

# Navigation and Nautical Astronomy

*Seventh Edition*



A Textbook on Navigation  
and Nautical Astronomy



Prepared for the Instruction of Midshipmen  
at the United States Naval Academy

*Original Edition (1926) by*

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Extracts from *Nautical Almanac 1939*

CORRECTIONS TO BE APPLIED TO THE OBSERVED ALTITUDE OF A STAR OR OF THE SUN'S LOWER LIMB, TO FIND THE TRUE ALTITUDE

TABLE A

TABLE B

TABLE C

Observed Altitude	☉		Date	☉		Correction for Height of Eye			
	Sun's Corr.	Star's Corr.		Additional Sun's Corr.	Height of Eye (feet)	Corr.	Height of Eye (feet)	Corr.	
6 30	+ 8.2	-7.9	Jan. 1	+0.3	0	0.0	100	- 9.8	
6 40	8.4	7.7			1	-1.0	150	12.0	
6 50	8.6	7.6	15	+0.3	2	1.4	200	13.9	
7 0	8.7	7.4			3	1.7	250	15.5	
7 10	8.9	7.2	Feb. 1	+0.3	4	2.0	300	17.0	
			15	+0.2	5	-2.2	350	-18.8	
7 20	+ 9.0	-7.1			6	2.4	400	19.6	
7 30	9.2	7.0	Mar. 1	+0.2	7	2.6	450	20.8	
7 40	9.3	6.8			8	2.8	500	21.9	
7 50	9.5	6.7	15	+0.1	9	2.9	550	23.0	
8 0	9.6	6.6			10	-3.1	600	-24.0	
8 10	+ 9.7	-6.4	Apr. 1	0.0	11	3.2	650	25.0	
8 20	9.8	6.3			12	3.4	700	25.9	
8 30	10.0	6.2	15	0.0	13	3.5	750	26.8	
8 40	10.1	6.1			14	3.7	800	27.7	
8 50	10.2	6.0	May 1	-0.1	15	-3.8	850	-28.6	
			15	-0.1	16	3.9	900	29.4	
9 0	+10.3	-5.9			17	4.0	950	30.2	
9 20	10.5	5.7	June 1	-0.2	18	4.1	1000	31.0	
9 40	10.6	5.5			19	4.3	1050	31.8	
10 0	10.8	5.3	15	-0.2	20	-4.4	1100	-32.5	
10 20	11.0	5.2			21	4.5	1150	33.2	
10 40	+11.2	-5.0	July 1	-0.2	22	4.6	1200	34.0	
11 0	11.3	4.9			23	4.7	1250	34.6	
11 30	11.5	4.7	15	-0.2	24	4.8	1300	35.3	
12 0	11.7	4.5			25	-4.0	1350	-36.0	
12 30	11.9	4.3	Aug. 1	-0.2	26	5.0	1400	36.7	
			15	-0.2	27	5.1	1450	37.3	
13 0	+12.0	-4.1			28	5.2	1500	38.0	
13 30	12.2	4.0	Sept. 1	-0.1	29	5.3	1550	38.6	
14 0	12.3	3.8			30	-5.4	1600	-39.2	
15 0	12.6	3.6	15	-0.1	31	5.4	1650	39.8	
16 0	12.8	3.4			32	5.5	1700	40.5	
			Oct. 1	0.0	33	5.6	1800	41.6	
17 0	+13.0	-3.2			34	5.7	1900	42.7	
18 0	13.2	3.0	15	+0.1	35	-5.8	2000	-43.8	
19 0	13.3	2.8			37	6.0	2100	44.9	
20 0	13.5	2.6	Nov. 1	+0.2	39	6.1	2200	46.0	
22 0	13.7	2.4			41	6.3	2300	47.0	
			15	+0.2	43	6.4	2400	47.9	
24 0	+14.0	-2.2			45	-6.6	2500	-49.0	
26 0	14.1	2.0	Dec. 1	+0.3	47	6.7	2600	50.0	
28 0	14.3	1.8			49	6.9	2700	50.9	
30 0	14.4	1.7	15	+0.3	51	7.0	2800	51.9	
32 0	14.6	1.6			53	7.1	2900	52.8	
			31	+0.3	55	-7.3	3000	-53.7	
34 0	+14.7	-1.4			60	7.6	3100	54.6	
36 0	14.8	1.3			65	7.9	3200	55.4	
38 0	14.9	1.3			70	8.2	3300	56.3	
40 0	15.0	1.2			75	8.5	3400	57.1	
45 0	15.1	1.0							
50 0	+15.3	-0.8							
55 0	15.4	0.7							
60 0	15.5	0.6							
65 0	15.6	0.5							
70 0	15.7	0.4							
75 0	+15.8	-0.3							
80 0	15.8	0.2							
85 0	15.9	-0.1							
90 0	+16.0	0.0							

