High School Department

180TH EXAMINATION

PLANE GEOMETRY

Wednesday, January 27, 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 State *three* theorems that conclude "the triangles are equal." Demonstrate *one* of these theorems.

2 Complete and demonstrate the following: the sum of the exterior angles of a polygon, made by producing each of its sides in succession, is equal to . . .

3 Prove that in the same circle or in equal circles if two chords are unequal, the greater chord is at the less distance from the center.

4 Prove that two triangles are similar if the sides of one are respectively parallel to the sides of the other.

5 Prove that the areas of two rectangles having equal altitudes are to each other as their bases.

Second division 6 The sides of a triangle are respectively 3, 25 and 26 inches; find the altitude on the shortest side.

7 Two tangents to a circle form an angle of 72°; find the number of degrees in an angle inscribed in each of the two arcs intercepted by the tangents.

8 The area of a circle circumscribed about an equilateral triangle is $7\frac{1}{3}\pi$ square inches; find the altitude of the triangle.

9 A chord 30 inches long subtends an arc of 120°; find the distance of the chord from the center of the circle.

10 The sides of a triangle are 6 inches, 7 inches and 8 inches respectively; find the bisector of the angle opposite the medium side.

Third division 11 Show how to construct angles of 30°, 150°, $22\frac{1}{2}$°, $67\frac{1}{2}$°, 105°.

12 Show how to construct a parallelogram, having given the diagonals and one side.

13 The bisectors of the equal angles of an isosceles triangle meet the equal sides at points A and B; prove that AB is parallel to the base of the triangle.

14 Prove that in any right triangle, the sum of the hypotenuse and the diameter of the inscribed circle equals the sum of the legs of the triangle.

15 Prove that the area of the regular inscribed hexagon is twice the area of the equilateral triangle inscribed in the same circle.