High School Department

162D EXAMINATION

PLANE TRIGONOMETRY

Thursday, January 25, 1900 — 9.15 a. m. to 12.15 p. m., only

Answer 10 questions but no more, including two of the last six. If more than 10 are answered only the first 10 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, S the area. In a right triangle C represents the right angle and c the hypotenuse. Each complete answer will receive 10 credits. Papers entitled to 75 or more credits will be accepted.

1 Find the radius of a circle if an arc 6 inches long subtends at the center an angle of 15 degrees.

2 Find the algebraic sign and the numeric value of *each* of the following: cos 135°, sec 210°, tan 150°, csc 120°, ctn 225°.

3-4 Given tan $A = -\frac{4}{3}$ and A in the fourth quadrant; represent graphically *five* other functions of A and find the algebraic sign and the numeric value of each.

5 Complete and demonstrate the following: *a*) the logarithm of a quotient is equal to . . . , *b*) the logarithm of a root is equal to . . .

6 Find cos 3*x* in terms of cos *x*.

7 Prove tan $(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

8 Prove that the square of any side of a triangle is equal to the sum of the squares of the other two sides diminished by twice the product of those sides into the cosine of the included angle.

9 Given sin 2*x* − cos *x* = cos² *x* ; find *x*.

10 A vertical pole, 60 feet high, standing on level ground, casts a shadow 53 feet 3 inches long; find the angle of elevation of the sun above the horizon.

11 The deck of a ship is on a level with a wharf; from a point on the wharf the angle of elevation of the top of the ship's mainmast is 28°; in a line with this point and the mast, and 100 feet farther from the ship, the angle of elevation is 20° 28'. Find the hight of the mast.

12-13 *ABCD* is a quadrilateral; the length of *AB* is 12 rods, of *BC* 15 rods, of *CD* 22 rods, and of *DA* 9 rods; *C* is an angle of 54° 40'. Find the area of the quadrilateral.

14-15 From a window, *A*, 100 feet above the level of a street, the angles of depression of the two ends of the street, *B* and *C*, are 36° 50' and 18° 30' respectively; *BAC* is an angle of 83° 15'. Find the length of the street *BC*.