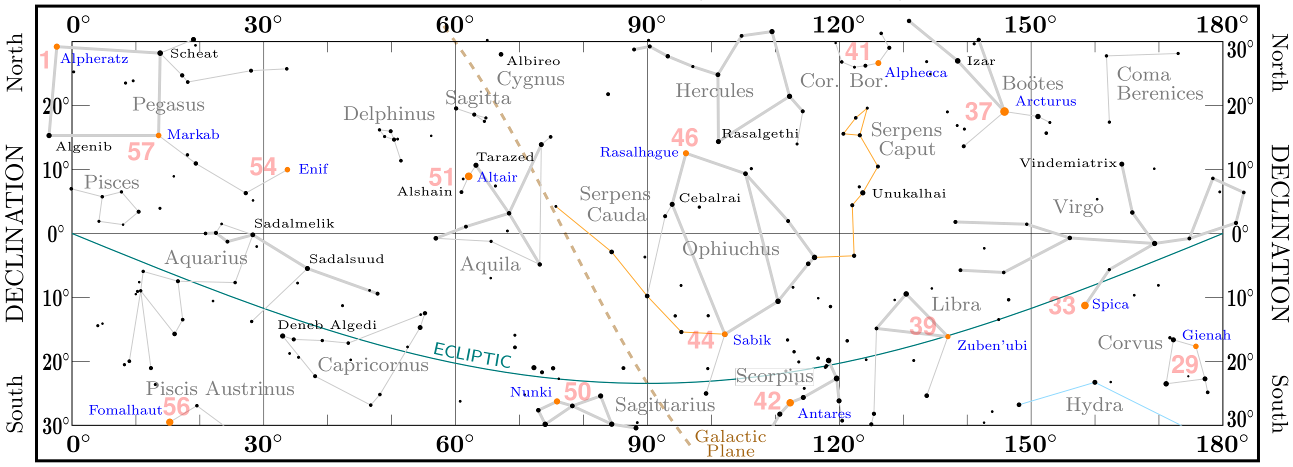
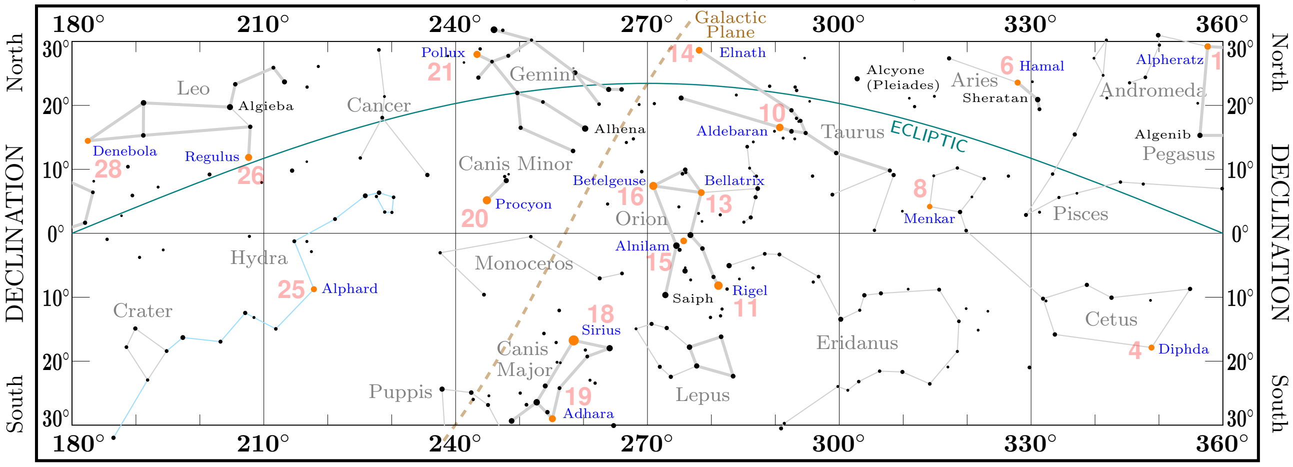
Generated using Skyfield
http://rhodesmill.org/skyfield/

EQUATORIAL STARS (SHA 0° to 180°)



SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



SIDEREAL HOUR ANGLE

Lunar Distance

December 2021

Author: Andrew Bauer

November 11, 2021

Disclaimer: These are computer generated tables - use them at your own risk. They replicate Lunar Distance algorithms with no guarantee of accuracy. They are intended to encourage the use of sextants, be it as a hobby or as a backup when electronics fail. The author claims no liability for any consequences arising from use of these tables and accompanying charts.

Lunar Distance

The Lunar Distance method (or the old method of "lunars") is an 18th century technique to find the time, typically to reset ship's clocks or as an emergency procedure. The method uses the Moon's apparent motion relative to the Sun, planets or stars like a clock to find a reference time (e.g. GMT). "Until 1906, the Nautical Almanac included lunar distance tables showing predicted geocentric angular distances between the Moon and selected bodies in 3-hour intervals. After the tables were dropped, lunar distances fell more or less into oblivion."[1]

"The methods are a good deal more laborious than the more commonplace procedures of celestial navigation. It is perhaps the most difficult possible operation within the discipline of celestial navigation. However, one argument for maintaining celestial skills is the utility of celestial navigation as an emergency substitute for electronic navigation."[2] "Nothing else comes close to the lunar for developing skill with a sextant - and the observation is demanding enough to hold one's interest for a lifetime."[3] Thus it is still a valuable process to learn and indeed worthwhile mastering. (A practised user can routinely find the correct time to within ±30 seconds.)

"Because the Moon moves much slower across the sky than the stars, its changing position can be used in sort of a reverse process of sight reduction to find the time."[4] "The basic idea of the lunar distance method is easy to comprehend. Since the Moon moves across the celestial sphere at a rate of about 0.5° per hour, the angular distance between the Moon and a celestial body in her path varies at a similar rate and rapidly enough to be used to measure the time. The time corresponding with an observed lunar distance can be found by comparison with tabulated values."[5] (The continuous motion of the Moon through the sky day-by-day implies that different celestial bodies will be selected for LD measurements on different days.)

The following Lunar Distance tables can contain up to 8 celestial bodies per day (due to the page width limitation). Generally, an attempt is made to include an even number of objects to the east and west of the Moon. The maximum LD angle chosen for inclusion in the tables is 120°, which is about the maximum angle a sextant can measure.

The celestial bodies available for LD measurement include the Sun, four planets (Venus, Mars, Jupiter, Saturn), 21 navigational stars (with magnitude ≤ 1.5) and Polaris.

Three different strategies are available to select suitable celestial bodies for inclusion in a daily LD table:

- pick celestial bodies closest to the Moon
- pick celestial bodies with the highest hourly LD delta (for best accuracy in time determination)
- pick the brightest celestial bodies (possibly easier to locate in the sky)

The celestial body LD angle at a particular hour of day still needs to fulfill several requirements:

- the LD of the Sun is >10° as the Moon is hardly visible during New Moon. (This applies to <u>all</u> celestial bodies)
- the LD of the Sun is >40° (otherwise the Moon is not visible)
- only LD angles <120° are tabulated
- the angle between the celestial body and the Sun ("Solar Distance") is >10° (otherwise the celestial body might not be visible)
- the Sun is not between the celestial body and the Moon (based on the Right Ascenscion of all three)
- the hourly LD delta is >15′ of arc (to avoid measurement errors). "The rate of change of LD becomes zero when LD passes through a minimum or maximum, making an observation useless."[6]
- the rate of change of the hourly LD delta does not exceed 0.016° (= 0.96′). This empirical figure removes LD values where linear interpolation (between hours) becomes unreliable.

Suggested further reading: "Stark Tables: For Clearing the Lunar Distance and Finding Universal Time by Sextant Observation" by Bruce Stark, ISBN 978-0-914025-21-4

[1] Henning Umland, Chapter 7 - Finding Time and Longitude by Lunar Distances
[2] Eric Romelczyk, The Journal of Navigation, Volume 72, Issue 6
[3] Bruce Stark, page vi, Tables For Clearing the Lunar Distance and Finding Universal Time by Sextant Observation
[4] Bruce Stark, https://www.celestaire.com/product/tables-for-clearing-the-lunar-distance/
[5] Henning Umland, Chapter 7 - Finding Time and Longitude by Lunar Distances
[6] Henning Umland, Chapter 7 - Finding Time and Longitude by Lunar Distances

Wed (h)	Moon GHA	ν	Dec	d	HP	-Rigil Kent.	±Hadar	-Sun	-Mars	+Regulus	+Procyon	+Pollux	+Betelgeuse
0	227°43.7	10.9′	**S**05°46.4	-15.6′	59.6′	56°46.1	55°07.3	46°16.9	28°43.3	52°43.3	87°46.5	88°54.6	113°43.9
1	242°13.6	10.8′	06°02.0	-15.6′	59.6′	56°25.0	54°48.8	45°43.4	28°09.1	53°19.0	88°20.3	89°30.6	114°17.7
2	256°43.4	10.7′	06°17.6	-15.6′	59.7′	56°04.1	54°30.4	45°09.9	27°34.8	53°54.9	88°54.1	90°06.5	114°51.5
3	271°13.1	10.7′	06°33.2	-15.6′	59.7′	55°43.3	54°12.3	44°36.4	27°00.4	54°30.7	89°27.9	90°42.6	115°25.3
4	285°42.8	10.6′	06°48.8	-15.6′	59.8′	55°22.6	53°54.3	44°02.8	26°26.1	55°06.7	90°01.8	91°18.7	115°59.1
5	300°12.3	10.5′	07°04.3	-15.5′	59.8′	55°02.1	53°36.5	43°29.2	25°51.6	55°42.6	90°35.7	91°54.8	116°33.0
6	314°41.8	10.4′	**S**07°19.9	-15.5′	59.8′	54°41.8	53°18.9	42°55.5	25°17.1	56°18.7	91°09.6	92°31.0	117°06.8
7	329°11.2	10.3′	07°35.4	-15.5′	59.9′	54°21.6	53°01.5	42°21.8	24°42.6	56°54.7	91°43.6	93°07.2	117°40.7
8	343°40.6	10.2′	07°50.9	-15.5′	59.9′	54°01.5	52°44.3	41°48.0	24°08.1	57°30.9	92°17.7	93°43.5	118°14.6
9	358°09.8	10.2′	08°06.3	-15.4′	59.9′	53°41.7	52°27.3	41°14.2	23°33.4	58°07.0	92°51.8	94°19.8	118°48.5
10	12°39.0	10.1′	08°21.8	-15.4′	60.0′	53°22.0	52°10.6	40°40.3	22°58.8	58°43.2	93°25.9	94°56.1	119°22.5
11	27°08.1	10.0′	08°37.2	-15.4′	60.0′	53°02.5	51°54.0	40°06.4	22°24.1	59°19.5	94°00.1	95°32.5	119°56.4
12	41°37.1	9.9′	**S**08°52.6	-15.4′	60.0′	52°43.2	51°37.7		21°49.3	59°55.8	94°34.3	96°09.0	
13	56°06.0	9.8′	09°07.9	-15.3′	60.1′	52°24.0	51°21.5		21°14.6	60°32.2	95°08.5	96°45.5	
14	70°34.8	9.7′	09°23.3	-15.3′	60.1′	52°05.1	51°05.7		20°39.7	61°08.6	95°42.8	97°22.0	
15	85°03.5	9.6′	09°38.5	-15.3′	60.1′	51°46.4	50°50.0		20°04.8	61°45.0	96°17.1	97°58.6	
16	99°32.1	9.5′	09°53.8	-15.2′	60.2′	51°27.8	50°34.6		19°29.9	62°21.5	96°51.5	98°35.2	
17	114°00.7	9.4′	10°09.0	-15.2′	60.2′	51°09.5	50°19.4		18°55.0	62°58.1	97°25.9	99°11.9	
18	128°29.1	9.4′	**S**10°24.2	-15.1′	60.2′	50°51.4			18°20.0	63°34.6	98°00.3	99°48.6	
19	142°57.5	9.3′	10°39.3	-15.1′	60.3′	50°33.5			17°44.9	64°11.3	98°34.7	100°25.4	
20	157°25.7	9.2′	10°54.4	-15.0′	60.3′	50°15.9			17°09.8	64°47.9	99°09.2	101°02.2	
21	171°53.9	9.1′	11°09.4	-15.0′	60.3′	49°58.5			16°34.7	65°24.7	99°43.7	101°39.0	
22	186°22.0	9.0′	11°24.4	-14.9′	60.4′	49°41.3			15°59.6	66°01.4	100°18.3	102°15.9	
23	200°49.9	8.9′	11°39.4	-14.9′	60.4′	49°24.4			15°24.4	66°38.2	100°52.9	102°52.8	
	SD = 16.3′		Mer. pass. 09:08										

Thu (h)	Moon GHA	ν	Dec	d	HP	-Rigil Kent.	-Mars	+Spica	+Arcturus	+Regulus	+Procyon	+Pollux	+Sirius
0	215°17.8	8.8′	**S**11°54.2	-14.8′	60.4′	49°07.7	14°49.1	13°54.2	31°00.8	67°15.0	101°27.5	103°29.7	108°58.3
1	229°45.6	8.7′	12°09.1	-14.8′	60.5′	48°51.3	14°13.8	14°28.6	31°17.7	67°51.9	102°02.1	104°06.7	109°23.9
2	244°13.2	8.6′	12°23.8	-14.7′	60.5′	48°35.1	13°38.5	15°03.1	31°35.1	68°28.8	102°36.8	104°43.8	109°49.4
3	258°40.8	8.5′	12°38.6	-14.7′	60.5′	48°19.2	13°03.2	15°37.9	31°53.0	69°05.8	103°11.4	105°20.8	110°14.9
4	273°08.3	8.4′	12°53.2	-14.6′	60.5′	48°03.6	12°27.8	16°12.9	32°11.4	69°42.8	103°46.1	105°58.0	110°40.4
5	287°35.6	8.3′	13°07.8	-14.5′	60.6′	47°48.3	11°52.4	16°48.1	32°30.3	70°19.8	104°20.9	106°35.1	111°05.7
6	302°02.9	8.1′	**S**13°22.3	-14.5′	60.6′	47°33.2	11°16.9	17°23.5	32°49.7	70°56.9	104°55.6	107°12.3	111°31.1
7	316°30.0	8.0′	13°36.8	-14.4′	60.6′		10°41.5	17°59.0	33°09.6	71°34.0	105°30.4	107°49.5	111°56.3
8	330°57.1	7.9′	13°51.2	-14.3′	60.7′		10°06.0	18°34.7	33°29.9	72°11.2	106°05.2	108°26.8	112°21.5
9	345°24.0	7.8′	14°05.5	-14.2′	60.7′		9°30.4	19°10.5	33°50.7	72°48.4	106°40.0	109°04.1	112°46.6
10	359°50.8	7.7′	14°19.8	-14.2′	60.7′		8°54.9	19°46.4	34°11.9	73°25.6	107°14.8	109°41.4	113°11.7
11	14°17.5	7.6′	14°33.9	-14.1′	60.7′		8°19.3	20°22.4	34°33.5	74°02.9	107°49.7	110°18.8	113°36.7
12	28°44.1	7.5′	**S**14°48.0	-14.0′	60.8′		7°43.7	20°58.6	34°55.5	74°40.2	108°24.5	110°56.2	114°01.6
13	43°10.6	7.4′	15°02.0	-13.9′	60.8′		7°08.1	21°34.8	35°18.0	75°17.5	108°59.4	111°33.6	114°26.4
14	57°37.0	7.3′	15°16.0	-13.8′	60.8′		6°32.5	22°11.2	35°40.8	75°54.9	109°34.3	112°11.1	114°51.2
15	72°03.3	7.2′	15°29.8	-13.8′	60.8′		5°56.9	22°47.6	36°04.0	76°32.3	110°09.2	112°48.6	115°15.8
16	86°29.5	7.1′	15°43.6	-13.7′	60.9′		5°21.3	23°24.1	36°27.6	77°09.7	110°44.1	113°26.1	115°40.4
17	100°55.5	6.9′	15°57.2	-13.6′	60.9′		4°45.7	24°00.7	36°51.5	77°47.2	111°19.0	114°03.7	116°04.9
18	115°21.4	6.8′	**S**16°10.8	-13.5′	60.9′		4°10.2	24°37.4	37°15.7	78°24.7	111°53.9	114°41.2	116°29.3
19	129°47.3	6.7′	16°24.3	-13.4′	60.9′		3°34.7	25°14.2	37°40.3	79°02.2	112°28.8	115°18.9	116°53.5
20	144°13.0	6.6′	16°37.7	-13.3′	61.0′		2°59.5	25°51.0	38°05.2	79°39.7	113°03.7	115°56.5	117°17.7
21	158°38.6	6.5′	16°51.0	-13.2′	61.0′		2°24.6	26°27.9	38°30.5	80°17.3	113°38.7	116°34.2	117°41.8
22	173°04.1	6.4′	17°04.2	-13.1′	61.0′		1°50.4	27°04.8	38°56.0	80°54.9	114°13.6	117°11.9	118°05.8
23	187°29.4	6.3′	17°17.3	-13.0′	61.0′			27°41.8	39°21.8	81°32.6	114°48.5	117°49.6	118°29.6
	SD = 16.5′		Mer. pass. 10:01										

