

High School Department

160TH EXAMINATION

PLANE GEOMETRY

August 1899—Three hours, only

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. Draw carefully and neatly each figure in construction or proof, using letters instead of numerals. Arrange work topically. Each complete answer will receive $12\frac{1}{2}$ credits. Papers entitled to 75 or more credits will be accepted.

First 1 Define theorem, corollary, sector, regular polygon, division trapezoid.

2 Prove that if two parallel lines are cut by a third line the alternate interior angles are equal.

3 Prove that the angle formed by two secants intersecting without the circumference is measured by one half the difference of the intercepted arcs.

4 Complete and demonstrate the following: In any obtuse triangle the square of the side opposite the obtuse angle is equal to . . .

5 Prove that the areas of two rectangles having equal altitudes are to each other as their bases, when these bases are incommensurable.

Second 6 One of the angles of a right triangle is 30° and the side opposite this angle is 4 feet; find the area of the circle circumscribing this triangle.

7 Find the area of an equilateral triangle circumscribing a circle whose circumference is 44 inches. [Assume $\pi = 3\frac{1}{2}$.]

8 Find the number of degrees in the angle formed by the bisectors of the acute angles of a right triangle.

9 The radii of two concentric circles are a and b ; find the length of a chord of the larger circle tangent to the smaller circle.

10 The acute angles of a rhomboid are each 60° ; the bases of the rhomboid are each 4 inches, and its sides are each 2 inches. Find the area of the figure formed by joining in succession the middle points of the four sides of the rhomboid.

Third 11 Construct a square equivalent to a given parallelogram.

12 Construct a circle equivalent to the difference of two given circles.

13 Construct a circle tangent to two given lines and passing through a given point on one of these lines.

14 Prove that the angle formed by two tangents is equal to twice the angle formed by the chord joining the points of tangency and a radius drawn to one of these points.

15 Two circumferences intersect in O and P , and the line AOB meets the circles in A and B ; prove that angle APB is constant, whatever the direction of AOB .