

2019 November 15 to Nov. 17

Sun				Moon				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	183°53.5	S18°20.7		333°21.1	8.6'	N21°32.7	4.9'	56.8'
1	198°53.4	21.3		347°48.7	8.6'	21°37.6	4.8'	56.9'
2	213°53.3	22.0		2°16.2	8.5'	21°42.3	4.7'	56.9'
3	228°53.2	· · 22.6		16°43.7	8.5'	21°47.0	4.6'	56.9'
4	243°53.1	23.3		31°11.1	8.4'	21°51.5	4.5'	56.9'
5	258°53.0	23.9		45°38.5	8.3'	21°55.9	4.3'	56.9'
6	273°52.9	S18°24.6		60°05.8	8.3'	N22°00.2	4.2'	57.0'
7	288°52.8	25.2		74°33.1	8.2'	22°04.4	4.1'	57.0'
8	303°52.7	25.8		89°00.3	8.2'	22°08.4	4.0'	57.0'
9	318°52.6	· · 26.5		103°27.4	8.1'	22°12.3	3.9'	57.0'
10	333°52.5	27.1		117°54.5	8.1'	22°16.1	3.7'	57.0'
11	348°52.4	27.8		132°21.5	8.0'	22°19.8	3.6'	57.1'
12	3°52.3	S18°28.4		146°48.5	8.0'	N22°23.3	3.5'	57.1'
13	18°52.2	29.0		161°15.4	7.9'	22°26.7	3.3'	57.1'
14	33°52.1	29.7		175°42.3	7.8'	22°30.0	3.2'	57.1'
15	48°51.9	· · 30.3		190°09.1	7.8'	22°33.2	3.1'	57.1'
16	63°51.8	30.9		204°35.9	7.8'	22°36.2	3.0'	57.2'
17	78°51.7	31.6		219°02.6	7.7'	22°39.1	2.8'	57.2'
18	93°51.6	S18°32.2		233°29.3	7.7'	N22°41.9	2.7'	57.2'
19	108°51.5	32.8		247°55.9	7.6'	22°44.5	2.6'	57.2'
20	123°51.4	33.5		262°22.5	7.6'	22°47.0	2.4'	57.2'
21	138°51.3	· · 34.1		276°49.1	7.5'	22°49.4	2.3'	57.3'
22	153°51.2	34.7		291°15.6	7.5'	22°51.6	2.2'	57.3'
23	168°51.1	35.4		305°42.0	7.4'	22°53.7	2.0'	57.3'
	SD.=16.2	d=-0.6				S.D.=15.5		
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	183°51.0	S18°36.0		320°08.5	7.4'	N22°55.7	1.9'	57.3'
1	198°50.9	36.6		334°34.9	7.4'	22°57.5	1.8'	57.3'
2	213°50.8	37.3		349°01.2	7.3'	22°59.2	1.6'	57.4'
3	228°50.7	· · 37.9		3°27.5	7.3'	23°00.8	1.5'	57.4'
4	243°50.6	38.5		17°53.8	7.3'	23°02.2	1.4'	57.4'
5	258°50.4	39.2		23°20.0	7.2'	23°03.5	1.2'	57.4'
6	273°50.3	S18°39.8		46°46.2	7.2'	N23°04.7	1.1'	57.4'
7	288°50.2	40.4		61°12.4	7.2'	23°05.7	1.0'	57.5'
8	303°50.1	41.0		75°38.6	7.1'	23°06.6	0.8'	57.5'
9	318°50.0	· · 41.7		90°04.7	7.1'	23°07.4	0.7'	57.5'
10	333°49.9	42.3		104°30.8	7.1'	23°08.0	0.5'	57.5'
11	348°49.8	42.9		118°56.8	7.0'	23°08.5	0.4'	57.5'
12	3°49.7	S18°43.5		133°22.9	7.0'	N23°08.8	0.3'	57.6'
13	18°49.6	44.2		147°48.9	7.0'	23°09.0	0.1'	57.6'
14	33°49.4	44.8		162°14.9	7.0'	23°09.0	-0.0'	57.6'
15	48°49.3	· · 45.4		176°40.8	7.0'	23°09.0	-0.2'	57.6'
16	63°49.2	46.0		191°06.8	6.9'	23°08.7	-0.3'	57.6'
17	78°49.1	46.7		205°32.7	6.9'	23°08.4	-0.4'	57.6'
18	93°49.0	S18°47.3		219°58.6	6.9'	N23°07.9	-0.6'	57.7'
19	108°48.9	47.9		234°24.5	6.9'	23°07.2	-0.7'	57.7'