CHIRRE FOR LOWER LIMB

Horizontal

Obs. Alt. Lower Limb	54'	55'	56'	57'
5.5	+59.0	+60.0	+62.1	+63.4
6.0	60.2	61.4	62.7	64.0
6.5	60.7	61.9	63.2	64.6
7.0	61.1	62.4	63.6	64.9
7.5	61.5	63.7	64.0	65.8
8.0	+61.8	+63.1	+64.3	+66.8
8.5	62.1	63.8	64.9	65.9
9.0	62.3	63.6	64.8	66.1
9.5	62.5	63.8	65.0	66.8
10.0	62.7	64.0	65.2	66.5
11	+63.0	+64.2	+65.5	+66.7
12	63.2	64.4	65.7	66.9
13	63.3	64.6	65.8	67.0
14	63.4	64.8	65.9	67.1
15	63.4	64.6	65.9	67.1
16	+63.4	+64.6	+65.8	+67.1
17	63.3	64.5	65.8	67.0
18	63.2	64.4	65.0	66.9
19	63.1	64.3	65.5	66.7
20	62.9	64.1	65.3	66.5
21	+62.7	+63.9	+65.1	+66.8
22	62.5	63.7	64.9	66.1
23	62.2	63.4	64.8	65.9
24	62.0	63.1	64.3	65.5
25	61.7	62.9	64.0	65.2
26	+61.3	+62.5	+63.7	+64.9
27	61.0	62.2	63.3	64.5
28	60.7	61.8	63.0	64.1
29	60.3	61.4	62.6	63.7
30	59.9	61.0	62.2	63.3
31	+59.5	+60.6	+61.7	+62.9
32	59.0	60.3	61.3	62.4
33	58.6	59.7	60.8	61.9
34	58.1	59.2	60.3	61.4
35	57.7	58.7	59.8	60.9
36	+57.2	+58.2	+59.3	+60.4
37	56.7	57.7	58.8	59.9
38	56.1	57.2	58.3	59.3
39	55.6	56.6	57.7	58.7
40	55.0	56.1	57.1	58.1
41	+54.4	+55.5	+56.5	+57.5
42	53.9	54.9	55.9	56.9
43	53.3	54.8	55.3	56.3
44	52.7	53.7	54.8	55.8
45	52.0	53.0	54.0	55.0

Extracts from *Nautical Almanac 1938*

TABLE D

CORRECTION TO THE OBSERVED ALTITUDE OF THE MOON  
FOR REFRACTION, PARALLAX, AND SEMIDIAMETER

OF A STAR OR  
ALTITUDE

TABLE C

Correction for Height of Eye

Height of Eye (feet)	Corr.
0.0	- 9.8
1.0	12.0
1.4	13.9
1.7	15.5
2.0	17.0
2.2	-18.3
2.4	19.6
2.6	20.8
2.8	21.9
2.9	23.0
3.1	-24.0
3.2	25.0
3.4	25.9
3.5	26.8
3.7	27.7
3.8	-28.6
3.9	29.4
4.0	30.2
4.1	31.0
4.3	31.8
4.4	-32.5
4.5	33.2
4.6	34.0
4.7	34.6
4.8	35.3
4.9	-36.0
5.0	36.7
5.1	37.3
5.2	38.0
5.3	38.6
5.4	-39.2
5.4	39.8
5.5	40.5
5.6	41.6
5.7	42.7
5.8	-43.8
6.0	44.9
6.1	46.0
6.3	47.0
6.4	47.9
6.6	-49.0
6.7	50.0
6.9	50.9
7.0	51.9
7.1	52.8
7.3	-53.7
7.6	54.6
7.9	55.4
8.2	56.3
8.5	57.1
8.8	-58.0
9.0	58.8
9.3	59.6
9.6	60.4
9.8	-62.0

