The University of the State of New York

229TH HIGH SCHOOL EXAMINATION

PLANE TRIGONOMETRY

Wednesday, June 20, 1923—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 $a = 75.9$, $b = 63.3$, $c = 47.8$; solve and check the triangle ABC. [16]

2 Given triangle ABC in which $AB = 63.4$, $A = 20°\ 25'\ 10''$, $B = 144°\ 43'\ 30''$; find the altitude on AB. [16]

3 OA and OB are two straight roads intersecting at O and making with each other an angle of $36°\ 15'$. At A is a house 1134 yards from O, and at B is another house 1572 yards from O. Find the angle that the line AB makes with the roads and find also the length of AB. [16]

4 Two points, A and B, 425 yards apart, are situated on one edge of a canyon. A point C, chosen on the opposite edge, at the same level as A and B, is directly above a point D at the bottom of the canyon. The following measurements are made: angle $CAB = 73°\ 18'$, angle $CBA = 63°\ 33'$, angle $CBD = 61°\ 41'$. Find the depth of the canyon. [16]

Group II

Answer four questions from this group.

5 Prove geometrically that $\cos(x + y) = \cos x \cos y - \sin x \sin y$, when x, y and $x + y$ are each less than $90°$. [13]

6 Prove that in any triangle ABC

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Consider the case (1) where angle A is acute, (2) where angle A is obtuse. [6, 7]

7 Prove the following identities:

$(\sec A + 2 \sin A)(\csc A - 2 \cos A) = 2 \cos 2A \times \cot 2A$ [7]

$\sin 2A = \dfrac{2 \tan A}{1 + \tan^2 A}$ [6]

8 *a* If $\sin x = -\frac{3}{5}$ and x is in the third quadrant, find

$\cos 2x$, $\cos\frac{x}{2}$, $\tan(90° + x)$ [3, 3, 3]

b Find the value of $\tan\frac{5\pi}{3}$ [4]

9 Solve the following equation for values of A between $0°$ and $360°$ and check *one* of these values:

$4 + \sin A = 6 \cos^2 A$

Solution of equation [6], finding the angles [6], checking [1]