07.4
Rigil Kent.	139°54.7	-60°52.6
Kochab	137°20.7	74°06.3
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.8	26°40.6
Antares	112°28.8	-26°27.3
Atria	107°32.9	-69°02.7
Sabik	102°15.0	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.3
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.7
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°54.0
Peacock	53°22.5	-56°42.1
Deneb	49°33.1	45°19.4
Enif	33°49.1	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 15 Wed	**SHA**	**Mer.pass**
Venus	142°36.8	08:55
Mars	84°10.0	12:49
Jupiter	4°22.2	18:06
Saturn	164°39.4	07:26

Dec 16 Thu	**SHA**	**Mer.pass**
Venus	141°51.5	08:54
Mars	83°19.9	12:48
Jupiter	4°17.5	18:02
Saturn	164°35.4	07:22

Dec 17 Fri	**SHA**	**Mer.pass**
Venus	141°05.2	08:53
Mars	82°29.8	12:48
Jupiter	4°12.5	17:58
Saturn	164°31.5	07:19

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°17.2	**S**23°14.8	77°58.6	15.7'	**N**08°07.9	11.6'	54.4'
1	196°16.9	14.9	92°33.3	15.7'	08°19.5	11.6'	54.5'
2	211°16.6	15.1	107°07.9	15.6'	08°31.1	11.6'	54.5'
3	226°16.3	· · 15.2	121°42.5	15.6'	08°42.6	11.5'	54.5'
4	241°16.0	15.4	136°17.1	15.5'	08°54.1	11.5'	54.5'
5	256°15.7	15.5	150°51.6	15.5'	09°05.6	11.5'	54.5'
6	271°15.4	**S**23°15.6	165°26.1	15.4'	**N**09°17.1	11.5'	54.5'
7	286°15.1	15.7	180°00.5	15.4'	09°28.5	11.4'	54.5'
8	301°14.8	15.9	194°34.9	15.4'	09°39.9	11.4'	54.6'
9	316°14.5	· · 16.0	209°09.2	15.3'	09°51.3	11.4'	54.6'
10	331°14.2	16.1	223°43.5	15.3'	10°02.7	11.3'	54.6'
11	346°13.9	16.3	238°17.7	15.2'	10°14.0	11.3'	54.6'
12	1°13.6	**S**23°16.4	252°51.9	15.2'	**N**10°25.2	11.3'	54.6'
13	16°13.3	16.5	267°26.0	15.1'	10°36.5	11.2'	54.6'
14	31°13.0	16.6	282°00.1	15.0'	10°47.7	11.2'	54.6'
15	46°12.7	· · 16.8	296°34.1	15.0'	10°58.9	11.2'	54.7'
16	61°12.4	16.9	311°08.1	14.9'	11°10.0	11.1'	54.7'
17	76°12.1	17.0	325°42.0	14.9'	11°21.1	11.1'	54.7'
18	91°11.8	**S**23°17.1	340°15.8	14.8'	**N**11°32.1	11.0'	54.7'
19	106°11.5	17.3	354°49.6	14.8'	11°43.2	11.0'	54.7'
20	121°11.2	17.4	9°23.3	14.7'	11°54.1	11.0'	54.7'
21	136°10.9	· · 17.5	23°57.0	14.6'	12°05.1	10.9'	54.8'
22	151°10.6	17.6	38°30.6	14.6'	12°16.0	10.9'	54.8'
23	166°10.3	17.7	53°04.2	14.5'	12°26.8	10.8'	54.8'
	SD.=16.2	d=-0.1	S.D.=14.9				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°10.0	**S**23°17.8	67°37.7	14.5'	**N**12°37.6	10.8'	54.8'
1	196°09.7	18.0	82°11.1	14.4'	12°48.4	10.7'	54.8'
2	211°09.4	18.1	96°44.5	14.3'	12°59.1	10.7'	54.9'
3	226°09.1	· · 18.2	111°17.8	14.3'	13°09.8	10.7'	54.9'
4	241°08.8	18.3	125°51.0	14.2'	13°20.4	10.6'	54.9'
5	256°08.5	18.4	140°24.2	14.1'	13°31.0	10.6'	54.9'
6	271°08.2	**S**23°18.5	154°57.3	14.1'	**N**13°41.5	10.5'	54.9'
7	286°07.9	18.6	169°30.4	14.0'	13°52.0	10.5'	54.9'
8	301°07.6	18.8	184°03.3	13.9'	14°02.4	10.4'	55.0'
9	316°07.2	· · 18.9	198°36.2	13.9'	14°12.8	10.4'	55.0'
10	331°06.9	19.0	213°09.1	13.8'	14°23.1	10.3'	55.0'
11	346°06.6	19.1	227°41.8	13.7'	14°33.4	10.2'	55.0'
12	1°06.3	**S**23°19.2	242°14.5	13.7'	**N**14°43.6	10.2'	55.1'
13	16°06.0	19.3	256°47.1	13.6'	14°53.8	10.1'	55.1'
14	31°05.7	19.4	271°19.7	13.5'	15°03.9	10.1'	55.1'
15	46°05.4	· · 19.5	285°52.2	13.4'	15°14.0	10.0'	55.1'
16	61°05.1	19.6	300°24.6	13.4'	15°24.0	10.0'	55.1'
17	76°04.8	19.7	314°56.9	13.3'	15°33.9	9.9'	55.2'
18	91°04.5	**S**23°19.8	329°29.1	13.2'	**N**15°43.8	9.8'	55.2'
19	106°04.2	19.9	344°01.3	13.1'	15°53.6	9.8'	55.2'
20	121°03.9	20.0	358°33.4	13.1'	16°03.4	9.7'	55.2'
21	136°03.6	· · 20.1	13°05.4	13.0'	16°13.0	9.7'	55.3'
22	151°03.3	20.2	27°37.4	12.9'	16°22.7	9.6'	55.3'
23	166°03.0	20.3	42°09.2	12.8'	16°32.2	9.5'	55.3'
	SD.=16.2	d=-0.1	S.D.=15.0				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°02.7	**S**23°20.4	56°41.0	12.7'	**N**16°41.7	9.5'	55.3'
1	196°02.4	20.5	71°12.7	12.7'	16°51.2	9.4'	55.4'
2	211°02.1	20.6	85°44.3	12.6'	17°00.5	9.3'	55.4'
3	226°01.8	· · 20.7	100°15.9	12.5'	17°09.8	9.3'	55.4'
4	241°01.5	20.8	114°47.3	12.4'	17°19.1	9.2'	55.4'
5	256°01.2	20.9	129°18.7	12.3'	17°28.2	9.1'	55.4'
6	271°00.9	**S**23°21.0	143°50.0	12.3'	**N**17°37.3	9.0'	55.5'
7	286°00.6	21.1	158°21.2	12.2'	17°46.3	9.0'	55.5'
8	301°00.3	21.2	172°52.3	12.1'	17°55.3	8.9'	55.5'
9	316°00.0	· · 21.3	187°23.4	12.0'	18°04.1	8.8'	55.5'
10	330°59.7	21.4	201°54.3	11.9'	18°12.9	8.7'	55.6'
11	345°59.4	21.4	216°25.2	11.8'	18°21.6	8.7'	55.6'
12	0°59.0	**S**23°21.5	230°56.0	11.7'	**N**18°30.2	8.6'	55.6'
13	15°58.7	21.6	245°26.7	11.7'	18°38.8	8.5'	55.7'
14	30°58.4	21.7	259°57.3	11.6'	18°47.3	8.4'	55.7'
15	45°58.1	· · 21.8	274°27.9	11.5'	18°55.7	8.3'	55.7'
16	60°57.8	21.9	288°58.3	11.4'	19°04.0	8.3'	55.7'
17	75°57.5	22.0	303°28.7	11.3'	19°12.2	8.2'	55.8'
18	90°57.2	**S**23°22.0	317°58.9	11.2'	**N**19°20.3	8.1'	55.8'
19	105°56.9	22.1	332°29.1	11.1'	19°28.4	8.0'	55.8'
20	120°56.6	22.2	346°59.2	11.1'	19°36.3	7.9'	55.8'
21	135°56.3	· · 22.3	1°29.2	11.0'	19°44.2	7.8'	55.9'
22	150°56.0	22.4	15°59.1	10.9'	19°52.0	7.7'	55.9'
23	165°55.7	22.4	30°29.0	10.8'	19°59.7	7.7'	55.9'
	SD.=16.2	d=-0.1	S.D.=15.2				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	08:21	10:49	▬	▬	13:02	15:30
N 70°	08:01	09:49	▬	▬	14:02	15:50
68°	07:46	09:14	▬	▬	14:37	16:05
66°	07:33	08:49	10:29	13:22	15:02	16:18
64°	07:22	08:30	09:47	14:04	15:21	16:29
62°	07:12	08:14	09:19	14:32	15:37	16:39
60°	07:04	08:01	08:58	14:53	15:51	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°	06:43	07:30	08:13	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	15:59	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	04:53	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	22:23
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	23:04	▭

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 10-12 68-84%
15	05:09	04:54	11:55	19:21	07:00	
16	04:40	04:25	11:56	20:06	07:43	
17	04:11	03:56	11:56	20:54	08:29	

December 18, 19, 20 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	86°30.2	226°48.3	S12°18.3	168°09.9	S24°08.3	90°37.7	S03°13.5	250°58.0	S04°04.9
1	101°32.7	241°48.8	18.8	183°10.3	08.2	105°39.9	13.4	266°00.3	05.0
2	116°35.2	256°49.3	19.3	198°10.6	08.1	120°42.1	13.3	281°02.6	05.0
3	131°37.6	271°49.8	·· 19.7	213°11.0	·· 08.0	135°44.4	·· 13.2	296°04.9	·· 05.1
4	146°40.1	286°50.2	20.2	228°11.4	07.9	150°46.6	13.1	311°07.2	05.1
5	161°42.6	301°50.7	20.7	243°11.8	07.8	165°48.9	13.0	326°09.5	05.2
6	176°45.0	316°51.2	S12°21.1	258°12.1	S24°07.7	180°51.1	S03°12.9	341°11.8	S04°05.2
7	191°47.5	331°51.7	21.6	273°12.5	07.6	195°53.4	12.8	356°14.1	05.3
8	206°50.0	346°52.1	22.1	288°12.9	07.5	210°55.6	12.7	11°16.4	05.4
9	221°52.4	1°52.6	·· 22.5	303°13.2	·· 07.4	225°57.9	·· 12.6	26°18.7	·· 05.4
10	236°54.9	16°53.1	23.0	318°13.6	07.3	241°00.1	12.5	41°21.0	05.5
11	251°57.4	31°53.5	23.5	333°14.0	07.2	256°02.4	12.4	56°23.4	05.5
12	266°59.8	46°54.0	S12°23.9	348°14.4	S24°07.1	271°04.6	S03°12.3	71°25.7	S04°05.6
13	282°02.3	61°54.4	24.4	3°14.7	07.0	286°06.9	12.2	86°28.0	05.6
14	297°04.7	76°54.9	24.9	18°15.1	06.9	301°09.1	12.0	101°30.3	05.7
15	312°07.2	91°55.4	·· 25.3	33°15.5	·· 06.8	316°11.3	·· 11.9	116°32.6	·· 05.7
16	327°09.7	106°55.8	25.8	48°15.9	06.7	331°13.6	11.8	131°34.9	05.8
17	342°12.1	121°56.3	26.3	63°16.2	06.6	346°15.8	11.7	146°37.2	05.8
18	357°14.6	136°56.7	S12°26.8	78°16.6	S24°06.5	1°18.1	S03°11.6	161°39.5	S04°05.9
19	12°17.1	151°57.2	27.2	93°17.0	06.4	16°20.3	11.5	176°41.8	05.9
20	27°19.5	166°57.6	27.7	108°17.4	06.3	31°22.6	11.4	191°44.1	06.0
21	42°22.0	181°58.1	·· 28.2	123°17.7	·· 06.2	46°24.8	·· 11.3	206°46.5	·· 06.0
22	57°24.5	196°58.5	28.7	138°18.1	06.1	61°27.0	11.2	221°48.8	06.1
23	72°26.9	211°59.0	29.1	153°18.5	06.0	76°29.3	11.1	236°51.1	06.1
Mer.pass.:18:11		v0.5 d-0.5 m-4.4		v0.4 d0.1 m1.3		v2.2 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	87°29.4	226°59.4	S12°29.6	168°18.9	S24°05.9	91°31.5	S03°11.0	251°53.4	S04°06.2
1	102°31.8	241°59.9	30.1	183°19.2	05.7	106°33.8	10.9	266°55.7	06.3
2	117°34.3	257°00.3	30.6	198°19.6	05.6	121°36.0	10.8	281°58.0	06.3
3	132°36.8	272°00.8	·· 31.0	213°20.0	·· 05.5	136°38.2	·· 10.7	297°00.3	·· 06.4
4	147°39.2	287°01.2	31.5	228°20.3	05.4	151°40.5	10.5	312°02.6	06.4
5	162°41.7	302°01.6	32.0	243°20.7	05.3	166°42.7	10.4	327°04.9	06.5
6	177°44.2	317°02.1	S12°32.5	258°21.1	S24°05.2	181°45.0	S03°10.3	342°07.3	S04°06.5
7	192°46.6	332°02.5	33.0	273°21.5	05.1	196°47.2	10.2	357°09.6	06.6
8	207°49.1	347°02.9	33.4	288°21.8	05.0	211°49.4	10.1	12°11.9	06.6
9	222°51.6	2°03.4	·· 33.9	303°22.2	·· 04.9	226°51.7	·· 10.0	27°14.2	·· 06.7
10	237°54.0	17°03.8	34.4	318°22.6	04.8	241°53.9	09.9	42°16.5	06.7
11	252°56.5	32°04.2	34.9	333°23.0	04.6	256°56.2	09.8	57°18.8	06.8
12	267°59.0	47°04.7	S12°35.4	348°23.3	S24°04.5	271°58.4	S03°09.7	72°21.1	S04°06.8
13	283°01.4	62°05.1	35.9	3°23.7	04.4	287°00.6	09.6	87°23.4	06.9
14	298°03.9	77°05.5	36.3	18°24.1	04.3	302°02.9	09.5	102°25.7	06.9
15	313°06.3	92°05.9	·· 36.8	33°24.5	·· 04.2	317°05.1	·· 09.4	117°28.1	·· 07.0
16	328°08.8	107°06.4	37.3	48°24.8	04.1	332°07.3	09.2	132°30.4	07.0
17	343°11.3	122°06.8	37.8	63°25.2	04.0	347°09.6	09.1	147°32.7	07.1
18	358°13.7	137°07.2	S12°38.3	78°25.6	S24°03.8	2°11.8	S03°09.0	162°35.0	S04°07.1
19	13°16.2	152°07.6	38.8	93°25.9	03.7	17°14.1	08.9	177°37.3	07.2
20	28°18.7	167°08.0	39.3	108°26.3	03.6	32°16.3	08.8	192°39.6	07.2
21	43°21.1	182°08.5	·· 39.8	123°26.7	·· 03.5	47°18.5	·· 08.7	207°41.9	·· 07.3
22	58°23.6	197°08.9	40.2	138°27.1	03.4	62°20.8	08.6	222°44.3	07.3
23	73°26.1	212°09.3	40.7	153°27.4	03.3	77°23.0	08.5	237°46.6	07.4
Mer.pass.:18:07		v0.4 d-0.5 m-4.4		v0.4 d0.1 m1.3		v2.2 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	88°28.5	227°09.7	S12°41.2	168°27.8	S24°03.1	92°25.2	S03°08.4	252°48.9	S04°07.4
1	103°31.0	242°10.1	41.7	183°28.2	03.0	107°27.5	08.3	267°51.2	07.5
2	118°33.5	257°10.5	42.2	198°28.6	02.9	122°29.7	08.1	282°53.5	07.5
3	133°35.9	272°10.9	·· 42.7	213°28.9	·· 02.8	137°31.9	·· 08.0	297°55.8	·· 07.6
4	148°38.4	287°11.3	43.2	228°29.3	02.7	152°34.2	07.9	312°58.1	07.6
5	163°40.8	302°11.7	43.7	243°29.7	02.5	167°36.4	07.8	328°00.5	07.7
6	178°43.3	317°12.1	S12°44.2	258°30.1	S24°02.4	182°38.6	S03°07.7	343°02.8	S04°07.7
7	193°45.8	332°12.5	44.7	273°30.4	02.3	197°40.9	07.6	358°05.1	07.8
8	208°48.2	347°12.9	45.2	288°30.8	02.2	212°43.1	07.5	13°07.4	07.8
9	223°50.7	2°13.3	·· 45.7	303°31.2	·· 02.1	227°45.3	·· 07.4	28°09.7	·· 07.9
10	238°53.2	17°13.7	46.2	318°31.5	01.9	242°47.6	07.3	43°12.0	07.9
11	253°55.6	32°14.1	46.6	333°31.9	01.8	257°49.8	07.1	58°14.3	08.0
12	268°58.1	47°14.5	S12°47.1	348°32.3	S24°01.7	272°52.0	S03°07.0	73°16.7	S04°08.0
13	284°00.6	62°14.9	47.6	3°32.7	01.6	287°54.3	06.9	88°19.0	08.1
14	299°03.0	77°15.3	48.1	18°33.0	01.4	302°56.5	06.8	103°21.3	08.1
15	314°05.5	92°15.7	·· 48.6	33°33.4	·· 01.3	317°58.7	·· 06.7	118°23.6	·· 08.2
16	329°08.0	107°16.1	49.1	48°33.8	01.2	333°01.0	06.6	133°25.9	08.2
17	344°10.4	122°16.5	49.6	63°34.2	01.1	348°03.2	06.5	148°28.2	08.3
18	359°12.9	137°16.8	S12°50.1	78°34.5	S24°00.9	3°05.4	S03°06.4	163°30.6	S04°08.3
19	14°15.3	152°17.2	50.6	93°34.9	00.8	18°07.6	06.2	178°32.9	08.4
20	29°17.8	167°17.6	51.1	108°35.3	00.7	33°09.9	06.1	193°35.2	08.4
21	44°20.3	182°18.0	·· 51.6	123°35.6	·· 00.5	48°12.1	·· 06.0	208°37.5	·· 08.5
22	59°22.7	197°18.4	52.1	138°36.0	00.4	63°14.3	05.9	223°39.8	08.5
23	74°25.2	212°18.7	52.6	153°36.4	00.3	78°16.6	05.8	238°42.1	08.6
Mer.pass.:18:03		v0.4 d-0.5 m-4.4		v0.4 d0.1 m1.3		v2.2 d0.1 m-2.3		v2.3 d-0.1 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.5	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.7	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°19.5	89°19.0
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.4
Capella	280°36.6	46°00.5
Bellatrix	278°33.6	6°21.6
Elnath	278°14.5	28°37.0
Alnilam	275°47.8	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.1
Sirius	258°34.9	-16°43.9
Adhara	255°13.6	-28°59.2
Procyon	245°01.3	5°11.7
Pollux	243°29.6	27°59.8
Avior	234°18.3	-59°32.6
Suhail	222°53.5	-43°28.5
Miaplacidus	221°39.6	-69°45.6
Alphard	217°57.7	-8°42.4
Regulus	207°45.3	11°54.6
Dubhe	193°53.6	61°41.1
Denebola	182°35.5	14°30.5
Gienah	175°54.2	-17°36.2
Acrux	173°11.6	-63°09.4
Gacrux	172°03.1	-57°10.3
Alioth	166°22.3	55°53.6
Spica	158°33.3	-11°13.1
Alkaid	153°00.5	49°15.2
Hadar	148°50.9	-60°25.4
Menkent	148°10.0	-36°25.3
Arcturus	145°57.6	19°07.4
Rigil Kent.	139°54.7	-60°52.6
Kochab	137°20.6	74°06.3
Zuben'ubi	137°07.7	-16°05.2
Alphecca	126°12.8	26°40.6
Antares	112°28.8	-26°27.3
Atria	107°32.9	-69°02.7
Sabik	102°15.0	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.5	12°33.2
Eltanin	90°47.5	51°29.3
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.7
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°54.0
Peacock	53°22.5	-56°42.1
Deneb	49°33.1	45°19.4
Enif	33°49.1	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 18 Sat	**SHA**	**Mer.pass**
Venus	140°18.1	08:53
Mars	81°39.6	12:47
Jupiter	4°07.4	17:55
Saturn	164°27.7	07:15

