High School Department

167TH EXAMINATION

TRIGONOMETRY

Thursday, January 24, 1901—9.15 a. m. to 12.15 p. m., only

Answer eight questions but **no more.** [*Include at least three from the third group 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 In a right triangle $\sin A = \frac{3}{5}$ and A is in the second quadrant; find the numeric value and the algebraic sign of *five* other functions of A.

2 Prove that $\frac{\sin A \sec A \cot A}{\sec A - \tan A} = \frac{1 + \cos A \tan A}{\cos A}$

3 Derive, without the use of the tables, the numeric value of *each* of the following: sin 75°, cos 240°, cos 105°, tan 330°, csc 15°.

4 Prove that the cosine of the sum of two angles is equal to the product of the cosines of the angles less the product of their sines.

5 Find the value of the sine of $\frac{1}{2}A$ and of the cosine of $\frac{1}{2}A$ in terms of cosine A.

Second division

6 The diagonals of a rectangle are each 63.8 feet long and the acute angle between them is 73° 40′; find the sides of the rectangle.

7 Given $A = 78° 30'$, $a = 17.3$ feet, $b = 11.4$ feet; find the remaining parts.

8 Two sides of a triangular field 18.6 rods and 22.9 rods long respectively, form an angle of 75° 25′; find the area of the field.

9–10 An observer on the bank of a stream finds the vertical angle subtended by a tree on the opposite bank to be 35° 20′; on walking back 24 feet from the bank he finds the angle subtended by the tree to be 23° 47′. Find the width of the stream.

Third division

11 Prove that in any spheric triangle the sines of the sides are proportional to the sines of the opposite angles.

12 Given in a spheric triangle $A = 75°$, $B = 81°$, $C = 70°$; find a.

13 Given in a spheric triangle $a = 42° 45'$, $b = 47° 15'$, $A = 56° 30'$; determine whether more than one solution is possible. Give proof.

14 Find in miles the shortest distance between Nantucket, latitude 41° 15′ north, longitude 70° west, and Eastport, latitude 44° 50′ north, longitude 67° west. [1° = 69.16 miles.]

15 Find the time of sunrise at Boston, latitude 42° 21′ north, when the sun's declination is 14° north.