The University of the State of New York

233d High School Examination

PLANE TRIGONOMETRY

Wednesday, June 17, 1925 — 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 $a = 34.38$, $b = 25.69$, $c = 30.17$; solve and check the triangle. [15, 1⅔]

2 Given $a = 438$, $b = 512$, $C = 102° 30'$; find A and B. [16⅔]

3 At 9 p. m. two lights, known to be k miles apart, are observed to be due east from a certain vessel. At 10 p. m. one of these lights bears N.E. and the other N.N.E. If the course of the ship is due south, express its rate in terms of k and the angles involved. [16⅔]

4 A bridge is to be built connecting two points A and B at the same level and on opposite sides of a gorge. The bridge is to be supported by a pier at a point C in the bottom of the gorge from which the angles of elevation of A and B are 25° 15′ and 42° 15′ respectively. Find the height of the pier if the distance AB is 255 feet. [16⅔]

Group II

Answer four questions from this group.

5 Prove geometrically that

$\sin(x + y) = \sin x \cos y + \cos x \sin y$, when x and y are both acute and $x + y$ is obtuse. [12½]

6 *a* If $x = \sin^{-1} \frac{3}{5}$ and $y = \cos^{-1} -(\frac{12}{13})$ and x and y are both in the second quadrant, find, without the use of tables, $\tan(x + y)$; $\sin 2x$; $\cos\left(\frac{x}{2}\right)$ [4, 3, 3]

b In a circle whose radius is 3 feet find the number of radians in an angle at the center, subtended by an arc of 8 feet. [2½]

7 *a* Construct a table of values for $y = \sin x$ at intervals of 30° as x varies from 0° to 360°. [3]

b Plot the graph of $y = \sin x$. [4]

c Express the following as functions of positive angles less than 45°: $\tan 130°$, $\sin(-280°)$, $\sec\left(\frac{15\pi}{4}\right)$ [1, 1½, 1½]

8 Prove the following identities:

a $\tan x + \cot x = \sec x \csc x$ [5]

b $\dfrac{\sin s - \sin(s - c)}{\sin s + \sin(s - c)} = \dfrac{\tan\left(\frac{c}{2}\right)}{\tan\left(\frac{a + b}{2}\right)}$ where $a + b + c = 2s$ [7½]

9 Solve the following equation for values of x between 0° and 360° and check one of these values:

$\cos 2x - 3 \cos x - 1 = 0$ [10, 2½]