The University of the State of New York

214th High School Examination

TRIGONOMETRY

Thursday, January 20, 1916—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 trigonometry.

The minimum time requirement for plane trigonometry is two recitations a a week for a school year; for plane and spheric trigonometry three recitations a week for a school year.

Students taking this examination may use textbooks and notes prepared previous to the examination, but there must be no communication among students after the examination has begun.

To receive credit for plane trigonometry, students should answer both group I and group II.
To receive credit for both plane and spheric trigonometry, students should omit *group II and answer group I and group III.*

Group I

1 *a* Find by logarithms the value of $\dfrac{(0.1136)^{\frac{3}{4}} \times \sqrt{81.86}}{\frac{3}{4} \times \sqrt[3]{2000}}$

  b Find $\log_a 2$, when $a = 2.718$

2 *a* If A, B, C are the angles of a triangle, prove that $\tan A + \tan B + \tan C = \tan A \tan B \tan C$.

  b If A, B, C are the angles of a triangle and $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$, find C (without using the tables).

3 *a* The extremities of a circular arc 5 feet long are joined to the middle point of the arc by straight lines, the angle between these lines being 132°; find the radius of the circle of which the arc is a part.

  b Express in circular (radian) measure, correct to *three* significant figures, (1) the supplement of 1.37 radians, (2) 74°, (3) the angle of a regular octagon.

4 A base line AB is drawn 132 feet in length in the same horizontal plane with C, the foot of a tree. The angles ABC and BAC are found to be 79° 56' and 78° 18' respectively; the angle of elevation of the top of the tree is found to be 19° 46' at A. Find the hight of the tree.

TRIGONOMETRY — *concluded*

Group II

5 *a* If sec 13° 41′ $= k$, make a list of all angles between −180° and +180° whose secant is k and also $-k$; whose cosecant is k and also $-k$.

b If cot $x = \frac{5}{12}$, find all the other functions of x (two cases). In each case tell in which quadrant x lies.

c State, with reasons, if it is possible to find angles to satisfy the following equations: (1) tan $x = 1$; (2) cos $x = \frac{0.934}{0.866}$; (3) sin $x +$ cos $x = 1$; (4) cos $x = 1$; (5) $\sin^2 x + \cos^2 x = \frac{1}{2}$; (6) sec $x = 3.1416$; (7) csc $x = \frac{1}{\sqrt{2}}$; (8) sin $x = \frac{4}{7}$, cos $x = \frac{6}{7}$; (9) tan $x = 100$; (10) sec $x = 0.78$

6 In a triangle, $a = 10$ cm, $b = 7$ cm, one angle is 95°. If no information is given as to which angle of the triangle is 95°, discuss how many triangles can be made. Select any one case, and for this case calculate the remaining sides and angles.

Group III

7 Given $a = 32° 17′$, $A = 70°$, $C = 90°$; find b, c and B.

8 Given $b = 82° 39′$, $A = 70° 7′$, $C = 116° 20′$; find B and c.