

**H. O. NO. 202:  
NOON-INTERVAL  
TABLES**

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**ANONYMOUS**

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# NOON-INTERVAL TABLES

FIRST EDITION

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### STATUTES OF AUTHORIZATION

There shall be a Hydrographic Office attached to the Bureau of Navigation in the Navy Department, for the improvement of the means for navigating safely the vessels of the Navy and of the mercantile marine, by providing, under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions for the use of all vessels of the United States, and for the benefit and use of navigators generally. (R. S. 431.)

The Secretary of the Navy is authorized to cause to be prepared, at the Hydrographic Office attached to the Bureau of Navigation in the Navy Department, maps, charts, and nautical books relating to and required in navigation, and to publish and furnish them to navigators at the cost of printing and paper, and to purchase the plates and copyrights of such existing maps, charts, navigators, sailing directions, and instructions, as he may consider necessary, and when he may deem it expedient to do so, and under such regulations and instructions as he may prescribe. (R. S. 432.)

## NOON-INTERVAL TABLES

The result computed from the morning time-sight of the sun, usually stated as the local apparent time, gives also the angle at the pole, or difference of longitude expressed in hours, minutes, and seconds, between the meridian of the observer and the meridian passing through the geographical position of the sun, or that place on the surface of the globe which has the sun in its zenith at the instant of observation. When the observer remains stationary, the interval of time that must elapse before the sun crosses his meridian, or the arrival of apparent noon, is therefore given by the number of hours, minutes, and seconds in this angle at the pole, or hour-angle, which interval is equal to the remainder found by subtracting from 12 hours the local apparent time. But when the observer is changing his place, if his movement has a component of change of place to the eastward or to the westward, that is, a component of change of longitude, the interval to noon will be shortened or lengthened according as his change of place causes him to move to the eastward to meet the sun, or to the westward to be overtaken by the sun.

The rate of change of longitude of the sun's geographical position in its diurnal path from east to west is  $15^{\circ}$  or 900' per hour, and if to this be added the hourly change in longitude of the observer when his change of place is to the eastward, or if from it be subtracted his hourly change in longitude when his change of place is to the westward, the result will be the rate of approach per hour of the meridian of the sun toward the meridian of the observer, expressed in minutes of arc of longitude. And this rate of approach being divided into the number of minutes of arc expressing the difference of longitude which separates the meridians of the sun and the observer at the instant of the morning time-sight, will give the interval to noon expressed in hours and fractions of an hour, provided the course and speed of the vessel remain uniform or, at least, the rate of change of longitude continues the same throughout.

With the aim of obviating the necessity on the part of navigators of arithmetical computations in finding the interval to noon for use in setting the ship's clock to the time of apparent noon and in ascertaining the run of the vessel from the morning time-sight until noon, the midshipmen of the class of 1921 of the United States Naval Academy, serving in the U. S. S. *Wisconsin* of the Midshipmen Practice Squadron, during the summer of 1919, worked out values extending throughout the scope of the present tables, under the direction of Lieut. Commander W. D. La Mont, United States Navy, by proceeding according to the formula deduced by Midshipman (now Lieut. Commander) Chapman Coleman Todd, jr., of the class of 1913 of the United States Naval Academy. By subsequent revision of this work in the Hydrographic Office the results now presented in the tables were obtained.

Side by side in each double column of the tables the interval to noon is stated in hours and decimals of an hour to the fourth decimal place, and also in hours, minutes, and seconds, reckoned from the local apparent time stated at the head of the column,

and corresponding to values of the hourly change of longitude of the observer ranging from 1' to 40', both to the eastward and to the westward. The local apparent times for which the intervals to noon are tabulated extend from 7 a. m. to 10 a. m. every 30 seconds.

For purposes of illustration the following example is given:

The navigator of a vessel steaming on a course  $66^\circ$  (true) finds from an a. m. observation of the sun, taken at W. T.  $8^h 00^m 02^s.5$ , that the L. A. T. is  $8^h 17^m 30^s$ , corresponding to the latitude by D. R.  $38^\circ 03'.2$  N. The vessel continues on this course at a speed of 11.7 knots until noon. Find the interval that will have elapsed when noon arrives, also the run to noon, and the change that will be necessary in the setting of the watch so that it will indicate 12 o'clock when noon arrives.

