188TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Thursday, January 25, 1906—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. 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 Give the value and the algebraic sign of the sine and of the cosine of an arc of 0°, 90°, 180°, 270° and 360°, in a circle whose radius is 1.

2 Without using the tables find the numeric value of (*a*) sin 15°, (*b*) cos 15°, (*c*) sin 75°, (*d*) cos 75°. [Give all the work.]

3 The secant of the angle x in the second quadrant is -3; construct the angle and find the numeric value of the tan $\frac{1}{2}x$ and cos $2x$.

4 Prove the relation $\cos 3x = 4\cos^3 x - 3\cos x$.

Second division

5 A man walking due west at a uniform rate, observes a tree 133.2 rods distant bearing due north at 1 p. m.; 15 minutes later the tree bears 67° 5′ east of north. Find the man's rate per hour of walking and the bearing of the tree at 2 p. m. [Do not consider curvature of the earth.]

6 B and C are inaccessible objects in a line with A; a distance of 586 feet is measured from A to D, angle BAD is 59° 45′, angle BDC is 39° 56′ and angle BDA is 58° 58′. Find the distance BC.

7–8 Given $C=24°$, $c=27$, $b=36$; find *two* possible values of a.

Third division

9 Derive the formula for the value of the sine of half an angle of a spheric triangle in terms of the sides of the triangle. $\left[\text{Assume } \cos A = \frac{\cos a - \cos b \cos c}{\sin b \sin c}\right]$

10 In a right spheric triangle $A=88° 12'$, $B=32° 42'$; find a, b and c.

11 In an oblique spheric triangle $A=134° 58'$, $B=50° 40'$, $c=69° 8'$; find a.

12 Using a diagram and giving necessary formulas, explain fully how to determine the time of sunset at any place on the earth's surface, when the declination of the sun and the latitude of the place are given.