High School Department

182D EXAMINATION

PLANE GEOMETRY

Wednesday, June 15, 1904—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 the sum of two lines drawn from a point to the extremities of a straight line is greater than the sum of two lines similarly drawn but included by them.

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

3 Prove that a diameter perpendicular to a chord bisects the chord and the arc subtended by it.

4 Complete the following: an inscribed angle is measured by . . . Demonstrate *two* cases.

5 Complete and demonstrate the following: the areas of two similar triangles are to each other as . . .

Second division

6 Find the number of sides of a regular polygon if (*a*) an interior angle is 135°, (*b*) an exterior angle is 72°. Mention the name of the polygon in each case.

7 Find the area of a triangle whose base is 10 inches and whose base angles are 120° and 30° respectively.

8 The sides of a triangle are 8 inches, 9 inches and 11 inches respectively; find the median to the longest side.

9 The area of an equilateral triangle is $48\sqrt{3}$; find the altitude of the triangle.

10 The centers of two circles whose radii are 12 inches and 9 inches respectively are 28 inches apart; find how far from the center of each circle the line of centers is cut by a common tangent.

Third division

11 Show how to construct the triangle mentioned in question 7.

12 Show how to find the center of a given circle. Give proof.

13 Prove that the diagonals of any parallelogram divide it into four equivalent triangles.

14 Prove that the area of an isosceles right triangle equals one fourth the square of its hypotenuse.

15 Two circles are tangent at *M*, and *AMB* is a secant cutting the circumferences at *A* and *B*; prove that tangents to the circles at *A* and *B* are parallel.