High School Department

156TH EXAMINATION

PLANE GEOMETRY

Wednesday, September 28, 1898—9.15 a. m. to 12.15 p. m., only

Answer eight questions including 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 Define *axiom, scalene triangle, tangent, sector, segment.*

2 Prove that if two angles have their sides respectively parallel they are either equal or supplementary.

3 Prove that two triangles are equal if they have three sides of the one equal respectively to three sides of the other.

4 Prove that two triangles are similar if they have their sides respectively perpendicular or parallel.

5 Deduce the formula for the area of a circle. Prove that the areas of circles are to each other as the squares of their radii.

Second division

6 If the sum of the interior angles of a polygon is equal to four times the sum of the exterior angles, how many sides has the polygon?

7 The shortest chord that can be drawn through a point 8 inches within the circumference of a given circle is 24 inches long; find the length of the diameter of the circle.

8 Find the area of a rhombus whose perimeter is 20 inches and difference of diagonals 2 inches.

9 A quadrilateral is inscribed in a circle; the first arc is half the second, the second is half the third, and the fourth equals 80°; find the value in degrees of the angles formed by the intersection of the diagonals of the quadrilateral.

10 Find the radius of a circle circumscribed about an equilateral triangle whose side is a.

Third division

11 Construct a circle with a given radius and tangent to two given intersecting lines.

12 Construct a pentagon equivalent to a given octagon and similar to a given pentagon.

13 Prove that a parallelogram inscribed in a circle is a rectangle.

14 Prove that the medians of an equilateral triangle form six equal triangles within the original triangle.

15 Find a line which shall be to a given line as $\sqrt{2}:1$