

High School Department

17TH EXAMINATION

PLANE GEOMETRY

Wednesday, September 25, 1901—9.15 a.m. to 12.15 p.m., only

Answer eight questions but no more, including at least one from each of the three divisions. If more than eight are answered only the first eight answers will be considered. Draw carefully and neatly each figure in construction or proof, using letters instead of numerals. Arrange work logically. Each complete answer will receive 12½ credits. Papers entitled to 75 or more credits will be accepted.

First division 1 Prove that from a point without a straight line only one perpendicular can be drawn to the line.

2 Prove that two right triangles are equal if the hypotenuse and a leg of the one are equal respectively to the hypotenuse and a leg of the other.

3 Prove that a radius perpendicular to a chord bisects the chord and its subtended arc.

4 Prove that the areas of two rectangles are to each other as the products of their bases by their altitudes.

5 Prove that two regular polygons of the same number of sides are similar.

Second division 6 The base of a triangle is 12 in., its sides are 6 in. and 8 in. respectively; a line parallel to the base of the triangle cuts off a triangle equal to $\frac{1}{4}$ of the first triangle. Find the three sides of the smaller triangle.

7 The inscribed angle formed by a diameter and the side of a regular polygon inscribed in the circle, intercepts an arc of 165° ; how many sides has the polygon?

8 The bases of an isosceles trapezoid are 15 in. and 9 in. respectively; each leg is 5 in. Find the length of a diagonal.

9 The radius of a circle inscribed in an equilateral triangle is r ; find the area of the triangle.

10 The side of a regular polygon inscribed in a circle is 3 in.; the side of the regular inscribed polygon of double the number of sides is $1\frac{7}{8}$ in. Find the radius of the circle.

Third division 11 Show how to draw through two sides of a triangle a line parallel to the third side so that the part intercepted by the sides shall have a given length. Give proof.

12 Prove that in an isosceles trapezoid the lines joining the middle points of the sides taken in succession, form a rhombus.

13 If the sides AD and BC of a trapezium ABCD inscribed in a circle are produced till they meet at E, prove that the triangle ABE and CDE are similar.

14 Prove that the angle at the center of a regular polygon is the supplement of an angle of the polygon.

15 In the parallelogram ABCD lines are drawn from B and D to E, any point in the diagonal AC; prove that the triangles AED and AEB are equal in area.