

PLANE GEOMETRY

Wednesday, January 23, 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 if two triangles have the three sides of one respectively equal to the three sides of the other, the triangles are congruent. $[12\frac{1}{2}]$
- 2 Prove that the diameter perpendicular to a chord bisects the chord and the arcs which the chord subtends. $[12\frac{1}{2}]$
- 3 Prove that the product of the segments of a chord that passes through a fixed point within a circle is the same for all directions of the chord. $[12\frac{1}{2}]$
- 4 Prove that the area of a regular polygon is equal to one half the product of its perimeter and its apothem. $[12\frac{1}{2}]$

Group II

Answer at least one question from this group.

Leave all construction lines on the paper.

- 5 a Given angles A and B and side c ; construct the triangle. [6]
b Circumscribe a circle about the triangle constructed in answer to a. $[6\frac{1}{2}]$
- 6 Given one angle of a rhombus and the diagonal drawn to the vertex of that angle; construct the rhombus. $[12\frac{1}{2}]$

Group III

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

- 7 Prove that two isosceles triangles are congruent if their bases and vertex angles are respectively equal. $[12\frac{1}{2}]$

- 8 a Show how to find a point inside a given triangle that is a given distance from one side of the triangle and equally distant from the other two sides. $[10\frac{1}{2}]$
b Would there ever be no point that would satisfy the given conditions? Explain. [1]
c Would there ever be more than one point that would satisfy the given conditions? Explain. [1]
- 9 Two tangents drawn to a circle of radius 8" from an external point form an angle of 60° with each other. Find the area of the segment bounded by the minor arc and the chord of contact. $[12\frac{1}{2}]$
- 10 The base of a triangle is 12". Two lines are drawn parallel to this base, terminating in the other two sides and dividing the triangle into three equal (equivalent) parts. Find the lengths of these parallel lines. $[12\frac{1}{2}]$
- 11 Prove that if all of the diagonals of a regular inscribed pentagon are drawn, the points of intersection will be the vertices of another regular pentagon. $[12\frac{1}{2}]$