New York State Education Department

209TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Tuesday, June 17, 1913—1.15 to 4.15 p. m., only

Write at top of first page of answer paper (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in trigonometry.

Students taking this examination may use textbooks and notes prepared previous to the examination, but they must not communicate or use material prepared by another after the examination has begun.

To receive credit for plane trigonometry students should answer group I and group II.

To receive credit for both plane and spheric trigonometry students should answer group I and group III.

Group I

1 *a* Without the use of tables, express in radical form $\tan 105°$.

b Prove the identity $\dfrac{\cos A}{1+\sin A} = \tan\left(45° - \dfrac{A}{2}\right)$

c Prove the identity $\dfrac{1+\sin 2x}{1-\sin 2x} = \left(\dfrac{\tan x + 1}{\tan x - 1}\right)^2$

2 There are two points, C and D, on the right bank of a river; a straight line, AB, 250 yards long, is measured on the left bank of the river, and angular measurements are taken as follows: $ABC = 53° 30'$, $CBD = 45° 15'$, $CAD = 37° 54'$, $DAB = 58° 20'$. What is the distance from C to D?

3 Given an oblique triangle with the parts $a = .432$, $b = .695$, $C = 22° 45'$; find the angles A and B.

Group II

4 The perimeter of a regular polygon of 11 sides is 42.64 feet; find the area.

5 Find all the positive angles less than 360° that satisfy the equation $\sin(60° - x) - \sin(60° + x) = \dfrac{\sqrt{3}}{2}$

6 *a* Deduce a formula for the area of a parallelogram in terms of two adjacent sides and the included angle.

b Find the area of the parallelogram whose sides are 221 and 463 and one of whose angles is 47° 36′.

Group III

7 Solve the exponential equation $3^{x+2} = 7^{x-2}$ and obtain the results to *four* decimal places.

8 In the spheric triangle given $A = 110°$, $B = 47° 35'$, $C = 90°$; solve the triangle.

9 If the legs of a right spheric triangle, a and b, are equal to each other, show that $\cos a = \cot A = \sqrt{\cos c}$