High School Department

157TH EXAMINATION

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 $\frac{5}{12}$.

7 Prove that $\cos(A-B)=\cos A \cos B+\sin A \sin B$

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

9 Given $\tan^2 A+4 \sin^2 A=6$; find A.

10 Prove that $\csc x-2 \operatorname{ctn} 2x \cos x=2 \sin x$

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 hight 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 hight 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 $ADC=42°$, angle $BCD=53°$, angle $BDC=96°$. Find the distance AB.