Obs. Alt. Lower Limb	Lower Limb								Obs. Alt. Upper Limb	Upper Limb							
	Horizontal Parallax									Horizontal Parallax							
	54'	55'	56'	57'	58'	59'	60'	61'		54'	55'	56'	57'	58'	59'	60'	61'
5.5	+59.6	+60.9	+62.1	+63.4	+64.7	+66.0	+67.3	+68.5	5.5	+39.4	+30.3	+20.9	+31.6	+32.3	+33.0	+33.7	+34.4
6.0	60.2	61.4	62.7	64.0	65.3	66.5	67.8	69.1	6.0	30.1	30.8	31.5	32.3	33.0	33.7	34.4	35.1
6.5	60.7	61.9	63.2	64.5	65.8	67.0	68.3	69.6	6.5	30.7	31.4	32.1	32.8	33.5	34.3	35.0	35.7
7.0	61.1	62.4	63.6	64.9	66.2	67.4	68.7	70.0	7.0	31.2	31.9	32.6	33.3	34.0	34.8	35.5	36.2
7.5	61.5	62.7	64.0	65.3	66.5	67.8	69.1	70.4	7.5	31.6	32.3	33.0	33.7	34.5	35.2	35.9	36.6
8.0	+61.8	+63.1	+64.3	+65.6	+66.9	+68.1	+69.4	+70.7	8.0	+32.0	+32.7	+33.4	+34.1	+34.8	+35.5	+36.2	+37.0
8.5	62.1	63.3	64.6	65.9	67.1	68.4	69.7	70.9	8.5	32.3	33.0	33.7	34.4	35.1	35.9	36.6	37.3
9.0	62.3	63.6	64.8	66.1	67.4	68.6	69.9	71.1	9.0	32.6	33.3	34.0	34.7	35.4	36.1	36.8	37.5
9.5	62.5	63.8	65.0	66.3	67.6	68.8	70.1	71.3	9.5	32.8	33.5	34.2	34.9	35.6	36.3	37.0	37.7
10.0	62.7	64.0	65.2	66.5	67.7	69.0	70.3	71.5	10.0	33.0	33.7	34.4	35.1	35.8	36.5	37.2	37.9
11	+63.0	+64.2	+65.5	+66.7	+68.0	+69.3	+70.5	+71.8	11	+33.3	+34.0	+34.7	+35.4	+36.2	+36.9	+37.6	+38.3
12	63.2	64.4	65.7	66.9	68.2	69.5	70.7	72.0	12	33.6	34.3	35.0	35.7	36.4	37.1	37.8	38.5
13	63.3	64.6	65.8	67.0	68.3	69.6	70.8	72.1	13	33.7	34.4	35.1	35.8	36.5	37.2	37.9	38.6
14	63.4	64.6	65.9	67.1	68.4	69.6	70.9	72.1	14	33.8	34.5	35.2	35.9	36.6	37.3	38.0	38.7
16	63.4	64.6	65.9	67.1	68.4	69.6	70.9	72.1	15	33.8	34.5	35.2	35.9	36.6	37.3	38.0	38.7
10	+63.4	+64.6	+65.8	+67.1	+68.3	+69.6	+70.8	+72.0	16	+33.8	+34.5	+35.2	+35.9	+36.6	+37.3	+38.0	+38.7
17	63.3	64.5	65.8	67.0	68.2	69.5	70.7	71.9	17	33.8	34.5	35.1	35.8	36.5	37.2	37.9	38.6
18	63.2	64.4	65.6	66.9	68.1	69.3	70.6	71.8	18	33.7	34.3	35.0	35.7	36.4	37.1	37.7	38.4
19	63.1	64.3	65.5	66.7	67.9	69.1	70.3	71.5	19	33.5	34.2	34.9	35.6	36.2	36.9	37.5	38.2
20	63.0	64.1	65.3	66.5	67.7	68.9	70.1	71.3	20	33.4	34.0	34.7	35.4	36.0	36.7	37.4	38.1
21	+62.7	+63.9	+65.1	+66.3	+67.5	+68.7	+70.0	+71.2	21	+33.2	+33.9	+34.5	+35.2	+35.8	+36.5	+37.2	+37.8
22	62.5	63.7	64.9	66.1	67.3	68.5	69.7	70.9	22	33.0	33.6	34.3	34.9	35.6	36.3	36.9	37.6
23	62.2	63.4	64.6	65.8	67.0	68.2	69.4	70.6	23	32.7	33.4	34.0	34.7	35.3	36.0	36.6	37.3
24	62.0	63.1	64.3	65.5	66.7	67.9	69.1	70.3	24	32.5	33.1	33.7	34.4	35.0	35.7	36.3	37.0
25	61.7	62.9	64.0	65.2	66.4	67.6	68.8	69.9	25	32.2	32.8	33.4	34.1	34.7	35.4	36.0	36.6
