

TRIGONOMETRY

Tuesday, January 16, 1912—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 trigonometry.

The minimum time requirement in either plane trigonometry or spheric trigonometry is one recitation a week for a school year or two recitations a week for half a school year.

To receive credit for plane trigonometry students should answer three questions from group I and three questions from group II.

To receive credit for both plane and spheric trigonometry students should answer three questions from group I and three questions from group III.

Group I

- 1 Calculate by means of logarithms  $\sqrt[3]{34.71 \times 0.002098}$
- 2 Show by means of a geometric diagram or otherwise that  $\tan \frac{x}{2} = \frac{1 - \cos x}{\sin x} = \frac{\sin x}{1 + \cos x}$
- 3 Prove that  $\sec^2 x + \csc^2 x = \sec^2 x \csc^2 x$
- 4 Find the values of  $x$  between  $0^\circ$  and  $360^\circ$  that will satisfy the equation  $\cos 2x(3 - 4 \cos^2 x) = 0$

Group II

- 5 Prove  $\frac{a+b}{c} = \frac{\cos \frac{1}{2}(A-B)}{\sin \frac{1}{2}C}$
- 6 State the law of cosines and give proof.
- 7 An observer in a balloon measures the angle of depression of an object on the ground and finds it to be  $63^\circ 58'$ ; after ascending vertically 582 feet, he finds that the angle of depression of the same object is  $74^\circ 49'$ . What was the height of the balloon at the time of the first observation?
- 8 Given  $a = 168.32$ ,  $b = 221.46$ ,  $A = 33^\circ 39' 16''$ ; find  $B$ .

Group III

- 9 State Napier's rules for right spheric triangles. By means of these rules write down *four* formulas that may be used in the solution of right spheric triangles and prove *one* of them.
- 10 In solving oblique spheric triangles what are the conditions for *two* solutions? Demonstrate.
- 11 In a spheric triangle given  $a = 51^\circ 43' 18''$ ,  $b = 38^\circ 2' 20''$ ,  $c = 75^\circ 11' 30''$ ; find  $A$ .
- 12 In a right spheric triangle given  $a = 46^\circ 50'$ ,  $b = 31^\circ 15'$ ; find  $c$  and  $A$ .