

TRIGONOMETRY

Tuesday, June 12, 1906—9.15 a. m. to 12.15 p. m., only

Answer eight questions. Include at least three from the third division if credit is desired for both plane and spheric trigonometry. 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 if written by students in class A; those entitled to 60 or more credits will be accepted if written by students in class B.

Give special attention to arrangement of work.

First division 1 Without using the tables, derive the numeric values of *six* trigonometric functions of 30° . [Do not reduce results to decimals.]

2 In a certain right triangle $b=5$ and $\tan A=2.4$; construct the triangle and find the numeric values of *six* functions of B . [Do not reduce results to decimals.]

3 Represent by lines *six* functions of an angle in the third quadrant. Indicate the algebraic sign of *each* of these functions and show in each case how the sign is determined by the direction of the line.

4 Assume the values of $\sin(A+B)$ and $\cos(A+B)$ and from them derive the value of $\sin \frac{1}{2}A$ and $\cos \frac{1}{2}A$.

Second division 5 Assuming that the area of a triangle equals $\frac{1}{2}ac \sin B$, derive the formula for the area of a triangle in terms of its sides.

6 Find the length of a side and the area of a regular pentagon inscribed in a circle whose radius is 12 feet.

7 The sides of a triangle are respectively 38.7 feet, 59.64 feet and 77.16 feet; find the largest angle.

8 In a triangle $A=52^\circ 30'$, $c=25$ feet, $b=40$ feet; find a .

Third division 9 Prove that in any right spheric triangle $\cos A = \tan b \cot c$.

10 In a right spheric triangle $a=23^\circ 15'$, $B=73^\circ 27'$; find A .

11 In an oblique spheric triangle $b=37^\circ 14'$, $a=121^\circ 28'$, $C=161^\circ 22'$; find A .

12 Explain in detail how to determine the distance between two places on the surface of the earth when the latitude and the longitude of each place are known.