26	+61.3	+62.5	+63.7	+64.9	+66.0	+67.2	+68.4	+69.6	26	+31.9	+32.5	+33.1	+33.7	+34.4	+35.0	+35.6	+36.2
27	61.0	62.2	63.3	64.5	65.7	66.8	68.0	69.2	27	31.5	32.1	32.8	33.4	34.0	34.6	35.2	35.8
28	60.7	61.8	63.0	64.1	65.3	66.4	67.6	68.8	28	31.2	31.8	32.4	33.0	33.6	34.2	34.8	35.4
29	60.3	61.4	62.6	63.7	64.9	66.0	67.2	68.4	29	30.8	31.4	32.0	32.6	33.2	33.8	34.4	35.0
30	59.9	61.0	62.2	63.3	64.4	65.6	66.7	67.9	30	30.4	31.0	31.6	32.2	32.8	33.4	34.0	34.6
31	+59.5	+60.6	+61.7	+62.9	+64.0	+65.1	+66.2	+67.4	31	+30.0	+30.6	+31.2	+31.8	+32.3	+32.9	+33.5	+34.1
32	59.0	60.2	61.3	62.4	63.5	64.7	65.8	66.9	32	29.6	30.1	30.7	31.3	31.9	32.5	33.0	33.6
33	58.6	59.7	60.8	61.9	63.1	64.2	65.3	66.4	33	29.1	29.7	30.3	30.9	31.4	32.0	32.5	33.1
34	58.1	59.2	60.3	61.4	62.5	63.6	64.7	65.8	34	28.7	29.2	29.8	30.4	30.9	31.5	32.0	32.6
35	57.7	58.7	59.8	60.9	62.0	63.1	64.2	65.3	35	28.2	28.7	29.3	29.8	30.4	30.9	31.5	32.0
36	+57.2	+58.2	+59.3	+60.4	+61.5	+62.6	+63.7	+64.7	36	+27.7	+28.2	+28.8	+29.3	+29.8	+30.4	+30.9	+31.5
37	56.7	57.7	58.8	59.8	60.9	62.0	63.1	64.2	37	27.2	27.7	28.2	28.8	29.3	29.8	30.3	30.9
38	56.1	57.2	58.2	59.3	60.4	61.4	62.5	63.6	38	26.7	27.2	27.7	28.2	28.7	29.2	29.7	30.3
39	55.6	56.6	57.7	58.7	59.8	60.8	61.9	62.9	39	26.1	26.6	27.1	27.6	28.1	28.6	29.1	29.6
40	55.0	56.1	57.1	58.1	59.2	60.2	61.3	62.3	40	25.6	26.1	26.6	27.1	27.6	28.0	28.5	29.0
41	+54.4	+55.5	+56.5	+57.5	+58.6	+59.6	+60.6	+61.6	41	+25.0	+25.5	+26.0	+26.4	+26.9	+27.4	+27.8	+28.4
42	53.9	54.9	55.9	56.9	57.9	58.9	59.9	60.9	42	24.4	24.9	25.4	25.8	26.3	26.8	27.3	27.7
43	53.3	54.3	55.3	56.3	57.3	58.3	59.3	60.3	43	23.8	24.3	24.7	25.2	25.6	26.1	26.6	27.0
44	52.7	53.7	54.6	55.6	56.6	57.6	58.6	59.6	44	23.2	23.6	24.1	24.5	25.0	25.4	25.9	26.3
45	52.0	53.0	54.0	55.0	56.0	57.0	58.0	59.0	45	22.6	23.0	23.4	23.9	24.3	24.7	25.2	25.6

For Height of Eye Correction See Table C



Extracts from *Nautical Almanac 1939*

TABLE D—Continued

CORRECTION TO THE OBSERVED ALTITUDE OF THE MOON  
FOR REFRACTION, PARALLAX, AND SEMIDIAMETER

Main table with columns for Lower Limb (Horizontal Parallax) and Upper Limb (Horizontal Parallax) for altitudes from 40 to 90 degrees. Columns include 54', 55', 56', 57', 58', 59', 60', 61' for both limbs.

For Height of Eye Correction See Table C

Vertical table on the right side showing G.C.T. and other astronomical data for various altitudes (0 to 90 degrees) and times (00 to 50 minutes).