The University of the State of New York

235TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, January 20, 1926 — 9.15 a. m. to 12.15 p. m., only

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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 if the diagonals of a quadrilateral bisect each other the figure is a parallelogram. [12½]

2 Prove that an angle formed by a tangent and a chord drawn from the point of contact is measured by one half the intercepted arc. [12½]

3 Prove that if two chords intersect within a circle, the product of the segments of one equals the product of the segments of the other. [12½]

4 Prove that the area of a regular polygon is equal to one half the product of its perimeter and its apothem. [12½]

Group II

Answer at least one question from this group.

Problems in this group should be constructed accurately with ruler and compasses. Leave all construction lines on the paper.

5 Construct triangle ABC when angle A, side AB and the altitude on side AB are given. [12½]

6 Find the locus of the end point remote from the circle of a tangent of length l drawn to a given circle of radius r. Prove your conclusion. [12½]

Group III

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

7 State and prove the converse of the following theorem: If the bisector of the exterior angle at C of triangle ABC is parallel to AB, then AC equals BC. [3, 9½]

8 Two secants are drawn to a circle from a given external point; if the intercepted chords are equal, prove that the two secants are equal. [12½]

9 On the longer diagonal AC of parallelogram $ABCD$, distance AP is taken equal to side AB; show that BC is greater than PC. [12½]

10 Two similar triangles have a combined area of 78 square inches. If two corresponding sides are 6 inches and 9 inches, find (*a*) the two areas, (*b*) the two altitudes corresponding to the given sides. [8, 4½]

11 Two tangents to a circle from the same point include an angle of 60°. If the radius is 8 inches find (*a*) the length of one of the tangents, (*b*) the area bounded by the two radii to the points of contact and the minor arc determined by the tangents. [6, 6½]

Or

In rectangle $ABCD$ diagonal AC is drawn; BE is perpendicular to AC at E. BE is 12 and EC exceeds AE by 7. Find the area of the rectangle. [12½]

12 A boat sails parallel to a straight coast at a distance of 5 miles from the shore and travels at the rate of 20 miles an hour. A coast defense gun situated on the shore has a range of 13 miles; for how long a time is the boat within the range of the gun? [12½]