201ST HIGH SCHOOL EXAMINATION
SOLID GEOMETRY
Thursday, June 9, 1910 — 9.15 a. m. to 12.15 p. m., only

Write at the top of the first page of your answer paper (*a*) the name of the school where you have studied, (*b*) the number of weeks and recitations a week that you have had in solid geometry.

Two recitations a week for a school year (or four recitations a week for half a school year), in a recognized academic school, is the regular requirement, and any statement showing less or other than this should be accompanied by a satisfactory claim or explanation made by the candidate and certified by the principal; otherwise such paper will be returned.

Answer eight questions, selecting two from each group.

Group I 1 Prove that all the perpendiculars to a given straight line at a given point lie in a plane perpendicular to that line.

2 Prove that the volume of a triangular pyramid is equal to one third the volume of a prism having the same base and the same altitude.

3 Find the total surface and the volume of a regular tetraedron whose edge is 8 centimeters.

Group II 4 Prove that sections of a prism made by parallel planes cutting all the lateral edges are equal polygons.

5 Prove that the acute angle which a straight line makes with its projection on a plane is the least angle which it makes with any line of the plane.

6 Prove that if from any point in a diedral angle perpendiculars are drawn to the faces, the plane determined by these perpendiculars is perpendicular to the edge of the diedral angle.

Group III 7 The edge of a cube is 5 inches; find the altitude of a right circular cylinder of equal volume whose base is inscribed in the base of the cube.

8 Regarding the earth as a sphere, show that $\frac{11}{16}$ of its volume is included between the planes of the small circles of 30° north latitude and 30° south latitude.

9 A lune whose angle is 36° is equivalent to a zone on the same sphere; find the ratio of the altitude of the zone to the radius of the sphere.

Group IV 10 The four sides of a certain spheric quadrilateral are equal; prove that its diagonals are perpendicular to each other.

11 Find the locus of a point whose distance from a fixed straight line is always equal to its distance from a fixed plane perpendicular to that line.

12 Find a point at equal distances from four points not all in the same plane.