Dec 19 Sun	**SHA**	**Mer.pass**
Venus	139°30.0	08:52
Mars	80°49.5	12:46
Jupiter	4°02.1	17:51
Saturn	164°24.0	07:11

Dec 20 Mon	**SHA**	**Mer.pass**
Venus	138°41.2	08:51
Mars	79°59.3	12:46
Jupiter	3°56.7	17:48
Saturn	164°20.4	07:08

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.4	S23°22.5	44°58.7	10.7'	N20°07.3	7.6'	55.9'
1	195°55.1	22.6	59°28.4	10.6'	20°14.8	7.5'	56.0'
2	210°54.8	22.7	73°57.9	10.5'	20°22.2	7.4'	56.0'
3	225°54.5	· · 22.8	88°27.4	10.4'	20°29.6	7.3'	56.0'
4	240°54.2	22.8	102°56.8	10.3'	20°36.8	7.2'	56.1'
5	255°53.9	22.9	117°26.1	10.3'	20°43.9	7.1'	56.1'
6	270°53.6	S23°23.0	131°55.3	10.2'	N20°51.0	7.0'	56.1'
7	285°53.2	23.1	146°24.5	10.1'	20°57.9	6.9'	56.1'
8	300°52.9	23.1	160°53.5	10.0'	21°04.7	6.8'	56.2'
9	315°52.6	· · 23.2	175°22.5	9.9'	21°11.5	6.7'	56.2'
10	330°52.3	23.3	189°51.3	9.8'	21°18.1	6.6'	56.2'
11	345°52.0	23.3	204°20.1	9.7'	21°24.6	6.5'	56.3'
12	0°51.7	S23°23.4	218°48.8	9.6'	N21°31.0	6.4'	56.3'
13	15°51.4	23.5	233°17.4	9.6'	21°37.3	6.3'	56.3'
14	30°51.1	23.5	247°45.9	9.5'	21°43.5	6.1'	56.3'
15	45°50.8	· · 23.6	262°14.3	9.4'	21°49.6	6.0'	56.4'
16	60°50.5	23.7	276°42.7	9.3'	21°55.6	5.9'	56.4'
17	75°50.2	23.7	291°11.0	9.2'	22°01.5	5.8'	56.4'
18	90°49.9	S23°23.8	305°39.1	9.1'	N22°07.2	5.7'	56.5'
19	105°49.6	23.9	320°07.2	9.0'	22°12.9	5.6'	56.5'
20	120°49.3	23.9	334°35.2	9.0'	22°18.4	5.5'	56.5'
21	135°49.0	· · 24.0	349°03.2	8.9'	22°23.8	5.4'	56.6'
22	150°48.6	24.0	3°31.0	8.8'	22°29.1	5.2'	56.6'
23	165°48.3	24.1	17°58.8	8.7'	22°34.3	5.1'	56.6'
	SD.=16.2	d=-0.1	S.D.=15.3				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.0	S23°24.2	32°26.4	8.6'	N22°39.4	5.0'	56.6'
1	195°47.7	24.2	46°54.0	8.6'	22°44.3	4.9'	56.7'
2	210°47.4	24.3	61°21.5	8.5'	22°49.2	4.8'	56.7'
3	225°47.1	· · 24.3	75°49.0	8.4'	22°53.9	4.6'	56.7'
4	240°46.8	24.4	90°16.3	8.3'	22°58.4	4.5'	56.8'
5	255°46.5	24.4	104°43.6	8.2'	23°02.9	4.4'	56.8'
6	270°46.2	S23°24.5	119°10.8	8.2'	N23°07.2	4.3'	56.8'
7	285°45.9	24.6	133°37.9	8.1'	23°11.4	4.1'	56.8'
8	300°45.6	24.6	148°05.0	8.0'	23°15.5	4.0'	56.9'
9	315°45.3	· · 24.7	162°32.0	7.9'	23°19.5	3.9'	56.9'
10	330°45.0	24.7	176°58.9	7.9'	23°23.3	3.8'	56.9'
11	345°44.7	24.8	191°25.7	7.8'	23°27.0	3.6'	57.0'
12	0°44.3	S23°24.8	205°52.4	7.7'	N23°30.5	3.5'	57.0'
13	15°44.0	24.9	220°19.1	7.7'	23°33.9	3.4'	57.0'
14	30°43.7	24.9	234°45.7	7.6'	23°37.2	3.2'	57.1'
15	45°43.4	· · 24.9	249°12.3	7.5'	23°40.4	3.1'	57.1'
16	60°43.1	25.0	263°38.8	7.4'	23°43.4	3.0'	57.1'
17	75°42.8	25.0	278°05.2	7.4'	23°46.3	2.8'	57.1'
18	90°42.5	S23°25.1	292°31.5	7.3'	N23°49.0	2.7'	57.2'
19	105°42.2	25.1	306°57.8	7.3'	23°51.7	2.5'	57.2'
20	120°41.9	25.2	321°24.0	7.2'	23°54.1	2.4'	57.2'
21	135°41.6	· · 25.2	335°50.2	7.1'	23°56.5	2.3'	57.3'
22	150°41.3	25.3	350°16.3	7.1'	23°58.7	2.1'	57.3'
23	165°41.0	25.3	4°42.3	7.0'	24°00.7	2.0'	57.3'
	SD.=16.2	d=-0.1	S.D.=15.5				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°40.6	S23°25.3	19°08.3	7.0'	N24°02.6	1.8'	57.3'
1	195°40.3	25.4	33°34.3	6.9'	24°04.4	1.7'	57.4'
2	210°40.0	25.4	48°00.1	6.8'	24°06.0	1.6'	57.4'
3	225°39.7	· · 25.4	62°25.9	6.8'	24°07.5	1.4'	57.4'
4	240°39.4	25.5	76°51.7	6.7'	24°08.8	1.3'	57.5'
5	255°39.1	25.5	91°17.4	6.7'	24°10.0	1.1'	57.5'
6	270°38.8	S23°25.6	105°43.1	6.6'	N24°11.1	1.0'	57.5'
7	285°38.5	25.6	120°08.7	6.6'	24°12.0	0.8'	57.5'
8	300°38.2	25.6	134°34.3	6.6'	24°12.7	0.7'	57.6'
9	315°37.9	· · 25.7	148°59.8	6.5'	24°13.4	0.5'	57.6'
10	330°37.6	25.7	163°25.3	6.5'	24°13.8	0.4'	57.6'
11	345°37.3	25.7	177°50.8	6.4'	24°14.1	0.2'	57.7'
12	0°36.9	S23°25.7	192°16.2	6.4'	N24°14.3	0.1'	57.7'
13	15°36.6	25.8	206°41.5	6.4'	24°14.3	-0.1'	57.7'
14	30°36.3	25.8	221°06.9	6.3'	24°14.2	-0.2'	57.7'
15	45°36.0	· · 25.8	235°32.2	6.3'	24°13.9	-0.4'	57.8'
16	60°35.7	25.9	249°57.5	6.3'	24°13.4	-0.5'	57.8'
17	75°35.4	25.9	264°22.7	6.2'	24°12.8	-0.7'	57.8'
18	90°35.1	S23°25.9	278°47.9	6.2'	N24°12.1	-0.8'	57.9'
19	105°34.8	25.9	293°13.1	6.2'	24°11.2	-1.0'	57.9'
20	120°34.5	25.9	307°38.2	6.1'	24°10.1	-1.1'	57.9'
21	135°34.2	· · 26.0	322°03.4	6.1'	24°08.9	-1.3'	57.9'
22	150°33.9	26.0	336°28.5	6.1'	24°07.6	-1.4'	58.0'
23	165°33.5	26.0	350°53.5	6.1'	24°06.1	-1.6'	58.0'
	SD.=16.2	d=-0.0	S.D.=15.7				

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

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 91-99%
18	03:42	03:27	11:57	21:45	09:19	
19	03:12	02:57	11:57	22:40	10:13	
20	02:43	02:28	11:58	23:38	11:09	

