High School Department

PLANE GEOMETRY

Monday, March 24, 1902 — 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 Define hypothesis, locus of a point, altitude, diameter, rhomboid.

2 Prove that if the opposite sides of a quadrilateral are equal, the figure is a parallelogram.

3 Prove that two mutually equiangular triangles are similar.

4 Prove that in the same circle or in equal circles equal arcs are subtended by equal chords. State the converse of this theorem.

5 Complete and demonstrate the following: the area of a regular polygon is equal to . . .

Second division

6 The three sides of an obtuse triangle are 4 inches, 13 inches and 15 inches respectively; find the altitude on the shortest side.

7 Two tangents to a circle 12 inches in diameter form an angle of 60°; find in inches the length of the arc between the points of contact.

8 A circular drive is 15 feet wide and the inclosed grass plot is 80 feet in diameter; find the area of the drive.

9 From P, a point $6\frac{1}{2}$ inches from the center of a circle whose diameter is 5 inches, a secant and a tangent are drawn; find the length of the tangent and the product of the secant and its external segment.

10 A rectangle and an equilateral triangle have equal areas and bases; their bases are each 4 inches. Find the altitude of the rectangle.

Third division

11 Show how to construct *a*) a circumference equal in length to the difference of two given circumferences, *b*) a circle equal in area to the sum of two given circles.

12 Prove that the sum of the perpendiculars dropped from the middle points of two sides of a triangle to the third side, is equal to the altitude on the third side.

13 Prove that two trapezoids are equal if their sides taken in order are equal each to each.

14 In a circle, chord CD intersects chord AB at E so that arc AC equals arc BC; prove that $CE:AC::AC:CD$.

15 Prove that tangents to a circle at the extremities of any two diameters form a rhombus.