The University of the State of New York

231st High School Examination

PLANE TRIGONOMETRY

Wednesday, June 18, 1924 — 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 $A = 118°\ 54'$, $C = 45°\ 43'$, $b = 415.36$; find a and c. [16]

2 Given $a = 18.5$, $b = 23.6$, $c = 28.1$; find the three angles and check. [15, 1]

3 Two buoys are situated in the same direction from a lighthouse whose top is 114.5 feet above the level of the water. From the top of the lighthouse the angles of depression of the two buoys are 37° and 15° respectively. Find the distance between the two buoys. [16]

4 Two points, A and B, are on opposite sides of a pond. The distance of A from a point C is 296.8 feet. The distance of B from C is 854.6 feet. The angle ACB is 87° 42'. Find the distance AB. [16]

Group II

Answer four questions from this group.

5 Prove that $\dfrac{a}{b} = \dfrac{\sin A}{\sin B}$ when (a) both A and B are acute, (b) either A or B is obtuse. [13]

6 a Prove that the area (K) of a triangle is equal to $\frac{1}{2} ac \sin B$. [6]

b From the formula derived in a deduce the formula

$$K = \frac{a^2 \sin B \sin C}{2 \sin (B + C)}$$ [7]

7 a Trace the changes in $\sin A$ and $\tan A$ as A varies from 0° to 360°. [7]

b If $\tan A = \frac{3}{4}$ and A is in the third quadrant, find the value of $\cos \frac{1}{2} A$. [6]

8 Prove the following identity:

$$\tan (x - 45°) + \cot (x + 45°) = 0$$ [13]

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

$$\sin^2 x - 2 \cos x + \frac{1}{4} = 0$$ [11, 2]