High School Department

162D EXAMINATION

PLANE GEOMETRY

Wednesday, January 24, 1900—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. Division of groups is not allowed. Each complete answer will receive 12½ credits. Papers entitled to 75 or more credits will be accepted.*

First division

1 Define *five* of the following: *angle, axiom, scholium, trapezium, perimeter, tangent, antecedent.*

2 Two angles whose sides are parallel each to each are either equal or supplementary. Give proof for both cases.

3 Prove that if two sides of a triangle are unequal the angles opposite are unequal and the greater angle is opposite the greater side.

4 Prove that an angle formed by two chords intersecting within the circumference is measured by one half the sum of the intercepted arcs.

5 Prove that the homologous altitudes of two similar triangles have the same ratio as any two homologous sides.

Second division

6 Find the area of a rhombus whose longer diagonal is 30 inches and whose perimeter is 68 inches.

7 Find the number of degrees in the angle formed by two secants which meet without the circle and intercept arcs of $\frac{1}{8}$ and $\frac{3}{16}$ of the circumference.

8–9 Find the area contained between three equal circles each of which is tangent externally to the other two and whose common radius is 2 inches.

10 The altitude of the segment of a circle is 9 inches and the length of the chord that subtends the segment is 30 inches; find the diameter of the circle.

Third division

11 Show how to draw a tangent to a given circle through a given point *a*) on the circumference, *b*) without the circumference.

12 Show how to inscribe a square in a given circle. Give proof.

13 Prove that if two adjacent sides of a quadrilateral are equal and the other two sides are equal the diagonals of the quadrilateral intersect at right angles.

14 Show how to construct a circle passing through a given point and tangent to a given circle at a given point.

15 Two tangents are drawn to a circle from a point without; prove that the triangle formed by these tangents and a tangent to the arc included by them has a perimeter equal to the sum of the first two tangents.