From the Traverse Tables the departure corresponding to the distance 11.7 on course  $66^\circ$ , is 10.69, which, in latitude  $38^\circ$ , is equivalent to a difference of longitude of 13.'6. Entering the Noon-Interval Tables in the column whose heading is L. A. T.  $8^h 17^m 30^s$ , and interpolating between the tabulated values for 13' hourly change of longitude to the eastward and 14' hourly change of longitude to the eastward, the interval to noon corresponding to 13.'6 hourly change of longitude to the eastward will be found to be  $3^h.6531$ , or  $3^h 39^m 11^s$ . Multiplying 11.7 by 3.6531 gives 42.7 nautical miles as the run to noon. The W. T. of noon would be  $8^h 00^m 02^s.5$  plus  $3^h 39^m 11^s$ , or  $11^h 39^m 13^s.5$ ; hence the watch would have to be set ahead  $20^m 46^s.5$  in order to indicate 12 o'clock upon the arrival of apparent noon.



Hourly change in longitude to eastward.	LOCAL APPARENT TIME OF BEGINNING OF INTERVAL.								Hourly change in longitude to eastward.
	7 <sup>h</sup> 00 <sup>m</sup> 00 <sup>s</sup>		7 <sup>h</sup> 00 <sup>m</sup> 30 <sup>s</sup>		7 <sup>h</sup> 01 <sup>m</sup> 00 <sup>s</sup>		7 <sup>h</sup> 01 <sup>m</sup> 30 <sup>s</sup>		
	Interval to noon.		Interval to noon.		Interval to noon.		Interval to noon.		
	Hours.	H. M. S.	Hours.	H. M. S.	Hours.	H. M. S.	Hours.	H. M. S.	
1	4.9945	4 59 40	4.9862	4 59 10	4.9778	4 58 40	4.9695	4 58 10	1
2	4.9889	4 59 20	4.9807	4 58 51	4.9723	4 58 20	4.9639	4 57 50	2
3	4.9834	4 59 00	4.9751	4 58 31	4.9667	4 58 00	4.9584	4 57 30	3
4	4.9779	4 58 40	4.9696	4 58 11	4.9612	4 57 40	4.9529	4 57 10	4
5	4.9724	4 58 21	4.9641	4 57 51	4.9557	4 57 20	4.9474	4 56 51	5
6	4.9669	4 58 01	4.9586	4 57 31	4.9503	4 57 01	4.9419	4 56 31	6
7	4.9614	4 57 41	4.9531	4 57 11	4.9448	4 56 41	4.9365	4 56 11	7
8	4.9559	4 57 21	4.9476	4 56 51	4.9394	4 56 22	4.9310	4 55 51	8
9	4.9505	4 57 01	4.9422	4 56 31	4.9340	4 56 02	4.9256	4 55 32	9
10	4.9451	4 56 42	4.9368	4 56 12	4.9286	4 55 43	4.9203	4 55 13	10