Fri (h)	Moon GHA	ν	Dec	d	HP	+Mars	+Spica	+Arcturus	+Regulus	+Adhara	+Procyon	+Pollux	+Sirius
0	201°54.7	6.1′	**S**17°30.2	-12.9′	61.0′		28°18.9	39°48.0	82°10.2	109°36.8	115°23.4	118°27.4	118°53.3
1	216°19.8	6.0′	17°43.1	-12.8′	61.1′		28°56.0	40°14.3	82°47.9	109°55.3	115°58.3	119°05.2	119°16.9
2	230°44.9	5.9′	17°55.9	-12.7′	61.1′		29°33.2	40°41.0	83°25.6	110°13.6	116°33.2	119°43.0	119°40.4
3	245°09.8	5.8′	18°08.5	-12.5′	61.1′		30°10.4	41°07.9	84°03.4	110°31.9	117°08.1		
4	259°34.6	5.7′	18°21.1	-12.4′	61.1′		30°47.7	41°35.1	84°41.2	110°50.0	117°43.0		
5	273°59.3	5.6′	18°33.5	-12.3′	61.1′		31°25.0	42°02.5	85°18.9	111°08.0	118°17.9		
6	288°23.9	5.5′	**S**18°45.8	-12.2′	61.1′	3°10.1	32°02.4	42°30.2	85°56.8	111°26.0	118°52.8		
7	302°48.3	5.3′	18°58.0	-12.1′	61.2′	3°45.7	32°39.8	42°58.0	86°34.6	111°43.8	119°27.6		
8	317°12.7	5.2′	19°10.1	-11.9′	61.2′	4°21.5	33°17.2	43°26.1	87°12.4	112°01.4			
9	331°36.9	5.1′	19°22.0	-11.8′	61.2′	4°57.4	33°54.7	43°54.5	87°50.3	112°19.0			
10	346°01.0	5.0′	19°33.8	-11.7′	61.2′	5°33.4	34°32.3	44°23.0	88°28.2	112°36.4			
11	0°25.0	4.9′	19°45.5	-11.6′	61.2′	6°09.5	35°09.8	44°51.7	89°06.1	112°53.7			
12	14°48.9	4.8′	**S**19°57.1	-11.4′	61.2′	6°45.7	35°47.4	45°20.6	89°44.1	113°10.9			
13	29°12.7	4.7′	20°08.5	-11.3′	61.2′	7°21.9	36°25.0	45°49.7	90°22.0	113°27.9			
14	43°36.4	4.6′	20°19.8	-11.1′	61.3′	7°58.1	37°02.7	46°19.0	91°00.0	113°44.8			
15	58°00.0	4.5′	20°30.9	-11.0′	61.3′				New Moon				
16	72°23.4	4.3′	20°41.9	-10.9′	61.3′				New Moon				
17	86°46.8	4.2′	20°52.8	-10.7′	61.3′				New Moon				
18	101°10.0	4.1′	**S**21°03.5	-10.6′	61.3′				New Moon				
19	115°33.1	4.0′	21°14.0	-10.4′	61.3′				New Moon				
20	129°56.2	3.9′	21°24.5	-10.3′	61.3′				New Moon				
21	144°19.1	3.8′	21°34.7	-10.1′	61.3′				New Moon				
22	158°41.9	3.7′	21°44.8	-10.0′	61.3′				New Moon				
23	173°04.6	3.6′	21°54.8	-9.8′	61.3′				New Moon				
	SD = 16.6′		Mer. pass. 10:58										

h Moon

Sat	GHA	ν	Dec	d	HP	
0	187°27.2	3.5′	**S**22°04.6	-9.6′	61.3′	New Moon
1	201°49.7	3.4′	22°14.2	-9.5′	61.4′	New Moon
2	216°12.2	3.3′	22°23.7	-9.3′	61.4′	New Moon
3	230°34.5	3.2′	22°33.0	-9.2′	61.4′	New Moon
4	244°56.7	3.1′	22°42.2	-9.0′	61.4′	New Moon
5	259°18.8	3.0′	22°51.2	-8.8′	61.4′	New Moon
6	273°40.9	2.9′	**S**23°00.0	-8.6′	61.4′	New Moon
7	288°02.8	2.9′	23°08.6	-8.5′	61.4′	New Moon
8	302°24.7	2.8′	23°17.1	-8.3′	61.4′	New Moon
9	316°46.4	2.7′	23°25.4	-8.1′	61.4′	New Moon
10	331°08.1	2.6′	23°33.5	-7.9′	61.4′	New Moon
11	345°29.7	2.5′	23°41.5	-7.8′	61.4′	New Moon
12	359°51.2	2.4′	**S**23°49.2	-7.6′	61.4′	New Moon
13	14°12.7	2.4′	23°56.8	-7.4′	61.4′	New Moon
14	28°34.0	2.3′	24°04.2	-7.2′	61.4′	New Moon
15	42°55.3	2.2′	24°11.4	-7.0′	61.4′	New Moon
16	57°16.6	2.1′	24°18.5	-6.8′	61.4′	New Moon
17	71°37.7	2.1′	24°25.3	-6.7′	61.4′	New Moon
18	85°58.8	2.0′	**S**24°32.0	-6.5′	61.4′	New Moon
19	100°19.8	2.0′	24°38.4	-6.3′	61.4′	New Moon
20	114°40.8	1.9′	24°44.7	-6.1′	61.3′	New Moon
21	129°01.7	1.8′	24°50.8	-5.9′	61.3′	New Moon
22	143°22.5	1.8′	24°56.7	-5.7′	61.3′	New Moon
23	157°43.3	1.7′	25°02.4	-5.5′	61.3′	New Moon
	SD = 16.7′		Mer. pass. 12:01			

h Moon Lunar Distance (objects with largest hourly LD delta)

Sun	GHA	ν	Dec	d	HP	-Achernar	-Deneb	-Fomalhaut	-Jupiter	-Altair	-Saturn	-Venus
0	172°04.0	1.7′	**S**25°07.9	-5.3′	61.3′	New Moon						
1	186°24.7	1.6′	25°13.2	-5.1′	61.3′	84°23.5	82°56.0	71°25.5	62°34.7	48°27.5	45°57.0	29°19.1
2	200°45.3	1.6′	25°18.3	-4.9′	61.3′	84°01.4	82°40.6	70°49.0	61°57.0	48°02.1	45°19.2	28°42.2
3	215°05.9	1.6′	25°23.2	-4.7′	61.3′	83°39.3	82°25.2	70°12.5	61°19.4	47°36.9	44°41.5	28°05.4
4	229°26.5	1.5′	25°27.9	-4.5′	61.3′	83°17.3	82°09.9	69°36.0	60°41.7	47°12.0	44°03.7	27°28.5
5	243°47.0	1.5′	25°32.4	-4.3′	61.3′	82°55.4	81°54.6	68°59.5	60°04.1	46°47.3	43°26.0	26°51.7
6	258°07.4	1.4′	**S**25°36.7	-4.1′	61.3′	82°33.4	81°39.4	68°23.1	59°26.5	46°22.8	42°48.3	26°14.8
7	272°27.9	1.4′	25°40.8	-3.9′	61.2′	82°11.6	81°24.3	67°46.7	58°48.9	45°58.6	42°10.6	25°38.0
8	286°48.3	1.4′	25°44.7	-3.7′	61.2′	81°49.7	81°09.2	67°10.3	58°11.3	45°34.7	41°33.0	25°01.2
9	301°08.7	1.4′	25°48.4	-3.5′	61.2′	81°27.9	80°54.2	66°33.9	57°33.7	45°11.0	40°55.3	24°24.5
10	315°29.1	1.4′	25°51.9	-3.3′	61.2′	81°06.2		65°57.6	56°56.2	44°47.6	40°17.7	23°47.7
11	329°49.4	1.3′	25°55.2	-3.1′	61.2′	80°44.5		65°21.3	56°18.6	44°24.4	39°40.1	23°11.0
12	344°09.8	1.3′	**S**25°58.3	-2.9′	61.2′	80°22.9		64°45.1	55°41.1	44°01.6	39°02.6	22°34.3
13	358°30.1	1.3′	26°01.2	-2.7′	61.2′	80°01.4		64°08.9	55°03.7	43°39.0	38°25.0	21°57.6
14	12°50.4	1.3′	26°03.8	-2.5′	61.1′	79°39.9		63°32.7	54°26.2	43°16.7	37°47.5	21°21.0
15	27°10.7	1.3′	26°06.3	-2.3′	61.1′	79°18.4		62°56.6	53°48.8	42°54.8	37°10.0	20°44.3
16	41°31.0	1.3′	26°08.6	-2.1′	61.1′	78°57.1		62°20.5	53°11.4	42°33.1	36°32.6	20°07.8
17	55°51.3	1.3′	26°10.6	-1.9′	61.1′	78°35.8		61°44.5	52°34.0	42°11.8	35°55.2	19°31.2
18	70°11.6	1.3′	**S**26°12.5	-1.6′	61.1′	78°14.6		61°08.5	51°56.6	41°50.8	35°17.8	18°54.7
19	84°31.9	1.3′	26°14.1	-1.4′	61.1′	77°53.4		60°32.5	51°19.3	41°30.2	34°40.4	18°18.2
20	98°52.2	1.3′	26°15.6	-1.2′	61.0′	77°32.3		59°56.6	50°42.0	41°09.9	34°03.1	17°41.7
21	113°12.6	1.3′	26°16.8	-1.0′	61.0′	77°11.3		59°20.8	50°04.8	40°49.9	33°25.8	17°05.3
22	127°32.9	1.4′	26°17.8	-0.8′	61.0′	76°50.4		58°45.0	49°27.5	40°30.3	32°48.6	16°28.9
23	141°53.3	1.4′	26°18.6	-0.6′	61.0′	76°29.6		58°09.2	48°50.3	40°11.1	32°11.4	15°52.5
	SD = 16.7′		Mer. pass. 13:06									

h Moon Lunar Distance (objects with largest hourly LD delta)

Mon	GHA	ν	Dec	d	HP	-Achernar	-Fomalhaut	-Jupiter	-Altair	-Saturn	-Venus
0	156°13.7	1.4′	**S**26°19.3	-0.4′	61.0′	76°08.8	57°33.5	48°13.1	39°52.3	31°34.2	15°16.2
1	170°34.1	1.4′	26°19.7	-0.2′	60.9′	75°48.2	56°57.9	47°36.0	39°33.8	30°57.1	14°40.0
2	184°54.5	1.5′	26°19.9	-0.0′	60.9′	75°27.6	56°22.3	46°58.9	39°15.7	30°20.0	14°03.8
3	199°15.0	1.5′	26°19.9	0.2′	60.9′	75°07.1	55°46.8	46°21.8	38°58.1	29°43.0	13°27.6
4	213°35.5	1.6′	26°19.7	0.4′	60.9′	74°46.8	55°11.3	45°44.8	38°40.9	29°06.0	12°51.5
5	227°56.1	1.6′	26°19.3	0.6′	60.8′	74°26.5	54°35.9	45°07.8	38°24.0	28°29.0	12°15.5
6	242°16.7	1.6′	**S**26°18.7	0.8′	60.8′	74°06.3	54°00.5	44°30.8	38°07.7	27°52.1	11°39.5
7	256°37.3	1.7′	26°17.9	1.0′	60.8′	73°46.2	53°25.3	43°53.9	37°51.7	27°15.3	11°03.7
8	270°58.0	1.7′	26°16.9	1.2′	60.8′	73°26.2	52°50.0	43°17.0	37°36.2	26°38.5	10°27.9
9	285°18.7	1.8′	26°15.6	1.4′	60.7′	73°06.3	52°14.9	42°40.1	37°21.2	26°01.8	9°52.2
10	299°39.5	1.8′	26°14.2	1.6′	60.7′	72°46.5	51°39.8	42°03.3		25°25.1	9°16.6
11	314°00.4	1.9′	26°12.6	1.8′	60.7′	72°26.9	51°04.8	41°26.5		24°48.4	8°41.1
12	328°21.3	2.0′	**S**26°10.8	2.0′	60.7′	72°07.3	50°29.9	40°49.8		24°11.9	8°05.8
13	342°42.2	2.0′	26°08.8	2.2′	60.6′	71°47.9	49°55.0	40°13.1		23°35.3	7°30.7
14	357°03.3	2.1′	26°06.6	2.4′	60.6′	71°28.5	49°20.2	39°36.5		22°58.9	6°55.8
15	11°24.4	2.2′	26°04.2	2.6′	60.6′	71°09.3	48°45.5	38°59.9		22°22.5	6°21.1
16	25°45.5	2.2′	26°01.6	2.8′	60.6′	70°50.2	48°10.9	38°23.3		21°46.2	5°46.8
17	40°06.8	2.3′	25°58.9	3.0′	60.5′	70°31.3	47°36.4	37°46.8		21°10.0	5°12.9
18	54°28.1	2.4′	**S**25°55.9	3.2′	60.5′	70°12.4	47°01.9	37°10.3		20°33.8	4°39.6
19	68°49.5	2.5′	25°52.7	3.4′	60.5′	69°53.7	46°27.6	36°33.9		19°57.7	4°07.0
20	83°11.0	2.6′	25°49.4	3.5′	60.4′	69°35.1	45°53.3	35°57.5		19°21.7	
21	97°32.5	2.6′	25°45.8	3.7′	60.4′	69°16.7	45°19.1	35°21.1		18°45.8	
22	111°54.2	2.7′	25°42.1	3.9′	60.4′	68°58.4	44°45.0	34°44.9		18°10.0	
23	126°15.9	2.8′	25°38.2	4.1′	60.3′	68°40.2	44°11.0	34°08.6		17°34.3	
	SD = 16.6′		Mer. pass. 14:12								

h Tue	Moon GHA	ν	Dec	d	HP	Lunar Distance (objects with largest hourly LD delta) -Achernar	-Fomalhaut	-Jupiter	-Saturn	+Venus	+Sun
0	140°37.8	2.9'	S25°34.1	4.3'	60.3'	68°22.1	43°37.1	33°32.4	16°58.7		
1	154°59.7	3.0'	25°29.8	4.5'	60.3'	68°04.2	43°03.3	32°56.3	16°23.3		
2	169°21.7	3.1'	25°25.4	4.6'	60.2'	67°46.4	42°29.7	32°20.2	15°47.9		
3	183°43.8	3.2'	25°20.7	4.8'	60.2'	67°28.8	41°56.1	31°44.2	15°12.7		
4	198°06.0	3.3'	25°15.9	5.0'	60.2'	67°11.3	41°22.6	31°08.2	14°37.6		
5	212°28.3	3.4'	25°10.9	5.2'	60.1'	66°54.0	40°49.3	30°32.3	14°02.7		
6	226°50.7	3.5'	S25°05.8	5.3'	60.1'	66°36.8	40°16.1	29°56.4	13°28.0		41°18.5
7	241°13.3	3.6'	25°00.4	5.5'	60.1'	66°19.8	39°43.0	29°20.6	12°53.4		41°52.6
8	255°35.9	3.7'	24°54.9	5.7'	60.0'	66°02.9	39°10.0	28°44.9	12°19.1		42°26.6
9	269°58.6	3.8'	24°49.3	5.8'	60.0'	65°46.2	38°37.1	28°09.2	11°45.0	5°01.1	43°00.5
10	284°21.5	4.0'	24°43.4	6.0'	60.0'	65°29.7	38°04.4	27°33.6	11°11.1	5°34.2	43°34.4
11	298°44.4	4.1'	24°37.4	6.2'	59.9'	65°13.3	37°31.8	26°58.0	10°37.6	6°07.7	44°08.3
12	313°07.5	4.2'	S24°31.2	6.3'	59.9'	64°57.0	36°59.4	26°22.5	10°04.4	6°41.5	44°42.1
13	327°30.7	4.3'	24°24.9	6.5'	59.9'	64°40.9	36°27.1	25°47.1	9°31.6	7°15.5	45°15.9
14	341°54.0	4.4'	24°18.4	6.7'	59.8'	64°25.0	35°55.0	25°11.7	8°59.3	7°49.6	45°49.6
15	356°17.4	4.5'	24°11.7	6.8'	59.8'	64°09.3	35°23.0	24°36.4	8°27.5	8°23.8	46°23.3
16	10°40.9	4.7'	24°04.9	7.0'	59.8'	63°53.7	34°51.1	24°01.2	7°56.3	8°58.2	46°56.9
17	25°04.6	4.8'	23°58.0	7.1'	59.7'	63°38.3	34°19.5	23°26.1	7°25.9	9°32.5	47°30.5
18	39°28.3	4.9'	S23°50.9	7.3'	59.7'	63°23.1	33°48.0	22°51.0	6°56.4	10°06.9	48°04.0
19	53°52.2	5.0'	23°43.6	7.4'	59.7'	63°08.1	33°16.7	22°16.0		10°41.4	48°37.5
20	68°16.2	5.1'	23°36.2	7.6'	59.6'		32°45.6	21°41.1		11°15.8	49°11.0
21	82°40.4	5.3'	23°28.6	7.7'	59.6'		32°14.6	21°06.3		11°50.3	49°44.4
22	97°04.7	5.4'	23°20.9	7.9'	59.5'		31°43.9	20°31.5		12°24.8	50°17.7
23	111°29.0	5.5'	23°13.0	8.0'	59.5'		31°13.3	19°56.9		12°59.2	50°51.0
	SD = 16.4′		Mer. pass. 15:15								

