183D HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Wednesday, September 28, 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 Prove that if two sides of a triangle are unequal, the angles opposite are unequal and the greater angle is opposite the greater side.

2 Prove that two parallelograms are equal if two sides and the included angle of the one are equal respectively to two sides and the included angle of the other.

3 Complete and demonstrate the following: an angle formed by two chords intersecting within the circumference is measured by . . .

4 Complete and demonstrate the following: the bisector of an angle of a triangle divides the opposite side into segments . . .

5 Prove that the square described on the hypotenuse of a right triangle is equivalent to the sum of the squares described on the legs.

Second division

6 The area of a rhombus is 120 square inches, one of the diagonals is 24 inches; find a side of the rhombus.

7 The lines joining the middle points of the sides of a triangle are 7 inches, 7½ inches and 6½ inches respectively; find the area of the triangle.

8 The area of a quadrant of a circle is 16 square feet; find the radius of the circle.

9 Find the area of the circular ring between two concentric circumferences whose lengths are 12π feet and 10π feet respectively.

10 Two equal circles with a radius 6 intersect so that the common chord is equal to the radius of the circles; find the area of the section common to the circles.

Third division

11 Find the locus of the middle points of the lines drawn from a given point to a given line. Give proof.

12 Show how to construct a circle whose area is (*a*) twice the area of a given circle, (*b*) one half the area of a given circle.

13 Prove that the angle formed by the bisectors of the equal angles of an isosceles triangle is equal to the exterior angle at the base of the triangle.

14 Prove that if two circumferences are tangent to each other their common internal tangent bisects their common exterior tangent.

15 In a regular pentagon all the diagonals are drawn, intersecting within the pentagon at points *a*, *b*, *c*, *d* and *e*; prove that *abcde* is a regular pentagon.