11	4.9407	4 56 23	4.9314	4 55 53	4.9232	4 55 24	4.9149	4 54 53	11
12	4.9343	4 56 03	4.9260	4 55 34	4.9178	4 55 04	4.9096	4 54 34	12
13	4.9279	4 55 43	4.9206	4 55 15	4.9124	4 54 45	4.9042	4 54 15	13
14	4.9235	4 55 24	4.9162	4 54 55	4.9070	4 54 25	4.8988	4 53 56	14
15	4.9181	4 55 05	4.9108	4 54 35	4.9016	4 54 06	4.8934	4 53 37	15
16	4.9127	4 54 45	4.9045	4 54 16	4.8962	4 53 46	4.8880	4 53 17	16
17	4.9073	4 54 26	4.8992	4 53 57	4.8909	4 53 27	4.8827	4 52 58	17
18	4.9019	4 54 07	4.8938	4 53 37	4.8856	4 53 08	4.8774	4 52 39	18
19	4.8966	4 53 47	4.8885	4 53 18	4.8803	4 52 49	4.8721	4 52 19	19
20	4.8913	4 53 29	4.8832	4 52 59	4.8750	4 52 30	4.8668	4 52 00	20
21	4.8860	4 53 09	4.8779	4 52 40	4.8697	4 52 11	4.8615	4 51 41	21
22	4.8807	4 52 50	4.8726	4 52 21	4.8644	4 51 52	4.8562	4 51 22	22
23	4.8754	4 52 31	4.8673	4 52 02	4.8592	4 51 33	4.8509	4 51 03	23
24	4.8701	4 52 12	4.8621	4 51 44	4.8540	4 51 14	4.8457	4 50 45	24
25	4.8649	4 51 51	4.8568	4 51 25	4.8487	4 50 55	4.8405	4 50 26	25
26	4.8596	4 51 34	4.8516	4 51 06	4.8434	4 50 36	4.8353	4 50 07	26
27	4.8543	4 51 16	4.8463	4 50 47	4.8381	4 50 17	4.8301	4 49 48	27
28	4.8491	4 50 51	4.8410	4 50 28	4.8329	4 49 58	4.8249	4 49 29	28
29	4.8439	4 50 38	4.8358	4 50 09	4.8277	4 49 40	4.8197	4 49 11	29
30	4.8387	4 50 10	4.8306	4 49 51	4.8226	4 49 21	4.8145	4 48 52	30
31	4.8335	4 50 00	4.8254	4 49 32	4.8174	4 49 02	4.8093	4 48 33	31
32	4.8283	4 49 43	4.8202	4 49 13	4.8122	4 48 44	4.8042	4 48 15	32
33	4.8231	4 49 23	4.8151	4 48 55	4.8071	4 48 26	4.7991	4 47 56	33
34	4.8179	4 49 04	4.8100	4 48 37	4.8019	4 48 07	4.7939	4 47 37	34
35	4.8128	4 48 46	4.8049	4 48 18	4.7968	4 47 48	4.7888	4 47 19	35
36	4.8076	4 48 27	4.7997	4 47 59	4.7916	4 47 30	4.7836	4 47 01	36
37	4.8025	4 48 09	4.7946	4 47 40	4.7865	4 47 11	4.7785	4 46 43	37
38	4.7974	4 47 51	4.7895	4 47 22	4.7814	4 46 53	4.7734	4 46 24	38
39	4.7923	4 47 32	4.7843	4 47 03	4.7763	4 46 35	4.7683	4 46 06	39
40	4.7872	4 47 14	4.7791	4 46 45	4.7713	4 46 17	4.7633	4 45 48	40