December 21, 22, 23 UT (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	89°27.7	227°19.1	S12°53.1	168°36.8	S24°00.2	93°18.8	S03°05.7	253°44.5	S04°08.6
1	104°30.1	242°19.5	53.6	183°37.1	24°00.0	108°21.0	05.6	268°46.8	08.7
2	119°32.6	257°19.9	54.1	198°37.5	23°59.9	123°23.2	05.5	283°49.1	08.7
3	134°35.1	272°20.2	·· 54.6	213°37.9	·· 59.8	138°25.5	·· 05.3	298°51.4	·· 08.8
4	149°37.5	287°20.6	55.1	228°38.3	59.6	153°27.7	05.2	313°53.7	08.8
5	164°40.0	302°21.0	55.7	243°38.6	59.5	168°29.9	05.1	328°56.1	08.9
6	179°42.5	317°21.3	S12°56.2	258°39.0	S23°59.4	183°32.1	S03°05.0	343°58.4	S04°08.9
7	194°44.9	332°21.7	56.7	273°39.4	59.2	198°34.4	04.9	359°00.7	09.0
8	209°47.4	347°22.1	57.2	288°39.7	59.1	213°36.6	04.8	14°03.0	09.0
9	224°49.8	2°22.4	·· 57.7	303°40.1	·· 59.0	228°38.8	·· 04.7	29°05.3	·· 09.1
10	239°52.3	17°22.8	58.2	318°40.5	58.8	243°41.1	04.5	44°07.6	09.1
11	254°54.8	32°23.2	58.7	333°40.9	58.7	258°43.3	04.4	59°10.0	09.2
12	269°57.2	47°23.5	S12°59.2	348°41.2	S23°58.6	273°45.5	S03°04.3	74°12.3	S04°09.2
13	284°59.7	62°23.9	12°59.7	3°41.6	58.4	288°47.7	04.2	89°14.6	09.3
14	300°02.2	77°24.2	13°00.2	18°42.0	58.3	303°50.0	04.1	104°16.9	09.3
15	315°04.6	92°24.6	·· 00.7	33°42.4	·· 58.2	318°52.2	·· 04.0	119°19.2	·· 09.4
16	330°07.1	107°24.9	01.2	48°42.7	58.0	333°54.4	03.9	134°21.6	09.4
17	345°09.6	122°25.3	01.7	63°43.1	57.9	348°56.6	03.7	149°23.9	09.5
18	0°12.0	137°25.7	S13°02.2	78°43.5	S23°57.7	3°58.8	S03°03.6	164°26.2	S04°09.5
19	15°14.5	152°26.0	02.8	93°43.8	57.6	19°01.1	03.5	179°28.5	09.6
20	30°17.0	167°26.3	03.3	108°44.2	57.5	34°03.3	03.4	194°30.8	09.6
21	45°19.4	182°26.7	·· 03.8	123°44.6	·· 57.3	49°05.5	·· 03.3	209°33.2	·· 09.7
22	60°21.9	197°27.0	04.3	138°45.0	57.2	64°07.7	03.2	224°35.5	09.7
23	75°24.3	212°27.4	04.8	153°45.3	57.0	79°10.0	03.1	239°37.8	09.8
Mer.pass.:17:59		v0.4 d-0.5 m-4.4		v0.4 d0.1 m1.3		v2.2 d0.1 m-2.3		v2.3 d-0.0 m0.8	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	90°26.8	227°27.7	S13°05.3	168°45.7	S23°56.9	94°12.2	S03°02.9	254°40.1	S04°09.8
1	105°29.3	242°28.1	05.8	183°46.1	56.8	109°14.4	02.8	269°42.4	09.9
2	120°31.7	257°28.4	06.3	198°46.4	56.6	124°16.6	02.7	284°44.8	09.9
3	135°34.2	272°28.8	·· 06.9	213°46.8	·· 56.5	139°18.8	·· 02.6	299°47.1	·· 09.9
4	150°36.7	287°29.1	07.4	228°47.2	56.3	154°21.1	02.5	314°49.4	10.0
5	165°39.1	302°29.4	07.9	243°47.6	56.2	169°23.3	02.4	329°51.7	10.0
6	180°41.6	317°29.8	S13°08.4	258°47.9	S23°56.1	184°25.5	S03°02.2	344°54.1	S04°10.1
7	195°44.1	332°30.1	08.9	273°48.3	55.9	199°27.7	02.1	359°56.4	10.1
8	210°46.5	347°30.4	09.4	288°48.7	55.8	214°29.9	02.0	14°58.7	10.2
9	225°49.0	2°30.8	·· 10.0	303°49.1	·· 55.6	229°32.2	·· 01.9	30°01.0	·· 10.2
10	240°51.5	17°31.1	10.5	318°49.4	55.5	244°34.4	01.8	45°03.3	10.3
11	255°53.9	32°31.4	11.0	333°49.8	55.3	259°36.6	01.7	60°05.7	10.3
12	270°56.4	47°31.7	S13°11.5	348°50.2	S23°55.2	274°38.8	S03°01.5	75°08.0	S04°10.4
13	285°58.8	62°32.1	12.0	3°50.5	55.0	289°41.0	01.4	90°10.3	10.4
14	301°01.3	77°32.4	12.5	18°50.9	54.9	304°43.3	01.3	105°12.6	10.5
15	316°03.8	92°32.7	·· 13.1	33°51.3	·· 54.7	319°45.5	·· 01.2	120°15.0	·· 10.5
16	331°06.2	107°33.0	13.6	48°51.7	54.6	334°47.7	01.1	135°17.3	10.6
17	346°08.7	122°33.3	14.1	63°52.0	54.4	349°49.9	01.0	150°19.6	10.6
18	1°11.2	137°33.7	S13°14.6	78°52.4	S23°54.3	4°52.1	S03°00.8	165°21.9	S04°10.7
19	16°13.6	152°34.0	15.1	93°52.8	54.1	19°54.3	00.7	180°24.2	10.7
20	31°16.1	167°34.3	15.7	108°53.2	54.0	34°56.6	00.6	195°26.6	10.7
21	46°18.6	182°34.6	·· 16.2	123°53.5	·· 53.8	49°58.8	·· 00.5	210°28.9	·· 10.8
22	61°21.0	197°34.9	16.7	138°53.9	53.7	65°01.0	00.4	225°31.2	10.8
23	76°23.5	212°35.2	17.2	153°54.3	53.5	80°03.2	00.2	240°33.5	10.9
Mer.pass.:17:55		v0.3 d-0.5 m-4.4		v0.4 d0.1 m1.3		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	91°26.0	227°35.5	S13°17.8	168°54.6	S23°53.4	95°05.4	S03°00.1	255°35.9	S04°10.9
1	106°28.4	242°35.9	18.3	183°55.0	53.2	110°07.6	03°00.0	270°38.2	11.0
2	121°30.9	257°36.2	18.8	198°55.4	53.1	125°09.9	02°59.9	285°40.5	11.0
3	136°33.3	272°36.5	·· 19.3	213°55.8	·· 52.9	140°12.1	·· 59.8	300°42.8	·· 11.1
4	151°35.8	287°36.8	19.8	228°56.1	52.8	155°14.3	59.7	315°45.2	11.1
5	166°38.3	302°37.1	20.4	243°56.5	52.6	170°16.5	59.5	330°47.5	11.2
6	181°40.7	317°37.4	S13°20.9	258°56.9	S23°52.5	185°18.7	S02°59.4	345°49.8	S04°11.2
7	196°43.2	332°37.7	21.4	273°57.2	52.3	200°20.9	59.3	0°52.1	11.3
8	211°45.7	347°38.0	21.9	288°57.6	52.2	215°23.1	59.2	15°54.5	11.3
9	226°48.1	2°38.3	·· 22.5	303°58.0	·· 52.0	230°25.3	·· 59.1	30°56.8	·· 11.3
10	241°50.6	17°38.6	23.0	318°58.4	51.8	245°27.6	58.9	45°59.1	11.4
11	256°53.1	32°38.9	23.5	333°58.7	51.7	260°29.8	58.8	61°01.4	11.4
12	271°55.5	47°39.2	S13°24.1	348°59.1	S23°51.5	275°32.0	S02°58.7	76°03.8	S04°11.5
13	286°58.0	62°39.5	24.6	3°59.5	51.4	290°34.2	58.6	91°06.1	11.5
14	302°00.4	77°39.8	25.1	18°59.9	51.2	305°36.4	58.5	106°08.4	11.6
15	317°02.9	92°40.0	·· 25.6	34°00.2	·· 51.0	320°38.6	·· 58.3	121°10.7	·· 11.6
16	332°05.4	107°40.3	26.2	49°00.6	50.9	335°40.8	58.2	136°13.1	11.7
17	347°07.8	122°40.6	26.7	64°01.0	50.7	350°43.0	58.1	151°15.4	11.7
18	2°10.3	137°40.9	S13°27.2	79°01.3	S23°50.6	5°45.3	S02°58.0	166°17.7	S04°11.8
19	17°12.8	152°41.2	27.7	94°01.7	50.4	20°47.5	57.9	181°20.1	11.8
20	32°15.2	167°41.5	28.3	109°02.1	50.2	35°49.7	57.7	196°22.4	11.8
21	47°17.7	182°41.8	·· 28.8	124°02.5	·· 50.1	50°51.9	·· 57.6	211°24.7	·· 11.9
22	62°20.2	197°42.0	29.3	139°02.8	49.9	65°54.1	57.5	226°27.0	11.9
23	77°22.6	212°42.3	29.9	154°03.2	49.8	80°56.3	57.4	241°29.4	12.0
Mer.pass.:17:51		v0.3 d-0.5 m-4.4		v0.4 d0.2 m1.3		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.6	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.7	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°20.1	89°19.0
Acamar	315°19.3	-40°15.7
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.4
Capella	280°36.6	46°00.6
Bellatrix	278°33.6	6°21.5
Elnath	278°14.5	28°37.0
Alnilam	275°47.8	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.1
Sirius	258°34.9	-16°43.9
Adhara	255°13.6	-28°59.2
Procyon	245°01.3	5°11.7
Pollux	243°29.5	27°59.8
Avior	234°18.3	-59°32.6
Suhail	222°53.5	-43°28.5
Miaplacidus	221°39.5	-69°45.6
Alphard	217°57.6	-8°42.4
Regulus	207°45.2	11°54.6
Dubhe	193°53.6	61°41.1
Denebola	182°35.4	14°30.4
Gienah	175°54.2	-17°36.2
Acrux	173°11.5	-63°09.4
Gacrux	172°03.1	-57°10.3
Alioth	166°22.3	55°53.6
Spica	158°33.3	-11°13.1
Alkaid	153°00.5	49°15.2
Hadar	148°50.9	-60°25.4
Menkent	148°09.9	-36°25.3
Arcturus	145°57.5	19°07.3
Rigil Kent.	139°54.6	-60°52.6
Kochab	137°20.6	74°06.3
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°28.8	-26°27.3
Atria	107°32.8	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.8	-37°06.6
Rasalhague	96°08.5	12°33.1
Eltanin	90°47.5	51°29.3
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.7
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°54.0
Peacock	53°22.5	-56°42.0
Deneb	49°33.1	45°19.4
Enif	33°49.1	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 21 Tue	**SHA**	**Mer.pass**
Venus	137°51.4	08:51
Mars	79°09.1	12:45
Jupiter	3°51.1	17:44
Saturn	164°16.8	07:04

Dec 22 Wed	**SHA**	**Mer.pass**
Venus	137°00.9	08:50
Mars	78°18.9	12:45
Jupiter	3°45.4	17:41
Saturn	164°13.3	07:00

Dec 23 Thu	**SHA**	**Mer.pass**
Venus	136°09.6	08:49
Mars	77°28.7	12:44
Jupiter	3°39.5	17:37
Saturn	164°09.9	06:57

Horizontal parallax	
Venus:	0.3
Mars:	0.1

DUT1 = UT1-UTC = -0.1338 sec ΔT = TT-UT1 = +66.3178 sec

2010 December 21 to Dec. 23 UT

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°33.2	S23°26.0	5°18.6	6.1'	N24°04.4	-1.7'	58.0'
1	195°32.9	26.1	19°43.7	6.0'	24°02.6	-1.9'	58.0'
2	210°32.6	26.1	34°08.7	6.0'	24°00.7	-2.0'	58.1'
3	225°32.3	· · 26.1	48°33.7	6.0'	23°58.5	-2.2'	58.1'
4	240°32.0	26.1	62°58.7	6.0'	23°56.3	-2.3'	58.1'
5	255°31.7	26.1	77°23.7	6.0'	23°53.8	-2.5'	58.1'
6	270°31.4	S23°26.1	91°48.7	6.0'	N23°51.3	-2.7'	58.2'
7	285°31.1	26.1	106°13.7	6.0'	23°48.5	-2.8'	58.2'
8	300°30.8	26.2	120°38.7	6.0'	23°45.6	-3.0'	58.2'
9	315°30.5	· · 26.2	135°03.6	6.0'	23°42.6	-3.1'	58.2'
10	330°30.1	26.2	149°28.6	6.0'	23°39.4	-3.3'	58.3'
11	345°29.8	26.2	163°53.6	6.0'	23°36.1	-3.4'	58.3'
12	0°29.5	S23°26.2	178°18.5	6.0'	N23°32.6	-3.6'	58.3'
13	15°29.2	26.2	192°43.5	6.0'	23°28.9	-3.7'	58.3'
14	30°28.9	26.2	207°08.5	6.0'	23°25.1	-3.9'	58.4'
15	45°28.6	· · 26.2	221°33.5	6.0'	23°21.2	-4.0'	58.4'
16	60°28.3	26.2	235°58.5	6.0'	23°17.0	-4.2'	58.4'
17	75°28.0	26.2	250°23.5	6.0'	23°12.8	-4.3'	58.4'
18	90°27.7	S23°26.2	264°48.5	6.0'	N23°08.4	-4.5'	58.5'
19	105°27.4	26.3	279°13.5	6.0'	23°03.8	-4.6'	58.5'
20	120°27.1	26.3	293°38.5	6.0'	22°59.1	-4.8'	58.5'
21	135°26.7	· · 26.3	308°03.6	6.1'	22°54.2	-4.9'	58.5'
22	150°26.4	26.3	322°28.7	6.1'	22°49.2	-5.1'	58.6'
23	165°26.1	26.3	336°53.8	6.1'	22°44.1	-5.2'	58.6'
	SD.=16.2	d=-0.0	S.D.=15.9				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°25.8	S23°26.3	351°18.9	6.1'	N22°38.8	-5.4'	58.6'
1	195°25.5	26.3	5°44.0	6.1'	22°33.3	-5.5'	58.6'
2	210°25.2	26.3	20°09.2	6.2'	22°27.7	-5.7'	58.6'
3	225°24.9	· · 26.3	34°34.4	6.2'	22°21.9	-5.8'	58.7'
4	240°24.6	26.3	48°59.6	6.2'	22°16.1	-6.0'	58.7'
5	255°24.3	26.3	63°24.8	6.3'	22°10.0	-6.1'	58.7'
6	270°24.0	S23°26.2	77°50.1	6.3'	N22°03.8	-6.3'	58.7'
7	285°23.6	26.2	92°15.4	6.3'	21°57.5	-6.4'	58.7'
8	300°23.3	26.2	106°40.7	6.3'	21°51.0	-6.5'	58.8'
9	315°23.0	· · 26.2	121°06.1	6.4'	21°44.4	-6.7'	58.8'
10	330°22.7	26.2	135°31.5	6.4'	21°37.6	-6.8'	58.8'
11	345°22.4	26.2	149°56.9	6.5'	21°30.7	-7.0'	58.8'
12	0°22.1	S23°26.2	164°22.4	6.5'	N21°23.7	-7.1'	58.8'
13	15°21.8	26.2	178°47.9	6.5'	21°16.5	-7.2'	58.9'
14	30°21.5	26.2	193°13.4	6.6'	21°09.2	-7.4'	58.9'
15	45°21.2	· · 26.2	207°39.0	6.6'	21°01.7	-7.5'	58.9'
16	60°20.9	26.2	222°04.6	6.6'	20°54.1	-7.7'	58.9'
17	75°20.5	26.1	236°30.3	6.7'	20°46.4	-7.8'	58.9'
18	90°20.2	S23°26.1	250°56.0	6.7'	N20°38.6	-7.9'	58.9'
19	105°19.9	26.1	265°21.8	6.8'	20°30.6	-8.1'	59.0'
20	120°19.6	26.1	279°47.6	6.8'	20°22.4	-8.2'	59.0'
21	135°19.3	· · 26.1	294°13.4	6.9'	20°14.2	-8.3'	59.0'
22	150°19.0	26.1	308°39.3	6.9'	20°05.8	-8.5'	59.0'
23	165°18.7	26.0	323°05.3	7.0'	19°57.3	-8.6'	59.0'
	SD.=16.2	d=0.0	S.D.=16.0				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°18.4	S23°26.0	337°31.3	7.0'	N19°48.6	-8.7'	59.0'
1	195°18.1	26.0	351°57.3	7.1'	19°39.8	-8.8'	59.1'
2	210°17.8	26.0	6°23.4	7.1'	19°30.9	-9.0'	59.1'
3	225°17.4	· · 26.0	20°49.5	7.2'	19°21.9	-9.1'	59.1'
4	240°17.1	25.9	35°15.7	7.2'	19°12.7	-9.2'	59.1'
5	255°16.8	25.9	49°42.0	7.3'	19°03.5	-9.3'	59.1'
6	270°16.5	S23°25.9	64°08.3	7.3'	N18°54.1	-9.5'	59.1'
7	285°16.2	25.9	78°34.6	7.4'	18°44.5	-9.6'	59.1'
8	300°15.9	25.8	93°01.0	7.4'	18°34.9	-9.7'	59.2'
9	315°15.6	· · 25.8	107°27.5	7.5'	18°25.2	-9.8'	59.2'
10	330°15.3	25.8	121°54.0	7.5'	18°15.3	-9.9'	59.2'
11	345°15.0	25.8	136°20.6	7.6'	18°05.3	-10.0'	59.2'
12	0°14.7	S23°25.7	150°47.2	7.7'	N17°55.2	-10.2'	59.2'
13	15°14.3	25.7	165°13.9	7.7'	17°45.0	-10.3'	59.2'
14	30°14.0	25.7	179°40.6	7.8'	17°34.7	-10.4'	59.2'
15	45°13.7	· · 25.6	194°07.4	7.8'	17°24.2	-10.5'	59.2'
16	60°13.4	25.6	208°34.2	7.9'	17°13.7	-10.6'	59.3'
17	75°13.1	25.6	223°01.1	7.9'	17°03.0	-10.7'	59.3'
18	90°12.8	S23°25.5	237°28.1	8.0'	N16°52.3	-10.8'	59.3'
19	105°12.5	25.5	251°55.1	8.0'	16°41.4	-10.9'	59.3'
20	120°12.2	25.5	266°22.2	8.1'	16°30.4	-11.0'	59.3'
21	135°11.9	· · 25.4	280°49.3	8.2'	16°19.4	-11.1'	59.3'
22	150°11.6	25.4	295°16.5	8.2'	16°08.2	-11.2'	59.3'
23	165°11.2	25.4	309°43.8	8.3'	15°56.9	-11.3'	59.3'
	SD.=16.2	d=0.0	S.D.=16.1				

