PLANE TRIGONOMETRY

Thursday, January 26, 1899—9.15 a.m. to 12.15 p.m., only

Answer 10 questions but no more. 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 Define radian, sine, cotangent, characteristic, complementary angles.

2–3 Represent graphically six trigonometric functions of an angle of 210°, and find the value and algebraic sign of each function.

4 Express as a function of an angle of 15° each of the following: sin 75°, tan 165°, cos 195°, ctn 255°, sec 285°.

5 Express (a) in circular measure (in terms of π, or in radians) 60°, 330°, 135°, (b) in degrees $\frac{3\pi}{5}, \frac{5\pi}{4}$

6 Construct a right triangle whose hypotenuse is 13 units and the tangent of one of whose acute angles is $\frac{4}{5}$.

7 Prove that cos (A−B) = cos A cos B + sin A sin B

8 Prove that tan $\frac{A}{2} = \frac{1 - \cos A}{1 + \cos A}$

9 Given tan A + 4 sin$^3$A = 6; find A.

10 Prove that csc x = $\frac{1}{2}$ ctn 2 x cos x = 2 sin x

11 At a distance of 100 feet from the bottom of a flagstaff the angle of elevation of its top is found to be 52° 45'; find the height of the flagstaff.

12 An observer at a certain point finds the angle of elevation of the top of a hill to be 32° 20'; from a point on the same level and 200 feet farther from the hill the angle of elevation is 24° 35'. Find the height of the hill above the level of the observer.

13 Find the area of a triangle in which $A = 85° 15'$, $B = 78° 35'$, $C = 40.8$.

14–15 A surveyor wishing to find the distance between two buoys, A and B, measures on the shore a base-line, CD, 100 yards long; he finds that angle $ACD = 120°$, angle $ADC = 43°$, angle $BCD = 53°$, angle $BDC = 96°$. Find the distance $AB$. 