Hourly change in longitude to eastward.	LOCAL APPARENT TIME OF BEGINNING OF INTERVAL.								Hourly change in longitude to eastward.
	7 <sup>h</sup> 02 <sup>m</sup> 00 <sup>s</sup>		7 <sup>h</sup> 02 <sup>m</sup> 30 <sup>s</sup>		7 <sup>h</sup> 03 <sup>m</sup> 00 <sup>s</sup>		7 <sup>h</sup> 03 <sup>m</sup> 30 <sup>s</sup>		
	Interval to noon		Interval to noon.		Interval to noon.		Interval to noon		
	Hours.	H. M. S.	Hours.	H. M. S.	Hours.	H. M. S.	Hours.	H. M. S.	
1	4 9612	4 57 40	4 9520	4 57 10	4 9446	4 56 41	4 9363	4 56 11	1
2	4 9557	4 57 20	4 9474	4 56 50	4 9391	4 56 21	4 9309	4 55 51	2
3	4 9502	4 57 01	4 9419	4 56 30	4 9336	4 56 01	4 9254	4 55 31	3
4	4 9447	4 56 41	4 9364	4 56 11	4 9281	4 55 41	4 9199	4 55 12	4
5	4 9393	4 56 21	4 9309	4 55 51	4 9227	4 55 22	4 9144	4 54 52	5
6	4 9338	4 56 02	4 9255	4 55 31	4 9173	4 55 02	4 9080	4 54 32	6
7	4 9294	4 55 42	4 9200	4 55 12	4 9119	4 54 42	4 9035	4 54 13	7
8	4 9220	4 55 22	4 9146	4 54 52	4 9064	4 54 23	4 8981	4 53 53	8
9	4 9176	4 55 03	4 9092	4 54 33	4 9010	4 54 04	4 8928	4 53 34	9
10	4 9121	4 54 43	4 9038	4 54 14	4 8956	4 53 45	4 8874	4 53 15	10
11	4 9077	4 54 24	4 8985	4 53 54	4 8902	4 53 25	4 8820	4 52 55	11
12	4 9013	4 54 05	4 8932	4 53 35	4 8840	4 53 06	4 8767	4 52 36	12
13	4 8960	4 53 46	4 8878	4 53 15	4 8796	4 52 47	4 8714	4 52 17	13
14	4 8906	4 53 26	4 8824	4 52 56	4 8743	4 52 27	4 8660	4 51 58	14
15	4 8853	4 53 07	4 8770	4 52 37	4 8689	4 52 08	4 8607	4 51 39	15
16	4 8799	4 52 48	4 8717	4 52 18	4 8636	4 51 49	4 8554	4 51 20	16
17	4 8746	4 52 29	4 8664	4 51 59	4 8583	4 51 30	4 8501	4 51 00	17
18	4 8693	4 52 10	4 8611	4 51 40	4 8530	4 51 11	4 8448	4 50 41	18
19	4 8640	4 51 50	4 8558	4 51 21	4 8477	4 50 52	4 8395	4 50 22	19
20	4 8587	4 51 31	4 8505	4 51 02	4 8424	4 50 33	4 8342	4 50 03	20
21	4 8535	4 51 13	4 8452	4 50 43	4 8371	4 50 14	4 8290	4 49 44	21
22	4 8482	4 50 54	4 8400	4 50 24	4 8319	4 49 55	4 8238	4 49 26	22
23	4 8429	4 50 34	4 8348	4 50 05	4 8267	4 49 36	4 8186	4 49 07	23
24	4 8377	4 50 16	4 8296	4 49 46	4 8215	4 49 17	4 8134	4 48 48	24
25	4 8325	4 49 57	4 8244	4 49 27	4 8163	4 48 58	4 8082	4 48 30	25
26	4 8273	4 49 38	4 8192	4 49 09	4 8111	4 48 39	4 8030	4 48 11	26
27	4 8220	4 49 19	4 8140	4 48 50	4 8059	4 48 21	4 7978	4 47 52	27
28	4 8168	4 49 00	4 8088	4 48 31	4 8007	4 48 03	4 7926	4 47 33	28
29	4 8116	4 48 42	4 8036	4 48 12	4 7955	4 47 44	4 7874	4 47 15	29
30	4 8065	4 48 23	4 7984	4 47 54	4 7903	4 47 25	4 7823	4 46 56	30
31	4 8013	4 48 05	4 7933	4 47 35	4 7852	4 47 06	4 7772	4 46 38	31
32	4 7962	4 47 47	4 7881	4 47 17	4 7801	4 46 48	4 7721	4 46 20	32
33	4 7911	4 47 28	4 7830	4 46 58	4 7750	4 46 30	4 7670	4 46 01	33
34	4 7859	4 47 09	4 7778	4 46 40	4 7698	4 46 11	4 7619	4 45 43	34
35	4 7808	4 46 51	4 7727	4 46 21	4 7647	4 45 52	4 7568	4 45 24	35
36	4 7757	4 46 32	4 7676	4 46 03	4 7596	4 45 34	4 7517	4 45 06	36
37	4 7706	4 46 14	4 7625	4 45 45	4 7546	4 45 16	4 7466	4 44 48	37
38	4 7655	4 45 56	4 7574	4 45 27	4 7495	4 44 58	4 7416	4 44 30	38
39	4 7604	4 45 37	4 7524	4 45 08	4 7444	4 44 40	4 7365	4 44 11	39
40	4 7553	4 45 19	4 7473	4 44 50	4 7394	4 44 20	4 7314	4 43 53	40