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

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%
21	02:13	01:58	11:58	–:–	12:07	○
22	01:43	01:28	11:59	00:36	13:05	
23	01:14	00:59	11:59	01:33	14:01	

December 24, 25, 26 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	92°25.1	227°42.6	S13°30.4	169°03.6	S23°49.6	95°58.5	S02°57.2	256°31.7	S04°12.0
1	107°27.6	242°42.9	30.9	184°04.0	49.4	111°00.7	57.1	271°34.0	12.1
2	122°30.0	257°43.1	31.5	199°04.3	49.3	126°02.9	57.0	286°36.3	12.1
3	137°32.5	272°43.4	·· 32.0	214°04.7	·· 49.1	141°05.1	·· 56.9	301°38.7	·· 12.2
4	152°34.9	287°43.7	32.5	229°05.1	48.9	156°07.3	56.8	316°41.0	12.2
5	167°37.4	302°44.0	33.1	244°05.4	48.8	171°09.6	56.6	331°43.3	12.2
6	182°39.9	317°44.2	S13°33.6	259°05.8	S23°48.6	186°11.8	S02°56.5	346°45.7	S04°12.3
7	197°42.3	332°44.5	34.1	274°06.2	48.4	201°14.0	56.4	1°48.0	12.3
8	212°44.8	347°44.8	34.7	289°06.6	48.3	216°16.2	56.3	16°50.3	12.4
9	227°47.3	2°45.0	·· 35.2	304°06.9	·· 48.1	231°18.4	·· 56.2	31°52.7	·· 12.4
10	242°49.7	17°45.3	35.7	319°07.3	47.9	246°20.6	56.0	46°55.0	12.5
11	257°52.2	32°45.6	36.3	334°07.7	47.8	261°22.8	55.9	61°57.3	12.5
12	272°54.7	47°45.8	S13°36.8	349°08.0	S23°47.6	276°25.0	S02°55.8	76°59.6	S04°12.6
13	287°57.1	62°46.1	37.3	4°08.4	47.4	291°27.2	55.7	92°02.0	12.6
14	302°59.6	77°46.4	37.9	19°08.8	47.3	306°29.4	55.5	107°04.3	12.6
15	318°02.1	92°46.6	·· 38.4	34°09.2	·· 47.1	321°31.6	·· 55.4	122°06.6	·· 12.7
16	333°04.5	107°46.9	38.9	49°09.5	46.9	336°33.8	55.3	137°09.0	12.7
17	348°07.0	122°47.1	39.5	64°09.9	46.7	351°36.0	55.2	152°11.3	12.8
18	3°09.4	137°47.4	S13°40.0	79°10.3	S23°46.6	6°38.2	S02°55.0	167°13.6	S04°12.8
19	18°11.9	152°47.6	40.6	94°10.7	46.4	21°40.4	54.9	182°15.9	12.9
20	33°14.4	167°47.9	41.1	109°11.0	46.2	36°42.6	54.8	197°18.3	12.9
21	48°16.8	182°48.1	·· 41.6	124°11.4	·· 46.0	51°44.8	·· 54.7	212°20.6	·· 12.9
22	63°19.3	197°48.4	42.2	139°11.8	45.9	66°47.0	54.6	227°22.9	13.0
23	78°21.8	212°48.6	42.7	154°12.1	45.7	81°49.2	54.4	242°25.3	13.0
Mer.pass.:17:47		v0.3 d-0.5 m-4.4		v0.4 d0.2 m1.3		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	93°24.2	227°48.9	S13°43.2	169°12.5	S23°45.5	96°51.4	S02°54.3	257°27.6	S04°13.1
1	108°26.7	242°49.1	43.8	184°12.9	45.4	111°53.6	54.2	272°29.9	13.1
2	123°29.2	257°49.4	44.3	199°13.3	45.2	126°55.8	54.1	287°32.3	13.2
3	138°31.6	272°49.6	·· 44.9	214°13.6	·· 45.0	141°58.1	·· 53.9	302°34.6	·· 13.2
4	153°34.1	287°49.9	45.4	229°14.0	44.8	157°00.3	53.8	317°36.9	13.3
5	168°36.6	302°50.1	45.9	244°14.4	44.6	172°02.5	53.7	332°39.3	13.3
6	183°39.0	317°50.3	S13°46.5	259°14.8	S23°44.5	187°04.7	S02°53.6	347°41.6	S04°13.3
7	198°41.5	332°50.6	47.0	274°15.1	44.3	202°06.9	53.4	2°43.9	13.4
8	213°43.9	347°50.8	47.6	289°15.5	44.1	217°09.1	53.3	17°46.3	13.4
9	228°46.4	2°51.1	·· 48.1	304°15.9	·· 43.9	232°11.3	·· 53.2	32°48.6	·· 13.5
10	243°48.9	17°51.3	48.7	319°16.2	43.8	247°13.5	53.1	47°50.9	13.5
11	258°51.3	32°51.5	49.2	334°16.6	43.6	262°15.7	52.9	62°53.3	13.5
12	273°53.8	47°51.8	S13°49.7	349°17.0	S23°43.4	277°17.9	S02°52.8	77°55.6	S04°13.6
13	288°56.3	62°52.0	50.3	4°17.4	43.2	292°20.1	52.7	92°57.9	13.6
14	303°58.7	77°52.2	50.8	19°17.7	43.0	307°22.3	52.6	108°00.3	13.7
15	319°01.2	92°52.4	·· 51.4	34°18.1	·· 42.9	322°24.5	·· 52.4	123°02.6	·· 13.7
16	334°03.7	107°52.7	51.9	49°18.5	42.7	337°26.7	52.3	138°04.9	13.8
17	349°06.1	122°52.9	52.5	64°18.9	42.5	352°28.9	52.2	153°07.3	13.8
18	4°08.6	137°53.1	S13°53.0	79°19.2	S23°42.3	7°31.0	S02°52.1	168°09.6	S04°13.8
19	19°11.0	152°53.3	53.5	94°19.6	42.1	22°33.2	51.9	183°11.9	13.9
20	34°13.5	167°53.6	54.1	109°20.0	41.9	37°35.4	51.8	198°14.3	13.9
21	49°16.0	182°53.8	·· 54.6	124°20.4	·· 41.7	52°37.6	·· 51.7	213°16.6	·· 14.0
22	64°18.4	197°54.0	55.2	139°20.7	41.6	67°39.8	51.6	228°18.9	14.0
23	79°20.9	212°54.2	55.7	154°21.1	41.4	82°42.0	51.4	243°21.3	14.1
Mer.pass.:17:43		v0.2 d-0.5 m-4.4		v0.4 d0.2 m1.3		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	94°23.4	227°54.4	S13°56.3	169°21.5	S23°41.2	97°44.2	S02°51.3	258°23.6	S04°14.1
1	109°25.8	242°54.7	56.8	184°21.8	41.0	112°46.4	51.2	273°25.9	14.1
2	124°28.3	257°54.9	57.4	199°22.2	40.8	127°48.6	51.1	288°28.3	14.2
3	139°30.8	272°55.1	·· 57.9	214°22.6	·· 40.6	142°50.8	·· 50.9	303°30.6	·· 14.2
4	154°33.2	287°55.3	58.4	229°23.0	40.4	157°53.0	50.8	318°32.9	14.3
5	169°35.7	302°55.5	59.0	244°23.3	40.3	172°55.2	50.7	333°35.3	14.3
6	184°38.2	317°55.7	S13°59.5	259°23.7	S23°40.1	187°57.4	S02°50.5	348°37.6	S04°14.3
7	199°40.6	332°55.9	14°00.1	274°24.1	39.9	202°59.6	50.4	3°40.0	14.4
8	214°43.1	347°56.1	00.6	289°24.5	39.7	218°01.8	50.3	18°42.3	14.4
9	229°45.5	2°56.3	·· 01.2	304°24.8	·· 39.5	233°04.0	·· 50.2	33°44.6	·· 14.5
10	244°48.0	17°56.5	01.7	319°25.2	39.3	248°06.2	50.0	48°47.0	14.5
11	259°50.5	32°56.7	02.3	334°25.6	39.1	263°08.4	49.9	63°49.3	14.5
12	274°52.9	47°56.9	S14°02.8	349°25.9	S23°38.9	278°10.6	S02°49.8	78°51.6	S04°14.6
13	289°55.4	62°57.1	03.4	4°26.3	38.7	293°12.8	49.7	93°54.0	14.6
14	304°57.9	77°57.3	03.9	19°26.7	38.5	308°15.0	49.5	108°56.3	14.7
15	320°00.3	92°57.5	·· 04.5	34°27.1	·· 38.3	323°17.1	·· 49.4	123°58.6	·· 14.7
16	335°02.8	107°57.7	05.0	49°27.4	38.2	338°19.3	49.3	139°01.0	14.8
17	350°05.3	122°57.9	05.6	64°27.8	38.0	353°21.5	49.1	154°03.3	14.8
18	5°07.7	137°58.1	S14°06.1	79°28.2	S23°37.8	8°23.7	S02°49.0	169°05.7	S04°14.8
19	20°10.2	152°58.3	06.7	94°28.6	37.6	23°25.9	48.9	184°08.0	14.9
20	35°12.7	167°58.5	07.2	109°28.9	37.4	38°28.1	48.8	199°10.3	14.9
21	50°15.1	182°58.7	·· 07.8	124°29.3	·· 37.2	53°30.3	·· 48.6	214°12.7	·· 15.0
22	65°17.6	197°58.9	08.3	139°29.7	37.0	68°32.5	48.5	229°15.0	15.0
23	80°20.0	212°59.1	08.9	154°30.1	36.8	83°34.7	48.4	244°17.3	15.0
Mer.pass.:17:40		v0.2 d-0.5 m-4.4		v0.4 d0.2 m1.3		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.3
Ankaa	353°17.3	-42°14.9
Schedar	349°42.6	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.8	-57°11.0
Hamal	328°02.6	23°31.0
Polaris	318°21.1	89°19.0
Acamar	315°19.3	-40°15.8
Menkar	314°16.7	4°08.0
Mirfak	308°42.5	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.4
Capella	280°36.6	46°00.6
Bellatrix	278°33.6	6°21.5
Elnath	278°14.5	28°37.0
Alnilam	275°47.8	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.1
Sirius	258°34.9	-16°43.9
Adhara	255°13.5	-28°59.3
Procyon	245°01.3	5°11.7
Pollux	243°29.5	27°59.8
Avior	234°18.2	-59°32.6
Suhail	222°53.5	-43°28.6
Miaplacidus	221°39.5	-69°45.6
Alphard	217°57.6	-8°42.5
Regulus	207°45.2	11°54.6
Dubhe	193°53.5	61°41.1
Denebola	182°35.4	14°30.4
Gienah	175°54.1	-17°36.2
Acrux	173°11.5	-63°09.4
Gacrux	172°03.0	-57°10.3
Alioth	166°22.2	55°53.6
Spica	158°33.2	-11°13.2
Alkaid	153°00.4	49°15.2
Hadar	148°50.8	-60°25.4
Menkent	148°09.9	-36°25.3
Arcturus	145°57.5	19°07.3
Rigil Kent.	139°54.6	-60°52.6
Kochab	137°20.6	74°06.3
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°28.8	-26°27.3
Atria	107°32.8	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.4	12°33.1
Eltanin	90°47.5	51°29.2
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.7
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°53.9
Peacock	53°22.5	-56°42.0
Deneb	49°33.1	45°19.4
Enif	33°49.1	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.2	28°08.8
Markab	13°40.2	15°16.1

Dec 24 Fri	**SHA**	**Mer.pass**
Venus	135°17.5	08:49
Mars	76°38.5	12:43
Jupiter	3°33.4	17:34
Saturn	164°06.6	06:53

Dec 25 Sat	**SHA**	**Mer.pass**
Venus	134°24.7	08:49
Mars	75°48.3	12:43
Jupiter	3°27.2	17:30
Saturn	164°03.4	06:49

Dec 26 Sun	**SHA**	**Mer.pass**
Venus	133°31.1	08:48
Mars	74°58.1	12:42
Jupiter	3°20.9	17:27
Saturn	164°00.2	06:45

