The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE TRIGONOMETRY

Wednesday, September 19, 1923—9.15 a. m. to 12.15 p. m., only

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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 Solve and check the triangle ABC, given $b = 41.554$, $A = 118°\ 56'$, $C = 45°\ 40'$ [16]

2 Solve and check the triangle ABC, given $a = 35.7$, $b = 50.9$, $c = 68.1$ [16]

3 Given a regular pentagon one of whose sides is 12; find the area of the pentagon. [16]

4 Two trains start at the same time from the same station on straight tracks diverging at an angle of $67°\ 45'$. If one runs at the rate of 32 miles an hour and the other at the rate of 46 miles an hour, how far apart will they be at the end of three hours? [16]

Group II
Answer four questions from this group.

5 Prove geometrically that when x, y and $x + y$ are acute angles $\cos (x + y) = \cos x \cos y - \sin x \sin y$ [13]

6 Prove that when A is either acute or obtuse in the triangle ABC, $a^2 = b^2 + c^2 - 2bc \cos A$ [13]

7 *a* Express as equivalent functions of a positive acute angle less than $45°$

$\sin 115°$, $\cos 110°$, $\tan (-235°)$, $\csc 317°$ [4]

b If $\cos x = -\frac{12}{13}$ and x is in the third quadrant, find the value of $\tan 2x$. [6]

c Express $120°$ as radians. [3]

8 Prove the following identity:

$$\tan (45° - \tfrac{1}{2}x) = \sqrt{\frac{1 - \sin x}{1 + \sin x}} \quad [13]$$

9 Solve the following equation for all values of A less than $360°$ and check *one* value:

$$3 \tan^2 A + 8 \cos^2 A = 7 \quad [11, 2]$$