The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE TRIGONOMETRY

Thursday, June 17, 1920—1.15 to 4.15 p. m., only

Answer six questions. Papers entitled to less than 75 credits will not be accepted.

1 *a* If $\tan A = \frac{a}{a+1}$ and $\tan B = \frac{1}{2a+1}$ prove that $\tan (A+B) = 1$

b Solve the equation $2\cos^2 A = 1 - \sin A$ for all values of A from 0° to 360°.
Check the largest angle found.

2 Prove the identity $\frac{\cos 2x}{1+\sin 2x} = \frac{\cot x - 1}{\cot x + 1}$

3 *a* Without the use of tables, find the value of sin 15°, leaving the answer in radical form.

b By the use of logarithms find the value of

$$\frac{0.076 \times \sqrt[3]{57.46}}{(2.34)^2}$$

4 If the angle A lies between 180° and 270° and $\tan A = \frac{5}{12}$, (*a*) find sin A and cos A, (*b*) using values found in the answer to (*a*) find sin $2A$ and $\cos \frac{A}{2}$

5 *a* Show that $\frac{\sin 2A - \sin A}{\cos A - \cos 2A} = \cot \frac{3A}{2}$

b Solve for x: $7^{2x+3} = 43$

6 In *each* of the following triangles state the number of solutions and show in full on your paper the reason for your conclusion in each case:

(1)	$b = 75.3$	$a = 49.7$	$A = 40°$
(2)	$a = 67.4$	$b = 97.6$	$c = 30.2$
(3)	$c = 156.3$	$b = 104.8$	$B = 142°$
(4)	$a = 56.7$	$b = 38.4$	$A = 58° 20'$
(5)	$a = 18.0$	$c = 9.0$	$C = 30°$

7 From the top of a lighthouse 257 feet above the sea, the angles of depression to two boats, in line with the lighthouse, are observed to be 14° and 32° respectively; find the distance between the two boats.

8 Given $a = 71.2$, $b = 64.8$, $c = 37$; find all the angles of the triangle.

9 The longer diagonal of a parallelogram is 500 feet and the angles it makes with the sides are 46° 36′ and 10° 12′; find the lengths of the sides and the area of the parallelogram.