Horizontal parallax	
Venus:	0.3
Mars:	0.1

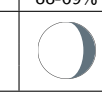
h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°10.9	**S**23°25.3	324°11.1	8.3'	**N**15°45.6	-11.4'	59.3'
1	195°10.6	25.3	338°38.4	8.4'	15°34.1	-11.5'	59.4'
2	210°10.3	25.2	353°05.9	8.5'	15°22.5	-11.6'	59.4'
3	225°10.0	· · 25.2	7°33.3	8.5'	15°10.9	-11.7'	59.4'
4	240°09.7	25.1	22°00.9	8.6'	14°59.1	-11.8'	59.4'
5	255°09.4	25.1	36°28.5	8.6'	14°47.3	-11.9'	59.4'
6	270°09.1	**S**23°25.1	50°56.1	8.7'	**N**14°35.4	-12.0'	59.4'
7	285°08.8	25.0	65°23.8	8.7'	14°23.4	-12.1'	59.4'
8	300°08.5	25.0	79°51.6	8.8'	14°11.3	-12.1'	59.4'
9	315°08.2	· · 24.9	94°19.4	8.8'	13°59.1	-12.2'	59.4'
10	330°07.8	24.9	108°47.3	8.9'	13°46.8	-12.3'	59.4'
11	345°07.5	24.8	123°15.2	9.0'	13°34.5	-12.4'	59.4'
12	0°07.2	**S**23°24.8	137°43.2	9.0'	**N**13°22.0	-12.5'	59.4'
13	15°06.9	24.7	152°11.3	9.1'	13°09.5	-12.5'	59.4'
14	30°06.6	24.7	166°39.4	9.1'	12°57.0	-12.6'	59.4'
15	45°06.3	· · 24.6	181°07.5	9.2'	12°44.3	-12.7'	59.5'
16	60°06.0	24.6	195°35.7	9.2'	12°31.6	-12.8'	59.5'
17	75°05.7	24.5	210°04.0	9.3'	12°18.7	-12.8'	59.5'
18	90°05.4	**S**23°24.5	224°32.3	9.3'	**N**12°05.9	-12.9'	59.5'
19	105°05.1	24.4	239°00.6	9.4'	11°52.9	-13.0'	59.5'
20	120°04.7	24.4	253°29.1	9.4'	11°39.9	-13.1'	59.5'
21	135°04.4	· · 24.3	267°57.5	9.5'	11°26.8	-13.1'	59.5'
22	150°04.1	24.2	282°26.1	9.5'	11°13.6	-13.2'	59.5'
23	165°03.8	24.2	296°54.6	9.6'	11°00.4	-13.3'	59.5'
	SD.=16.2	d=0.0	S.D.=16.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°03.5	**S**23°24.1	311°23.2	9.6'	**N**10°47.1	-13.3'	59.5'
1	195°03.2	24.1	325°51.9	9.7'	10°33.8	-13.4'	59.5'
2	210°02.9	24.0	340°20.6	9.7'	10°20.4	-13.4'	59.5'
3	225°02.6	· · 24.0	354°49.4	9.8'	10°06.9	-13.5'	59.5'
4	240°02.3	23.9	9°18.2	9.8'	09°53.4	-13.5'	59.5'
5	255°02.0	23.8	23°47.1	9.9'	09°39.8	-13.6'	59.5'
6	270°01.7	**S**23°23.8	38°16.0	9.9'	**N**09°26.2	-13.7'	59.5'
7	285°01.3	23.7	52°44.9	10.0'	09°12.5	-13.7'	59.5'
8	300°01.0	23.6	67°13.9	10.0'	08°58.8	-13.8'	59.5'
9	315°00.7	· · 23.6	81°43.0	10.1'	08°45.0	-13.8'	59.5'
10	330°00.4	23.5	96°12.0	10.1'	08°31.2	-13.9'	59.5'
11	345°00.1	23.4	110°41.2	10.1'	08°17.3	-13.9'	59.5'
12	359°59.8	**S**23°23.4	125°10.3	10.2'	**N**08°03.4	-13.9'	59.5'
13	14°59.5	23.3	139°39.5	10.2'	07°49.4	-14.0'	59.5'
14	29°59.2	23.2	154°08.8	10.3'	07°35.4	-14.0'	59.5'
15	44°58.9	· · 23.2	168°38.1	10.3'	07°21.4	-14.1'	59.5'
16	59°58.6	23.1	183°07.4	10.3'	07°07.3	-14.1'	59.5'
17	74°58.2	23.0	197°36.8	10.4'	06°53.1	-14.1'	59.5'
18	89°57.9	**S**23°22.9	212°06.2	10.4'	**N**06°39.0	-14.2'	59.5'
19	104°57.6	22.9	226°35.6	10.4'	06°24.8	-14.2'	59.5'
20	119°57.3	22.8	241°05.1	10.5'	06°10.5	-14.2'	59.5'
21	134°57.0	· · 22.7	255°34.6	10.5'	05°56.3	-14.3'	59.5'
22	149°56.7	22.6	270°04.1	10.5'	05°42.0	-14.3'	59.5'
23	164°56.4	22.6	284°33.7	10.6'	05°27.7	-14.3'	59.5'
	SD.=16.3	d=0.1	S.D.=16.2				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°56.1	**S**23°22.5	299°03.2	10.6'	**N**05°13.3	-14.4'	59.5'
1	194°55.8	22.4	313°32.9	10.6'	04°58.9	-14.4'	59.5'
2	209°55.5	22.3	328°02.5	10.7'	04°44.5	-14.4'	59.5'
3	224°55.2	· · 22.2	342°32.2	10.7'	04°30.1	-14.4'	59.5'
4	239°54.9	22.2	357°01.9	10.7'	04°15.7	-14.5'	59.5'
5	254°54.5	22.1	11°31.7	10.7'	04°01.2	-14.5'	59.5'
6	269°54.2	**S**23°22.0	26°01.4	10.8'	**N**03°46.7	-14.5'	59.5'
7	284°53.9	21.9	40°31.2	10.8'	03°32.2	-14.5'	59.5'
8	299°53.6	21.8	55°01.0	10.8'	03°17.7	-14.5'	59.5'
9	314°53.3	· · 21.7	69°30.8	10.8'	03°03.2	-14.5'	59.5'
10	329°53.0	21.7	84°00.7	10.9'	02°48.6	-14.6'	59.5'
11	344°52.7	21.6	98°30.6	10.9'	02°34.0	-14.6'	59.5'
12	359°52.4	**S**23°21.5	113°00.5	10.9'	**N**02°19.5	-14.6'	59.4'
13	14°52.1	21.4	127°30.4	10.9'	02°04.9	-14.6'	59.4'
14	29°51.8	21.3	142°00.3	10.9'	01°50.3	-14.6'	59.4'
15	44°51.5	· · 21.2	156°30.3	11.0'	01°35.7	-14.6'	59.4'
16	59°51.2	21.1	171°00.2	11.0'	01°21.1	-14.6'	59.4'
17	74°50.8	21.0	185°30.2	11.0'	01°06.5	-14.6'	59.4'
18	89°50.5	**S**23°20.9	200°00.2	11.0'	**N**00°51.9	-14.6'	59.4'
19	104°50.2	20.8	214°30.2	11.0'	00°37.3	-14.6'	59.4'
20	119°49.9	20.7	229°00.2	11.0'	00°22.7	-14.6'	59.4'
21	134°49.6	· · 20.7	243°30.2	11.0'	**N**00°08.1	-14.6'	59.4'
22	149°49.3	20.6	258°00.2	11.0'	**S**00°06.5	-14.6'	59.4'
23	164°49.0	20.5	272°30.3	11.0'	00°21.1	-14.6'	59.4'
	SD.=16.3	d=0.1	S.D.=16.2				

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 19-21 88-69%
24	00:44	00:29	12:00	02:29	14:55	
25	00:14	00:01	12:00	03:21	15:47	
26	00:16	00:30	12:01	04:12	16:37	

December 27, 28, 29 UT (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	95°22.5	227°59.3	S14°09.4	169°30.4	S23°36.6	98°36.9	S02°48.2	259°19.7	S04°15.1
1	110°25.0	242°59.5	10.0	184°30.8	36.4	113°39.1	48.1	274°22.0	15.1
2	125°27.4	257°59.6	10.5	199°31.2	36.2	128°41.2	48.0	289°24.4	15.2
3	140°29.9	272°59.8	·· 11.1	214°31.5	·· 36.0	143°43.4	·· 47.9	304°26.7	·· 15.2
4	155°32.4	288°00.0	11.6	229°31.9	35.8	158°45.6	47.7	319°29.0	15.2
5	170°34.8	303°00.2	12.2	244°32.3	35.6	173°47.8	47.6	334°31.4	15.3
6	185°37.3	318°00.4	S14°12.7	259°32.7	S23°35.4	188°50.0	S02°47.5	349°33.7	S04°15.3
7	200°39.8	333°00.5	13.3	274°33.0	35.2	203°52.2	47.3	4°36.1	15.4
8	215°42.2	348°00.7	13.8	289°33.4	35.0	218°54.4	47.2	19°38.4	15.4
9	230°44.7	3°00.9	·· 14.4	304°33.8	·· 34.8	233°56.6	·· 47.1	34°40.7	·· 15.4
10	245°47.1	18°01.1	14.9	319°34.2	34.6	248°58.8	46.9	49°43.1	15.5
11	260°49.6	33°01.2	15.5	334°34.5	34.4	264°00.9	46.8	64°45.4	15.5
12	275°52.1	48°01.4	S14°16.0	349°34.9	S23°34.2	279°03.1	S02°46.7	79°47.8	S04°15.5
13	290°54.5	63°01.6	16.6	4°35.3	34.0	294°05.3	46.6	94°50.1	15.6
14	305°57.0	78°01.8	17.1	19°35.7	33.8	309°07.5	46.4	109°52.4	15.6
15	320°59.5	93°01.9	·· 17.7	34°36.0	·· 33.6	324°09.7	·· 46.3	124°54.8	·· 15.7
16	336°01.9	108°02.1	18.3	49°36.4	33.4	339°11.9	46.2	139°57.1	15.7
17	351°04.4	123°02.3	18.8	64°36.8	33.2	354°14.1	46.0	154°59.5	15.7
18	6°06.9	138°02.4	S14°19.4	79°37.2	S23°33.0	9°16.2	S02°45.9	170°01.8	S04°15.8
19	21°09.3	153°02.6	19.9	94°37.5	32.8	24°18.4	45.8	185°04.1	15.8
20	36°11.8	168°02.8	20.5	109°37.9	32.5	39°20.6	45.6	200°06.5	15.9
21	51°14.3	183°02.9	·· 21.0	124°38.3	·· 32.3	54°22.8	·· 45.5	215°08.8	·· 15.9
22	66°16.7	198°03.1	21.6	139°38.7	32.1	69°25.0	45.4	230°11.2	15.9
23	81°19.2	213°03.2	22.1	154°39.0	31.9	84°27.2	45.2	245°13.5	16.0
Mer.pass.:17:36		v0.2 d-0.6 m-4.4		v0.4 d0.2 m1.3		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	96°21.6	228°03.4	S14°22.7	169°39.4	S23°31.7	99°29.4	S02°45.1	260°15.9	S04°16.0
1	111°24.1	243°03.6	23.2	184°39.8	31.5	114°31.5	45.0	275°18.2	16.0
2	126°26.6	258°03.7	23.8	199°40.2	31.3	129°33.7	44.8	290°20.5	16.1
3	141°29.0	273°03.9	·· 24.4	214°40.5	·· 31.1	144°35.9	·· 44.7	305°22.9	·· 16.1
4	156°31.5	288°04.0	24.9	229°40.9	30.9	159°38.1	44.6	320°25.2	16.2
5	171°34.0	303°04.2	25.5	244°41.3	30.7	174°40.3	44.4	335°27.6	16.2
6	186°36.4	318°04.3	S14°26.0	259°41.6	S23°30.5	189°42.5	S02°44.3	350°29.9	S04°16.2
7	201°38.9	333°04.5	26.6	274°42.0	30.2	204°44.6	44.2	5°32.3	16.3
8	216°41.4	348°04.6	27.1	289°42.4	30.0	219°46.8	44.1	20°34.6	16.3
9	231°43.8	3°04.8	·· 27.7	304°42.8	·· 29.8	234°49.0	·· 43.9	35°36.9	·· 16.4
10	246°46.3	18°04.9	28.3	319°43.1	29.6	249°51.2	43.8	50°39.3	16.4
11	261°48.8	33°05.1	28.8	334°43.5	29.4	264°53.4	43.7	65°41.6	16.4
12	276°51.2	48°05.2	S14°29.4	349°43.9	S23°29.2	279°55.5	S02°43.5	80°44.0	S04°16.5
13	291°53.7	63°05.3	29.9	4°44.3	29.0	294°57.7	43.4	95°46.3	16.5
14	306°56.1	78°05.5	30.5	19°44.6	28.8	309°59.9	43.3	110°48.7	16.5
15	321°58.6	93°05.6	·· 31.0	34°45.0	·· 28.5	325°02.1	·· 43.1	125°51.0	·· 16.6
16	337°01.1	108°05.8	31.6	49°45.4	28.3	340°04.3	43.0	140°53.4	16.6
17	352°03.5	123°05.9	32.2	64°45.8	28.1	355°06.4	42.9	155°55.7	16.7
18	7°06.0	138°06.0	S14°32.7	79°46.1	S23°27.9	10°08.6	S02°42.7	170°58.0	S04°16.7
19	22°08.5	153°06.2	33.3	94°46.5	27.7	25°10.8	42.6	186°00.4	16.7
20	37°10.9	168°06.3	33.8	109°46.9	27.5	40°13.0	42.5	201°02.7	16.8
21	52°13.4	183°06.5	·· 34.4	124°47.3	·· 27.2	55°15.2	·· 42.3	216°05.1	·· 16.8
22	67°15.9	198°06.6	34.9	139°47.6	27.0	70°17.3	42.2	231°07.4	16.8
23	82°18.3	213°06.7	35.5	154°48.0	26.8	85°19.5	42.1	246°09.8	16.9
Mer.pass.:17:32		v0.2 d-0.6 m-4.3		v0.4 d0.2 m1.2		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	97°20.8	228°06.8	S14°36.1	169°48.4	S23°26.6	100°21.7	S02°41.9	261°12.1	S04°16.9
1	112°23.2	243°07.0	36.6	184°48.8	26.4	115°23.9	41.8	276°14.5	16.9
2	127°25.7	258°07.1	37.2	199°49.1	26.1	130°26.1	41.7	291°16.8	17.0
3	142°28.2	273°07.2	·· 37.7	214°49.5	·· 25.9	145°28.2	·· 41.5	306°19.2	·· 17.0
4	157°30.6	288°07.4	38.3	229°49.9	25.7	160°30.4	41.4	321°21.5	17.1
5	172°33.1	303°07.5	38.9	244°50.3	25.5	175°32.6	41.2	336°23.8	17.1
6	187°35.6	318°07.6	S14°39.4	259°50.6	S23°25.2	190°34.8	S02°41.1	351°26.2	S04°17.1
7	202°38.0	333°07.7	40.0	274°51.0	25.0	205°36.9	41.0	6°28.5	17.2
8	217°40.5	348°07.8	40.5	289°51.4	24.8	220°39.1	40.8	21°30.9	17.2
9	232°43.0	3°08.0	·· 41.1	304°51.8	·· 24.6	235°41.3	·· 40.7	36°33.2	·· 17.2
10	247°45.4	18°08.1	41.7	319°52.1	24.4	250°43.5	40.6	51°35.6	17.3
11	262°47.9	33°08.2	42.2	334°52.5	24.1	265°45.6	40.4	66°37.9	17.3
12	277°50.4	48°08.3	S14°42.8	349°52.9	S23°23.9	280°47.8	S02°40.3	81°40.3	S04°17.3
13	292°52.8	63°08.4	43.3	4°53.3	23.7	295°50.0	40.2	96°42.6	17.4
14	307°55.3	78°08.5	43.9	19°53.6	23.5	310°52.2	40.0	111°45.0	17.4
15	322°57.7	93°08.7	·· 44.5	34°54.0	·· 23.2	325°54.3	·· 39.9	126°47.3	·· 17.5
16	338°00.2	108°08.8	45.0	49°54.4	23.0	340°56.5	39.8	141°49.7	17.5
17	353°02.7	123°08.9	45.6	64°54.8	22.8	355°58.7	39.6	156°52.0	17.5
18	8°05.1	138°09.0	S14°46.1	79°55.1	S23°22.5	11°00.9	S02°39.5	171°54.4	S04°17.6
19	23°07.6	153°09.1	46.7	94°55.5	22.3	26°03.0	39.3	186°56.7	17.6
20	38°10.1	168°09.2	47.3	109°55.9	22.1	41°05.2	39.2	201°59.1	17.6
21	53°12.5	183°09.3	·· 47.8	124°56.3	·· 21.9	56°07.4	·· 39.1	217°01.4	·· 17.7
22	68°15.0	198°09.4	48.4	139°56.7	21.6	71°09.6	38.9	232°03.8	17.7
23	83°17.5	213°09.5	48.9	154°57.0	21.4	86°11.7	38.8	247°06.1	17.7
Mer.pass.:17:28		v0.1 d-0.6 m-4.3		v0.4 d0.2 m1.2		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.3
Ankaa	353°17.4	-42°14.9
Schedar	349°42.6	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.8	-57°11.1
Hamal	328°02.6	23°31.0
Polaris	318°22.1	89°19.0
Acamar	315°19.4	-40°15.8
Menkar	314°16.7	4°08.0
Mirfak	308°42.6	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.4
Capella	280°36.6	46°00.6
Bellatrix	278°33.6	6°21.5
Elnath	278°14.5	28°37.0
Alnilam	275°47.8	-1°11.7
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.1
Sirius	258°34.9	-16°43.9
Adhara	255°13.5	-28°59.3
Procyon	245°01.2	5°11.7
Pollux	243°29.5	27°59.8
Avior	234°18.2	-59°32.6
Suhail	222°53.4	-43°28.6
Miaplacidus	221°39.5	-69°45.6
Alphard	217°57.6	-8°42.5
Regulus	207°45.2	11°54.6
Dubhe	193°53.5	61°41.1
Denebola	182°35.4	14°30.4
Gienah	175°54.1	-17°36.2
Acrux	173°11.5	-63°09.4
Gacrux	172°03.0	-57°10.3
Alioth	166°22.2	55°53.6
Spica	158°33.2	-11°13.2
Alkaid	153°00.4	49°15.2
Hadar	148°50.8	-60°25.4
Menkent	148°09.9	-36°25.3
Arcturus	145°57.5	19°07.3
Rigil Kent.	139°54.6	-60°52.6
Kochab	137°20.5	74°06.3
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.8	26°40.5
Antares	112°28.8	-26°27.3
Atria	107°32.8	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.4	12°33.1
Eltanin	90°47.5	51°29.2
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.7
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°53.9
Peacock	53°22.5	-56°42.0
Deneb	49°33.1	45°19.4
Enif	33°49.1	9°55.7
Al Na'ir	27°46.1	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.3	28°08.8
Markab	13°40.2	15°16.1

