

The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE TRIGONOMETRY

Wednesday, September 10, 1919—9.15 a. m. to 12.15 p. m., only

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

1 If  $r$  is the radius of a circle, prove that the area of a regular circumscribed polygon of  $n$  sides is  $nr^2 \tan \frac{180^\circ}{n}$

2 Prove that

$$a \quad \sin 2A = \frac{2 \tan A}{1 + \tan^2 A}$$

$$b \quad \cot \frac{1}{2}x = \frac{\sin x}{1 - \cos x}$$

3 Find the value of

$$\sqrt[5]{\frac{7.3106^4 \times (-0.000348)^{\frac{2}{3}}}{14.873}}$$

4 A tower stands on the bank of a river. An observer on the opposite bank measures a horizontal line 168.7 feet long in the same level with the base and in the same vertical plane with the top of the tower and finds the angles of elevation of the top from the extremities of the line are  $54.6^\circ$  and  $31.5^\circ$ . If the height of the observer's eye is 5 feet, how high is the tower?

5 Solve the following equation for all values of  $A$  less than  $360^\circ$ :  $\cos A + \sqrt{3} \sin A = 1$

6 a If  $\tan A = \frac{1}{2}\sqrt{3}$  find the sine and the cosine of  $A$  in the quadrant in which the sine of  $A$  is negative.

b Using 5 as a base, what are the logarithms of 1, 5, 125 and 625?

7 A wheel which is 3 feet in diameter is traveling at the rate of 10 miles an hour; find in radians per second the velocity of a point on the rim.

8 Solve the triangle  $ABC$  for  $c$  if  $a = 43.73$ ,  $b = 52.06$  and  $C = 27^\circ 31'$ .