h Wed	Moon GHA	ν	Dec	d	HP	Lunar Distance (objects with largest hourly LD delta) -Rigel	-Aldebaran	-Fomalhaut	-Jupiter	+Saturn	+Venus	+Altair	+Sun
0	125°53.6	5.6'	S23°05.0	8.1'	59.5'			30°43.0	19°22.3		13°33.7		51°24.3
1	140°18.2	5.8'	22°56.9	8.3'	59.4'	119°42.3		30°12.9	18°47.8		14°08.1		51°57.5
2	154°43.0	5.9'	22°48.6	8.4'	59.4'	119°14.2		29°43.0	18°13.5		14°42.5		52°30.6
3	169°07.9	6.0'	22°40.2	8.5'	59.4'	118°46.0		29°13.4	17°39.2		15°16.9		53°03.8
4	183°32.9	6.2'	22°31.7	8.7'	59.3'	118°17.8	119°33.3	28°44.0	17°05.1		15°51.2		53°36.8
5	197°58.0	6.3'	22°23.0	8.8'	59.3'	117°49.5	118°58.0	28°14.8	16°31.1		16°25.6		54°09.8
6	212°23.3	6.4'	S22°14.2	8.9'	59.2'	117°21.2	118°22.8	27°46.0	15°57.2		16°59.9		54°42.8
7	226°48.7	6.5'	22°05.2	9.1'	59.2'	116°52.9	117°47.6	27°17.4	15°23.4		17°34.1		55°15.7
8	241°14.3	6.7'	21°56.2	9.2'	59.2'	116°24.6	117°12.5	26°49.1	14°49.8		18°08.4		55°48.6
9	255°40.0	6.8'	21°47.0	9.3'	59.1'	115°56.2	116°37.4	26°21.1	14°16.4		18°42.6		56°21.4
10	270°05.8	6.9'	21°37.7	9.4'	59.1'	115°27.8	116°02.3	25°53.4	13°43.1		19°16.7		56°54.2
11	284°31.7	7.1'	21°28.2	9.5'	59.1'	114°59.4	115°27.3	25°26.1	13°10.0		19°50.8		57°26.9
12	298°57.8	7.2'	S21°18.7	9.7'	59.0'	114°30.9	114°52.3	24°59.1	12°37.1		20°24.9		57°59.6
13	313°23.9	7.3'	21°09.0	9.8'	59.0'	114°02.5	114°17.4	24°32.4	12°04.5		20°59.0		58°32.2
14	327°50.3	7.5'	20°59.3	9.9'	58.9'	113°34.0	113°42.6	24°06.2	11°32.1		21°33.0		59°04.8
15	342°16.7	7.6'	20°49.4	10.0'	58.9'	113°05.5	113°07.7	23°40.3	10°59.9	7°52.5	22°07.0		59°37.3
16	356°43.3	7.7'	20°39.4	10.1'	58.9'	112°37.0	112°33.0	23°14.9	10°28.1	8°22.6	22°40.9		60°09.8
17	11°10.0	7.8'	20°29.2	10.2'	58.8'	112°08.5	111°58.2	22°49.8	9°56.7	8°53.2	23°14.8		60°42.2
18	25°36.8	8.0'	S20°19.0	10.3'	58.8'	111°40.0	111°23.6	22°25.3	9°25.6	9°24.3	23°48.7		61°14.6
19	40°03.8	8.1'	20°08.7	10.4'	58.7'	111°11.5	110°48.9	22°01.2	8°55.1	9°55.7	24°22.5		61°46.9
20	54°30.9	8.2'	19°58.3	10.5'	58.7'	110°43.0	110°14.3	21°37.6	8°25.0	10°27.3	24°56.3		62°19.2
21	68°58.1	8.4'	19°47.7	10.6'	58.7'	110°14.5	109°39.8	21°14.5	7°55.6	10°59.3	25°30.0	38°24.9	62°51.4
22	83°25.5	8.5'	19°37.1	10.7'	58.6'	109°45.9	109°05.3	20°52.0	7°27.0	11°31.4	26°03.7	38°40.4	63°23.6
23	97°53.0	8.6'	19°26.4	10.8'	58.6'	109°17.4	108°30.9	20°30.1	6°59.2	12°03.7	26°37.3	38°56.3	63°55.8
	SD = 16.2′		Mer. pass. 16:14										

h Thu	Moon GHA	ν	Dec	d	HP	Lunar Distance (objects with largest hourly LD delta) -Betelgeuse	-Capella	-Rigel	-Aldebaran	+Jupiter	+Saturn	+Venus	+Sun
0	112°20.6	8.7'	S19°15.5	10.9'	58.5'			108°48.9	107°56.5		12°36.2	27°10.9	64°27.8
1	126°48.3	8.9'	19°04.6	11.0'	58.5'		119°43.0	108°20.4	107°22.1		13°08.7	27°44.5	64°59.9
2	141°16.2	9.0'	18°53.6	11.1'	58.5'		119°11.5	107°51.8	106°47.8		13°41.4	28°18.0	65°31.9
3	155°44.1	9.1'	18°42.5	11.2'	58.4'		118°40.0	107°23.3	106°13.5		14°14.1	28°51.5	66°03.8
4	170°12.3	9.2'	18°31.3	11.3'	58.4'		118°08.6	106°54.8	105°39.3		14°46.9	29°24.9	66°35.7
5	184°40.5	9.4'	18°20.0	11.4'	58.3'		117°37.1	106°26.3	105°05.2		15°19.8	29°58.3	67°07.5
6	199°08.8	9.5'	S18°08.7	11.4'	58.3'		117°05.7	105°57.8	104°31.1		15°52.7	30°31.7	67°39.3
7	213°37.3	9.6'	17°57.2	11.5'	58.3'		116°34.3	105°29.3	103°57.0		16°25.6	31°05.0	68°11.1
8	228°05.9	9.7'	17°45.7	11.6'	58.2'	119°43.5	116°02.9	105°00.9	103°23.0		16°58.6	31°38.2	68°42.8
9	242°34.6	9.8'	17°34.1	11.7'	58.2'	119°11.6	115°31.5	104°32.4	102°49.0		17°31.5	32°11.5	69°14.4
10	257°03.5	10.0'	17°22.4	11.8'	58.1'	118°39.8	115°00.1	104°04.0	102°15.1		18°04.5	32°44.6	69°46.0
11	271°32.4	10.1'	17°10.6	11.8'	58.1'	118°07.9	114°28.8	103°35.5	101°41.2		18°37.5	33°17.8	70°17.5
12	286°01.5	10.2'	S16°58.8	11.9'	58.1'	117°36.1	113°57.5	103°07.1	101°07.4		19°10.5	33°50.9	70°49.0
13	300°30.7	10.3'	16°46.9	12.0'	58.0'	117°04.4	113°26.2	102°38.7	100°33.6		19°43.5	34°23.9	71°20.5
14	315°00.0	10.4'	16°34.9	12.1'	58.0'	116°32.6	112°54.9	102°10.3	99°59.8		20°16.5	34°56.9	71°51.9
15	329°29.4	10.5'	16°22.8	12.1'	57.9'	116°00.9	112°23.6	101°42.0	99°26.2		20°49.5	35°29.9	72°23.3
16	343°59.0	10.7'	16°10.7	12.2'	57.9'	115°29.2	111°52.4	101°13.6	98°52.5		21°22.4	36°02.8	72°54.6
17	358°28.6	10.8'	15°58.5	12.3'	57.9'	114°57.5	111°21.2	100°45.3	98°18.9		21°55.4	36°35.7	73°25.8
18	12°58.4	10.9'	S15°46.3	12.3'	57.8'	114°25.9	110°50.0	100°17.0	97°45.4		22°28.3	37°08.5	73°57.0
19	27°28.3	11.0'	15°33.9	12.4'	57.8'	113°54.2	110°18.8	99°48.7	97°11.8		23°01.2	37°41.3	74°28.2
20	41°58.3	11.1'	15°21.6	12.4'	57.7'	113°22.6	109°47.7	99°20.5	96°38.4	7°32.2	23°34.1	38°14.0	74°59.3
21	56°28.4	11.2'	15°09.1	12.5'	57.7'	112°51.1	109°16.6	98°52.2	96°05.0	8°00.0	24°07.0	38°46.7	75°30.4
22	70°58.6	11.3'	14°56.6	12.6'	57.7'	112°19.5	108°45.5	98°24.0	95°31.6	8°28.5	24°39.9	39°19.4	76°01.4
23	85°28.9	11.4'	14°44.1	12.6'	57.6'	111°48.0	108°14.5	97°55.8	94°58.3	8°57.4	25°12.7	39°52.0	76°32.4
	SD = 16.0′		Mer. pass. 17:06										

