2. Having taken the following compass bearings of a distant object, find the object's magnetic bearing and thence the deviation :—

MAGNETIC BEARING REQUIRED.

Ship's Head by Standard Compass	Bearing of Distant Object by Standard Compass	Deviation required	Ship's Head by Standard Compass	Bearing of Distant Object by Standard Compass	Deviation required
North	N34°W		South	N66°W	
NE	N47°W		SW	N49°W	
East	N64°W		West	N36°W	
SE	N73°W		NW	N31°W	

3. With the deviations as above, construct a curve of deviations on a Napier's diagram, and give the courses you would steer by the standard compass to make the following courses, magnetic :
Magnetic courses—NNE, SE by E, WSW, NW by W.
Compass courses required.

4. A ship's mast measures vertically 124 ft. from trunk to water-line.
Required—The angle to which a sextant must be set for another ship to maintain station on her at a distance of one cable, height of observer's eye being 30 ft.

5. Draw a figure and prove that $\dfrac{1}{\sqrt{1+\cot^2 A}} = \sqrt{1 - \dfrac{1}{\sec^2 A}}$

3. GREAT-CIRCLE SAILING.*

Time allowed 2 hours.

Find the initial course and distance on the arc of a great circle from Y to Z: Lat. of Y, 34° 10' S.; long. of Y, 25° 42' E. Lat. of Z, 20° 00' S.; long. of Z, 105° 10' E.

Find the latitude and longitude of vertex and the latitude at which the track of the great circle intersects the meridians, psssing through the 40th degree of east longitude and every 20° of longitude in succession until arriving at Z. Explain briefly how the course and distance from one point to another is then found.

4. COMPASS-DEVIATION.

Time allowed 1½ hours.

Diagrams should be drawn where necessary to illustrate the answers.

1. What is meant by "deviation," and how would you determine whether the deviation was easterly or westerly ?
2. Describe the meaning of the term "semicircular deviation," stating by what coefficients it is represented, and how you determine when they are plus (+) and when minus (—).
3. State clearly what rules must be observed when placing compensating-magnets and soft iron to correct a compass, and what may be the result if these rules are not observed.
4. If coefficient B be corrected by means of a permanent magnet only, would you expect the compensation to remain correct when the ship changes her magnetic latitude ? State your reasons.
5. Supposing that it is possible for you to move your correcting-magnets, describe how, on the open sea, you would proceed to adjust your compass.
6. If a ship is beating to windward when she tacks, under what circumstances will the heeling-error retain the same name, and under what circumstances will it take the contrary name ?

5. NAVAL ARCHITECTURE AND STABILITY.

Time allowed 1½ hours.

1. What are the chief functions of the garboard strake, and how is it fitted to a (a) flat plate keel, (b) side bar keel, (c) bar keel ?
2. Describe how transverse bulkheads are plated, stiffened, and connected to the shell plating, and how they are made water-tight.

* One of these papers will be omitted.