Dec 27 Mon	**SHA**	**Mer.pass**
Venus	132°36.8	08:48
Mars	74°07.9	12:42
Jupiter	3°14.4	17:23
Saturn	163°57.2	06:42

Dec 28 Tue	**SHA**	**Mer.pass**
Venus	131°41.8	08:48
Mars	73°17.8	12:41
Jupiter	3°07.7	17:20
Saturn	163°54.2	06:38

Dec 29 Wed	**SHA**	**Mer.pass**
Venus	130°46.1	08:47
Mars	72°27.6	12:40
Jupiter	3°00.9	17:16
Saturn	163°51.3	06:34

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.1375 sec ΔT = TT-UT1 = +66.3215 sec

2010 December 27 to Dec. 29 UT

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°48.7	S23°20.4	287°00.3	11.0'	S00°35.7	-14.6'	59.4'
1	194°48.4	20.3	301°30.4	11.1'	00°50.3	-14.6'	59.4'
2	209°48.1	20.2	316°00.4	11.1'	01°04.9	-14.6'	59.4'
3	224°47.8	· · 20.1	330°30.5	11.1'	01°19.5	-14.6'	59.4'
4	239°47.5	20.0	345°00.5	11.1'	01°34.0	-14.6'	59.3'
5	254°47.1	19.9	359°30.6	11.1'	01°48.6	-14.5'	59.3'
6	269°46.8	S23°19.8	14°00.7	11.1'	S02°03.1	-14.5'	59.3'
7	284°46.5	19.7	28°30.7	11.1'	02°17.6	-14.5'	59.3'
8	299°46.2	19.5	43°00.8	11.1'	02°32.1	-14.5'	59.3'
9	314°45.9	· · 19.4	57°30.8	11.1'	02°46.6	-14.5'	59.3'
10	329°45.6	19.3	72°00.9	11.1'	03°01.1	-14.5'	59.3'
11	344°45.3	19.2	86°30.9	11.0'	03°15.5	-14.4'	59.3'
12	359°45.0	S23°19.1	101°01.0	11.0'	S03°29.9	-14.4'	59.3'
13	14°44.7	19.0	115°31.0	11.0'	03°44.3	-14.4'	59.3'
14	29°44.4	18.9	130°01.1	11.0'	03°58.7	-14.4'	59.3'
15	44°44.1	· · 18.8	144°31.1	11.0'	04°13.0	-14.3'	59.3'
16	59°43.8	18.7	159°01.1	11.0'	04°27.3	-14.3'	59.2'
17	74°43.5	18.6	173°31.1	11.0'	04°41.6	-14.3'	59.2'
18	89°43.2	S23°18.5	188°01.1	11.0'	S04°55.9	-14.2'	59.2'
19	104°42.8	18.3	202°31.1	11.0'	05°10.1	-14.2'	59.2'
20	119°42.5	18.2	217°01.0	11.0'	05°24.3	-14.2'	59.2'
21	134°42.2	· · 18.1	231°31.0	10.9'	05°38.5	-14.1'	59.2'
22	149°41.9	18.0	246°00.9	10.9'	05°52.6	-14.1'	59.2'
23	164°41.6	17.9	260°30.8	10.9'	06°06.7	-14.1'	59.2'
	SD.=16.3	d=0.1	S.D.=16.2				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°41.3	S23°17.8	275°00.7	10.9'	S06°20.8	-14.0'	59.2'
1	194°41.0	17.7	289°30.6	10.9'	06°34.8	-14.0'	59.2'
2	209°40.7	17.5	304°00.5	10.9'	06°48.8	-14.0'	59.2'
3	224°40.4	· · 17.4	318°30.3	10.8'	07°02.7	-13.9'	59.1'
4	239°40.1	17.3	333°00.2	10.8'	07°16.6	-13.9'	59.1'
5	254°39.8	17.2	347°30.0	10.8'	07°30.4	-13.8'	59.1'
6	269°39.5	S23°17.0	1°59.7	10.8'	S07°44.2	-13.8'	59.1'
7	284°39.2	16.9	16°29.5	10.7'	07°58.0	-13.7'	59.1'
8	299°38.9	16.8	30°59.2	10.7'	08°11.7	-13.7'	59.1'
9	314°38.6	· · 16.7	45°28.9	10.7'	08°25.4	-13.6'	59.1'
10	329°38.3	16.6	59°58.6	10.7'	08°39.0	-13.6'	59.1'
11	344°37.9	16.4	74°28.3	10.6'	08°52.5	-13.5'	59.1'
12	359°37.6	S23°16.3	88°57.9	10.6'	S09°06.0	-13.5'	59.0'
13	14°37.3	16.2	103°27.5	10.6'	09°19.5	-13.4'	59.0'
14	29°37.0	16.0	117°57.0	10.5'	09°32.9	-13.4'	59.0'
15	44°36.7	· · 15.9	132°26.6	10.5'	09°46.2	-13.3'	59.0'
16	59°36.4	15.8	146°56.1	10.5'	09°59.5	-13.3'	59.0'
17	74°36.1	15.6	161°25.5	10.5'	10°12.7	-13.2'	59.0'
18	89°35.8	S23°15.5	175°55.0	10.4'	S10°25.9	-13.1'	59.0'
19	104°35.5	15.4	190°24.4	10.4'	10°39.0	-13.1'	59.0'
20	119°35.2	15.3	204°53.7	10.3'	10°52.0	-13.0'	59.0'
21	134°34.9	· · 15.1	219°23.1	10.3'	11°05.0	-12.9'	58.9'
22	149°34.6	15.0	233°52.4	10.3'	11°17.9	-12.9'	58.9'
23	164°34.3	14.8	248°21.6	10.2'	11°30.8	-12.8'	58.9'
	SD.=16.3	d=0.1	S.D.=16.1				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°34.0	S23°14.7	262°50.9	10.2'	S11°43.5	-12.7'	58.9'
1	194°33.7	14.6	277°20.0	10.2'	11°56.3	-12.7'	58.9'
2	209°33.4	14.4	291°49.2	10.1'	12°08.9	-12.6'	58.9'
3	224°33.1	· · 14.3	306°18.3	10.1'	12°21.4	-12.5'	58.9'
4	239°32.8	14.2	320°47.4	10.0'	12°33.9	-12.5'	58.9'
5	254°32.5	14.0	335°16.4	10.0'	12°46.4	-12.4'	58.8'
6	269°32.2	S23°13.9	349°45.4	10.0'	S12°58.7	-12.3'	58.8'
7	284°31.8	13.7	4°14.3	9.9'	13°11.0	-12.2'	58.8'
8	299°31.5	13.6	18°43.2	9.9'	13°23.2	-12.1'	58.8'
9	314°31.2	· · 13.4	33°12.1	9.8'	13°35.3	-12.1'	58.8'
10	329°30.9	13.3	47°40.9	9.8'	13°47.3	-12.0'	58.8'
11	344°30.6	13.2	62°09.6	9.7'	13°59.2	-11.9'	58.8'
12	359°30.3	S23°13.0	76°38.4	9.7'	S14°11.1	-11.8'	58.7'
13	14°30.0	12.9	91°07.1	9.7'	14°22.9	-11.7'	58.7'
14	29°29.7	12.7	105°35.7	9.6'	14°34.6	-11.7'	58.7'
15	44°29.4	· · 12.6	120°04.3	9.6'	14°46.2	-11.6'	58.7'
16	59°29.1	12.4	134°32.8	9.5'	14°57.7	-11.5'	58.7'
17	74°28.8	12.3	149°01.3	9.5'	15°09.2	-11.4'	58.7'
18	89°28.5	S23°12.1	163°29.8	9.4'	S15°20.5	-11.3'	58.7'
19	104°28.2	12.0	177°58.2	9.4'	15°31.8	-11.2'	58.6'
20	119°27.9	11.8	192°26.5	9.3'	15°42.9	-11.1'	58.6'
21	134°27.6	· · 11.6	206°54.8	9.3'	15°54.0	-11.0'	58.6'
22	149°27.3	11.5	221°23.1	9.2'	16°05.0	-10.9'	58.6'
23	164°27.0	11.3	235°51.3	9.2'	16°15.8	-10.8'	58.6'
	SD.=16.3	d=0.1	S.D.=16.0				

Lat.	**Twilight** Naut.	**Twilight** Civil	**Sunrise**	**Sunset**	**Twilight** Civil	**Twilight** Naut.
N 72°	08:27	10:53	▬	▬	13:10	15:37
N 70°	08:07	09:54	▬	▬	14:09	15:56
68°	07:51	09:20	▬	▬	14:43	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	15:31	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	17:19
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	17:53	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	04:59	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	20:12	20:56	22:01
52°	01:34	02:52	03:40	20:22	21:11	22:28
54°	00:50	02:34	03:28	20:34	21:29	23:12
56°	▭	02:12	03:14	20:49	21:50	▭
58°	▭	01:43	02:57	21:05	22:19	▭
S 60°	▭	00:54	02:37	21:25	23:07	▭

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 22-24 58-35%
27	00:45	01:00	12:01	05:02	17:27	
28	01:15	01:29	12:01	05:52	18:17	
29	01:44	01:59	12:02	06:42	19:08	

December 30, 31, 01 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	98°19.9	228°09.6	S14°49.5	169°57.4	S23°21.2	101°13.9	S02°38.7	262°08.5	S04°17.8
1	113°22.4	243°09.7	50.1	184°57.8	20.9	116°16.1	38.5	277°10.8	17.8
2	128°24.9	258°09.8	50.6	199°58.2	20.7	131°18.2	38.4	292°13.2	17.8
3	143°27.3	273°09.9	·· 51.2	214°58.5	·· 20.5	146°20.4	·· 38.3	307°15.5	·· 17.9
4	158°29.8	288°10.0	51.7	229°58.9	20.2	161°22.6	38.1	322°17.9	17.9
5	173°32.2	303°10.1	52.3	244°59.3	20.0	176°24.8	38.0	337°20.2	17.9
6	188°34.7	318°10.2	S14°52.9	259°59.7	S23°19.8	191°26.9	S02°37.8	352°22.6	S04°18.0
7	203°37.2	333°10.3	53.4	275°00.0	19.5	206°29.1	37.7	7°24.9	18.0
8	218°39.6	348°10.4	54.0	290°00.4	19.3	221°31.3	37.6	22°27.3	18.1
9	233°42.1	3°10.5	·· 54.6	305°00.8	·· 19.1	236°33.4	·· 37.4	37°29.6	·· 18.1
10	248°44.6	18°10.6	55.1	320°01.2	18.8	251°35.6	37.3	52°32.0	18.1
11	263°47.0	33°10.7	55.7	335°01.5	18.6	266°37.8	37.2	67°34.3	18.2
12	278°49.5	48°10.8	S14°56.2	350°01.9	S23°18.4	281°39.9	S02°37.0	82°36.7	S04°18.2
13	293°52.0	63°10.9	56.8	5°02.3	18.1	296°42.1	36.9	97°39.0	18.2
14	308°54.4	78°10.9	57.4	20°02.7	17.9	311°44.3	36.7	112°41.4	18.3
15	323°56.9	93°11.0	·· 57.9	35°03.0	·· 17.7	326°46.5	·· 36.6	127°43.7	·· 18.3
16	338°59.3	108°11.1	58.5	50°03.4	17.4	341°48.6	36.5	142°46.1	18.3
17	354°01.8	123°11.2	59.0	65°03.8	17.2	356°50.8	36.3	157°48.4	18.4
18	9°04.3	138°11.3	S14°59.6	80°04.2	S23°16.9	11°53.0	S02°36.2	172°50.8	S04°18.4
19	24°06.7	153°11.4	15°00.2	95°04.6	16.7	26°55.1	36.0	187°53.1	18.4
20	39°09.2	168°11.4	00.7	110°04.9	16.5	41°57.3	35.9	202°55.5	18.5
21	54°11.7	183°11.5	·· 01.3	125°05.3	·· 16.2	56°59.5	·· 35.8	217°57.8	·· 18.5
22	69°14.1	198°11.6	01.9	140°05.7	16.0	72°01.6	35.6	233°00.2	18.5
23	84°16.6	213°11.7	02.4	155°06.1	15.7	87°03.8	35.5	248°02.5	18.6
Mer.pass.:17:24		v0.1 d-0.6 m-4.3		v0.4 d0.2 m1.2		v2.2 d0.1 m-2.2		v2.3 d-0.0 m0.8	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	99°19.1	228°11.7	S15°03.0	170°06.4	S23°15.5	102°06.0	S02°35.4	263°04.9	S04°18.6
1	114°21.5	243°11.8	03.5	185°06.8	15.3	117°08.1	35.2	278°07.3	18.6
2	129°24.0	258°11.9	04.1	200°07.2	15.0	132°10.3	35.1	293°09.6	18.7
3	144°26.5	273°12.0	·· 04.7	215°07.6	·· 14.8	147°12.5	·· 34.9	308°12.0	·· 18.7
4	159°28.9	288°12.0	05.2	230°08.0	14.5	162°14.6	34.8	323°14.3	18.7
5	174°31.4	303°12.1	05.8	245°08.3	14.3	177°16.8	34.7	338°16.7	18.8
6	189°33.8	318°12.2	S15°06.4	260°08.7	S23°14.0	192°18.9	S02°34.5	353°19.0	S04°18.8
7	204°36.3	333°12.2	06.9	275°09.1	13.8	207°21.1	34.4	8°21.4	18.8
8	219°38.8	348°12.3	07.5	290°09.5	13.5	222°23.3	34.2	23°23.7	18.9
9	234°41.2	3°12.4	·· 08.1	305°09.8	·· 13.3	237°25.4	·· 34.1	38°26.1	·· 18.9
10	249°43.7	18°12.4	08.6	320°10.2	13.0	252°27.6	34.0	53°28.4	18.9
11	264°46.2	33°12.5	09.2	335°10.6	12.8	267°29.8	33.8	68°30.8	19.0
12	279°48.6	48°12.6	S15°09.7	350°11.0	S23°12.6	282°31.9	S02°33.7	83°33.2	S04°19.0
13	294°51.1	63°12.6	10.3	5°11.3	12.3	297°34.1	33.5	98°35.5	19.0
14	309°53.6	78°12.7	10.9	20°11.7	12.1	312°36.3	33.4	113°37.9	19.1
15	324°56.0	93°12.8	·· 11.4	35°12.1	·· 11.8	327°38.4	·· 33.3	128°40.2	·· 19.1
16	339°58.5	108°12.8	12.0	50°12.5	11.6	342°40.6	33.1	143°42.6	19.1
17	355°01.0	123°12.9	12.6	65°12.9	11.3	357°42.7	33.0	158°44.9	19.2
18	10°03.4	138°12.9	S15°13.1	80°13.2	S23°11.1	12°44.9	S02°32.8	173°47.3	S04°19.2
19	25°05.9	153°13.0	13.7	95°13.6	10.8	27°47.1	32.7	188°49.6	19.2
20	40°08.3	168°13.0	14.2	110°14.0	10.6	42°49.2	32.5	203°52.0	19.3
21	55°10.8	183°13.1	·· 14.8	125°14.4	·· 10.3	57°51.4	·· 32.4	218°54.4	·· 19.3
22	70°13.3	198°13.1	15.4	140°14.8	10.1	72°53.5	32.3	233°56.7	19.3
23	85°15.7	213°13.2	15.9	155°15.1	09.8	87°55.7	32.1	248°59.1	19.3
Mer.pass.:17:20		v0.1 d-0.6 m-4.3		v0.4 d0.2 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m0.8	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	100°18.2	228°13.2	S15°16.5	170°15.5	S23°09.6	102°57.9	S02°32.0	264°01.4	S04°19.4
1	115°20.7	243°13.3	17.1	185°15.9	09.3	118°00.0	31.8	279°03.8	19.4
2	130°23.1	258°13.3	17.6	200°16.3	09.0	133°02.2	31.7	294°06.1	19.4
3	145°25.6	273°13.4	·· 18.2	215°16.6	·· 08.8	148°04.4	·· 31.6	309°08.5	·· 19.5
4	160°28.1	288°13.4	18.7	230°17.0	08.5	163°06.5	31.4	324°10.9	19.5
5	175°30.5	303°13.5	19.3	245°17.4	08.3	178°08.7	31.3	339°13.2	19.5
6	190°33.0	318°13.5	S15°19.9	260°17.8	S23°08.0	193°10.8	S02°31.1	354°15.6	S04°19.6
7	205°35.5	333°13.6	20.4	275°18.2	07.8	208°13.0	31.0	9°17.9	19.6
8	220°37.9	348°13.6	21.0	290°18.5	07.5	223°15.1	30.8	24°20.3	19.6
9	235°40.4	3°13.6	·· 21.6	305°18.9	·· 07.3	238°17.3	·· 30.7	39°22.7	·· 19.7
10	250°42.8	18°13.7	22.1	320°19.3	07.0	253°19.5	30.6	54°25.0	19.7
11	265°45.3	33°13.7	22.7	335°19.7	06.7	268°21.6	30.4	69°27.4	19.7
12	280°47.8	48°13.7	S15°23.3	350°20.1	S23°06.5	283°23.8	S02°30.3	84°29.7	S04°19.8
13	295°50.2	63°13.8	23.8	5°20.4	06.2	298°25.9	30.1	99°32.1	19.8
14	310°52.7	78°13.8	24.4	20°20.8	06.0	313°28.1	30.0	114°34.4	19.8
15	325°55.2	93°13.8	·· 24.9	35°21.2	·· 05.7	328°30.2	·· 29.8	129°36.8	·· 19.9
16	340°57.6	108°13.9	25.5	50°21.6	05.4	343°32.4	29.7	144°39.2	19.9
17	356°00.1	123°13.9	26.1	65°21.9	05.2	358°34.6	29.6	159°41.5	19.9
18	11°02.6	138°13.9	S15°26.6	80°22.3	S23°04.9	13°36.7	S02°29.4	174°43.9	S04°19.9
19	26°05.0	153°14.0	27.2	95°22.7	04.7	28°38.9	29.3	189°46.2	20.0
20	41°07.5	168°14.0	27.8	110°23.1	04.4	43°41.0	29.1	204°48.6	20.0
21	56°10.0	183°14.0	·· 28.3	125°23.5	·· 04.1	58°43.2	·· 29.0	219°51.0	·· 20.0
22	71°12.4	198°14.1	28.9	140°23.8	03.9	73°45.3	28.8	234°53.3	20.1
23	86°14.9	213°14.1	29.4	155°24.2	03.6	88°47.5	28.7	249°55.7	20.1
Mer.pass.:17:16		v0.0 d-0.6 m-4.3		v0.4 d0.3 m1.2		v2.2 d0.1 m-2.2		v2.4 d-0.0 m0.8	