DUT1 = UT1-UTC = -0.1035 sec   ΔT = TT-UT1 = +69.2875 sec

2021 December 10 to Dec. 12 UT

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Fri	**GHA**	ν	**Dec**	*d*	**HP**	**-Betelgeuse**	**-Capella**	**-Rigel**	**-Aldebaran**	**+Jupiter**	**+Saturn**	**+Venus**	**+Sun**
0	99°59.3	11.5′	**S**14°31.4	12.7′	57.6′	111°16.5	107°43.4	97°27.7	94°25.0	9°26.8	25°45.5	40°24.6	77°03.3
1	114°29.8	11.6′	14°18.8	12.7′	57.6′	110°45.0	107°12.4	96°59.5	93°51.8	9°56.5	26°18.2	40°57.1	77°34.2
2	129°00.5	11.7′	14°06.0	12.8′	57.5′	110°13.6	106°41.5	96°31.4	93°18.6	10°26.5	26°51.0	41°29.6	78°05.1
3	143°31.2	11.8′	13°53.3	12.8′	57.5′	109°42.2	106°10.5	96°03.3	92°45.4	10°56.8	27°23.7	42°02.1	78°35.9
4	158°02.0	11.9′	13°40.4	12.9′	57.4′	109°10.8	105°39.6	95°35.3	92°12.4	11°27.2	27°56.4	42°34.5	79°06.6
5	172°33.0	12.0′	13°27.5	12.9′	57.4′	108°39.5	105°08.7	95°07.3	91°39.3	11°57.8	28°29.0	43°06.9	79°37.3
6	187°04.0	12.1′	**S**13°14.6	13.0′	57.4′	108°08.2	104°37.9	94°39.3	91°06.3	12°28.6	29°01.6	43°39.2	80°08.0
7	201°35.1	12.2′	13°01.6	13.0′	57.3′	107°36.9	104°07.1	94°11.3	90°33.3	12°59.5	29°34.2	44°11.5	80°38.6
8	216°06.3	12.3′	12°48.6	13.1′	57.3′	107°05.7	103°36.3	93°43.4	90°00.4	13°30.4	30°06.8	44°43.7	81°09.2
9	230°37.7	12.4′	12°35.6	13.1′	57.3′	106°34.4	103°05.5	93°15.5	89°27.5	14°01.5	30°39.3	45°16.0	81°39.7
10	245°09.1	12.5′	12°22.5	13.1′	57.2′	106°03.2	102°34.8	92°47.6	88°54.7	14°32.7	31°11.8	45°48.1	82°10.2
11	259°40.6	12.6′	12°09.3	13.2′	57.2′	105°32.1	102°04.1	92°19.8	88°21.9	15°03.9	31°44.2	46°20.3	82°40.6
12	274°12.2	12.7′	**S**11°56.1	13.2′	57.1′	105°01.0	101°33.4	91°51.9	87°49.2	15°35.1	32°16.7	46°52.3	83°11.0
13	288°43.9	12.8′	11°42.9	13.3′	57.1′	104°29.9	101°02.8	91°24.2	87°16.5	16°06.4	32°49.0	47°24.4	83°41.4
14	303°15.7	12.9′	11°29.6	13.3′	57.1′	103°58.8	100°32.2	90°56.4	86°43.8	16°37.8	33°21.4	47°56.4	84°11.7
15	317°47.5	13.0′	11°16.3	13.3′	57.0′	103°27.8	100°01.6	90°28.7	86°11.2	17°09.1	33°53.7	48°28.4	84°42.0
16	332°19.5	13.0′	11°03.0	13.4′	57.0′	102°56.8	99°31.1	90°01.1	85°38.6	17°40.5	34°26.0	49°00.3	85°12.2
17	346°51.5	13.1′	10°49.7	13.4′	57.0′	102°25.8	99°00.6	89°33.4	85°06.1	18°11.9	34°58.2	49°32.2	85°42.4
18	1°23.6	13.2′	**S**10°36.3	13.4′	56.9′	101°54.9	98°30.1	89°05.8	84°33.6	18°43.3	35°30.4	50°04.1	86°12.5
19	15°55.9	13.3′	10°22.8	13.5′	56.9′	101°24.0	97°59.6	88°38.3	84°01.2	19°14.7	36°02.6	50°35.9	86°42.6
20	30°28.1	13.4′	10°09.4	13.5′	56.8′	100°53.1	97°29.2	88°10.8	83°28.8	19°46.1	36°34.8	51°07.7	87°12.7
21	45°00.5	13.4′	09°55.9	13.5′	56.8′	100°22.3	96°58.9	87°43.3	82°56.4	20°17.5	37°06.9	51°39.4	87°42.7
22	59°33.0	13.5′	09°42.4	13.5′	56.8′	99°51.5	96°28.5	87°15.8	82°24.1	20°49.0	37°38.9	52°11.1	88°12.6
23	74°05.5	13.6′	09°28.8	13.6′	56.7′	99°20.7	95°58.2	86°48.4	81°51.8	21°20.4	38°11.0	52°42.8	88°42.6
	SD = 15.7′		Mer. pass. 17:54										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Sat	**GHA**	ν	**Dec**	*d*	**HP**	**-Pollux**	**-Betelgeuse**	**-Capella**	**-Aldebaran**	**+Jupiter**	**+Saturn**	**+Venus**	**+Sun**
0	88°38.1	13.7′	**S**09°15.3	13.6′	56.7′		98°50.0	95°27.9	81°19.6	21°51.8	38°43.0	53°14.4	89°12.5
1	103°10.8	13.8′	09°01.7	13.6′	56.7′		98°19.3	94°57.7	80°47.4	22°23.1	39°14.9	53°46.0	89°42.3
2	117°43.5	13.8′	08°48.0	13.6′	56.6′		97°48.6	94°27.5	80°15.2	22°54.5	39°46.9	54°17.6	90°12.1
3	132°16.4	13.9′	08°34.4	13.7′	56.6′		97°18.0	93°57.3	79°43.1	23°25.9	40°18.8	54°49.1	90°41.9
4	146°49.3	14.0′	08°20.8	13.7′	56.6′		96°47.4	93°27.2	79°11.0	23°57.2	40°50.6	55°20.6	91°11.6
5	161°22.2	14.0′	08°07.1	13.7′	56.5′		96°16.8	92°57.1	78°39.0	24°28.5	41°22.4	55°52.0	91°41.3
6	175°55.3	14.1′	**S**07°53.4	13.7′	56.5′		95°46.3	92°27.0	78°07.0	24°59.8	41°54.2	56°23.5	92°11.0
7	190°28.4	14.2′	07°39.7	13.7′	56.5′		95°15.8	91°57.0	77°35.0	25°31.1	42°26.0	56°54.8	92°40.6
8	205°01.5	14.2′	07°25.9	13.7′	56.4′		94°45.3	91°27.0	77°03.1	26°02.4	42°57.7	57°26.2	93°10.2
9	219°34.8	14.3′	07°12.2	13.8′	56.4′		94°14.9	90°57.0	76°31.2	26°33.7	43°29.4	57°57.5	93°39.7
10	234°08.1	14.4′	06°58.4	13.8′	56.4′		93°44.5	90°27.1	75°59.3	27°04.9	44°01.0	58°28.8	94°09.2
11	248°41.4	14.4′	06°44.6	13.8′	56.3′	119°33.4	93°14.1	89°57.2	75°27.5	27°36.1	44°32.7	59°00.0	94°38.7
12	263°14.9	14.5′	**S**06°30.9	13.8′	56.3′	119°01.5	92°43.8	89°27.3	74°55.8	28°07.3	45°04.3	59°31.2	95°08.1
13	277°48.3	14.5′	06°17.1	13.8′	56.3′	118°29.6	92°13.5	88°57.5	74°24.0	28°38.4	45°35.8	60°02.4	95°37.5
14	292°21.9	14.6′	06°03.2	13.8′	56.2′	117°57.8	91°43.2	88°27.7	73°52.3	29°09.6	46°07.3	60°33.6	96°06.9
15	306°55.5	14.7′	05°49.4	13.8′	56.2′	117°25.9	91°13.0	87°57.9	73°20.7	29°40.7	46°38.8	61°04.7	96°36.2
16	321°29.1	14.7′	05°35.6	13.8′	56.2′	116°54.1	90°42.8	87°28.2	72°49.0	30°11.8	47°10.3	61°35.8	97°05.5
17	336°02.8	14.8′	05°21.8	13.8′	56.1′	116°22.4	90°12.6	86°58.5	72°17.4	30°42.8	47°41.7	62°06.8	97°34.7
18	350°36.6	14.8′	**S**05°07.9	13.9′	56.1′	115°50.7	89°42.5	86°28.8	71°45.9	31°13.9	48°13.1	62°37.9	98°03.9
19	5°10.4	14.9′	04°54.1	13.9′	56.1′	115°19.0	89°12.4	85°59.2	71°14.4	31°44.9	48°44.4	63°08.8	98°33.1
20	19°44.3	14.9′	04°40.2	13.9′	56.0′	114°47.3	88°42.3	85°29.6	70°42.9	32°15.9	49°15.7	63°39.8	99°02.3
21	34°18.2	15.0′	04°26.3	13.9′	56.0′	114°15.7	88°12.3	85°00.1	70°11.5	32°46.9	49°47.0	64°10.7	99°31.4
22	48°52.2	15.0′	04°12.5	13.9′	56.0′	113°44.1	87°42.3	84°30.5	69°40.0	33°17.8	50°18.3	64°41.6	100°00.4
23	63°26.2	15.1′	03°58.6	13.9′	56.0′	113°12.6	87°12.3	84°01.1	69°08.7	33°48.7	50°49.5	65°12.5	100°29.5
	SD = 15.5′		Mer. pass. 18:39										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Sun	**GHA**	ν	**Dec**	*d*	**HP**	**-Pollux**	**-Betelgeuse**	**-Capella**	**-Aldebaran**	**+Jupiter**	**+Saturn**	**+Venus**	**+Sun**
0	78°00.2	15.1′	**S**03°44.7	13.9′	55.9′	112°41.1	86°42.4	83°31.6	68°37.3	34°19.6	51°20.7	65°43.3	100°58.5
1	92°34.3	15.1′	03°30.9	13.9′	55.9′	112°09.6	86°12.5	83°02.2	68°06.0	34°50.5	51°51.9	66°14.1	101°27.5
2	107°08.5	15.2′	03°17.0	13.9′	55.9′	111°38.1	85°42.6	82°32.8	67°34.7	35°21.3	52°23.0	66°44.9	101°56.4
3	121°42.6	15.2′	03°03.1	13.9′	55.8′	111°06.7	85°12.7	82°03.5	67°03.5	35°52.1	52°54.1	67°15.7	102°25.3
4	136°16.9	15.3′	02°49.3	13.9′	55.8′	110°35.3	84°42.9	81°34.2	66°32.3	36°22.9	53°25.2	67°46.4	102°54.2
5	150°51.1	15.3′	02°35.4	13.9′	55.8′	110°03.9	84°13.2	81°04.9	66°01.1	36°53.6	53°56.2	68°17.1	103°23.0
6	165°25.4	15.3′	**S**02°21.6	13.9′	55.7′	109°32.6	83°43.4	80°35.7	65°30.0	37°24.4	54°27.3	68°47.8	103°51.9
7	179°59.8	15.4′	02°07.7	13.9′	55.7′	109°01.3	83°13.7	80°06.5	64°58.9	37°55.1	54°58.2	69°18.4	104°20.6
8	194°34.2	15.4′	01°53.8	13.8′	55.7′	108°30.1	82°44.0	79°37.3	64°27.8	38°25.8	55°29.2	69°49.0	104°49.4
9	209°08.6	15.4′	01°40.0	13.8′	55.7′	107°58.8	82°14.4	79°08.2	63°56.8	38°56.4	56°00.1	70°19.6	105°18.1
10	223°43.0	15.5′	01°26.2	13.8′	55.6′	107°27.6	81°44.8	78°39.1	63°25.8	39°27.0	56°31.0	70°50.2	105°46.8
11	238°17.5	15.5′	01°12.3	13.8′	55.6′	106°56.4	81°15.2	78°10.0	62°54.8	39°57.6	57°01.9	71°20.7	106°15.5
12	252°52.0	15.5′	**S**00°58.5	13.8′	55.6′	106°25.3	80°45.7	77°41.0	62°23.8	40°28.2	57°32.7	71°51.2	106°44.1
13	267°26.5	15.6′	00°44.7	13.8′	55.6′	105°54.2	80°16.1	77°12.0	61°52.9	40°58.8	58°03.5	72°21.7	107°12.7
14	282°01.1	15.6′	00°30.9	13.8′	55.5′	105°23.1	79°46.7	76°43.0	61°22.0	41°29.3	58°34.3	72°52.1	107°41.3
15	296°35.7	15.6′	00°17.1	13.8′	55.5′	104°52.0	79°17.2	76°14.1	60°51.2	41°59.8	59°05.1	73°22.6	108°09.8
16	311°10.3	15.6′	**S**00°03.3	13.8′	55.5′	104°21.0	78°47.8	75°45.2	60°20.3	42°30.3	59°35.8	73°53.0	108°38.3
17	325°45.0	15.7′	**N**00°10.5	13.8′	55.4′	103°50.0	78°18.4	75°16.4	59°49.5	43°00.8	60°06.5	74°23.4	109°06.8
18	340°19.7	15.7′	**N**00°24.2	13.7′	55.4′	103°19.0	77°49.1	74°47.6	59°18.8	43°31.2	60°37.2	74°53.7	109°35.3
19	354°54.3	15.7′	00°38.0	13.7′	55.4′	102°48.0	77°19.7	74°18.8	58°48.0	44°01.6	61°07.8	75°24.1	110°03.7
20	9°29.1	15.7′	00°51.7	13.7′	55.4′	102°17.1	76°50.5	73°50.0	58°17.3	44°32.0	61°38.5	75°54.4	110°32.1
21	24°03.8	15.8′	01°05.4	13.7′	55.3′	101°46.2	76°21.2	73°21.3	57°46.7	45°02.3	62°09.1	76°24.6	111°00.5
22	38°38.6	15.8′	01°19.1	13.7′	55.3′	101°15.4	75°52.0	72°52.7	57°16.0	45°32.7	62°39.6	76°54.9	111°28.9
23	53°13.3	15.8′	01°32.8	13.7′	55.3′	100°44.5	75°22.8	72°24.0	56°45.4	46°03.0	63°10.2	77°25.2	111°57.2
	SD = 15.3′		Mer. pass. 19:21										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Mon	**GHA**	ν	**Dec**	d	**HP**	**-Procyon**	**-Pollux**	**-Betelgeuse**	**-Aldebaran**	**+Fomalhaut**	**+Jupiter**	**+Saturn**	**+Venus**
0	67°48.1	15.8′	**N**01°46.4	13.6′	55.3′	100°48.2	100°13.7	74°53.6	56°14.8	42°02.4	46°33.3	63°40.7	77°55.4
1	82°22.9	15.8′	02°00.1	13.6′	55.2′	100°19.3	99°42.9	74°24.5	55°44.2	42°30.6	47°03.6	64°11.2	78°25.6
2	96°57.7	15.8′	02°13.7	13.6′	55.2′	99°50.5	99°12.1	73°55.4	55°13.7	42°58.7	47°33.8	64°41.7	78°55.8
3	111°32.6	15.8′	02°27.3	13.6′	55.2′	99°21.7	98°41.4	73°26.3	54°43.2	43°27.0	48°04.0	65°12.2	79°25.9
4	126°07.4	15.9′	02°40.9	13.6′	55.2′	98°52.9	98°10.7	72°57.3	54°12.7	43°55.2	48°34.2	65°42.6	79°56.0
5	140°42.3	15.9′	02°54.5	13.5′	55.1′	98°24.1	97°40.0	72°28.3	53°42.3	44°23.5	49°04.4	66°13.0	80°26.2
6	155°17.2	15.9′	**N**03°08.0	13.5′	55.1′	97°55.4	97°09.3	71°59.3	53°11.9	44°51.7	49°34.6	66°43.4	80°56.3
7	169°52.0	15.9′	03°21.5	13.5′	55.1′	97°26.6	96°38.6	71°30.4	52°41.5	45°20.0	50°04.7	67°13.7	81°26.3
8	184°26.9	15.9′	03°35.0	13.5′	55.1′	96°57.9	96°08.0	71°01.5	52°11.1	45°48.4	50°34.8	67°44.1	81°56.4
9	199°01.8	15.9′	03°48.5	13.4′	55.1′	96°29.2	95°37.4	70°32.6	51°40.7	46°16.7	51°04.9	68°14.4	82°26.4
10	213°36.7	15.9′	04°01.9	13.4′	55.0′	96°00.5	95°06.8	70°03.8	51°10.4	46°45.1	51°35.0	68°44.7	82°56.4
11	228°11.6	15.9′	04°15.4	13.4′	55.0′	95°31.8	94°36.3	69°35.0	50°40.1	47°13.4	52°05.0	69°14.9	83°26.4
12	242°46.5	15.9′	**N**04°28.8	13.4′	55.0′	95°03.2	94°05.7	69°06.2	50°09.9	47°41.8	52°35.1	69°45.2	83°56.4
13	257°21.4	15.9′	04°42.1	13.3′	55.0′	94°34.5	93°35.2	68°37.4	49°39.6	48°10.2	53°05.1	70°15.4	84°26.4
14	271°56.4	15.9′	04°55.5	13.3′	54.9′	94°05.9	93°04.7	68°08.7	49°09.4	48°38.6	53°35.1	70°45.6	84°56.3
15	286°31.3	15.9′	05°08.8	13.3′	54.9′	93°37.3	92°34.2	67°40.0	48°39.2	49°07.0	54°05.0	71°15.8	85°26.2
16	301°06.2	15.9′	05°22.1	13.3′	54.9′	93°08.7	92°03.8	67°11.4	48°09.1	49°35.5	54°35.0	71°46.0	85°56.1
17	315°41.1	15.9′	05°35.3	13.2′	54.9′	92°40.2	91°33.4	66°42.8	47°38.9	50°03.9	55°04.9	72°16.1	86°26.0
18	330°16.0	15.9′	**N**05°48.5	13.2′	54.9′	92°11.6	91°02.9	66°14.2	47°08.8	50°32.4	55°34.8	72°46.2	86°55.9
19	344°50.9	15.9′	06°01.7	13.2′	54.8′	91°43.1	90°32.5	65°45.7	46°38.7	51°00.8	56°04.7	73°16.3	87°25.7
20	359°25.8	15.9′	06°14.9	13.1′	54.8′	91°14.6	90°02.2	65°17.1	46°08.7	51°29.3	56°34.6	73°46.4	87°55.6
21	14°00.7	15.9′	06°28.0	13.1′	54.8′	90°46.1	89°31.8	64°48.7	45°38.6	51°57.8	57°04.5	74°16.5	88°25.4
