High School Department

159TH EXAMINATION

PLANE GEOMETRY

Wednesday, June 14, 1899—9.15 a. m. to 12.15 p. m., only

Answer eight questions including 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 *five* of the following: *rhombus, postulate, segment, variable, proportion, similar polygons, sector.*

2 Prove that if two parallel lines are cut by a third line the sum of the interior angles on the same side of the secant line is equal to two right angles.

3 Prove that the radius perpendicular to a chord bisects the chord and the subtended arc.

4 Prove that two mutually equiangular triangles are similar.

5 Prove that the area of a square on the hypotenuse of a right triangle is equivalent to the sum of the areas of the squares on the other two sides.

Second division

6 ABC is a triangle inscribed in a circle whose radius is 2 feet; AB is the diameter of the circle and the angle ABC is 30°. Find the area of the triangle.

7 Find the area of a circle circumscribing a rectangle whose altitude is 6 feet and whose base is 8 feet.

8 Find the length of a tangent drawn to a circle, whose radius is 8 inches, from a point 9 inches from the circumference.

9 AB is the diameter of a circle; AC and BD are chords intersecting at O, and AOD is an angle of 40°. Find the number of degrees in the arc DC.

10 Find the area of a regular hexagon inscribed in a circle whose radius is r.

Third division

11 Show how to construct a square equivalent to a given triangle.

12 Given the lines a, b and c; construct x (1) when $x=\frac{ab}{c}$, (2) when $x=\frac{a^2}{c}$

13 Show how to construct a circle equivalent to the sum of two given circles.

14 In the parallelogram $ABCD$, E and F are the middle points of the sides BC and AD respectively; prove that the lines AE and CF trisect the diagonal BD.

15 Through P, the point of tangency of two circles, a line MPN is drawn cutting the circles at M and N; prove that the tangents drawn through M and N are parallel.