*New York State Education Department*

205TH HIGH SCHOOL EXAMINATION

# PLANE GEOMETRY

**Tuesday,** September 19, 1911—9.15 a. m. to 12.15 p. m., only

*Answer eight questions, selecting two from each group. Each complete answer will receive 12½ credits. Papers entitled to less than 75 credits will not be accepted.*

**Group I** 1 Prove that if two sides of a triangle are unequal, the angles opposite these sides are unequal and the angle opposite the greater side is the greater.

2 Prove that the tangents to a circle drawn from an external point are equal.

3 Prove that if in a right triangle a perpendicular is drawn from the vertex of the right angle to the hypotenuse, the perpendicular is a mean proportional between the segments of the hypotenuse.

**Group II** 4 Prove that the areas of two similar triangles are to each other as the squares of any two corresponding sides.

5 Prove that the area of an equilateral triangle is equal to $\frac{a^2}{4}\sqrt{3}$, $a$ being one of its sides.

6 Prove that the opposite angles of an inscribed quadrilateral are supplementary.

**Group III** 7 The perimeter of an isosceles triangle is 16; the base of the triangle is $1\frac{1}{3}$ times each leg. Find the area of the triangle.

8 An arc of a circle whose radius is 12 ft subtends a central angle of 20°; an equal arc of another circle subtends a central angle of 30°. Find the radius of the second circle.

9 The base of a triangle is 12 ft and the other sides are 10 ft and 8 ft; find the segments of the base made by the bisector of the vertical angle.

**Group IV** 10 Prove that the diagonals of an inscribed parallelogram are diameters of the circle.

11 Let $a$, $b$ and $c$ be three lines; construct the line $x$ so that $x = \frac{ab}{c}$. Give proof.

12 Construct angles of 30° and 105°. Explain the constructions.