22	28°35.6	15.9′	06°41.1	13.1′	54.8′	90°17.6	89°01.5	64°20.2	45°08.6	52°26.3	57°34.3	74°46.5	88°55.2
23	43°10.5	15.9′	06°54.2	13.0′	54.8′	89°49.1	88°31.2	63°51.8	44°38.7	52°54.8	58°04.1	75°16.6	89°25.0
	SD = 15.1′		Mer. pass. 20:02										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Tue	**GHA**	ν	**Dec**	d	**HP**	**-Regulus**	**-Procyon**	**-Pollux**	**-Aldebaran**	**+Fomalhaut**	**+Jupiter**	**+Saturn**	**+Venus**
0	57°45.3	15.9′	**N**07°07.2	13.0′	54.8′		89°20.7	88°00.9	44°08.7	53°23.3	58°33.9	75°46.6	89°54.8
1	72°20.2	15.9′	07°20.2	13.0′	54.7′		88°52.3	87°30.6	43°38.8	53°51.8	59°03.7	76°16.6	90°24.6
2	86°55.1	15.8′	07°33.2	12.9′	54.7′		88°23.9	87°00.3	43°08.8	54°20.3	59°33.5	76°46.6	90°54.3
3	101°29.9	15.8′	07°46.1	12.9′	54.7′		87°55.5	86°30.1	42°39.0	54°48.8	60°03.2	77°16.5	91°24.0
4	116°04.7	15.8′	07°59.0	12.8′	54.7′		87°27.1	85°59.9	42°09.1	55°17.3	60°33.0	77°46.5	91°53.8
5	130°39.6	15.8′	08°11.8	12.8′	54.7′		86°58.7	85°29.7	41°39.3	55°45.8	61°02.7	78°16.4	92°23.5
6	145°14.4	15.8′	**N**08°24.6	12.8′	54.6′		86°30.4	84°59.5	41°09.4	56°14.4	61°32.4	78°46.3	92°53.1
7	159°49.1	15.8′	08°37.4	12.7′	54.6′		86°02.1	84°29.3	40°39.7	56°42.9	62°02.1	79°16.2	93°22.8
8	174°23.9	15.8′	08°50.1	12.7′	54.6′		85°33.8	83°59.1	40°09.9	57°11.4	62°31.8	79°46.1	93°52.5
9	188°58.7	15.7′	09°02.8	12.6′	54.6′	119°42.4	85°05.5	83°29.0	39°40.2	57°40.0	63°01.4	80°15.9	94°22.1
10	203°33.4	15.7′	09°15.5	12.6′	54.6′	119°12.4	84°37.2	82°58.9	39°10.4	58°08.5	63°31.1	80°45.8	94°51.8
11	218°08.1	15.7′	09°28.1	12.6′	54.6′	118°42.4	84°09.0	82°28.8	38°40.8	58°37.1	64°00.7	81°15.6	95°21.4
12	232°42.8	15.7′	**N**09°40.6	12.5′	54.5′	118°12.4	83°40.7	81°58.7	38°11.1	59°05.6	64°30.3	81°45.4	95°51.0
13	247°17.5	15.7′	09°53.1	12.5′	54.5′	117°42.5	83°12.5	81°28.6	37°41.5	59°34.2	64°59.9	82°15.2	96°20.6
14	261°52.1	15.6′	10°05.6	12.4′	54.5′	117°12.5	82°44.3	80°58.5	37°11.8	60°02.7	65°29.5	82°45.0	96°50.2
15	276°26.8	15.6′	10°18.0	12.4′	54.5′	116°42.6	82°16.1	80°28.5	36°42.3	60°31.3	65°59.1	83°14.7	97°19.8
16	291°01.4	15.6′	10°30.4	12.3′	54.5′	116°12.6	81°48.0	79°58.5	36°12.7	60°59.8	66°28.6	83°44.5	97°49.4
17	305°36.0	15.6′	10°42.8	12.3′	54.5′	115°42.7	81°19.8	79°28.4	35°43.2	61°28.4	66°58.2	84°14.2	98°18.9
18	320°10.5	15.5′	**N**10°55.1	12.2′	54.4′	115°12.8	80°51.7	78°58.4	35°13.6	61°56.9	67°27.7	84°44.0	98°48.5
19	334°45.1	15.5′	11°07.3	12.2′	54.4′	114°42.9	80°23.6	78°28.4	34°44.2	62°25.5	67°57.2	85°13.7	99°18.0
20	349°19.6	15.5′	11°19.5	12.1′	54.4′	114°13.0	79°55.5	77°58.5	34°14.7	62°54.0	68°26.7	85°43.4	99°47.6
21	3°54.1	15.5′	11°31.6	12.1′	54.4′	113°43.1	79°27.4	77°28.5	33°45.3	63°22.6	68°56.2	86°13.1	100°17.1
22	18°28.5	15.4′	11°43.7	12.0′	54.4′	113°13.3	78°59.4	76°58.5	33°15.9	63°51.1	69°25.7	86°42.7	100°46.6
23	33°02.9	15.4′	11°55.8	12.0′	54.4′	112°43.4	78°31.3	76°28.6	32°46.5	64°19.7	69°55.2	87°12.4	101°16.1
	SD = 14.9′		Mer. pass. 20:44										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Wed	**GHA**	ν	**Dec**	d	**HP**	**-Regulus**	**-Procyon**	**-Pollux**	**-Aldebaran**	**+Fomalhaut**	**+Jupiter**	**+Saturn**	**+Venus**
0	47°37.3	15.4′	**N**12°07.8	11.9′	54.4′	112°13.6	78°03.3	75°58.7	32°17.1	64°48.2	70°24.6	87°42.1	101°45.6
1	62°11.7	15.3′	12°19.7	11.9′	54.4′	111°43.8	77°35.3	75°28.7	31°47.8	65°16.8	70°54.1	88°11.7	102°15.1
2	76°46.0	15.3′	12°31.6	11.8′	54.3′	111°14.0	77°07.3	74°58.8	31°18.5	65°45.3	71°23.5	88°41.3	102°44.5
3	91°20.3	15.3′	12°43.4	11.8′	54.3′	110°44.2	76°39.4	74°28.9	30°49.3	66°13.9	71°52.9	89°10.9	103°14.0
4	105°54.6	15.2′	12°55.2	11.7′	54.3′	110°14.4	76°11.4	73°59.1	30°20.1	66°42.4	72°22.3	89°40.5	103°43.5
5	120°28.8	15.2′	13°06.9	11.7′	54.3′	109°44.6	75°43.5	73°29.2	29°50.9	67°11.0	72°51.7	90°10.1	104°12.9
6	135°03.0	15.2′	**N**13°18.6	11.6′	54.3′	109°14.8	75°15.6	72°59.3	29°21.7	67°39.5	73°21.1	90°39.7	104°42.4
7	149°37.2	15.1′	13°30.2	11.6′	54.3′	108°45.0	74°47.7	72°29.5	28°52.6	68°08.1	73°50.5	91°09.3	105°11.8
8	164°11.3	15.1′	13°41.7	11.5′	54.3′	108°15.3	74°19.8	71°59.6	28°23.5	68°36.6	74°19.9	91°38.8	105°41.2
9	178°45.4	15.1′	13°53.2	11.4′	54.3′	107°45.6	73°52.0	71°29.8	27°54.4	69°05.2	74°49.2	92°08.4	106°10.6
10	193°19.4	15.0′	14°04.7	11.4′	54.2′	107°15.8	73°24.1	71°00.0	27°25.4	69°33.7	75°18.6	92°37.9	106°40.1
11	207°53.4	15.0′	14°16.1	11.3′	54.2′	106°46.1	72°56.3	70°30.2	26°56.4	70°02.3	75°47.9	93°07.4	107°09.5
12	222°27.4	14.9′	**N**14°27.4	11.3′	54.2′	106°16.4	72°28.5	70°00.4	26°27.4	70°30.8	76°17.3	93°37.0	107°38.9
13	237°01.3	14.9′	14°38.6	11.2′	54.2′	105°46.7	72°00.7	69°30.6	25°58.5	70°59.3	76°46.6	94°06.5	108°08.3
14	251°35.2	14.9′	14°49.8	11.1′	54.2′	105°17.0	71°33.0	69°00.8	25°29.6	71°27.9	77°15.9	94°36.0	108°37.7
15	266°09.1	14.8′	15°01.0	11.1′	54.2′	104°47.3	71°05.3	68°31.1	25°00.8	71°56.4	77°45.2	95°05.5	109°07.0
16	280°42.9	14.8′	15°12.0	11.0′	54.2′	104°17.6	70°37.5	68°01.3	24°32.0	72°25.0	78°14.5	95°34.9	109°36.4
17	295°16.7	14.7′	15°23.0	10.9′	54.2′	103°47.9	70°09.8	67°31.5	24°03.3	72°53.5	78°43.8	96°04.4	110°05.8
18	309°50.4	14.7′	**N**15°34.0	10.9′	54.2′	103°18.2	69°42.2	67°01.8	23°34.6	73°22.0	79°13.1	96°33.9	110°35.2
19	324°24.1	14.6′	15°44.9	10.8′	54.1′	102°48.6	69°14.5	66°32.1	23°06.0	73°50.6	79°42.3	97°03.3	111°04.5
20	338°57.7	14.6′	15°55.7	10.7′	54.1′	102°18.9	68°46.9	66°02.3	22°37.4	74°19.1	80°11.6	97°32.8	111°33.9
21	353°31.3	14.6′	16°06.4	10.7′	54.1′	101°49.3	68°19.3	65°32.6	22°08.9	74°47.6	80°40.9	98°02.2	112°03.2
22	8°04.9	14.5′	16°17.1	10.6′	54.1′	101°19.7	67°51.7	65°02.9	21°40.4	75°16.2	81°10.1	98°31.7	112°32.6
23	22°38.4	14.5′	16°27.7	10.5′	54.1′	100°50.0	67°24.1	64°33.2	21°12.0	75°44.7	81°39.3	99°01.1	113°01.9
	SD = 14.8′		Mer. pass. 21:27										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Thu	**GHA**	ν	**Dec**	*d*	**HP**	**-Regulus**	**-Procyon**	**-Pollux**	**-Aldebaran**	**+Fomalhaut**	**+Jupiter**	**+Saturn**	**+Venus**
0	37°11.8	14.4′	**N**16°38.2	10.5′	54.1′	100°20.4	66°56.5	64°03.5	20°43.6	76°13.2	82°08.6	99°30.5	113°31.3
1	51°45.2	14.4′	16°48.7	10.4′	54.1′	99°50.8	66°29.0	63°33.8	20°15.4	76°41.7	82°37.8	99°59.9	114°00.6
2	66°18.6	14.3′	16°59.1	10.3′	54.1′	99°21.2	66°01.5	63°04.1	19°47.2	77°10.3	83°07.0	100°29.3	114°29.9
3	80°51.9	14.3′	17°09.4	10.3′	54.1′	98°51.6	65°34.0	62°34.5	19°19.0	77°38.8	83°36.2	100°58.7	114°59.3
4	95°25.2	14.2′	17°19.7	10.2′	54.1′	98°22.0	65°06.6	62°04.8	18°51.0	78°07.3	84°05.4	101°28.1	115°28.6
5	109°58.4	14.2′	17°29.9	10.1′	54.1′	97°52.4	64°39.1	61°35.1	18°23.1	78°35.8	84°34.6	101°57.5	115°57.9
6	124°31.6	14.1′	**N**17°40.0	10.0′	54.1′	97°22.8	64°11.7	61°05.5	17°55.2	79°04.3	85°03.8	102°26.9	116°27.2
7	139°04.7	14.1′	17°50.0	10.0′	54.0′	96°53.2	63°44.3	60°35.8	17°27.5	79°32.8	85°33.0	102°56.3	116°56.5
8	153°37.8	14.0′	18°00.0	9.9′	54.0′	96°23.6	63°16.9	60°06.2	16°59.8	80°01.4	86°02.2	103°25.6	117°25.9
9	168°10.8	14.0′	18°09.9	9.8′	54.0′	95°54.0	62°49.6	59°36.5	16°32.3	80°29.9	86°31.4	103°55.0	117°55.2
10	182°43.8	13.9′	18°19.7	9.7′	54.0′	95°24.5	62°22.3	59°06.9	16°05.0	80°58.4	87°00.6	104°24.3	118°24.5
11	197°16.7	13.9′	18°29.4	9.7′	54.0′	94°54.9	61°55.0	58°37.3	15°37.7	81°26.9	87°29.7	104°53.7	118°53.8
12	211°49.6	13.8′	**N**18°39.1	9.6′	54.0′	94°25.4	61°27.7	58°07.7	15°10.6	81°55.4	87°58.9	105°23.0	119°23.1
13	226°22.4	13.8′	18°48.6	9.5′	54.0′	93°55.8	61°00.5	57°38.0	14°43.7	82°23.9	88°28.1	105°52.4	119°52.4
14	240°55.2	13.7′	18°58.1	9.4′	54.0′	93°26.2	60°33.2	57°08.4	14°16.9	82°52.4	88°57.2	106°21.7	
15	255°27.9	13.7′	19°07.5	9.3′	54.0′	92°56.7	60°06.1	56°38.8	13°50.4	83°20.9	89°26.4	106°51.0	
16	270°00.6	13.6′	19°16.9	9.2′	54.0′	92°27.2	59°38.9	56°09.2	13°24.1	83°49.4	89°55.5	107°20.4	
17	284°33.2	13.6′	19°26.1	9.2′	54.0′	91°57.6	59°11.8	55°39.6	12°58.0	84°17.9	90°24.6	107°49.7	
18	299°05.8	13.5′	**N**19°35.3	9.1′	54.0′	91°28.1	58°44.6	55°10.0	12°32.1	84°46.4	90°53.8	108°19.0	
19	313°38.3	13.5′	19°44.4	9.0′	54.0′	90°58.6	58°17.6	54°40.4	12°06.6	85°14.9	91°22.9	108°48.3	
20	328°10.7	13.4′	19°53.4	8.9′	54.0′	90°29.0	57°50.5	54°10.8	11°41.4	85°43.4	91°52.0	109°17.6	
21	342°43.1	13.3′	20°02.3	8.8′	54.0′	89°59.5	57°23.5	53°41.3	11°16.5	86°11.9	92°21.2	109°46.9	
22	357°15.5	13.3′	20°11.1	8.7′	54.0′	89°30.0	56°56.5	53°11.7	10°52.0	86°40.4	92°50.3	110°16.2	
23	11°47.8	13.2′	20°19.8	8.7′	54.0′	89°00.5	56°29.5	52°42.1	10°28.0	87°08.8	93°19.4	110°45.5	
	SD = 14.8′		Mer. pass. 22:11										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Fri	**GHA**	ν	**Dec**	*d*	**HP**	**-Regulus**	**-Procyon**	**-Pollux**	**-Betelgeuse**	**+Fomalhaut**	**+Jupiter**	**+Saturn**	**+Altair**
0	26°20.0	13.2′	**N**20°28.5	8.6′	54.0′	88°31.0	56°02.6	52°12.5	31°27.6	87°37.3	93°48.5	111°14.8	115°28.1
1	40°52.2	13.1′	20°37.1	8.5′	53.9′	88°01.4	55°35.7	51°43.0	31°04.1	88°05.8	94°17.7	111°44.1	115°51.4
2	55°24.3	13.1′	20°45.5	8.4′	53.9′	87°31.9	55°08.9	51°13.4	30°40.7	88°34.3	94°46.8	112°13.4	116°14.6
3	69°56.4	13.0′	20°53.9	8.3′	53.9′	87°02.4	54°42.0	50°43.8	30°17.5	89°02.8	95°15.9	112°42.7	116°37.8
4	84°28.4	13.0′	21°02.2	8.2′	53.9′	86°32.9	54°15.2	50°14.3	29°54.5	89°31.3	95°45.0	113°12.0	117°01.0
5	99°00.4	12.9′	21°10.4	8.1′	53.9′	86°03.4	53°48.5	49°44.7	29°31.6	89°59.7	96°14.1	113°41.2	117°24.1
6	113°32.3	12.9′	**N**21°18.5	8.0′	53.9′	85°33.9	53°21.8	49°15.2	29°09.0	90°28.2	96°43.2	114°10.5	117°47.1
7	128°04.2	12.8′	21°26.6	7.9′	53.9′	85°04.4	52°55.1	48°45.6	28°46.5	90°56.7	97°12.3	114°39.8	118°10.1
8	142°36.0	12.8′	21°34.5	7.8′	53.9′	84°34.9	52°28.4	48°16.1	28°24.2	91°25.2	97°41.4	115°09.1	118°33.0
9	157°07.7	12.7′	21°42.3	7.7′	53.9′	84°05.4	52°01.8	47°46.5	28°02.2	91°53.6	98°10.5	115°38.3	118°55.9
10	171°39.4	12.6′	21°50.1	7.6′	53.9′	83°35.9	51°35.2	47°17.0	27°40.3	92°22.1	98°39.6	116°07.6	119°18.7
11	186°11.1	12.6′	21°57.7	7.5′	53.9′	83°06.4	51°08.7	46°47.4	27°18.7	92°50.6	99°08.7	116°36.9	119°41.4
12	200°42.7	12.5′	**N**22°05.2	7.4′	53.9′	82°36.9	50°42.2	46°17.9	26°57.3	93°19.0	99°37.8	117°06.1	
13	215°14.2	12.5′	22°12.7	7.4′	53.9′	82°07.4	50°15.8	45°48.3	26°36.2	93°47.5	100°06.8	117°35.4	
14	229°45.7	12.4′	22°20.0	7.3′	53.9′	81°37.9	49°49.4	45°18.8	26°15.3	94°15.9	100°35.9	118°04.6	
15	244°17.1	12.4′	22°27.3	7.2′	53.9′	81°08.4	49°23.0	44°49.3	25°54.7	94°44.4	101°05.0	118°33.9	
16	258°48.5	12.3′	22°34.4	7.1′	53.9′	80°39.0	48°56.7	44°19.7	25°34.3	95°12.9	101°34.1	119°03.2	
17	273°19.8	12.3′	22°41.5	7.0′	53.9′	80°09.5	48°30.4	43°50.2	25°14.3	95°41.3	102°03.2	119°32.4	
18	287°51.1	12.2′	**N**22°48.4	6.9′	53.9′	79°40.0	48°04.2	43°20.6	24°54.5	96°09.8	102°32.3		
19	302°22.3	12.2′	22°55.3	6.7′	53.9′	79°10.5	47°38.1	42°51.1	24°35.0	96°38.2	103°01.4		
20	316°53.5	12.1′	23°02.0	6.6′	53.9′	78°41.0	47°11.9	42°21.6	24°15.9	97°06.7	103°30.5		
21	331°24.6	12.1′	23°08.7	6.5′	53.9′	78°11.5	46°45.9	41°52.1	23°57.1	97°35.1	103°59.5		
