

185TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, March 29, 1905 — 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 if two parallel lines are cut by a transversal, the alternate interior angles are equal.

2 What is the locus of a point equidistant from the extremities of a straight line? Give proof.

3 Prove that in the same circle or in equal circles equal chords are equally distant from the center.

4 Prove that two mutually equiangular triangles are similar.

5 State and prove the relation between the areas of two triangles having an angle of the one equal to an angle of the other.

Second division 6 In a trapezoid the bases are respectively 5 feet and 26 feet, the legs 10 feet and 17 feet, and the area 124 square feet; find the projection of each leg on the base.

7 Find the product of the segments of any chord drawn through a point 20 inches from the center of a circle whose radius is 29 inches. What is the length of the shortest chord that can be drawn through that point?

8 The area of a triangle is 21 square inches; the sides including the vertical angle are respectively 7 inches and $8\frac{1}{2}$ inches. Find the area of each triangle into which the bisector of the vertical angle divides the first triangle. Apply the theorem of question 5.

9 The altitude of an equilateral triangle is 12 inches; find the apothem of an equivalent regular hexagon.

10 Two sides of a triangle are respectively 13 inches and 15 inches; the altitude on the third side is 12 inches. Find the radius of the circle circumscribed about the triangle.

Third division 11 Show how to construct a circumference which shall pass through a given point and be tangent to a given line at a given point.

12 Show how to construct a tangent through a given point in a given circumference without using the center.

13 What is the figure formed by the lines connecting the middle points of the sides of a square? Give proof.

14 Prove that the angle formed by two tangents to a circle is twice as great as the angle formed by the radius to a point of contact and the chord joining the points of contact.

15 If the vertical angle of an isosceles triangle is a right angle, what is the ratio of the base to the altitude of the triangle? Give proof.