20	123°48.8	48.5		248°50.4	6.9'	23°06.4	-0.9'	57.7'
21	138°48.6	· · 49.1		263°16.3	6.9'	23°05.5	-1.0'	57.7'
22	153°48.5	49.8		277°42.1	6.8'	23°04.4	-1.1'	57.7'
23	168°48.4	50.4		292°08.0	6.8'	23°03.2	-1.3'	57.8'
	SD.=16.2	d=-0.6				S.D.=15.6		
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	183°48.3	S18°51.0		306°33.8	6.8'	N23°01.9	-1.4'	57.8'
1	198°48.2	51.6		320°59.6	6.8'	23°00.4	-1.6'	57.8'
2	213°48.1	52.2		335°25.4	6.8'	22°58.7	-1.7'	57.8'
3	228°48.0	· · 52.8		349°51.2	6.8'	22°57.0	-1.8'	57.8'
4	243°47.8	53.5		4°17.1	6.8'	22°55.1	-2.0'	57.9'
5	258°47.7	54.1		18°42.9	6.8'	22°53.0	-2.1'	57.9'
6	273°47.6	S18°54.7		33°08.7	6.8'	N22°50.8	-2.3'	57.9'
7	288°47.5	55.3		47°34.4	6.8'	22°48.5	-2.4'	57.9'
8	303°47.4	55.9		62°00.2	6.8'	22°46.0	-2.6'	57.9'
9	318°47.2	· · 56.5		76°26.0	6.8'	22°43.4	-2.7'	58.0'
10	333°47.1	57.1		90°51.8	6.8'	22°40.6	-2.8'	58.0'
11	348°47.0	57.7		105°17.7	6.8'	22°37.7	-3.0'	58.0'
12	3°46.9	S18°58.4		119°43.5	6.8'	N22°34.7	-3.1'	58.0'
13	18°46.8	59.0		134°09.3	6.8'	22°31.5	-3.3'	58.0'
14	33°46.6	18°59.6		148°35.1	6.8'	22°28.1	-3.4'	58.1'
15	48°46.5	19°00.2		163°00.9	6.8'	22°24.7	-3.5'	58.1'
16	63°46.4	00.8		177°26.8	6.8'	22°21.1	-3.7'	58.1'
17	78°46.3	01.4		191°52.6	6.9'	22°17.3	-3.8'	58.1'
18	93°46.1	S19°02.0		206°18.5	6.9'	N22°13.5	-3.9'	58.1'
19	108°46.0	02.6		220°44.4	6.9'	22°09.4	-4.1'	58.1'
20	123°45.9	03.2		235°10.3	6.9'	22°05.3	-4.2'	58.2'
21	138°45.8	· · 03.8		249°36.2	6.9'	22°01.0	-4.4'	58.2'
22	153°45.6	04.4		264°02.1	6.9'	21°56.6	-4.5'	58.2'
23	168°45.5	05.0		278°28.1	7.0'	21°52.0	-4.6'	58.2'
	SD.=16.2	d=-0.6				S.D.=15.8		

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

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

Day	Sun			Moon		
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 91-75%
15	15:34	15:29	11:45	01:51	14:18	
16	15:24	15:19	11:45	02:46	15:14	
17	15:13	15:08	11:45	03:42	16:11	

17 NOV 2019
SUNRISE

$\lambda = 37-02.2 \text{ N}$
 $\lambda = 076-17.5 \text{ W}$

ALMANAC

$$+2.01^\circ \left(\begin{array}{c} 40^\circ \text{N} \\ 37-02.2 \text{ N} \\ 35^\circ \text{N} \end{array} \right) +5^\circ$$

$$\begin{array}{c} 0646 \\ \textcircled{0639} \\ 0635 \end{array} \begin{array}{c} \nearrow \\ \nearrow \\ \nearrow \end{array} +11$$

$$\frac{5}{11} = \frac{2.01}{\textcircled{4.48}}$$

$$ZD = +5R$$

$$76.3^\circ \text{W} \xleftarrow{1.3^\circ} 75^\circ \text{W}$$

$$\textcircled{0644} \xleftarrow{+5m} 0639$$

$$\frac{15^\circ}{60m} = \frac{1.3^\circ}{5.2m}$$