22	345°55.6	12.0′	23°15.2	6.4′	53.9′	77°42.0	46°19.9	41°22.5	23°38.6	98°03.5	104°28.6		
23	0°26.7	12.0′	23°21.7	6.3′	53.9′	77°12.5	45°53.9	40°53.0	23°20.5	98°32.0	104°57.7		
	SD = 14.7′		Mer. pass. 22:58										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Sat	**GHA**	ν	**Dec**	*d*	**HP**	**-Arcturus**	**-Regulus**	**-Procyon**	**-Pollux**	**+Aldebaran**	**+Achernar**	**+Fomalhaut**	**+Jupiter**
0	14°57.6	11.9′	**N**23°28.0	6.2′	53.9′		76°43.0	45°28.0	40°23.5		89°47.7	99°00.4	105°26.8
1	29°28.5	11.9′	23°34.2	6.1′	53.9′		76°13.6	45°02.2	39°53.9		90°05.0	99°28.9	105°55.9
2	43°59.4	11.8′	23°40.3	6.0′	53.9′		75°44.1	44°36.4	39°24.4		90°22.3	99°57.3	106°25.0
3	58°30.2	11.8′	23°46.4	5.9′	53.9′		75°14.6	44°10.7	38°54.9		90°39.5	100°25.7	106°54.1
4	73°00.9	11.7′	23°52.3	5.8′	53.9′		74°45.1	43°45.0	38°25.4		90°56.8	100°54.2	107°23.1
5	87°31.6	11.7′	23°58.1	5.7′	53.9′		74°15.6	43°19.4	37°55.8	8°52.6	91°14.1	101°22.6	107°52.2
6	102°02.3	11.6′	**N**24°03.7	5.6′	53.9′		73°46.1	42°53.9	37°26.3	9°14.1	91°31.4	101°51.0	108°21.3
7	116°32.9	11.6′	24°09.3	5.5′	53.9′		73°16.6	42°28.5	36°56.8	9°36.3	91°48.6	102°19.4	108°50.4
8	131°03.5	11.5′	24°14.8	5.4′	53.9′		72°47.1	42°03.1	36°27.3	9°59.2	92°05.9	102°47.8	109°19.5
9	145°34.0	11.5′	24°20.2	5.2′	53.9′		72°17.6	41°37.8	35°57.7	10°22.6	92°23.2	103°16.3	109°48.6
10	160°04.5	11.4′	24°25.4	5.1′	53.9′	119°37.2	71°48.1	41°12.5	35°28.2	10°46.5	92°40.4	103°44.7	110°17.7
11	174°34.9	11.4′	24°30.5	5.0′	53.9′	119°12.1	71°18.6	40°47.4	34°58.7	11°10.9	92°57.7	104°13.1	110°46.8
12	189°05.2	11.3′	**N**24°35.6	4.9′	53.9′	118°46.9	70°49.1	40°22.3	34°29.2	11°35.7	93°14.9	104°41.5	111°15.9
13	203°35.6	11.3′	24°40.5	4.8′	53.9′	118°21.7	70°19.6	39°57.3	33°59.6	12°00.8	93°32.2	105°09.9	111°45.0
14	218°05.9	11.2′	24°45.3	4.7′	53.9′	117°56.5	69°50.1	39°32.4	33°30.1	12°26.3	93°49.4	105°38.3	112°14.1
15	232°36.1	11.2′	24°49.9	4.6′	53.9′	117°31.2	69°20.6	39°07.6	33°00.6	12°52.0	94°06.6	106°06.7	112°43.2
16	247°06.3	11.2′	24°54.5	4.4′	53.9′	117°05.9	68°51.1	38°42.9	32°31.1	13°18.1	94°23.8	106°35.1	113°12.3
17	261°36.5	11.1′	24°58.9	4.3′	53.9′	116°40.5	68°21.6	38°18.3	32°01.5	13°44.3	94°41.0	107°03.5	113°41.4
18	276°06.6	11.1′	**N**25°03.3	4.2′	53.9′	116°15.1	67°52.1	37°53.7	31°32.0	14°10.8	94°58.2	107°31.8	114°10.5
19	290°36.7	11.0′	25°07.5	4.1′	53.9′	115°49.7	67°22.6	37°29.3	31°02.5	14°37.5	95°15.3	108°00.2	114°39.6
20	305°06.7	11.0′	25°11.6	4.0′	53.9′	115°24.2	66°53.0	37°05.0	30°33.0	15°04.4	95°32.5	108°28.6	115°08.7
21	319°36.7	11.0′	25°15.6	3.9′	53.9′	114°58.7	66°23.5	36°40.8	30°03.4	15°31.4	95°49.6	108°57.0	115°37.8
22	334°06.6	10.9′	25°19.4	3.7′	53.9′	114°33.2	65°54.0	36°16.7	29°33.9	15°58.6	96°06.8	109°25.3	116°06.9
23	348°36.6	10.9′	25°23.2	3.6′	53.9′	114°07.6	65°24.5	35°52.7	29°04.4	16°25.9	96°23.9	109°53.7	116°36.0
	SD = 14.7′		Mer. pass. 23:47										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Sun	**GHA**	*ν*	**Dec**	*d*	**HP**	**-Spica**	**-Arcturus**	**-Regulus**	**-Pollux**	**+Aldebaran**	**+Achernar**	**+Fomalhaut**	**+Jupiter**
0	3°06.4	10.8′	N25°26.8	3.5′	53.9′	118°58.1	113°42.0	64°55.0	28°34.9	16°53.4	96°41.0	110°22.1	117°05.1
1	17°36.3	10.8′	25°30.3	3.4′	53.9′	118°28.6	113°16.4	64°25.4	28°05.3	17°21.0	96°58.0	110°50.4	117°34.3
2	32°06.1	10.8′	25°33.7	3.3′	53.9′	117°59.1	112°50.7	63°55.9	27°35.8	17°48.7	97°15.1	111°18.8	118°03.4
3	46°35.9	10.7′	25°37.0	3.1′	53.9′	117°29.6	112°25.0	63°26.4	27°06.3	18°16.4	97°32.1	111°47.1	118°32.5
4	61°05.6	10.7′	25°40.1	3.0′	53.9′	117°00.1	111°59.3	62°56.8	26°36.8	18°44.3	97°49.1	112°15.5	119°01.7
5	75°35.3	10.7′	25°43.1	2.9′	54.0′	116°30.6	111°33.6	62°27.3	26°07.3	19°12.3	98°06.1	112°43.8	119°30.8
6	90°05.0	10.6′	N25°46.0	2.8′	54.0′	116°01.1	111°07.8	61°57.7	25°37.7	19°40.4	98°23.1	113°12.1	119°59.9
7	104°34.7	10.6′	25°48.8	2.7′	54.0′	115°31.5	110°42.0	61°28.2	25°08.2	20°08.5	98°40.0	113°40.4	
8	119°04.3	10.6′	25°51.4	2.5′	54.0′	115°02.0	110°16.1	60°58.6	24°38.7	20°36.7	98°56.9	114°08.8	
9	133°33.9	10.6′	25°54.0	2.4′	54.0′	114°32.5	109°50.3	60°29.1	24°09.2	21°05.0	99°13.8	114°37.1	
10	148°03.4	10.5′	25°56.4	2.3′	54.0′	114°02.9	109°24.4	59°59.5	23°39.7	21°33.4	99°30.7	115°05.4	
11	162°32.9	10.5′	25°58.7	2.2′	54.0′	113°33.4	108°58.5	59°30.0	23°10.2	22°01.8	99°47.6	115°33.7	
12	177°02.4	10.5′	N26°00.8	2.0′	54.0′	113°03.8	108°32.5	59°00.4	22°40.7	22°30.2	100°04.4	116°02.0	
13	191°31.9	10.5′	26°02.9	1.9′	54.0′	112°34.3	108°06.6	58°30.8	22°11.2	22°58.8	100°21.2	116°30.2	
14	206°01.4	10.4′	26°04.8	1.8′	54.0′	112°04.7	107°40.6	58°01.3	21°41.7	23°27.3	100°37.9	116°58.5	
15	220°30.8	10.4′	26°06.6	1.7′	54.0′	111°35.1	107°14.6	57°31.7	21°12.2	23°56.0	100°54.6	117°26.8	
16	235°00.2	10.4′	26°08.2	1.5′	54.0′	111°05.5	106°48.6	57°02.1	20°42.7	24°24.6	101°11.3	117°55.1	
17	249°29.6	10.4′	26°09.8	1.4′	54.0′	110°35.9	106°22.5	56°32.5	20°13.2	24°53.3	101°28.0	118°23.3	
18	263°59.0	10.4′	N26°11.2	1.3′	54.0′	110°06.4	105°56.4	56°03.0	19°43.7	25°22.1	101°44.6	118°51.6	
19	278°28.3	10.3′	26°12.4	1.2′	54.0′	109°36.8	105°30.3	55°33.4	19°14.2	25°50.9	102°01.2	119°19.8	
20	292°57.7	10.3′	26°13.6	1.0′	54.0′	109°07.1	105°04.2	55°03.8	18°44.8	26°19.7	102°17.8	119°48.0	
21	307°27.0	10.3′	26°14.6	0.9′	54.0′	108°37.5	104°38.1	54°34.2	18°15.3	26°48.6	102°34.3		
22	321°56.3	10.3′	26°15.5	0.8′	54.0′	108°07.9	104°11.9	54°04.6	17°45.9	27°17.5	102°50.8		
23	336°25.6	10.3′	26°16.3	0.6′	54.0′	107°38.3	103°45.7	53°35.0	17°16.4	27°46.4	103°07.3		
	SD = 14.7′		Mer. pass. –:–										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Mon	**GHA**	*ν*	**Dec**	*d*	**HP**	**-Spica**	**-Arcturus**	**-Regulus**	**-Pollux**	**+Betelgeuse**	**+Capella**	**+Aldebaran**	**+Rigel**
0	350°54.8	10.3′	N26°17.0	0.5′	54.1′	107°08.7	103°19.5	53°05.4	16°47.0			28°15.4	39°04.9
1	5°24.1	10.2′	26°17.5	0.4′	54.1′	106°39.0	102°53.3	52°35.7	16°17.6		24°47.1	28°44.4	39°20.7
2	19°53.3	10.2′	26°17.9	0.3′	54.1′	106°09.4	102°27.0	52°06.1	15°48.2		25°02.8	29°13.4	39°36.7
3	34°22.6	10.2′	26°18.1	0.1′	54.1′	105°39.7	102°00.8	51°36.5	15°18.9		25°19.0	29°42.5	39°53.0
4	48°51.8	10.2′	26°18.3	0.0′	54.1′	105°10.0	101°34.5	51°06.9	14°49.5	21°36.1	25°35.5	30°11.6	40°09.5
5	63°21.0	10.2′	26°18.3	-0.1′	54.1′	104°40.4	101°08.2	50°37.2	14°20.2	21°51.7	25°52.4	30°40.7	40°26.2
6	77°50.2	10.2′	N26°18.2	-0.2′	54.1′	104°10.7	100°41.9	50°07.6	13°50.9	22°07.8	26°09.7	31°09.8	40°43.1
7	92°19.4	10.2′	26°17.9	-0.4′	54.1′	103°41.0	100°15.6	49°38.0	13°21.6	22°24.4	26°27.3	31°39.0	41°00.2
8	106°48.6	10.2′	26°17.5	-0.5′	54.1′	103°11.3	99°49.2	49°08.3	12°52.4	22°41.3	26°45.3	32°08.2	41°17.6
9	121°17.8	10.2′	26°17.0	-0.6′	54.1′	102°41.6	99°22.9	48°38.7	12°23.2	22°58.7	27°03.6	32°37.4	41°35.1
10	135°47.0	10.2′	26°16.4	-0.8′	54.1′	102°11.9	98°56.5	48°09.0	11°54.0	23°16.5	27°22.2	33°06.6	41°52.8
11	150°16.2	10.2′	26°15.6	-0.9′	54.1′	101°42.2	98°30.1	47°39.4	11°24.9	23°34.7	27°41.1	33°35.9	42°10.7
12	164°45.4	10.2′	N26°14.8	-1.0′	54.1′	101°12.5	98°03.7	47°09.7	10°55.8	23°53.3	28°00.4	34°05.2	42°28.8
13	179°14.6	10.2′	26°13.7	-1.1′	54.1′	100°42.7	97°37.3	46°40.0	10°26.9	24°12.2	28°19.9	34°34.5	42°47.1
14	193°43.8	10.2′	26°12.6	-1.3′	54.2′	100°13.0	97°10.8	46°10.3	9°58.0	24°31.4	28°39.6	35°03.8	43°05.6
15	208°13.0	10.2′	26°11.3	-1.4′	54.2′	99°43.2	96°44.4	45°40.7	9°29.2	24°51.0	28°59.7	35°33.2	43°24.2
16	222°42.2	10.2′	26°09.9	-1.5′	54.2′	99°13.5	96°17.9	45°11.0	9°00.4	25°10.9	29°20.0	36°02.5	43°43.0
17	237°11.4	10.2′	26°08.4	-1.7′	54.2′	98°43.7	95°51.4	44°41.3	8°31.9	25°31.2	29°40.6	36°31.9	44°02.0
18	251°40.6	10.2′	N26°06.7	-1.8′	54.2′	98°13.9	95°24.9	44°11.6	8°03.4	25°51.7	30°01.4	37°01.3	44°21.1
19	266°09.8	10.2′	26°05.0	-1.9′	54.2′	97°44.2	94°58.4	43°41.9	7°35.2	26°12.5	30°22.4	37°30.8	44°40.4
20	280°39.0	10.2′	26°03.0	-2.0′	54.2′	97°14.4	94°31.9	43°12.2	7°07.2	26°33.6	30°43.7	38°00.2	44°59.9
21	295°08.3	10.2′	26°01.0	-2.2′	54.2′	96°44.6	94°05.4	42°42.5	6°39.4	26°54.9	31°05.2	38°29.7	45°19.5
22	309°37.5	10.3′	25°58.8	-2.3′	54.2′	96°14.7	93°38.8	42°12.8	6°12.0	27°16.5	31°26.9	38°59.2	45°39.2
23	324°06.8	10.3′	25°56.5	-2.4′	54.2′	95°44.9	93°12.3	41°43.1	5°44.9	27°38.4	31°48.8	39°28.7	45°59.1
	SD = 14.7′		Mer. pass. 00:38										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Tue	**GHA**	*ν*	**Dec**	*d*	**HP**	**-Spica**	**-Arcturus**	**-Regulus**	**±Pollux**	**+Betelgeuse**	**+Capella**	**+Aldebaran**	**+Rigel**
0	338°36.0	10.3′	N25°54.1	-2.5′	54.3′	95°15.1	92°45.7	41°13.3	5°18.4	28°00.5	32°10.9	39°58.2	46°19.2
1	353°05.3	10.3′	25°51.6	-2.7′	54.3′	94°45.3	92°19.2	40°43.6	4°52.5	28°22.8	32°33.2	40°27.7	46°39.4
2	7°34.6	10.3′	25°48.9	-2.8′	54.3′	94°15.4	91°52.6	40°13.9	4°27.5	28°45.3	32°55.7	40°57.3	46°59.7
3	22°03.9	10.3′	25°46.1	-2.9′	54.3′	93°45.5	91°26.0	39°44.2		29°08.1	33°18.4	41°26.9	47°20.2
4	36°33.2	10.3′	25°43.2	-3.1′	54.3′	93°15.7	90°59.4	39°14.4		29°31.0	33°41.3	41°56.5	47°40.8
5	51°02.6	10.4′	25°40.1	-3.2′	54.3′	92°45.8	90°32.8	38°44.7		29°54.2	34°04.3	42°26.1	48°01.6
6	65°31.9	10.4′	N25°36.9	-3.3′	54.3′	92°15.9	90°06.1	38°14.9		30°17.5	34°27.5	42°55.7	48°22.5
7	80°01.3	10.4′	25°33.6	-3.4′	54.3′	91°46.0	89°39.5	37°45.2		30°41.0	34°50.8	43°25.3	48°43.5
8	94°30.7	10.4′	25°30.2	-3.6′	54.3′	91°16.1	89°12.9	37°15.4		31°04.7	35°14.4	43°55.0	49°04.6
9	109°00.1	10.4′	25°26.6	-3.7′	54.3′	90°46.2	88°46.2	36°45.7		31°28.6	35°38.0	44°24.7	49°25.8
10	123°29.6	10.5′	25°23.0	-3.8′	54.4′	90°16.2	88°19.5	36°15.9		31°52.6	36°01.8	44°54.4	49°47.2
11	137°59.0	10.5′	25°19.2	-3.9′	54.4′	89°46.3	87°52.9	35°46.1		32°16.8	36°25.8	45°24.1	50°08.7
12	152°28.5	10.5′	N25°15.2	-4.1′	54.4′	89°16.4	87°26.2	35°16.4		32°41.2	36°49.8	45°53.8	50°30.3
13	166°58.0	10.5′	25°11.2	-4.2′	54.4′	88°46.4	86°59.5	34°46.6		33°05.7	37°14.1	46°23.6	50°52.0
14	181°27.6	10.6′	25°07.0	-4.3′	54.4′	88°16.4	86°32.8	34°16.8		33°30.3	37°38.4	46°53.3	51°13.8
15	195°57.1	10.6′	25°02.7	-4.4′	54.4′	87°46.4	86°06.1	33°47.0		33°55.1	38°02.9	47°23.1	51°35.7
16	210°26.7	10.6′	24°58.3	-4.5′	54.4′	87°16.4	85°39.4	33°17.3		34°20.0	38°27.5	47°52.9	51°57.8
17	224°56.3	10.6′	24°53.7	-4.7′	54.4′	86°46.4	85°12.7	32°47.5		34°45.0	38°52.2	48°22.7	52°19.9
18	239°26.0	10.7′	N24°49.1	-4.8′	54.5′	86°16.4	84°46.0	32°17.7		35°10.2	39°17.0	48°52.5	52°42.1
19	253°55.6	10.7′	24°44.3	-4.9′	54.5′	85°46.4	84°19.3	31°47.9	5°30.2	35°35.5	39°42.0	49°22.4	53°04.5
20	268°25.3	10.7′	24°39.4	-5.0′	54.5′	85°16.3	83°52.6	31°18.1	5°57.2	36°00.9	40°07.0	49°52.3	53°26.9
21	282°55.1	10.8′	24°34.4	-5.1′	54.5′	84°46.3	83°25.9	30°48.3	6°24.6	36°26.4	40°32.2	50°22.1	53°49.4
22	297°24.8	10.8′	24°29.2	-5.3′	54.5′	84°16.2	82°59.1	30°18.5	6°52.5	36°52.1	40°57.5	50°52.0	54°12.1
23	311°54.6	10.8′	24°23.9	-5.4′	54.5′	83°46.1	82°32.4	29°48.7	7°20.6	37°17.8	41°22.8	51°21.9	54°34.8
	SD = 14.8′		Mer. pass. 01:29										

