The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE TRIGONOMETRY

Wednesday, September 17, 1924—9.15 a. m. to 12.15 p. m., only

Answer seven questions, including three from group I and four from group II. Papers entitled to less than 75 credits will not be accepted.
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.

Group I

Answer three questions from this group.

1 Given $a = 14.6$, $b = 16.7$, $c = 18.8$; solve and check the triangle. [15, 1]

2 Given $b = 47.9$, $c = 33.1$, $A = 123° \ 47' \ 14''$; solve the triangle. [16]

3 A horizontal line AB measures 400 yards long; from a point in AB a balloon ascends vertically until its elevation angles at A and B are 64° 15′ and 48° 20′ respectively. Find the height of the balloon. [16]

4 A man standing at point A due south of a water tower 150 feet high finds its elevation to be 72° 20′; he walks due west to a point B where the elevation is 44° 50′. What is the distance between A and B? [16]

Group II

Answer four questions from this group.

5 Assuming the Law of Cosines, deduce a formula for finding an angle of a triangle in terms of its sides. [13]

6 Assuming the formulas for the sine and cosine of the sum and of the difference of two angles, deduce the formula for

a $\sin A + \sin B$ [6]

b $\cos A - \cos B$ [7]

7 Prove the following identity:

$$\frac{\sin^2 A - \sin^2 B}{\sin A \cos A - \sin B \cos B} = \tan (A + B) \qquad [13]$$

8 *a* Express the following as functions of positive angles less than 45°:

$\sin 105°$; $\cos (-143°)$; $\tan (-51° \ 48')$; $\cot 315°$ [8]

b If $\tan A = \frac{1}{7}$ and $\tan B = \frac{1}{3}$, express as a common fraction the value of $\tan (B - 2A)$. [5]

9 Solve the following equation for all positive values of A less than 360°: $\frac{1 - \tan A}{1 + \tan A} = 2 \cos 2A$ [13]