

TRIGONOMETRY

Thursday, June 15, 1905—9.15 a. m. to 12.15 p. m., only

Answer eight questions but no more. Include at least three from the third division if credit is desired for both plane and spheric trigonometry. If more than eight are answered only the first eight answers will be considered. Division of groups is not allowed. A, B and C represent the angles of a triangle, a, b and c the opposite sides. In a right triangle C represents the right angle. Each complete answer will receive 12½ credits. Papers entitled to 75 or more credits will be accepted.

Give special attention to arrangement of work.

First division 1 Define sine, secant, inverse function, polar triangle, angle, logarithm.

2 In a plane triangle the angle $A=45^\circ$, and the angle $B=30^\circ$; find, without using the tables, the numerical value of sine C. Give all the work.

3 Name the quadrant in which the angle is found which has (a) sine positive, cosine negative, (b) sine negative, cosine positive, (c) tangent positive, secant negative, (d) tangent positive, secant positive, (e) cosine negative, cosecant positive.

4 In a right triangle $\cos A = \frac{1}{2}$ and side $b=5$ feet; express as common fractions the values of $\tan A$, $\sec A$, $\sin B$, $\cos B$, $\csc B$, side a , side c .

Second division 5 Prove that in any plane triangle

$$\frac{a+b}{a-b} = \frac{\tan \frac{1}{2}(A+B)}{\tan \frac{1}{2}(A-B)}$$

6 In a triangle two sides and an angle opposite one of them are given; discuss all the conditions under which there may be (a) one solution, (b) two solutions. Give proof in each case.

7 In a given plane triangle $A=38^\circ 35'$, $B=57^\circ 42'$, $c=400$ feet; find C , a and b .

8 In a plane triangle $a=43$ rods, $b=56$ rods, $c=60$ rods; find the angle C and the area of the triangle.

Third division 9 Write the four formulas known as Napier's analogies. Show how one of these formulas may be applied to the solution of a triangle.

10-11 Assuming the earth to be a sphere whose radius is 4000 miles, find the distance in miles between Gibraltar, latitude $36^\circ 9'$ north, longitude $5^\circ 21'$ west, and New York, latitude $40^\circ 43'$ north, longitude 74° west.

12 In a spheric triangle $A=110^\circ 30'$, $B=115^\circ 40'$, $C=120^\circ 20'$; find a .