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.

June 16, 2020

Explanation of The Nautical Almanac Daily Pages updated.odt

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

Fri

Fri	Aries GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn 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

Sat

Sat	Aries GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn 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	18.1
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

Sun	Aries GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn 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

Stars

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

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

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

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

Horizontal parallax
Venus: 0.1
Mars: 0.2

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file date- June 16 2020

2020 January 01 to Jan. 03

Wed

h	Sun GHA	Sun Dec	Moon GHA	ν	Moon 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

h	Sun GHA	Sun Dec	Moon GHA	ν	Moon 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

h	Sun GHA	Sun Dec	Moon GHA	ν	Moon 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.	Civil	Sunrise	Sunset	Twilight Civil	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	▭

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

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