The University of the State of New York

224TH HIGH SCHOOL EXAMINATION

PLANE TRIGONOMETRY

Wednesday, January 19, 1921—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 plane trigonometry.

The minimum time requirement for plane trigonometry is two recitations a week for a school year.

Answer seven questions, including two questions from group I, three from group II and two from group III.

A, B and C represent the angles of a triangle ABC; a, b and c represent the respective opposite sides. In a right triangle, C represents the right angle.

Give special attention to neatness and arrangement of work.

Credits: Group I, 14 each; group II, 14 each; group III, 15 each.

Group I

Answer two questions from this group.

1 Prove the formula for $\cos(x+y)$ when x, y and $(x+y)$ are positive acute angles.

2 Complete and prove: The difference of the sines of two angles is equal to . . .

3 Prove that in an acute-angled triangle the square of any side equals the sum of the squares of the other two sides minus twice their product into the cosine of their included angle.

Group II

Answer three questions from this group.

4 Given $\sin x = \frac{4}{5}$, $\tan y = 1\frac{5}{12}$, where x is in the second quadrant and y is in the first; find (*a*) $\sin(x-y)$, (*b*) $\tan 2x$.

5 *a* Show that

$\cos 60° - \cos 120° + \sin(-90°) - \sin 135° + \cos(-45°) = 0$

b Express as functions of positive acute angles:

$\sin 140°$, $\cos 220°$, $\tan(-250°)$

6 Prove the following identities:

a $\tan A + \cot A = \sec A \times \csc A$

b $\sec 2x = \dfrac{\csc^2 x}{\csc^2 x - 2}$

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7 Solve for values of x between 0° and 360°:

a $4\cos^2 x + 1 = 8\sin x$

b $\cos 2x + 5\cos x = 2$

Group III

Answer two questions from this group.

8 Find the value of $\dfrac{14.243 \times \sqrt{.0746}}{\sqrt[3]{17.42 \times (2.34)^2}}$

9 Solve and check the triangle ABC, given $a = 21.2$, $b = 32.4$, $C = 68° 12'$

10 A building surmounted by a flagpole 20 feet high stands on level ground; from a point on the ground the angles of elevation of the top and bottom of the pole are 53° 5′ and 45° 11′ respectively. How high is the building?