197TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Tuesday, January 26, 1909—9.15 a. m. to 12.15 p. m., only

Candidates for plane trigonometry will answer six questions, selecting three from group I and three from group II.
Candidates for plane and spheric trigonometry will answer two questions from group I, two questions from group II and two questions from group III.
Candidates for spheric trigonometry who have previously passed plane trigonometry will answer three questions from group III.
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.
Give special attention to arrangement of work.

Group I

1 Solve $\sin^2 x - \cos x = \frac{1}{4}$; find x.

2 The legs of a right triangle are 9 and 40; express as common fractions *six* trigonometric functions of the smallest angle.

3 Prove that $\sin^2 A + \cos^2 A = 1$

4 Prove that the cosine of the difference of two angles is equal to the product of the cosines plus the product of the sines.

Group II

5 Two sides of a triangle are $a=300$ feet, $b=374$ feet; the included angle C is 74° 50′. Find the angles A and B.

6 From a point on the bank of a river the angle of elevation of a building on the opposite bank is 17° 26′; from a point 180 feet farther away, in the same horizontal plane, the angle of elevation of the building is 10° 15′. Find the width of the river.

7 The sides of a triangle are 13, 14, 15; find the smallest angle.

8 Using logarithms, determine the numeric value of the following:

$$\sqrt[3]{\frac{64 \times 25}{4000 \div \frac{1}{2}}}$$

Group III

9 Find the shortest distance measured on the earth's surface between Boston (42° 21′ N., 71° 3′ W.) and Cape Town (33° 56′ S., 18° 28′ E.). Assume the earth to be spheric and 7912 miles in diameter.

10 Given in a spheric triangle $B=98°\ 30'$, $C=67°\ 20'$, $a=60°\ 40'$; find A.

11 Prove geometrically that in a right spheric triangle $\sin A = \frac{\sin a}{\sin c}$

12 A person in latitude 43° N. observes the altitude of the sun to be 24° when its declination is 15° N.; find the hour of the day.