The University of the State of New York

231st High School Examination

PLANE GEOMETRY

Wednesday, June 18, 1924 — 9.15 a. m. to 12.15 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 geometry.

The minimum time requirement is five recitations a week for a school year.

Name the author of the textbook you have used in plane geometry.

Answer eight questions, including not more than three from group I and at least one from group II.

Group I

Do not answer more than three questions from this group.

1 Prove that the opposite sides of a parallelogram are equal and the opposite angles are equal. [12½]

2 Prove that an angle formed by two chords intersecting each other within a circle is measured by one half the sum of the arc intercepted between its sides and the arc intercepted between the sides of its vertical angle. [12½]

3 Prove that if two triangles have the angles of one equal respectively to the angles of the other, the triangles are similar. [12½]

4 Prove that the area of a parallelogram is equal to the product of its base and its altitude. [12½]

Group II

Answer at least one question from this group.

Leave all construction lines on the paper.

5 Through a given point outside a given circle construct a tangent to the circle. [12½]

6 Given side b, angle A and the median to side b; construct the triangle. [12½]

Group III

Irrational results may be left in the form of π and radicals unless otherwise stated.

7 A line is drawn through the intersection O of the diagonals of a parallelogram and terminates in two opposite sides. Prove that this line is bisected by point O. [12½]

8 Two circles have radii 6″ and 8″ respectively. Find the radius of a circle (*a*) whose area equals the sum of the two given areas [6½], (*b*) whose circumference equals the sum of the two given circumferences [6].

9 Find all points that are equidistant from two given concentric circles and also equidistant from two given points on the larger circle. [12½]

10 If P is any point in chord AB, and PC is perpendicular to diameter AD, prove that $AC \times AD = AB \times AP$. [12½]

11 Prove that if each side of an equilateral triangle is trisected (divided into three equal parts) and all trisection points are *joined in order*, a regular hexagon will be formed. [12½]

12 A circle whose center is O has a radius 9″ long. From a point P, 15″ from O, tangents are drawn touching the circle at A and B.

a Find the length of AP. [6]

b Find the distance from O to chord AB. [6½]