SOLID GEOMETRY

Monday, June 12, 1911 — 9:15 a.m. to 12:15 p.m., only

Write at top of first page of answer paper (a) name of school where you have studied, (b) number of weeks and recitations a week in solid geometry. The minimum time requirement is two recitations a week for a school year or four recitations a week for half a school year.

Answer eight questions, selecting four from each group.

Group I

1. Prove that if two planes are perpendicular to each other, a straight line drawn in one of them perpendicular to their line of intersection is perpendicular to the other plane.

2. Prove that the sum of the face angles of any convex polyedral angle is less than four right angles.

3. Complete and demonstrate the following: Any two rectangular parallelepipeds are to each other as . . .

4. Prove that the volume of any pyramid is equal to one third the product of its base by its altitude.

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

6. Prove that the area of the surface of a sphere is equal to the product of the diameter of the sphere by the circumference of a great circle.

Group II

7. Define five of the following: diedral angle, projection of a line on a plane, symmetric trihedral angles, prism, right cylinder, sphere.

8. The volume of a sphere is $2929\frac{1}{2}$ cubic inches; find its surface.

9. Find the ratio of the volumes of two similar tetrahedrons whose homologous edges are as 1 : 8. Find the ratio of their homologous edges if their volumes are as 1 : 8.

10. The volume of a regular square pyramid is 18 cubic feet; its altitude is twice one side of the base. Find (a) the total surface of the pyramid, (b) the area of a section made by a plane parallel to the base and one foot from the base.

11. If each of two intersecting planes is parallel to a given line their intersection is parallel to the given line.

12. Find the locus of a point on a sphere that is equidistant from two given points on the surface.