DUT1 = UT1-UTC = -0.1016 sec   ΔT = TT-UT1 = +69.2856 sec

2021 December 22 to Dec. 24 UT

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Wed	GHA	ν	Dec	d	HP	-Mars	-Antares	-Spica	-Regulus	+Pollux	+Betelgeuse	+Capella	+Aldebaran
0	326°24.4	10.9′	N24°18.6	-5.5′	54.5′			83°16.0	29°19.0	7°49.0	37°43.6	41°48.3	51°51.9
1	340°54.3	10.9′	24°13.1	-5.6′	54.5′			82°45.9	28°49.2	8°17.7	38°09.6	42°13.9	52°21.8
2	355°24.2	10.9′	24°07.4	-5.7′	54.6′			82°15.8	28°19.4	8°46.5	38°35.6	42°39.5	52°51.8
3	9°54.1	11.0′	24°01.7	-5.9′	54.6′			81°45.7	27°49.6	9°15.5	39°01.8	43°05.3	53°21.7
4	24°24.1	11.0′	23°55.8	-6.0′	54.6′			81°15.6	27°19.8	9°44.7	39°28.0	43°31.1	53°51.7
5	38°54.1	11.0′	23°49.9	-6.1′	54.6′			80°45.4	26°50.0	10°13.9	39°54.4	43°57.0	54°21.7
6	53°24.1	11.1′	N23°43.8	-6.2′	54.6′			80°15.2	26°20.3	10°43.3	40°20.8	44°23.0	54°51.8
7	67°54.2	11.1′	23°37.6	-6.3′	54.6′			79°45.1	25°50.5	11°12.7	40°47.3	44°49.1	55°21.8
8	82°24.3	11.1′	23°31.2	-6.4′	54.7′			79°14.9	25°20.7	11°42.3	41°13.9	45°15.3	55°51.9
9	96°54.4	11.2′	23°24.8	-6.5′	54.7′			78°44.6	24°51.0	12°11.9	41°40.6	45°41.5	56°22.0
10	111°24.6	11.2′	23°18.3	-6.7′	54.7′			78°14.4	24°21.2	12°41.6	42°07.3	46°07.9	56°52.0
11	125°54.8	11.3′	23°11.6	-6.8′	54.7′	119°36.4		77°44.2	23°51.5	13°11.3	42°34.1	46°34.3	57°22.2
12	140°25.1	11.3′	N23°04.8	-6.9′	54.7′	119°07.8		77°13.9	23°21.8	13°41.2	43°01.0	47°00.8	57°52.3
13	154°55.4	11.3′	22°57.9	-7.0′	54.7′	118°39.2		76°43.7	22°52.1	14°11.0	43°28.0	47°27.3	58°22.4
14	169°25.7	11.4′	22°50.9	-7.1′	54.7′	118°10.5		76°13.4	22°22.4	14°40.9	43°55.1	47°53.9	58°52.6
15	183°56.1	11.4′	22°43.8	-7.2′	54.8′	117°41.9		75°43.1	21°52.7	15°10.9	44°22.2	48°20.6	59°22.8
16	198°26.5	11.5′	22°36.6	-7.3′	54.8′	117°13.2		75°12.8	21°23.0	15°40.9	44°49.4	48°47.4	59°53.0
17	212°57.0	11.5′	22°29.3	-7.4′	54.8′	116°44.5		74°42.5	20°53.4	16°11.0	45°16.7	49°14.2	60°23.2
18	227°27.5	11.5′	N22°21.8	-7.5′	54.8′	116°15.8		74°12.1	20°23.7	16°41.0	45°44.0	49°41.1	60°53.4
19	241°58.0	11.6′	22°14.3	-7.7′	54.8′	115°47.0	119°35.2	73°41.8	19°54.2	17°11.2	46°11.4	50°08.1	61°23.7
20	256°28.6	11.6′	22°06.6	-7.8′	54.8′	115°18.3	119°04.8	73°11.4	19°24.6	17°41.3	46°38.9	50°35.1	61°54.0
21	270°59.2	11.7′	21°58.9	-7.9′	54.9′	114°49.5	118°34.3	72°41.0	18°55.0	18°11.5	47°06.4	51°02.2	62°24.2
22	285°29.9	11.7′	21°51.0	-8.0′	54.9′	114°20.7	118°03.9	72°10.6	18°25.5	18°41.8	47°34.0	51°29.3	62°54.5
23	300°00.6	11.7′	21°43.0	-8.1′	54.9′	113°51.9	117°33.4	71°40.2	17°56.1	19°12.0	48°01.6	51°56.5	63°24.9
	SD = 14.9′		Mer. pass. 02:19										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Thu	GHA	ν	Dec	d	HP	-Antares	-Mars	-Spica	-Regulus	+Pollux	+Betelgeuse	+Capella	+Aldebaran
0	314°31.3	11.8′	N21°34.9	-8.2′	54.9′	117°02.9	113°23.1	71°09.8	17°26.7	19°42.3	48°29.3	52°23.8	63°55.2
1	329°02.1	11.8′	21°26.8	-8.3′	54.9′	116°32.4	112°54.3	70°39.4	16°57.3	20°12.6	48°57.1	52°51.1	64°25.6
2	343°32.9	11.9′	21°18.5	-8.4′	54.9′	116°01.9	112°25.5	70°08.9	16°28.0	20°43.0	49°24.9	53°18.5	64°56.0
3	358°03.8	11.9′	21°10.1	-8.5′	55.0′	115°31.4	111°56.6	69°38.4	15°58.8	21°13.4	49°52.8	53°45.9	65°26.4
4	12°34.7	12.0′	21°01.6	-8.6′	55.0′	115°00.8	111°27.7	69°07.9	15°29.6	21°43.8	50°20.7	54°13.4	65°56.8
5	27°05.7	12.0′	20°53.0	-8.7′	55.0′	114°30.2	110°58.8	68°37.4	15°00.5	22°14.2	50°48.7	54°41.0	66°27.2
6	41°36.6	12.0′	N20°44.3	-8.8′	55.0′	113°59.7	110°29.9	68°06.9	14°31.5	22°44.7	51°16.7	55°08.6	66°57.7
7	56°07.7	12.1′	20°35.5	-8.9′	55.0′	113°29.0	110°01.0	67°36.3	14°02.5	23°15.2	51°44.8	55°36.2	67°28.2
8	70°38.8	12.1′	20°26.6	-9.0′	55.1′	112°58.4	109°32.0	67°05.8	13°33.7	23°45.7	52°12.9	56°03.9	67°58.7
9	85°09.9	12.2′	20°17.6	-9.1′	55.1′	112°27.8	109°03.0	66°35.2	13°05.1	24°16.2	52°41.1	56°31.7	68°29.2
10	99°41.1	12.2′	20°08.5	-9.2′	55.1′	111°57.1	108°34.1	66°04.6	12°36.5	24°46.8	53°09.4	56°59.5	68°59.7
11	114°12.3	12.2′	19°59.3	-9.3′	55.1′	111°26.4	108°05.0	65°34.0	12°08.1	25°17.4	53°37.7	57°27.3	69°30.3
12	128°43.5	12.3′	N19°50.0	-9.4′	55.1′	110°55.7	107°36.0	65°03.4	11°39.9	25°48.0	54°06.0	57°55.2	70°00.9
13	143°14.8	12.3′	19°40.6	-9.5′	55.2′	110°25.0	107°07.0	64°32.7	11°11.9	26°18.7	54°34.4	58°23.2	70°31.5
14	157°46.1	12.4′	19°31.1	-9.6′	55.2′	109°54.2	106°37.9	64°02.0	10°44.2	26°49.3	55°02.8	58°51.2	71°02.1
15	172°17.5	12.4′	19°21.5	-9.7′	55.2′	109°23.4	106°08.8	63°31.3	10°16.7	27°20.0	55°31.3	59°19.2	71°32.7
16	186°48.9	12.5′	19°11.9	-9.8′	55.2′	108°52.6	105°39.7	63°00.6	9°49.5	27°50.8	55°59.8	59°47.3	72°03.4
17	201°20.4	12.5′	19°02.1	-9.9′	55.2′	108°21.8	105°10.6	62°29.9	9°22.7	28°21.5	56°28.4	60°15.5	72°34.1
18	215°51.9	12.5′	N18°52.2	-10.0′	55.3′	107°51.0	104°41.4	61°59.2	8°56.3	28°52.3	56°57.0	60°43.6	73°04.8
19	230°23.4	12.6′	18°42.3	-10.0′	55.3′	107°20.2	104°12.3	61°28.4	8°30.4	29°23.1	57°25.7	61°11.9	73°35.5
20	244°55.0	12.6′	18°32.3	-10.1′	55.3′	106°49.3	103°43.1	60°57.6	8°05.0	29°53.9	57°54.4	61°40.1	74°06.2
21	259°26.6	12.7′	18°22.1	-10.2′	55.3′	106°18.4	103°13.9	60°26.8	7°40.3	30°24.7	58°23.1	62°08.5	74°37.0
22	273°58.2	12.7′	18°11.9	-10.3′	55.3′	105°47.5	102°44.7	59°56.0	7°16.4	30°55.6	58°51.9	62°36.8	75°07.8
23	288°29.9	12.7′	18°01.6	-10.4′	55.4′	105°16.5	102°15.4	59°25.2	6°53.4	31°26.5	59°20.8	63°05.2	75°38.6
	SD = 15.0′		Mer. pass. 03:08										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Fri	GHA	ν	Dec	d	HP	-Sun	-Antares	-Mars	-Spica	+Pollux	+Betelgeuse	+Capella	+Aldebaran
0	303°01.7	12.8′	N17°51.2	-10.5′	55.4′		104°45.6	101°46.1	58°54.3	31°57.4	59°49.7	63°33.7	76°09.5
1	317°33.4	12.8′	17°40.7	-10.6′	55.4′		104°14.6	101°16.8	58°23.4	32°28.4	60°18.6	64°02.2	76°40.3
2	332°05.2	12.8′	17°30.1	-10.7′	55.4′		103°43.6	100°47.5	57°52.5	32°59.3	60°47.5	64°30.7	77°11.2
3	346°37.1	12.9′	17°19.5	-10.7′	55.5′		103°12.5	100°18.2	57°21.6	33°30.3	61°16.5	64°59.3	77°42.1
4	1°09.0	12.9′	17°08.7	-10.8′	55.5′		102°41.5	99°48.8	56°50.7	34°01.3	61°45.6	65°27.9	78°13.0
5	15°40.9	13.0′	16°57.9	-10.9′	55.5′		102°10.4	99°19.4	56°19.7	34°32.4	62°14.7	65°56.5	78°44.0
6	30°12.9	13.0′	N16°47.0	-11.0′	55.5′		101°39.3	98°50.0	55°48.7	35°03.5	62°43.8	66°25.2	79°15.0
7	44°44.8	13.0′	16°36.0	-11.1′	55.5′		101°08.2	98°20.6	55°17.7	35°34.6	63°13.0	66°54.0	79°46.0
8	59°16.9	13.1′	16°24.9	-11.2′	55.6′		100°37.1	97°51.1	54°46.7	36°05.7	63°42.2	67°22.7	80°17.0
9	73°48.9	13.1′	16°13.7	-11.2′	55.6′		100°05.9	97°21.7	54°15.7	36°36.8	64°11.4	67°51.5	80°48.0
10	88°21.0	13.1′	16°02.5	-11.3′	55.6′		99°34.7	96°52.2	53°44.6	37°08.0	64°40.7	68°20.4	81°19.1
11	102°53.2	13.2′	15°51.2	-11.4′	55.6′		99°03.5	96°22.6	53°13.5	37°39.2	65°10.0	68°49.3	81°50.2
12	117°25.3	13.2′	N15°39.8	-11.5′	55.7′		98°32.2	95°53.1	52°42.4	38°10.4	65°39.4	69°18.2	82°21.3
13	131°57.5	13.2′	15°28.3	-11.6′	55.7′		98°01.0	95°23.5	52°11.3	38°41.7	66°08.8	69°47.2	82°52.5
14	146°29.7	13.3′	15°16.7	-11.6′	55.7′	119°54.2	97°29.7	94°53.9	51°40.1	39°13.0	66°38.3	70°16.2	83°23.6
15	161°02.0	13.3′	15°05.1	-11.7′	55.7′	119°25.4	96°58.4	94°24.3	51°08.9	39°44.3	67°07.7	70°45.3	83°54.8
16	175°34.3	13.3′	14°53.4	-11.8′	55.8′	118°56.5	96°27.0	93°54.6	50°37.7	40°15.6	67°37.3	71°14.3	84°26.1
17	190°06.6	13.4′	14°41.6	-11.9′	55.8′	118°27.7	95°55.6	93°25.0	50°06.5	40°47.0	68°06.8	71°43.5	84°57.3
18	204°39.0	13.4′	N14°29.7	-11.9′	55.8′	117°58.8	95°24.2	92°55.3	49°35.3	41°18.4	68°36.4	72°12.6	85°28.6
19	219°11.3	13.4′	14°17.8	-12.0′	55.8′	117°29.9	94°52.8	92°25.5	49°04.0	41°49.8	69°06.0	72°41.8	85°59.9
20	233°43.8	13.4′	14°05.8	-12.1′	55.9′	117°00.9	94°21.4	91°55.8	48°32.7	42°21.2	69°35.7	73°11.1	86°31.2
21	248°16.2	13.5′	13°53.7	-12.2′	55.9′	116°32.0	93°49.9	91°26.0	48°01.4	42°52.7	70°05.4	73°40.3	87°02.6
22	262°48.7	13.5′	13°41.5	-12.2′	55.9′	116°03.0	93°18.4	90°56.2	47°30.1	43°24.2	70°35.2	74°09.6	87°34.0
23	277°21.1	13.5′	13°29.3	-12.3′	55.9′	115°34.0	92°46.9	90°26.3	46°58.7	43°55.8	71°04.9	74°39.0	88°05.4
	SD = 15.1′		Mer. pass. 03:55										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Sat	**GHA**	ν	**Dec**	d	**HP**	**-Sun**	**-Antares**	**-Mars**	**-Spica**	**+Regulus**	**+Pollux**	**+Betelgeuse**	**+Aldebaran**
0	291°53.7	13.5′	**N**13°17.0	-12.4′	56.0′	115°04.9	92°15.3	89°56.5	46°27.3	9°19.8	44°27.3	71°34.8	88°36.8
1	306°26.2	13.6′	13°04.7	-12.4′	56.0′	114°35.9	91°43.7	89°26.6	45°55.9	9°47.3	44°58.9	72°04.6	89°08.3
2	320°58.7	13.6′	12°52.2	-12.5′	56.0′	114°06.8	91°12.1	88°56.7	45°24.5	10°15.1	45°30.5	72°34.5	89°39.8
3	335°31.3	13.6′	12°39.7	-12.6′	56.0′	113°37.6	90°40.5	88°26.7	44°53.1	10°43.4	46°02.2	73°04.4	90°11.3
4	350°03.9	13.6′	12°27.2	-12.6′	56.1′	113°08.5	90°08.8	87°56.8	44°21.6	11°12.0	46°33.8	73°34.4	90°42.8
5	4°36.6	13.6′	12°14.5	-12.7′	56.1′	112°39.3	89°37.1	87°26.7	43°50.1	11°40.8	47°05.6	74°04.4	91°14.4
6	19°09.2	13.7′	**N**12°01.8	-12.8′	56.1′	112°10.1	89°05.4	86°56.7	43°18.6	12°10.0	47°37.3	74°34.4	91°46.0
7	33°41.9	13.7′	11°49.1	-12.8′	56.2′	111°40.8	88°33.6	86°26.7	42°47.0	12°39.3	48°09.1	75°04.5	92°17.7
8	48°14.6	13.7′	11°36.2	-12.9′	56.2′	111°11.5	88°01.8	85°56.6	42°15.5	13°08.9	48°40.9	75°34.6	92°49.3
9	62°47.3	13.7′	11°23.4	-13.0′	56.2′	110°42.2	87°30.0	85°26.4	41°43.9	13°38.7	49°12.7	76°04.8	93°21.0
10	77°20.0	13.7′	11°10.4	-13.0′	56.2′	110°12.9	86°58.2	84°56.3	41°12.3	14°08.7	49°44.5	76°34.9	93°52.7
11	91°52.7	13.8′	10°57.4	-13.1′	56.3′	109°43.5	86°26.3	84°26.1	40°40.6	14°38.8	50°16.4	77°05.2	94°24.5
12	106°25.5	13.8′	**N**10°44.3	-13.1′	56.3′	109°14.1	85°54.4	83°55.9	40°09.0	15°09.1	50°48.4	77°35.4	94°56.3
13	120°58.3	13.8′	10°31.2	-13.2′	56.3′	108°44.7	85°22.5	83°25.7	39°37.3	15°39.5	51°20.3	78°05.7	95°28.1
14	135°31.0	13.8′	10°18.0	-13.2′	56.4′	108°15.3	84°50.5	82°55.4	39°05.6	16°10.0	51°52.3	78°36.0	95°59.9
15	150°03.8	13.8′	10°04.7	-13.3′	56.4′	107°45.8	84°18.5	82°25.1	38°33.8	16°40.7	52°24.3	79°06.4	96°31.8
16	164°36.6	13.8′	09°51.4	-13.4′	56.4′	107°16.2	83°46.5	81°54.7	38°02.1	17°11.5	52°56.4	79°36.8	97°03.7
17	179°09.4	13.8′	09°38.1	-13.4′	56.4′	106°46.7	83°14.4	81°24.4	37°30.3	17°42.4	53°28.4	80°07.2	97°35.7
18	193°42.3	13.8′	**N**09°24.7	-13.5′	56.5′	106°17.1	82°42.3	80°54.0	36°58.5	18°13.3	54°00.5	80°37.7	98°07.6
19	208°15.1	13.8′	09°11.2	-13.5′	56.5′	105°47.5	82°10.2	80°23.6	36°26.7	18°44.4	54°32.7	81°08.2	98°39.6
20	222°48.0	13.8′	08°57.7	-13.6′	56.5′	105°17.8	81°38.0	79°53.1	35°54.8	19°15.6	55°04.9	81°38.7	99°11.6
21	237°20.8	13.9′	08°44.1	-13.6′	56.6′	104°48.2	81°05.8	79°22.6	35°22.9	19°46.8	55°37.1	82°09.3	99°43.7
22	251°53.7	13.9′	08°30.5	-13.7′	56.6′	104°18.5	80°33.6	78°52.1	34°51.1	20°18.2	56°09.3	82°39.9	100°15.8
23	266°26.5	13.9′	08°16.8	-13.7′	56.6′	103°48.7	80°01.4	78°21.5	34°19.1	20°49.6	56°41.6	83°10.6	100°47.9
	SD = 15.3′		Mer. pass. 04:41										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Sun	**GHA**	ν	**Dec**	d	**HP**	**-Sun**	**-Antares**	**-Mars**	**-Spica**	**+Regulus**	**+Pollux**	**+Betelgeuse**	**+Aldebaran**
0	280°59.4	13.9′	**N**08°03.0	-13.8′	56.7′	103°18.9	79°29.1	77°50.9	33°47.2	21°21.1	57°13.9	83°41.3	101°20.1
1	295°32.2	13.9′	07°49.3	-13.8′	56.7′	102°49.1	78°56.8	77°20.3	33°15.3	21°52.7	57°46.3	84°12.0	101°52.3
2	310°05.1	13.9′	07°35.4	-13.9′	56.7′	102°19.3	78°24.4	76°49.6	32°43.3	22°24.3	58°18.7	84°42.7	102°24.5
3	324°38.0	13.9′	07°21.5	-13.9′	56.7′	101°49.4	77°52.0	76°18.9	32°11.3	22°56.0	58°51.1	85°13.5	102°56.8
4	339°10.9	13.9′	07°07.6	-14.0′	56.8′	101°19.5	77°19.6	75°48.2	31°39.3	23°27.8	59°23.5	85°44.3	103°29.1
5	353°43.7	13.9′	06°53.6	-14.0′	56.8′	100°49.5	76°47.1	75°17.4	31°07.2	23°59.6	59°56.0	86°15.2	104°01.4
6	8°16.6	13.9′	**N**06°39.6	-14.1′	56.8′	100°19.5	76°14.7	74°46.6	30°35.2	24°31.5	60°28.5	86°46.1	104°33.7
7	22°49.4	13.9′	06°25.6	-14.1′	56.9′	99°49.5	75°42.1	74°15.8	30°03.1	25°03.5	61°01.1	87°17.0	105°06.1
8	37°22.3	13.8′	06°11.4	-14.2′	56.9′	99°19.5	75°09.6	73°44.9	29°31.0	25°35.5	61°33.7	87°48.0	105°38.6
9	51°55.1	13.8′	05°57.3	-14.2′	56.9′	98°49.4	74°37.0	73°14.0	28°58.9	26°07.6	62°06.3	88°19.0	106°11.0
10	66°28.0	13.8′	05°43.1	-14.2′	57.0′	98°19.2	74°04.3	72°43.1	28°26.8	26°39.7	62°39.0	88°50.0	106°43.5
11	81°00.8	13.8′	05°28.9	-14.3′	57.0′	97°49.1	73°31.7	72°12.1	27°54.6	27°11.9	63°11.7	89°21.1	107°16.1
12	95°33.6	13.8′	**N**05°14.6	-14.3′	57.0′	97°18.9	72°59.0	71°41.1	27°22.5	27°44.1	63°44.4	89°52.2	107°48.6
13	110°06.5	13.8′	05°00.3	-14.4′	57.1′	96°48.6	72°26.2	71°10.0	26°50.3	28°16.4	64°17.2	90°23.3	108°21.2
14	124°39.3	13.8′	04°45.9	-14.4′	57.1′	96°18.4	71°53.5	70°38.9	26°18.1	28°48.8	64°50.0	90°54.5	108°53.9
15	139°12.1	13.8′	04°31.5	-14.4′	57.1′	95°48.1	71°20.6	70°07.8	25°46.0	29°21.2	65°22.9	91°25.7	109°26.5
16	153°44.8	13.8′	04°17.1	-14.5′	57.2′	95°17.7	70°47.8	69°36.7	25°13.8	29°53.7	65°55.7	91°56.9	109°59.2
17	168°17.6	13.7′	04°02.7	-14.5′	57.2′	94°47.3	70°14.9	69°05.5	24°41.6	30°26.2	66°28.7	92°28.2	110°32.0
18	182°50.3	13.7′	**N**03°48.2	-14.5′	57.2′	94°16.9	69°42.0	68°34.2	24°09.4	30°58.8	67°01.6	92°59.5	111°04.7
19	197°23.1	13.7′	03°33.6	-14.6′	57.3′	93°46.5	69°09.0	68°03.0	23°37.2	31°31.4	67°34.6	93°30.9	111°37.6
20	211°55.8	13.7′	03°19.1	-14.6′	57.3′	93°16.0	68°36.0	67°31.6	23°05.0	32°04.0	68°07.7	94°02.2	112°10.4
21	226°28.5	13.7′	03°04.5	-14.6′	57.3′	92°45.4	68°03.0	67°00.3	22°32.7	32°36.8	68°40.8	94°33.7	112°43.3
22	241°01.1	13.6′	02°49.9	-14.7′	57.4′	92°14.9	67°29.9	66°28.9	22°00.5	33°09.5	69°13.9	95°05.1	113°16.2
23	255°33.8	13.6′	02°35.2	-14.7′	57.4′	91°44.2	66°56.8	65°57.5	21°28.4	33°42.3	69°47.0	95°36.6	113°49.2
	SD = 15.5′		Mer. pass. 05:26										

h	Moon					Lunar Distance (objects with largest hourly LD delta)							
Mon	**GHA**	ν	**Dec**	d	**HP**	**-Sun**	**-Antares**	**-Mars**	**-Spica**	**+Regulus**	**+Pollux**	**+Betelgeuse**	**+Aldebaran**
0	270°06.4	13.6′	**N**02°20.5	-14.7′	57.4′	91°13.6	66°23.7	65°26.0	20°56.2	34°15.2	70°20.2	96°08.1	114°22.2
1	284°39.0	13.6′	02°05.8	-14.7′	57.5′	90°42.9	65°50.5	64°54.5	20°24.0	34°48.1	70°53.5	96°39.6	114°55.2
2	299°11.6	13.5′	01°51.1	-14.8′	57.5′	90°12.2	65°17.3	64°23.0	19°51.9	35°21.1	71°26.7	97°11.2	115°28.3
3	313°44.1	13.5′	01°36.3	-14.8′	57.5′	89°41.4	64°44.0	63°51.4	19°19.8	35°54.1	72°00.0	97°42.8	116°01.4
4	328°16.6	13.5′	01°21.5	-14.8′	57.6′	89°10.6	64°10.7	63°19.8	18°47.7	36°27.2	72°33.4	98°14.5	116°34.5
5	342°49.1	13.5′	01°06.7	-14.8′	57.6′	88°39.8	63°37.3	62°48.1	18°15.6	37°00.3	73°06.8	98°46.2	117°07.7
6	357°21.6	13.4′	**N**00°51.9	-14.9′	57.6′	88°08.9	63°04.0	62°16.4	17°43.6	37°33.4	73°40.2	99°17.9	117°40.9
7	11°54.0	13.4′	00°37.0	-14.9′	57.7′	87°37.9	62°30.5	61°44.7	17°11.7	38°06.6	74°13.7	99°49.6	118°14.2
8	26°26.4	13.4′	00°22.1	-14.9′	57.7′	87°07.0	61°57.1	61°12.9	16°39.8	38°39.9	74°47.2	100°21.4	118°47.5
9	40°58.8	13.3′	**N**00°07.2	-14.9′	57.7′	86°36.0	61°23.6	60°41.0	16°07.9	39°13.2	75°20.8	100°53.2	119°20.8
10	55°31.1	13.3′	**S**00°07.7	-14.9′	57.8′	86°04.9	60°50.0	60°09.2	15°36.2	39°46.5	75°54.4	101°25.1	119°54.2
11	70°03.4	13.2′	00°22.6	-15.0′	57.8′	85°33.8	60°16.5	59°37.3	15°04.5	40°19.9	76°28.0	101°56.9	
12	84°35.6	13.2′	**S**00°37.6	-15.0′	57.8′	85°02.7	59°42.8	59°05.3	14°33.0	40°53.4	77°01.7	102°28.9	
13	99°07.8	13.2′	00°52.5	-15.0′	57.9′	84°31.5	59°09.2	58°33.3	14°01.6	41°26.9	77°35.4	103°00.8	
14	113°40.0	13.1′	01°07.5	-15.0′	57.9′	84°00.3	58°35.5	58°01.3	13°30.3	42°00.4	78°09.2	103°32.8	
15	128°12.1	13.1′	01°22.5	-15.0′	58.0′	83°29.1	58°01.7	57°29.2	12°59.2	42°34.0	78°43.0	104°04.8	
16	142°44.2	13.0′	01°37.5	-15.0′	58.0′	82°57.8	57°28.0	56°57.1	12°28.3	43°07.6	79°16.8	104°36.8	
17	157°16.2	13.0′	01°52.5	-15.0′	58.0′	82°26.4	56°54.1	56°25.0	11°57.7	43°41.3	79°50.7	105°08.9	
18	171°48.2	12.9′	**S**02°07.5	-15.0′	58.1′	81°55.1	56°20.3	55°52.8	11°27.3	44°15.0	80°24.7	105°41.0	
19	186°20.1	12.9′	02°22.6	-15.0′	58.1′	81°23.6	55°46.4	55°20.5	10°57.1	44°48.8	80°58.6	106°13.1	
20	200°52.0	12.8′	02°37.6	-15.0′	58.1′	80°52.2	55°12.4	54°48.3	10°27.4	45°22.6	81°32.6	106°45.2	
21	215°23.8	12.8′	02°52.7	-15.1′	58.2′	80°20.7	54°38.4	54°15.9	9°58.1	45°56.5	82°06.7	107°17.4	
22	229°55.6	12.7′	03°07.7	-15.1′	58.2′	79°49.1	54°04.4	53°43.6	9°29.2	46°30.4	82°40.8	107°49.6	
23	244°27.3	12.7′	03°22.8	-15.1′	58.2′	79°17.5	53°30.4	53°11.2	9°01.0	47°04.3	83°15.0	108°21.9	
	SD = 15.7′		Mer. pass. 06:11										

h   Moon   Lunar Distance (objects with largest hourly LD delta)

