

SPHERIC TRIGONOMETRY

Wednesday, June 18, 1924—1.15 to 4.15 p. m., only

Write at top of first page of answer paper (a) name of school where you have studied, (b) number of weeks and recitations a week in spheric trigonometry.

The minimum time requirement for spheric trigonometry is two recitations a week for half a school year, or the equivalent.

Answer six questions, including three from group I, one from group II and two from group III.

A , B and C represent the angles of a triangle ABC ; a , b and c represent the respective opposite sides. In a right triangle, C represents the right angle.

Give special attention to neatness and arrangement of work.

In the examination in spheric trigonometry the use of the slide rule will be allowed for checking, provided all computations with tables are shown on the answer paper.

Group I

Answer three questions from this group.

- 1 Prove geometrically that in any right spheric triangle

$$\cos c = \cos a \cos b \quad [7]$$

$$\cos A = \tan b \cot c \quad [8]$$

- 2 Prove that in any oblique spheric triangle in which the angle A is acute

$$\cos a = \cos b \cos c + \sin b \sin c \cos A \quad [15]$$

- 3 Prove that in any right spheric triangle

a an oblique angle and its opposite side are always in the same quadrant; [7]

b if the hypotenuse is greater than 90° , the two oblique angles are in different quadrants. [8]

- 4 If the sides a and b of a right spheric triangle are equal, prove that

$$\cos a = \cot A = \sqrt{\cos c} \quad [15]$$

Group II

Answer one question from this group.

- 5 In the right spheric triangle ABC , given $a = 22^\circ 15'$, $c = 54^\circ 8'$; solve the triangle [12]. Check the results [3].

- 6 In the isosceles spheric triangle ABC , given $b = 68^\circ 45'$, $c = 68^\circ 45'$, $B = 40^\circ 30'$; solve the triangle. [15]

Group III

Answer two questions from this group.

- 7 In the spheric triangle ABC ,

given $A = 124^\circ 30'$, $C = 46^\circ 15'$, $b = 82^\circ 10'$; solve the triangle. [20]

8 A ship starting from a point on the equator in longitude 130° west sails for 3 days along the arc of a great circle and arrives at a point whose latitude is 20° north and whose longitude is 150° west. What is the daily rate of the ship's sailing if the radius of the earth is considered to be 4000 miles? [20]

9 Find the shortest distance in nautical miles measured on the earth's surface between Boston (lat. $42^\circ 21' N.$, long. $71^\circ 3' W.$) and Paris (lat. $48^\circ 50' N.$, long. $2^\circ 20' E.$). [A nautical mile is the length of $1'$ of the arc of a great circle on the earth's surface.] [20]