The University of the State of New York

223D HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Thursday, June 17, 1920—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 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 four questions from group I and four from the other two groups, at least one question to be selected from group II.

Group I

1 Prove that if two opposite sides of a quadrilateral are equal and parallel, the figure is a parallelogram.

2 Prove that if a line divides two sides of a triangle proportionally, it is parallel to the third side.

3 Prove that an angle formed by two secants intersecting outside of a circumference is measured by one half the difference of the intercepted arcs.

4 Prove that a circle may be circumscribed about any regular polygon.

5 Answer *four* of the following:

a What is meant by saying that certain parts, for example, two sides and the included angle, *determine* a triangle?

b What is meant by saying that a central angle is *measured by* its intercepted arc?

c What is meant by saying that the area of a rectangle is equal to the product of its base and altitude?

d What is meant by saying that the ratio of any circumference to its diameter is *constant* and equal to π?

e What two things must be shown in proving any line or group of lines a locus?

f What is the difference between the statements "the square *on* the line AB" and "the square *of* the line AB"?

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Group II

6 Construct a square equivalent (equal in area) to a given parallelogram.

7 Construct a tangent to a given circle (*a*) from a given external point, (*b*) at a given point on the circumference.

8 Construct x if $x = \sqrt{a^2 + b^2}$ when a and b are two given lines.

Group III

9 The sides of a triangle are 9, 10 and 17. Compute (*a*) the altitude on side 9, (*b*) the median to side 10.

10 Two tangents to a circle form an angle of 75°. Find (*a*) the number of degrees in each of the two intercepted arcs, (*b*) the length of the minor arc if the radius of the circle is 10″.

11 Two adjacent sides of a parallelogram are 8″ and 12″ respectively, and they form an angle of 60°. Find the area of the parallelogram.

12 Prove that if two diagonals of an inscribed regular pentagon intersect, the longer segment of either diagonal is equal to a side of the pentagon.

13 In the triangle ABC, medians AE and CD intersect at point O. Prove that the triangle AOC is equal in area to the quadrilateral $DBEO$.