Stars

	SHA	**Dec**
Alpheratz	357°45.4	29°09.3
Ankaa	353°17.4	-42°14.9
Schedar	349°42.6	56°36.2
Diphda	348°57.6	-17°55.6
Achernar	335°27.8	-57°11.1
Hamal	328°02.6	23°31.0
Polaris	318°22.9	89°19.1
Acamar	315°19.4	-40°15.8
Menkar	314°16.7	4°08.0
Mirfak	308°42.6	49°54.2
Aldebaran	290°51.1	16°31.9
Rigel	281°13.4	-8°11.4
Capella	280°36.6	46°00.6
Bellatrix	278°33.6	6°21.5
Elnath	278°14.5	28°37.0
Alnilam	275°47.8	-1°11.8
Betelgeuse	271°02.9	7°24.5
Canopus	263°56.4	-52°42.2
Sirius	258°34.9	-16°44.0
Adhara	255°13.5	-28°59.3
Procyon	245°01.2	5°11.7
Pollux	243°29.5	27°59.8
Avior	234°18.2	-59°32.7
Suhail	222°53.4	-43°28.6
Miaplacidus	221°39.4	-69°45.6
Alphard	217°57.6	-8°42.5
Regulus	207°45.2	11°54.6
Dubhe	193°53.4	61°41.1
Denebola	182°35.4	14°30.4
Gienah	175°54.1	-17°36.2
Acrux	173°11.4	-63°09.4
Gacrux	172°03.0	-57°10.3
Alioth	166°22.2	55°53.6
Spica	158°33.2	-11°13.2
Alkaid	153°00.4	49°15.2
Hadar	148°50.8	-60°25.4
Menkent	148°09.9	-36°25.3
Arcturus	145°57.5	19°07.3
Rigil Kent.	139°54.5	-60°52.6
Kochab	137°20.5	74°06.3
Zuben'ubi	137°07.6	-16°05.2
Alphecca	126°12.7	26°40.5
Antares	112°28.8	-26°27.3
Atria	107°32.7	-69°02.7
Sabik	102°14.9	-15°44.3
Shaula	96°24.7	-37°06.6
Rasalhague	96°08.4	12°33.1
Eltanin	90°47.5	51°29.2
Kaus Aust.	83°46.6	-34°22.7
Vega	80°40.6	38°47.7
Nunki	76°00.9	-26°16.9
Altair	62°10.3	8°53.9
Peacock	53°22.5	-56°42.0
Deneb	49°33.1	45°19.4
Enif	33°49.1	9°55.7
Al Na'ir	27°46.2	-46°54.6
Fomalhaut	15°26.0	-29°33.9
Scheat	13°55.3	28°08.8
Markab	13°40.2	15°16.1

Dec 30 Thu	**SHA**	**Mer.pass**
Venus	129°49.7	08:47
Mars	71°37.5	12:40
Jupiter	2°54.0	17:13
Saturn	163°48.5	06:30

Dec 31 Fri	**SHA**	**Mer.pass**
Venus	128°52.7	08:47
Mars	70°47.4	12:39
Jupiter	2°46.9	17:09
Saturn	163°45.8	06:27

Jan 01 Sat	**SHA**	**Mer.pass**
Venus	127°55.0	08:47
Mars	69°57.3	12:39
Jupiter	2°39.7	17:06
Saturn	163°43.2	06:23

Horizontal parallax	
Venus:	0.2
Mars:	0.1

DUT1 = UT1-UTC = -0.1394 sec ΔT = TT-UT1 = +66.3234 sec

2010 December 30 to Jan. 01 UT

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°26.7	S23°11.2	250°19.5	9.1'	S16°26.6	-10.7'	58.6'
1	194°26.4	11.0	264°47.6	9.1'	16°37.3	-10.6'	58.6'
2	209°26.1	10.9	279°15.7	9.0'	16°47.9	-10.5'	58.5'
3	224°25.8	· · 10.7	293°43.7	9.0'	16°58.4	-10.4'	58.5'
4	239°25.5	10.5	308°11.7	8.9'	17°08.8	-10.3'	58.5'
5	254°25.2	10.4	322°39.6	8.9'	17°19.1	-10.2'	58.5'
6	269°24.9	S23°10.2	337°07.5	8.8'	S17°29.2	-10.1'	58.5'
7	284°24.6	10.1	351°35.3	8.8'	17°39.3	-10.0'	58.5'
8	299°24.3	09.9	6°03.1	8.8'	17°49.3	-9.9'	58.5'
9	314°24.0	· · 09.7	20°30.8	8.7'	17°59.1	-9.8'	58.4'
10	329°23.7	09.6	34°58.5	8.7'	18°08.9	-9.7'	58.4'
11	344°23.4	09.4	49°26.1	8.6'	18°18.5	-9.6'	58.4'
12	359°23.1	S23°09.2	63°53.7	8.6'	S18°28.1	-9.5'	58.4'
13	14°22.8	09.1	78°21.2	8.5'	18°37.5	-9.4'	58.4'
14	29°22.5	08.9	92°48.7	8.5'	18°46.8	-9.3'	58.4'
15	44°22.2	· · 08.7	107°16.1	8.4'	18°56.0	-9.1'	58.4'
16	59°21.9	08.6	121°43.5	8.4'	19°05.1	-9.0'	58.3'
17	74°21.6	08.4	136°10.9	8.3'	19°14.1	-8.9'	58.3'
18	89°21.3	S23°08.2	150°38.2	8.3'	S19°23.0	-8.8'	58.3'
19	104°21.0	08.1	165°05.4	8.2'	19°31.7	-8.7'	58.3'
20	119°20.7	07.9	179°32.6	8.2'	19°40.3	-8.6'	58.3'
21	134°20.4	· · 07.7	193°59.8	8.1'	19°48.8	-8.4'	58.3'
22	149°20.1	07.5	208°26.9	8.1'	19°57.2	-8.3'	58.2'
23	164°19.8	07.4	222°53.9	8.0'	20°05.5	-8.2'	58.2'
	SD.=16.3	d=0.2	S.D.=15.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°19.5	S23°07.2	237°21.0	8.0'	S20°13.6	-8.1'	58.2'
1	194°19.2	07.0	251°47.9	8.0'	20°21.6	-8.0'	58.2'
2	209°18.9	06.8	266°14.9	7.9'	20°29.5	-7.8'	58.2'
3	224°18.6	· · 06.7	280°41.7	7.9'	20°37.3	-7.7'	58.2'
4	239°18.3	06.5	295°08.6	7.8'	20°44.9	-7.6'	58.1'
5	254°18.0	06.3	309°35.4	7.8'	20°52.5	-7.5'	58.1'
6	269°17.7	S23°06.1	324°02.2	7.7'	S20°59.9	-7.3'	58.1'
7	284°17.4	05.9	338°28.9	7.7'	21°07.1	-7.2'	58.1'
8	299°17.1	05.8	352°55.6	7.7'	21°14.3	-7.1'	58.1'
9	314°16.8	· · 05.6	7°22.2	7.6'	21°21.3	-6.9'	58.1'
10	329°16.5	05.4	21°48.8	7.6'	21°28.2	-6.8'	58.0'
11	344°16.2	05.2	36°15.4	7.5'	21°34.9	-6.7'	58.0'
12	359°15.9	S23°05.0	50°41.9	7.5'	S21°41.5	-6.5'	58.0'
13	14°15.6	04.8	65°08.4	7.5'	21°48.0	-6.4'	58.0'
14	29°15.3	04.6	79°34.8	7.4'	21°54.3	-6.3'	58.0'
15	44°15.0	· · 04.5	94°01.2	7.4'	22°00.6	-6.1'	58.0'
16	59°14.7	04.3	108°27.6	7.4'	22°06.6	-6.0'	57.9'
17	74°14.4	04.1	122°54.0	7.3'	22°12.6	-5.9'	57.9'
18	89°14.1	S23°03.9	137°20.3	7.3'	S22°18.4	-5.7'	57.9'
19	104°13.8	03.7	151°46.6	7.3'	22°24.1	-5.6'	57.9'
20	119°13.5	03.5	166°12.9	7.2'	22°29.6	-5.5'	57.9'
21	134°13.2	· · 03.3	180°39.1	7.2'	22°35.0	-5.3'	57.9'
22	149°12.9	03.1	195°05.3	7.2'	22°40.3	-5.2'	57.8'
23	164°12.6	02.9	209°31.5	7.2'	22°45.4	-5.1'	57.8'
	SD.=16.3	d=0.2	S.D.=15.8				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°12.3	S23°02.7	223°57.6	7.1'	S22°50.4	-4.9'	57.8'
1	194°12.0	02.5	238°23.8	7.1'	22°55.2	-4.8'	57.8'
2	209°11.7	02.3	252°49.9	7.1'	22°59.9	-4.6'	57.8'
3	224°11.4	· · 02.1	267°16.0	7.1'	23°04.5	-4.5'	57.7'
4	239°11.1	01.9	281°42.0	7.1'	23°08.9	-4.3'	57.7'
5	254°10.8	01.7	296°08.1	7.0'	23°13.2	-4.2'	57.7'
6	269°10.5	S23°01.5	310°34.1	7.0'	S23°17.3	-4.1'	57.7'
7	284°10.2	01.3	325°00.1	7.0'	23°21.3	-3.9'	57.7'
8	299°09.9	01.1	339°26.1	7.0'	23°25.2	-3.8'	57.7'
9	314°09.6	· · 00.9	353°52.1	7.0'	23°28.9	-3.6'	57.6'
10	329°09.3	00.7	8°18.1	7.0'	23°32.4	-3.5'	57.6'
11	344°09.0	00.5	22°44.0	7.0'	23°35.8	-3.3'	57.6'
12	359°08.7	S23°00.3	37°10.0	6.9'	S23°39.1	-3.2'	57.6'
13	14°08.4	23°00.1	51°35.9	6.9'	23°42.3	-3.1'	57.6'
14	29°08.1	22°59.9	66°01.8	6.9'	23°45.2	-2.9'	57.5'
15	44°07.8	· · 59.7	80°27.8	6.9'	23°48.1	-2.8'	57.5'
16	59°07.5	59.5	94°53.7	6.9'	23°50.8	-2.6'	57.5'
17	74°07.2	59.3	109°19.6	6.9'	23°53.3	-2.5'	57.5'
18	89°06.9	S22°59.1	123°45.5	6.9'	S23°55.7	-2.3'	57.5'
19	104°06.6	58.9	138°11.4	6.9'	23°58.0	-2.2'	57.4'
20	119°06.4	58.7	152°37.4	6.9'	24°00.1	-2.0'	57.4'
21	134°06.1	· · 58.5	167°03.3	6.9'	24°02.1	-1.9'	57.4'
22	149°05.8	58.2	181°29.2	6.9'	24°03.9	-1.8'	57.4'
23	164°05.5	58.0	195°55.1	6.9'	24°05.6	-1.6'	57.4'
	SD.=16.3	d=0.2	S.D.=15.7				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	**Sun** Eqn.of Time 12^h mm:ss	**Sun** Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	**Moon** Mer.Pass. Lower hh:mm	**Moon** Age 25-27 25-9%
30	02:13	02:28	12:02	07:35	20:02	
31	02:42	02:57	12:03	08:29	20:57	
01	03:11	03:25	12:03	09:25	21:54	

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 36	Sun Plan.	Aries	Moon	v and d corr		
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 37	Sun Plan.	Aries	Moon	v and d corr		
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 38	Sun Plan.	Aries	Moon	v and d corr		
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 51	Sun Plan.	Aries	Moon	v and d corr		
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 52	Sun Plan.	Aries	Moon	v and d corr		
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 53	Sun Plan.	Aries	Moon	v and d corr		
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 57	Sun Plan.	Aries	Moon	v and d corr		
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 58	Sun Plan.	Aries	Moon	v and d corr		
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 59	Sun Plan.	Aries	Moon	v and d corr		
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

