The University of the State of New York

228th High School Examination

PLANE TRIGONOMETRY

Wednesday, January 24, 1923—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 five recitations a week for half a school year, or the equivalent.

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

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.

In the examination in plane trigonometry the use of the slide rule will be allowed for checking, provided all computations with tables are shown on the answer paper.

Group I

Answer three questions from this group.

1 Given $a = 14.63$, $B = 16°\ 23'$, $C = 44°\ 40'$; solve the triangle *ABC*. [16]

2 Given $a = 42.4$, $b = 58.9$, $C = 79°\ 31'$; solve and check the triangle *ABC*. [14, 2]

3 Given $a = 23.76$, $b = 42.38$, $c = 31.16$; solve and check the triangle *ABC*. [14, 2]

4 To find the distance *AB* across a river, a base line *AC* is laid off equal to 430 feet. The angle *A* is measured and found to be $81°\ 30'$; the angle *C* is $58°\ 40'$. Find the length of *AB*. [16]

Group II

Answer four questions from this group.

5 Derive the formula for $\tan (x + y)$ in terms of $\tan x$ and $\tan y$. [13]

6 From the formula $a^2 = b^2 + c^2 - 2bc \cos A$, derive the formula $\sin \tfrac{1}{2}A = \sqrt{\dfrac{(s-b)(s-c)}{bc}}$ [13]

7 *a* Given $\sin x = \tfrac{4}{5}$ and angle x in the second quadrant; find (1) $\sin 2x$, (2) $\sin \tfrac{1}{2}x$ [5, 5]

b Express $\tfrac{7}{12}\,\pi$ radians in degrees. [3]

8 Prove the following identities:

$$\tan x + \cot x = \frac{2}{\sin 2x}$$ [9]

$$\sin(x + y) \cos y - \cos(x + y) \sin y = \sin x$$ [4]

9 Solve for values of x between $0°$ and $360°$ and check:

$$\cos^2 x = 2 \sin^2 x - \tfrac{1}{2}\sin x$$ [10, 3]