Tue	GHA	ν	Dec	d	HP	-Sun	-Antares	-Mars	-Spica	+Regulus	+Procyon	+Pollux	+Betelgeuse
0	258°59.0	12.6′	**S**03°37.8	-15.1′	58.3′	78°45.9	52°56.2	52°38.7	8°33.4	47°38.3	82°57.6	83°49.1	108°54.1
1	273°30.6	12.6′	03°52.9	-15.1′	58.3′	78°14.2	52°22.1	52°06.2	8°06.6	48°12.4	83°29.7	84°23.4	109°26.4
2	288°02.2	12.5′	04°08.0	-15.1′	58.3′	77°42.5	51°47.9	51°33.7	7°40.8	48°46.5	84°01.9	84°57.6	109°58.7
3	302°33.7	12.4′	04°23.0	-15.1′	58.4′	77°10.8	51°13.7	51°01.1		49°20.6	84°34.1	85°32.0	110°31.1
4	317°05.1	12.4′	04°38.1	-15.1′	58.4′	76°39.0	50°39.4	50°28.5		49°54.8	85°06.3	86°06.3	111°03.5
5	331°36.5	12.3′	04°53.1	-15.0′	58.4′	76°07.1	50°05.1	49°55.8		50°29.1	85°38.6	86°40.7	111°35.9
6	346°07.9	12.3′	**S**05°08.2	-15.0′	58.5′	75°35.2	49°30.7	49°23.1		51°03.4	86°11.0	87°15.2	112°08.3
7	0°39.1	12.2′	05°23.2	-15.0′	58.5′	75°03.3	48°56.3	48°50.4		51°37.7	86°43.3	87°49.7	112°40.7
8	15°10.3	12.1′	05°38.3	-15.0′	58.6′	74°31.3	48°21.9	48°17.6		52°12.1	87°15.8	88°24.2	113°13.2
9	29°41.4	12.1′	05°53.3	-15.0′	58.6′	73°59.3	47°47.4	47°44.7		52°46.5	87°48.2	88°58.8	113°45.7
10	44°12.5	12.0′	06°08.3	-15.0′	58.6′	73°27.3	47°12.9	47°11.8		53°21.0	88°20.7	89°33.4	114°18.2
11	58°43.5	11.9′	06°23.3	-15.0′	58.7′	72°55.1	46°38.3	46°38.9		53°55.5	88°53.3	90°08.1	114°50.8
12	73°14.4	11.8′	**S**06°38.3	-15.0′	58.7′	72°23.0	46°03.7	46°05.9		54°30.0	89°25.9	90°42.8	115°23.3
13	87°45.2	11.8′	06°53.3	-15.0′	58.7′	71°50.8	45°29.1	45°32.9		55°04.6	89°58.5	91°17.5	115°55.9
14	102°16.0	11.7′	07°08.2	-14.9′	58.8′	71°18.6	44°54.4	44°59.9		55°39.3	90°31.2	91°52.3	116°28.5
15	116°46.7	11.6′	07°23.2	-14.9′	58.8′	70°46.3	44°19.7	44°26.8		56°14.0	91°03.9	92°27.2	117°01.1
16	131°17.3	11.5′	07°38.1	-14.9′	58.8′	70°14.0	43°44.9	43°53.6		56°48.8	91°36.7	93°02.0	117°33.8
17	145°47.9	11.5′	07°53.0	-14.9′	58.9′	69°41.6	43°10.1	43°20.4		57°23.5	92°09.5	93°37.0	118°06.4
18	160°18.3	11.4′	**S**08°07.9	-14.9′	58.9′	69°09.2	42°35.3	42°47.2		57°58.4	92°42.3	94°12.0	118°39.1
19	174°48.7	11.3′	08°22.8	-14.8′	58.9′	68°36.8	42°00.4	42°13.9		58°33.3	93°15.2	94°47.0	119°11.8
20	189°19.0	11.2′	08°37.6	-14.8′	59.0′	68°04.3	41°25.5	41°40.6		59°08.2	93°48.1	95°22.0	119°44.5
21	203°49.2	11.1′	08°52.4	-14.8′	59.0′	67°31.7	40°50.5	41°07.2		59°43.2	94°21.1	95°57.1	
22	218°19.4	11.1′	09°07.2	-14.8′	59.1′	66°59.2	40°15.5	40°33.8		60°18.2	94°54.1	96°32.3	
23	232°49.4	11.0′	09°21.9	-14.7′	59.1′	66°26.5	39°40.4	40°00.4		60°53.3	95°27.1	97°07.5	
	SD = 15.9′		Mer. pass. 06:57										

h   Moon   Lunar Distance (objects with largest hourly LD delta)

Wed	GHA	ν	Dec	d	HP	-Sun	-Rigil Kent.	-Mars	-Antares	+Spica	+Regulus	+Procyon	+Pollux
0	247°19.4	10.9′	**S**09°36.7	-14.7′	59.1′	65°53.9	51°50.0	39°26.9	39°05.4		61°28.4	96°00.1	97°42.7
1	261°49.3	10.8′	09°51.3	-14.7′	59.2′	65°21.2	51°32.0	38°53.4	38°30.2	9°15.4	62°03.5	96°33.3	98°18.0
2	276°19.1	10.7′	10°06.0	-14.6′	59.2′	64°48.4	51°14.3	38°19.8	37°55.1	9°45.0	62°38.7	97°06.4	98°53.3
3	290°48.8	10.6′	10°20.6	-14.6′	59.2′	64°15.6	50°56.7	37°46.2	37°19.9	10°15.2	63°14.0	97°39.6	99°28.7
4	305°18.4	10.5′	10°35.2	-14.5′	59.3′	63°42.8	50°39.4	37°12.5	36°44.6	10°46.0	63°49.3	98°12.8	100°04.1
5	319°47.9	10.4′	10°49.7	-14.5′	59.3′	63°09.9	50°22.3	36°38.8	36°09.4	11°17.3	64°24.6	98°46.0	100°39.5
6	334°17.3	10.3′	**S**11°04.2	-14.5′	59.3′	62°37.0	50°05.3	36°05.0	35°34.1	11°49.0	65°00.0	99°19.3	101°15.0
7	348°46.6	10.2′	11°18.7	-14.4′	59.4′	62°04.0	49°48.6	35°31.2	34°58.7	12°21.1	65°35.5	99°52.6	101°50.6
8	3°15.9	10.1′	11°33.1	-14.4′	59.4′	61°31.0	49°32.1	34°57.4	34°23.3	12°53.5	66°10.9	100°26.0	102°26.2
9	17°45.0	10.0′	11°47.5	-14.3′	59.4′	60°57.9	49°15.9	34°23.5	33°47.9	13°26.3	66°46.4	100°59.3	103°01.8
10	32°14.0	9.9′	12°01.8	-14.3′	59.5′	60°24.8	48°59.8	33°49.6	33°12.5	13°59.3	67°22.0	101°32.7	103°37.5
11	46°43.0	9.8′	12°16.1	-14.2′	59.5′	59°51.7	48°44.1	33°15.6	32°37.0	14°32.5	67°57.6	102°06.2	104°13.2
12	61°11.8	9.7′	**S**12°30.3	-14.2′	59.5′	59°18.5	48°28.5	32°41.6	32°01.4	15°06.0	68°33.3	102°39.7	104°48.9
13	75°40.5	9.6′	12°44.5	-14.1′	59.6′	58°45.3	48°13.2	32°07.5	31°25.9	15°39.7	69°09.0	103°13.2	105°24.7
14	90°09.2	9.5′	12°58.6	-14.1′	59.6′	58°12.1	47°58.2	31°33.4	30°50.3	16°13.6	69°44.7	103°46.7	106°00.6
15	104°37.7	9.4′	13°12.6	-14.0′	59.6′	57°38.8		30°59.3	30°14.7	16°47.7	70°20.5	104°20.2	106°36.5
16	119°06.1	9.3′	13°26.6	-13.9′	59.7′	57°05.4		30°25.1	29°39.0	17°21.9	70°56.3	104°53.8	107°12.4
17	133°34.4	9.2′	13°40.6	-13.9′	59.7′	56°32.0		29°50.9	29°03.3	17°56.2	71°32.2	105°27.4	107°48.3
18	148°02.6	9.1′	**S**13°54.4	-13.8′	59.7′	55°58.6		29°16.6	28°27.6	18°30.7	72°08.1	106°01.1	108°24.3
19	162°30.7	9.0′	14°08.3	-13.7′	59.8′	55°25.1		28°42.3	27°51.9	19°05.4	72°44.0	106°34.7	109°00.4
20	176°58.7	8.9′	14°22.0	-13.7′	59.8′	54°51.6		28°08.0	27°16.1	19°40.2	73°20.0	107°08.4	109°36.5
21	191°26.6	8.8′	14°35.7	-13.6′	59.8′	54°18.1		27°33.6	26°40.3	20°15.0	73°56.1	107°42.1	110°12.6
22	205°54.4	8.7′	14°49.3	-13.5′	59.9′	53°44.5		26°59.2	26°04.5	20°50.0	74°32.2	108°15.8	110°48.8
23	220°22.0	8.5′	15°02.8	-13.5′	59.9′	53°10.9		26°24.7	25°28.7	21°25.1	75°08.3	108°49.6	111°25.0
	SD = 16.1′		Mer. pass. 07:46										

h   Moon   Lunar Distance (objects with largest hourly LD delta)

Thu	GHA	ν	Dec	d	HP	-Sun	-Mars	-Antares	+Spica	+Arcturus	+Regulus	+Procyon	+Pollux
0	234°49.6	8.4′	**S**15°16.3	-13.4′	59.9′	52°37.2	25°50.2	24°52.8	22°00.3	35°38.0	75°44.4	109°23.4	112°01.3
1	249°17.0	8.3′	15°29.7	-13.3′	60.0′	52°03.5	25°15.7	24°16.9	22°35.6	36°00.3	76°20.6	109°57.2	112°37.5
2	263°44.3	8.2′	15°43.0	-13.2′	60.0′	51°29.8	24°41.1	23°41.0	23°11.0	36°22.9	76°56.9	110°31.0	113°13.9
3	278°11.5	8.1′	15°56.2	-13.1′	60.0′	50°56.0	24°06.5	23°05.1	23°46.5	36°45.9	77°33.2	111°04.8	113°50.2
4	292°38.6	8.0′	16°09.4	-13.1′	60.0′	50°22.2	23°31.8	22°29.2	24°22.0	37°09.2	78°09.5	111°38.6	114°26.7
5	307°05.6	7.9′	16°22.4	-13.0′	60.1′	49°48.4	22°57.1	21°53.2	24°57.6	37°32.8	78°45.9	112°12.5	115°03.1
6	321°32.4	7.7′	**S**16°35.4	-12.9′	60.1′	49°14.5	22°22.4	21°17.3	25°33.3	37°56.8	79°22.3	112°46.4	115°39.6
7	335°59.1	7.6′	16°48.3	-12.8′	60.1′	48°40.5	21°47.6	20°41.3	26°09.1	38°21.1	79°58.7	113°20.2	116°16.1
8	350°25.8	7.5′	17°01.1	-12.7′	60.2′	48°06.6	21°12.8	20°05.4	26°45.0	38°45.6	80°35.2	113°54.1	116°52.7
9	4°52.3	7.4′	17°13.8	-12.6′	60.2′	47°32.6	20°38.0	19°29.4	27°20.9	39°10.5	81°11.7	114°28.0	117°29.3
10	19°18.6	7.3′	17°26.4	-12.5′	60.2′	46°58.5	20°03.1	18°53.5	27°56.9	39°35.6	81°48.3	115°02.0	118°05.9
11	33°44.9	7.1′	17°38.9	-12.4′	60.2′	46°24.5	19°28.2	18°17.5	28°32.9	40°01.0	82°24.9	115°35.9	118°42.6
12	48°11.0	7.0′	**S**17°51.3	-12.3′	60.3′	45°50.4	18°53.3	17°41.6	29°09.0	40°26.7	83°01.5	116°09.8	119°19.3
13	62°37.0	6.9′	18°03.7	-12.2′	60.3′	45°16.2	18°18.3	17°05.7	29°45.2	40°52.6	83°38.2	116°43.8	119°56.1
14	77°02.9	6.8′	18°15.9	-12.1′	60.3′	44°42.1	17°43.3	16°29.8	30°21.4	41°18.8	84°14.9	117°17.7	
15	91°28.7	6.7′	18°28.0	-12.0′	60.4′	44°07.9	17°08.2	15°54.0	30°57.7	41°45.3	84°51.6	117°51.6	
16	105°54.4	6.5′	18°40.0	-11.9′	60.4′	43°33.6	16°33.1	15°18.2	31°34.0	42°11.9	85°28.4	118°25.6	
17	120°19.9	6.4′	18°51.9	-11.8′	60.4′	42°59.4	15°58.0	14°42.5	32°10.4	42°38.8	86°05.2	118°59.5	
18	134°45.3	6.3′	**S**19°03.7	-11.7′	60.4′	42°25.1	15°22.9	14°06.8	32°46.9	43°06.0	86°42.0	119°33.5	
19	149°10.6	6.2′	19°15.4	-11.6′	60.5′	41°50.7	14°47.7	13°31.2	33°23.4	43°33.3	87°18.9		
20	163°35.8	6.0′	19°26.9	-11.4′	60.5′	41°16.4	14°12.5	12°55.7	33°59.9	44°00.9	87°55.8		
21	178°00.8	5.9′	19°38.4	-11.3′	60.5′	40°42.0	13°37.3	12°20.4	34°36.5	44°28.7	88°32.8		
22	192°25.7	5.8′	19°49.7	-11.2′	60.5′	40°07.6	13°02.0	11°45.1	35°13.2	44°56.6	89°09.8		
23	206°50.5	5.7′	20°00.9	-11.1′	60.6′		12°26.8	11°10.1	35°49.9	45°24.8	89°46.8		
	SD = 16.3′		Mer. pass. 08:40										

DUT1 = UT1-UTC = -0.1027 sec   ΔT = TT-UT1 = +69.2867 sec

2021 December 31 UT

h	Moon					Lunar Distance (objects with largest hourly LD delta)					
Fri	**GHA**	ν	**Dec**	*d*	**HP**	**-Mars**	**-Antares**	**+Spica**	**+Arcturus**	**+Regulus**	**+Adhara**
0	221°15.2	5.6'	**S**20°12.0	-11.0'	60.6'	11°51.5	10°35.2	36°26.6	45°53.2	90°23.8	113°26.1
1	235°39.7	5.4'	20°22.9	-10.8'	60.6'	11°16.1	10°00.6	37°03.4	46°21.7	91°00.9	113°42.7
2	250°04.2	5.3'	20°33.7	-10.7'	60.6'	10°40.8	9°26.3	37°40.2	46°50.4	91°38.0	113°59.1
3	264°28.5	5.2'	20°44.4	-10.6'	60.7'	10°05.5	8°52.3	38°17.1	47°19.3	92°15.1	114°15.4
4	278°52.7	5.1'	20°55.0	-10.4'	60.7'	9°30.1	8°18.8	38°54.0	47°48.4	92°52.3	114°31.5
5	293°16.8	5.0'	21°05.4	-10.3'	60.7'	8°54.7	7°45.9	39°30.9	48°17.7	93°29.5	114°47.5
6	307°40.7	4.8'	**S**21°15.7	-10.2'	60.7'	8°19.3	7°13.6	40°07.9	48°47.1	94°06.7	115°03.4
7	322°04.5	4.7'	21°25.8	-10.0'	60.7'	7°44.0	6°42.1	40°44.9	49°16.6	94°44.0	115°19.1
8	336°28.3	4.6'	21°35.9	-9.9'	60.8'	7°08.6		41°22.0	49°46.3	95°21.3	115°34.7
9	350°51.9	4.5'	21°45.7	-9.7'	60.8'	6°33.3		41°59.1	50°16.2	95°58.6	115°50.1
10	5°15.3	4.4'	21°55.4	-9.6'	60.8'	5°58.0		42°36.2	50°46.2	96°35.9	116°05.4
11	19°38.7	4.3'	22°05.0	-9.4'	60.8'	5°22.7		43°13.3	51°16.3	97°13.3	116°20.5
12	34°02.0	4.1'	**S**22°14.4	-9.3'	60.8'	4°47.6		43°50.5	51°46.6	97°50.7	
13	48°25.1	4.0'	22°23.7	-9.1'	60.9'	4°12.6		44°27.8	52°17.0	98°28.1	
14	62°48.1	3.9'	22°32.8	-9.0'	60.9'	3°37.8		45°05.0	52°47.6	99°05.5	
15	77°11.0	3.8'	22°41.8	-8.8'	60.9'	3°03.4		45°42.3	53°18.2	99°43.0	
16	91°33.8	3.7'	22°50.6	-8.6'	60.9'	2°29.6		46°19.6	53°49.0	100°20.5	
17	105°56.5	3.6'	22°59.3	-8.5'	60.9'			46°57.0	54°19.9	100°58.0	
18	120°19.1	3.5'	**S**23°07.7	-8.3'	60.9'			47°34.4	54°50.9	101°35.5	
19	134°41.6	3.4'	23°16.1	-8.2'	61.0'			48°11.8	55°22.1	102°13.1	
20	149°04.0	3.3'	23°24.2	-8.0'	61.0'			48°49.2	55°53.3	102°50.6	
21	163°26.3	3.2'	23°32.2	-7.8'	61.0'			49°26.6	56°24.6	103°28.2	
22	177°48.4	3.1'	23°40.1	-7.7'	61.0'			50°04.1	56°56.1	104°05.8	
23	192°10.5	3.0'	23°47.7	-7.5'	61.0'			50°41.6	57°27.6	104°43.4	
	SD = 16.5′		Mer. pass. 09:38								