High School Department

161ST EXAMINATION

PLANE GEOMETRY

Wednesday, September 27, 1899—9.15 a. m. to 12.15 p. m., only

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Answer eight questions but **no more,** *including one from each of the three divisions. If more than eight are answered only the first eight answers will be considered. Division of groups is not allowed. 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 *line, polygon, circle, corollary, theorem.*

2 Prove that if two opposite sides of a quadrilateral are equal and parallel the figure is a parallelogram.

3 Prove that an inscribed angle is measured by one half the arc included between its sides.

4 Prove that if two straight lines can be cut by a third line making the alternate angles equal the two lines are parallel.

5 Prove that the areas of any two rectangles are to each other as the products of their bases and altitudes.

Second division

6 The sides of a triangle are 3 feet, 5 feet and 7 feet respectively; show whether this triangle is obtuse-angled or acute-angled.

7 The circumference of a circle and the perimeter of a square are each equal to 44 feet; find the difference in their areas. [Assume $\pi = 3\frac{1}{7}$.]

8 Two equal circles of 6 foot radius intersect so that the circumference of each passes through the center of the other; find the length of their common chord.

9 The radii of two circles are respectively 5 feet and 2 feet and the distance between their centers is 12 feet; find the length of their common tangent.

10 The sides of a certain triangle are $a = 8$ feet, $b = 11$ feet, $c = 13$ feet; in a similar triangle the side $a' = 9$ feet. Find the two remaining sides of the second triangle and the ratio of the areas of the two triangles.

Third division

11 Show how to divide a line into three parts that shall be in the proportion of 2, 3 and 4.

12 Show how to construct a line whose length shall be $\sqrt{3}$.

13 Show how to construct a line that shall pass through any given point and make equal angles with two non-parallel lines.

14–15 Prove that if the diagonals of an inscribed quadrilateral bisect each other the figure is a rectangle.