5. A beacon, 45 ft. high, subtends a vertical sextant angle of 1° 10'. After steering 3 miles it was observed to be abeam. What vertical angle would it subtend after steaming a further 2½ miles on the same course ?

6. What is meant by a Sidereal Day and how is the length of a Sidereal Day determined ?

7. Show clearly how the sum or difference of the Meridian Zenith Distance of a Heavenly Body and its declination is equal to the Latitude of an Observer.

8. Enumerate and explain the corrections to be applied to an observed sextant angle.

9. Having been given a definite scale of Latitude for a Mercator Chart, explain fully how you could then draw up a scale of Longitude.

10. Draw a figure and trace the changes in the sign and magnitude of the Sine, Cosine, and Tangent of an angle as it increases from 0° to 180°.

11. In Latitude 48° N., on March 7th, 1929, what will be the hour angle of the star a Leonis (Regulus) when its altitude is 37°?

12. State fully what you know of the Earth's orbit.

PRACTICAL NAVIGATION I.
Paper 2 (2 hours).

1. The Pile Lighthouse off Belfast is charted as 40 ft. high. How high above sea-level would this lighthouse be on 10th November, 1929, at 19h. 00m. standard time. M.H.W.S. 11·1 ft.

2. The departure position being in Lat. 32° S., Long. 33° W., a steamer makes the following true courses and distances : West 310 miles, South 410 miles, East 310 miles. Find the position arrived at.

3. Find, by Mercator's Sailing, the true course and distance from A in Lat. 43° 25' S., Long. 149° 02' E., to B in Lat. 40° 20' S., Long. 172° 22' E.; and give also the compass course to steer if the variation is 10° 30' E. and the Deviation is 17° 40' W.

4. What effect has temperature upon chronometers and why is the temperature an important factor when chronometers are being compared ?

5. Chronometer A is 10m. 33s. fast of B. B is 29m. 17s. slow of C. If C is 29m. 18s. fast of G.M.T., find A's error on G.M.T.

6. On 17th December, 1929, the position by D.R. being Lat. 39° 50' S., Long. 2° 06' W., the star β Canis Majoris (Mirzam) bore East by compass, the correct G.M.T. being 22h. 04m. 39s.

Find the true bearing of the star and thence the error and deviation of the compass, the variation being 28° W.

PRACTICAL NAVIGATION II.
Paper 3 (3 hours).

1. From the following data find the position of the ship by D.R. at 9 p.m.
    (1) 2h. 15m. p.m. Tuskar Rock (Lat. 52° 12' N., Long. 6° 12' 20" W.) bore N. 70° W., compass (Dev. 4° W., Var. 16° W.), Dist. 7 miles ship's head S. 20 W., Log 25.
    (2) 3h. 00m. p.m. Course altered S. 70° W. (Dev. 6° W., Var. 16° W.), Log 33.
    (3) 4h. 00m. p.m. Course altered S. 72° W. (Dev. 6° W., Var. 16° W.), Log 44.
    (4) 9h. 00m. p.m., Log 100.

2. On 10th June, 1929, at 00h. 38m. (M.T.S. approx.), in Lat. 39° 40' N., Long. 41° 06' W., by D.R., the observed meridian altitude of Saturn was 28° 11' bearing South. Index error 01' +; Height of eye, 42 ft.
Find the latitude and position line.

3. On 30th June, 1929, at about 12h. 25m. p.m., the D.R. position of the ship being Lat. 39° 30' S., Long. 100° 13' W., the observed altitude of the sun's L.L. was 26° 59'. Time by chronometer was 19h. 19m. 00s., being 7m. 25s. fast of G.M.T. Sextant error, 2' 20" +; Height of eye, 45 ft.
Find the Latitude and the position line.

4. On 3rd November, 1929, at about 09h. 45m. a.m., the D.R. position being Lat. 51° N., Long. 12° W., the following observations were made : Obs. Alt. Sun's L.L. 17° 48'; G.M.T. 10h. 21m. 29s. ; Sextant error, nil ; Height of eye, 26 ft.
Find the position line upon which the ship is situated.