195TH HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Monday, June 15, 1908 — 9.15 a. m. to 12.15 p. m., only

Answer eight questions, selecting at least two from each group.

Group I 1 Prove that through a given point one perpendicular, and only one, can be drawn to a given plane.

2 Prove that if three straight lines are intersected by three parallel planes their corresponding segments are proportional.

3 Prove that the lateral area of a prism is equal to the product of a lateral edge by the perimeter of the right section.

4 Prove that the shortest distance on the surface of a sphere between any two points on that surface is the arc, not greater than a semicircumference, of the great circle which joins them.

Group II 5 Prove that the sum of the angles of a spheric triangle is greater than $180°$ and less than $540°$.

6 Find the area of a lune whose angle is $30°$ on a sphere having a radius of 10 inches.

7 Find the number of cubic feet of concrete in a dam 250 feet long, 31 feet high, 33 feet wide at the bottom and 5 feet wide at the top.

8 Find the length of wire $\frac{1}{16}$ of an inch in diameter that can be made from a cubic foot of copper.

Group III 9 The altitude of a cone, the diameter of its base and the edge of a given cube are equal; find the ratio of the volume of the cone to the volume of the cube.

10 A right cone a foot high is cut into two equal parts by a plane parallel to the base; find the altitude of the frustum.

11 Name the five regular convex polyedrons and prove that there can be no others.

12 Find the radius of a sphere whose volume in cubic inches equals its surface in square inches.