High School Department

168TH EXAMINATION

PLANE GEOMETRY

Wednesday, March 27, 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 Two angles whose sides are perpendicular each to each are either equal or supplementary. Give proof for both cases.

2 Prove that two tangents to a circle drawn from an exterior point are equal, and make equal angles with the line joining the point to the center.

3 Prove that if two polygons are composed of the same number of triangles, similar each to each, and similarly placed, the polygons are similar.

4 Complete and demonstrate the following: the area of a trapezoid is equal to . . .

5 State the ratio that exists between the areas of two similar segments. Give proof.

Second division

6 The sides of a triangle are 18, 15 and 12 inches respectively; find the bisector of the largest angle.

7 From a point 12 inches from the center of a circle whose radius is 8 inches, a secant 16 inches long is drawn terminating in the concave arc; find the segments of the secant made by the circumference of the circle.

8 Find the area of a regular hexagon circumscribed about a circle whose radius is 4 inches.

9 The sum of the diagonals of a rhombus is 23 inches and one diagonal is 7 inches longer than the other; find the area and the perimeter of the rhombus.

10 Find the radius of a semicircle whose area is 88.3575 square inches.

Third division

11 Prove that the greater segments of two intersecting diagonals of a regular pentagon are equal.

12 Find the locus of the middle points of all chords of a given length that can be drawn in a given circle. Give proof.

13 Determine the ratio of the area of a rhombus to the area of the rectangle of its diagonals. Give proof.

14 AB and CD are unequal parallel chords; prove that AD and BC will intersect on the diameter perpendicular to the chords, or on this diameter produced.

15 The bisector of angle C of the inscribed triangle ABC cuts AB in D and the circumference in E; prove that AC:CD::CE:BC.