University of the State of New York

High School Department

172D EXAMINATION

PLANE GEOMETRY

Wednesday, January 29, 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 State *three* conclusions of the following and prove *one* of them: if two parallels are cut by a transversal . . .

2 Prove that in the same circle or in equal circles equal chords are equally distant from the center.

3 Prove that if a line is drawn through two sides of a triangle parallel to the third side, it divides those sides proportionally, when the segments are incommensurable.

4 State the proportion that exists between the areas of two similar polygons and their homologous sides. Give proof.

5 Prove that a circle can be circumscribed about any regular polygon.

Second division

6 The legs of a right triangle are 5 inches and 12 inches respectively; find the altitude on the hypotenuse and the projections of the legs on the hypotenuse.

7 An angle inscribed in a circle and an angle formed by two tangents drawn from an exterior point to the circle, intercept the same arc. The inscribed angle is 48°; find the angle formed by the tangents.

8 The radius of a circle is 8 inches; find the area of the segment subtended by the side of an inscribed square.

9 One of the acute angles of a rhombus is 60° and the shorter diagonal is 20 feet; find the area of the rhombus.

10 The point P is 6 inches from the center of a circle whose radius is 10 inches; find the longest and the shortest chord and the product of the segments of any chord drawn through P.

Third division

11 Show how to construct a circle tangent to two given parallel lines and passing through a given point unequally distant from the two lines.

12 Prove that the radius of a circle circumscribed about an equilateral triangle is $\frac{2}{3}$ the altitude of the triangle.

13 Prove that if from a point in the base of an isosceles triangle parallels to the legs are drawn, the perimeter of the parallelogram formed equals the sum of the legs of the triangle.

14 Prove that if two tangents drawn from an exterior point to a circle form an angle of 120°, the distance from the point to the center of the circle is equal to the sum of the tangents.

15 Prove that two isosceles triangles having an angle of one equal to the homologous angle of the other are similar.