The University of the State of New York

220TH HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Thursday, January 23, 1919—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 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.

Candidates for plane trigonometry should answer six questions, including three from group I and three from group II.

Candidates for plane and spheric trigonometry should answer six questions, including two from group I, two from group II and two from group III.

Candidates for spheric trigonometry who have previously passed plane trigonometry should answer three questions from group III.

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

1 *a* Prove $\sin^4 x - \cos^4 x = -\cos 2x$

b Prove $\tan x + \tan y = \dfrac{\sin(x+y)}{\cos x \cos y}$

2 *a* Solve $11.07^x = 345.2$

b Perform the following operations by using logarithms:

$$\sqrt[5]{\frac{0.07 \times 0.00964}{3.141 \times 0.876}}$$

3 *a* State the sign of the sin, cos, tan and cot of *each* of the following angles: 125°, −65°, 405°

b Given $\cos A = -\frac{3}{5}$. Obtain the sin, tan and cot of A in the quadrant in which $\tan A$ is positive.

c Express cos 232.25° as the function of an angle less than 45°.

4 *a* A point on the rim of a wheel 20 feet in diameter has a speed of 100 feet a second; through how many radians does it pass in 12 seconds?

b Over what part of a radian does the minute hand of a clock move in 10 minutes?

c Express in degrees the angles $\frac{2\pi}{3}$, $\frac{\pi}{4}$, π

d Express in radians 60°, 90°, 135°.

5 Given $\tan A = \frac{4}{3}$. Find the value of $\cos 2A$. In which quadrant will $2A$ lie if A is in the first quadrant? if A is in the third quadrant?

Group II

6 When a balloon which is ascending uniformly and vertically is one mile high, the angle of elevation is observed to be 36° 20′; 20 minutes later the angle of elevation is observed to be 55° 40′. How fast is the balloon moving?

7 Two ships are anchored at some distance from the shore. Assuming a base line of definite length located on the shore, state what observations would be necessary for an observer on the shore to compute the distance between the ships. Explain clearly how you would employ the data thus obtained to get the desired result.

8 The diagonals of a parallelogram are 81 and 106; if they cross each other at an angle of 29° 18′, find the area of the parallelogram.

9 A concrete column in the form of an octagonal prism has a base edge of 10″; find the area of its cross section.

Group III

10 In a right spheric triangle ABC, given $A=36°$, $B=63°$; find the value of the sides. Check your solution.

11 Solve the isosceles spheric triangle whose sides are given as follows: $a=108° 25'$, $b=108° 25'$, $c=123° 48'$

12 In an oblique spheric triangle, given $A=120°$, $B=82°$, $C=140°$; find the length of the side opposite B.