

PLANE GEOMETRY

Wednesday, June 21, 1922—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 diagonals of any parallelogram bisect each other. [12½]
- 2 Prove that the angle formed by a tangent and a secant intersecting outside the circle is measured by one half the difference between the intercepted arcs. [12½]
- 3 Prove that if two triangles have an angle of one equal to an angle of the other and the sides including these angles proportional, the triangles are similar. [12½]
- 4 Prove that the area of any triangle is equal to one half 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 Inscribe a regular hexagon in a given circle. Prove your construction. [4, 8½]
- 6 Construct a square equivalent to a given scalene triangle. [12½]

Group III

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

- 7 In the triangle ABC the perpendiculars from A and B to the opposite sides are equal. Prove that the triangle is isosceles. [12½]

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8 $ABCD$ is a parallelogram. On the diagonal BD points E and F are taken so that $BE = DF$. Prove that $AECF$ is a parallelogram. [12½]

9 From the vertex B of the inscribed isosceles triangle ABC , a chord BE is drawn cutting the base in D . Prove that $(AB)^2 = BD \times BE$. [12½]

10 The corresponding altitudes of two similar triangles are 8 inches and 9 inches; the area of the larger triangle is 108 square inches. Find the area of the other triangle and the base of each. [6½, 3, 3]

11 The area of a square is 72 square inches. Find the area of the circumscribed circle. [12½]