Conversion of Arc to Time

0° - 59°			60° - 119°			120° - 179°			180° - 239°			240° - 299°			300° - 360°		
°	h	m	°	h	m	°	h	m	°	h	m	°	h	m	°	h	m
0	0	00	**60**	4	00	**120**	8	00	**180**	12	00	**240**	16	00	**300**	20	00
1	0	04	**61**	4	04	**121**	8	04	**181**	12	04	**241**	16	04	**301**	20	04
2	0	08	**62**	4	08	**122**	8	08	**182**	12	08	**242**	16	08	**302**	20	08
3	0	12	**63**	4	12	**123**	8	12	**183**	12	12	**243**	16	12	**303**	20	12
4	0	16	**64**	4	16	**124**	8	16	**184**	12	16	**244**	16	16	**304**	20	16
5	0	20	**65**	4	20	**125**	8	20	**185**	12	20	**245**	16	20	**305**	20	20
6	0	24	**66**	4	24	**126**	8	24	**186**	12	24	**246**	16	24	**306**	20	24
7	0	28	**67**	4	28	**127**	8	28	**187**	12	28	**247**	16	28	**307**	20	28
8	0	32	**68**	4	32	**128**	8	32	**188**	12	32	**248**	16	32	**308**	20	32
9	0	36	**69**	4	36	**129**	8	36	**189**	12	36	**249**	16	36	**309**	20	36
10	0	40	**70**	4	40	**130**	8	40	**190**	12	40	**250**	16	40	**310**	20	40
11	0	44	**71**	4	44	**131**	8	44	**191**	12	44	**251**	16	44	**311**	20	44
12	0	48	**72**	4	48	**132**	8	48	**192**	12	48	**252**	16	48	**312**	20	48
13	0	52	**73**	4	52	**133**	8	52	**193**	12	52	**253**	16	52	**313**	20	52
14	0	56	**74**	4	56	**134**	8	56	**194**	12	56	**254**	16	56	**314**	20	56
15	1	00	**75**	5	00	**135**	9	00	**195**	13	00	**255**	17	00	**315**	21	00
16	1	04	**76**	5	04	**136**	9	04	**196**	13	04	**256**	17	04	**316**	21	04
17	1	08	**77**	5	08	**137**	9	08	**197**	13	08	**257**	17	08	**317**	21	08
18	1	12	**78**	5	12	**138**	9	12	**198**	13	12	**258**	17	12	**318**	21	12
19	1	16	**79**	5	16	**139**	9	16	**199**	13	16	**259**	17	16	**319**	21	16
20	1	20	**80**	5	20	**140**	9	20	**200**	13	20	**260**	17	20	**320**	21	20
21	1	24	**81**	5	24	**141**	9	24	**201**	13	24	**261**	17	24	**321**	21	24
22	1	28	**82**	5	28	**142**	9	28	**202**	13	28	**262**	17	28	**322**	21	28
23	1	32	**83**	5	32	**143**	9	32	**203**	13	32	**263**	17	32	**323**	21	32
24	1	36	**84**	5	36	**144**	9	36	**204**	13	36	**264**	17	36	**324**	21	36
25	1	40	**85**	5	40	**145**	9	40	**205**	13	40	**265**	17	40	**325**	21	40
26	1	44	**86**	5	44	**146**	9	44	**206**	13	44	**266**	17	44	**326**	21	44
27	1	48	**87**	5	48	**147**	9	48	**207**	13	48	**267**	17	48	**327**	21	48
28	1	52	**88**	5	52	**148**	9	52	**208**	13	52	**268**	17	52	**328**	21	52
29	1	56	**89**	5	56	**149**	9	56	**209**	13	56	**269**	17	56	**329**	21	56
30	2	00	**90**	6	00	**150**	10	00	**210**	14	00	**270**	18	00	**330**	22	00
31	2	04	**91**	6	04	**151**	10	04	**211**	14	04	**271**	18	04	**331**	22	04
32	2	08	**92**	6	08	**152**	10	08	**212**	14	08	**272**	18	08	**332**	22	08
33	2	12	**93**	6	12	**153**	10	12	**213**	14	12	**273**	18	12	**333**	22	12
34	2	16	**94**	6	16	**154**	10	16	**214**	14	16	**274**	18	16	**334**	22	16
35	2	20	**95**	6	20	**155**	10	20	**215**	14	20	**275**	18	20	**335**	22	20
36	2	24	**96**	6	24	**156**	10	24	**216**	14	24	**276**	18	24	**336**	22	24
37	2	28	**97**	6	28	**157**	10	28	**217**	14	28	**277**	18	28	**337**	22	28
38	2	32	**98**	6	32	**158**	10	32	**218**	14	32	**278**	18	32	**338**	22	32
39	2	36	**99**	6	36	**159**	10	36	**219**	14	36	**279**	18	36	**339**	22	36
40	2	40	**100**	6	40	**160**	10	40	**220**	14	40	**280**	18	40	**340**	22	40
41	2	44	**101**	6	44	**161**	10	44	**221**	14	44	**281**	18	44	**341**	22	44
42	2	48	**102**	6	48	**162**	10	48	**222**	14	48	**282**	18	48	**342**	22	48
43	2	52	**103**	6	52	**163**	10	52	**223**	14	52	**283**	18	52	**343**	22	52
44	2	56	**104**	6	56	**164**	10	56	**224**	14	56	**284**	18	56	**344**	22	56
45	3	00	**105**	7	00	**165**	11	00	**225**	15	00	**285**	19	00	**345**	23	00
46	3	04	**106**	7	04	**166**	11	04	**226**	15	04	**286**	19	04	**346**	23	04
47	3	08	**107**	7	08	**167**	11	08	**227**	15	08	**287**	19	08	**347**	23	08
48	3	12	**108**	7	12	**168**	11	12	**228**	15	12	**288**	19	12	**348**	23	12
49	3	16	**109**	7	16	**169**	11	16	**229**	15	16	**289**	19	16	**349**	23	16
50	3	20	**110**	7	20	**170**	11	20	**230**	15	20	**290**	19	20	**350**	23	20
51	3	24	**111**	7	24	**171**	11	24	**231**	15	24	**291**	19	24	**351**	23	24
52	3	28	**112**	7	28	**172**	11	28	**232**	15	28	**292**	19	28	**352**	23	28
53	3	32	**113**	7	32	**173**	11	32	**233**	15	32	**293**	19	32	**353**	23	32
54	3	36	**114**	7	36	**174**	11	36	**234**	15	36	**294**	19	36	**354**	23	36
55	3	40	**115**	7	40	**175**	11	40	**235**	15	40	**295**	19	40	**355**	23	40
56	3	44	**116**	7	44	**176**	11	44	**236**	15	44	**296**	19	44	**356**	23	44
57	3	48	**117**	7	48	**177**	11	48	**237**	15	48	**297**	19	48	**357**	23	48
58	3	52	**118**	7	52	**178**	11	52	**238**	15	52	**298**	19	52	**358**	23	52
59	3	56	**119**	7	56	**179**	11	56	**239**	15	56	**299**	19	56	**359**	23	56
60	4	00	**120**	8	00	**180**	12	00	**240**	16	00	**300**	20	00	**360**	24	00

0′ - 59′			0″ - 59″	
′	m	s	″	s
0	0	00	**0**	0.00
1	0	04	**1**	0.07
2	0	08	**2**	0.13
3	0	12	**3**	0.20
4	0	16	**4**	0.27
5	0	20	**5**	0.33
6	0	24	**6**	0.40
7	0	28	**7**	0.47
8	0	32	**8**	0.53
9	0	36	**9**	0.60
10	0	40	**10**	0.67
11	0	44	**11**	0.73
12	0	48	**12**	0.80
13	0	52	**13**	0.87
14	0	56	**14**	0.93
15	1	00	**15**	1.00
16	1	04	**16**	1.07
17	1	08	**17**	1.13
18	1	12	**18**	1.20
19	1	16	**19**	1.27
20	1	20	**20**	1.33
21	1	24	**21**	1.40
22	1	28	**22**	1.47
23	1	32	**23**	1.53
24	1	36	**24**	1.60
25	1	40	**25**	1.67
26	1	44	**26**	1.73
27	1	48	**27**	1.80
28	1	52	**28**	1.87
29	1	56	**29**	1.93
30	2	00	**30**	2.00
31	2	04	**31**	2.07
32	2	08	**32**	2.13
33	2	12	**33**	2.20
34	2	16	**34**	2.27
35	2	20	**35**	2.33
36	2	24	**36**	2.40
37	2	28	**37**	2.47
38	2	32	**38**	2.53
39	2	36	**39**	2.60
40	2	40	**40**	2.67
41	2	44	**41**	2.73
42	2	48	**42**	2.80
43	2	52	**43**	2.87
44	2	56	**44**	2.93
45	3	00	**45**	3.00
46	3	04	**46**	3.07
47	3	08	**47**	3.13
48	3	12	**48**	3.20
49	3	16	**49**	3.27
50	3	20	**50**	3.33
51	3	24	**51**	3.40
52	3	28	**52**	3.47
53	3	32	**53**	3.53
54	3	36	**54**	3.60
55	3	40	**55**	3.67
56	3	44	**56**	3.73
57	3	48	**57**	3.80
58	3	52	**58**	3.87
59	3	56	**59**	3.93
60	4	00	**60**	4.00

h= hours of time **m**= minutes of time **s** = seconds of time **′** = minutes of arc **″** = seconds of arc

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	See table ←	
3.6	**– 3.4**	11.9		
3.8	**– 3.5**	12.6	**meters**	
4.0	**– 3.6**	13.3	20	**– 7.9**
4.3	**– 3.7**	14.1	22	**– 8.3**
4.5	**– 3.8**	14.9	24	**– 8.6**
4.7	**– 3.9**	15.7	26	**– 9.0**
5.0	**– 4.0**	16.5	28	**– 9.3**
5.2	**– 4.1**	17.4		
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		
7.2	**– 4.8**	23.9	40	**– 11.1**
7.5	**– 4.9**	24.9	42	**– 11.4**
7.9	**– 5.0**	26.0	44	**– 11.7**
8.2	**– 5.1**	27.1	46	**– 11.9**
8.5	**– 5.2**	28.1	48	**– 12.2**
8.8	**– 5.3**	29.2	**feet**	'
9.2	**– 5.4**	30.4	2	**– 1.4**
9.5	**– 5.5**	31.5	4	**– 1.9**
9.9	**– 5.6**	32.7	6	**– 2.4**
10.3	**– 5.7**	33.9	8	**– 2.7**
10.6	**– 5.8**	35.1	10	**– 3.1**
11.0	**– 5.9**	36.3	See table ←	
11.4	**– 6.0**	37.6		
11.8	**– 6.1**	38.9	**feet**	'
12.2	**– 6.2**	40.1	70	**– 8.1**
12.6	**– 6.3**	41.5	75	**– 8.4**
13.0	**– 6.4**	42.8	80	**– 8.7**
13.4	**– 6.5**	44.2	85	**– 8.9**
13.8	**– 6.6**	45.5	90	**– 9.2**
14.2	**– 6.7**	46.9	95	**9.5**
14.7	**– 6.8**	48.4		
15.1	**– 6.9**	49.8	100	**– 9.7**
15.5	**– 7.0**	51.3	105	**– 9.9**
16.0	**– 7.1**	52.8	110	**– 10.2**
16.5	**– 7.2**	54.3	115	**– 10.4**
16.9	**– 7.3**	55.8	120	**– 10.6**
17.4	**– 7.4**	57.4	125	**– 10.8**
17.9	**– 7.5**	58.9		
18.4	**– 7.6**	60.5	130	**– 11.1**
18.8	**– 7.7**	62.1	135	**– 11.3**
19.3	**– 7.8**	63.8	140	**– 11.5**
19.8	**– 7.9**	65.4	145	**– 11.7**
20.4	**– 8.0**	67.1	150	**– 11.9**
20.9	**– 8.1**	68.8	155	**– 12.1**
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.
	Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		Corr^n		
'	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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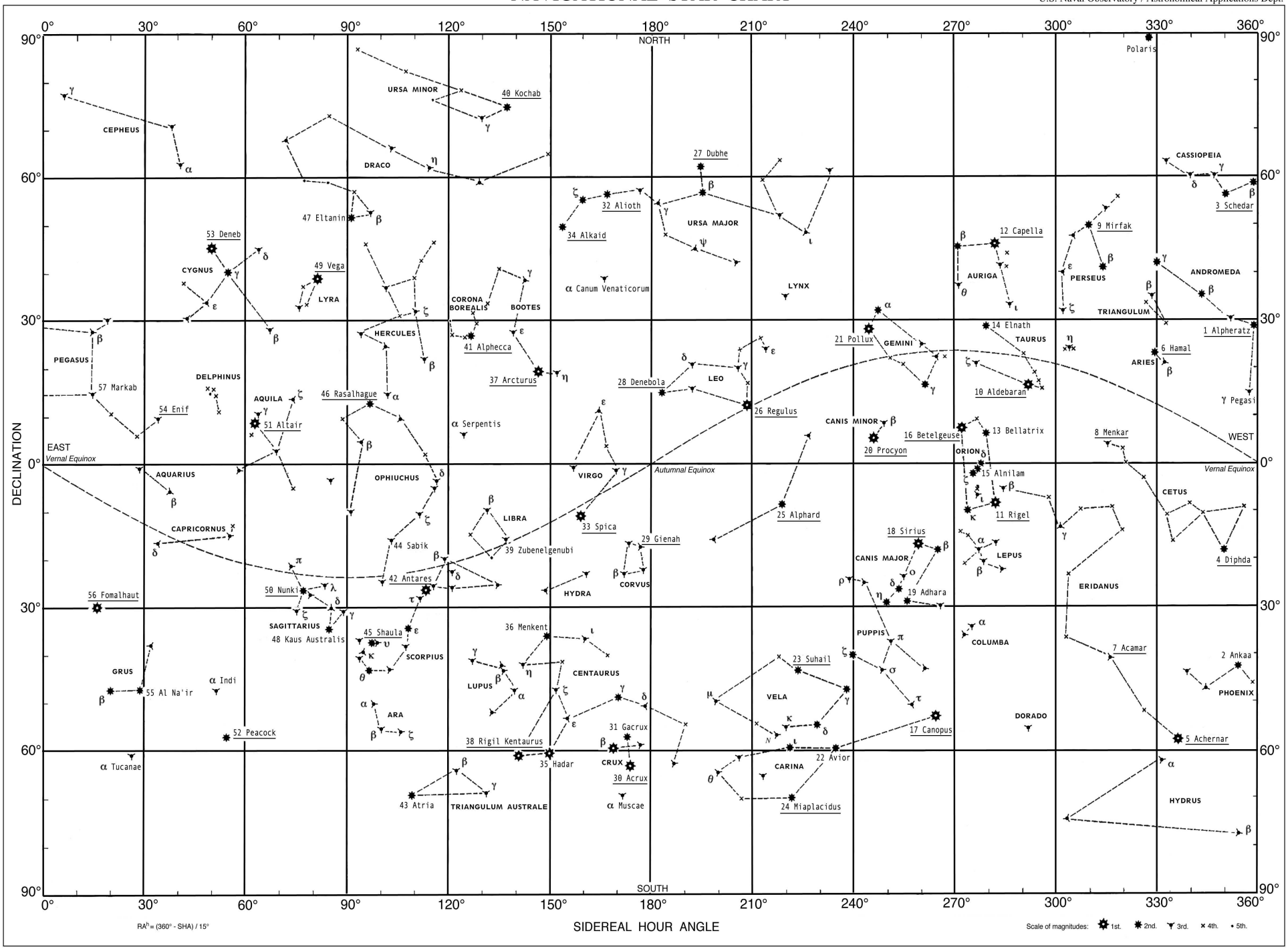
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