INTERVAL TO NOON

Hourly change in longitude to eastward.	LOCAL APPARENT TIME OF BEGINNING OF INTERVAL.								Hourly change in longitude to eastward.
	7 <sup>h</sup> 04 <sup>m</sup> 00 <sup>s</sup>		7 <sup>h</sup> 04 <sup>m</sup> 30 <sup>s</sup>		7 <sup>h</sup> 05 <sup>m</sup> 00 <sup>s</sup>		7 <sup>h</sup> 05 <sup>m</sup> 30 <sup>s</sup>		
	Interval to noon.		Interval to noon.		Interval to noon.		Interval to noon.		
	Hours.	H. M. S.	Hours.	H. M. S.	Hours.	H. M. S.	Hours.	H. M. S.	
1	4 0278	4 55 40	4 0196	4 55 11	4 0112	4 54 40	4 0020	4 54 10	1
2	4 0223	4 55 20	4 0141	4 54 51	4 0057	4 54 21	4 8975	4 53 51	2
3	4 0168	4 55 00	4 0086	4 54 31	4 0002	4 54 01	4 8921	4 53 31	3
4	4 0114	4 54 41	4 0032	4 54 12	4 8948	4 53 41	4 8867	4 53 12	4
5	4 0060	4 54 21	4 8978	4 53 52	4 8894	4 53 22	4 8813	4 52 52	5
6	4 0006	4 54 02	4 8924	4 53 33	4 8840	4 53 02	4 8759	4 52 33	6
7	4 8952	4 53 43	4 8870	4 53 13	4 8786	4 52 43	4 8705	4 52 14	7
8	4 8898	4 53 23	4 8816	4 52 54	4 8732	4 52 24	4 8651	4 51 54	8
9	4 8845	4 53 04	4 8763	4 52 35	4 8679	4 52 05	4 8598	4 51 35	9
10	4 8791	4 52 45	4 8709	4 52 15	4 8626	4 51 45	4 8544	4 51 16	10
11	4 8737	4 52 25	4 8656	4 51 56	4 8573	4 51 26	4 8491	4 50 57	11
12	4 8684	4 52 06	4 8603	4 51 37	4 8520	4 51 07	4 8438	4 50 38	12
13	4 8630	4 51 47	4 8550	4 51 18	4 8467	4 50 48	4 8385	4 50 19	13
14	4 8577	4 51 28	4 8497	4 50 58	4 8414	4 50 29	4 8332	4 49 59	14
15	4 8524	4 51 09	4 8444	4 50 39	4 8361	4 50 10	4 8279	4 49 40	15
16	4 8470	4 50 49	4 8391	4 50 20	4 8308	4 49 51	4 8226	4 49 21	16
17	4 8419	4 50 31	4 8338	4 50 02	4 8255	4 49 32	4 8173	4 49 02	17
18	4 8366	4 50 12	4 8285	4 49 42	4 8203	4 49 13	4 8121	4 48 43	18
19	4 8314	4 49 53	4 8232	4 49 24	4 8150	4 48 54	4 8060	4 48 24	19
20	4 8261	4 49 34	4 8179	4 49 04	4 8098	4 48 35	4 8016	4 48 06	20
21	4 8208	4 49 15	4 8127	4 48 45	4 8046	4 48 16	4 7964	4 47 47	21
22	4 8156	4 48 56	4 8075	4 48 27	4 7994	4 47 57	4 7912	4 47 28	22
23	4 8104	4 48 37	4 8023	4 48 08	4 7942	4 47 39	4 7861	4 47 10	23
24	4 8052	4 48 19	4 7972	4 47 50	4 7890	4 47 20	4 7809	4 46 51	24
25	4 8000	4 48 00	4 7920	4 47 31	4 7838	4 47 01	4 7757	4 46 33	25
26	4 7948	4 47 41	4 7868	4 47 12	4 7786	4 46 43	4 7705	4 46 14	26
27	4 7896	4 47 23	4 7816	4 46 53	4 7734	4 46 24	4 7654	4 45 55	27
28	4 7844	4 47 04	4 7764	4 46 35	4 7683	4 46 06	4 7602	4 45 37	28
29	4 7793	4 46 45	4 7713	4 46 17	4 7632	4 45 47	4 7551	4 45 18	29
30	4 7742	4 46 27	4 7661	4 45 58	4 7581	4 45 29	4 7500	4 45 00	30
31	4 7691	4 46 09	4 7610	4 45 40	4 7530	4 45 11	4 7450	4 44 42	31
32	4 7640	4 45 50	4 7559	4 45 21	4 7479	4 44 52	4 7399	4 44 24	32
33	4 7589	4 45 32	4 7509	4 45 03	4 7428	4 44 34	4 7348	4 44 05	33
34	4 7538	4 45 13	4 7458	4 44 45	4 7377	4 44 15	4 7297	4 43 47	34
35	4 7487	4 44 55	4 7407	4 44 27	4 7326	4 43 57	4 7246	4 43 29	35
36	4 7436	4 44 37	4 7356	4 44 08	4 7275	4 43 39	4 7195	4 43 10	36
37	4 7385	4 44 19	4 7305	4 43 50	4 7225	4 43 21	4 7145	4 42 52	37
38	4 7335	4 44 01	4 7255	4 43 32	4 7175	4 43 03	4 7095	4 42 34	38
39	4 7284	4 43 42	4 7204	4 43 13	4 7124	4 42 45	4 7045	4 42 16	39
40	4 7234	4 43 24	4 7154	4 42 55	4 7074	4 42 27	4 6995	4 41 58	40