SOLID GEOMETRY

Monday, September 13, 1926 — 1.15 to 4.15 p. m., only

Answer eight questions. Irrational results may be left in the form of π and radicals unless otherwise stated. Papers entitled to less than 75 credits will not be accepted.

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

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

3 Prove that the sum of the sides of a convex spheric polygon is less than the circumference of a great circle.

4 Prove that every section of a circular cone made by a plane parallel to its base is a circle, the center of which is the intersection of the plane with the axis.

5 *a* Find the locus of all straight lines that make a given angle with a given plane at a given point.

b Find the locus of points in a given plane equidistant from two points not in that plane.

6 A right circular cone inscribed in a sphere has its slant height and the diameter of its base each equal to 12". Find the volume of the sphere.

7 Prove that a line and a plane each perpendicular to the same line are parallel to each other.

8 Prove that any line passing through the point of intersection of the diagonals of a parallelepiped and terminated by its faces is bisected at that point.

9 The base of a pyramid is a rectangle whose length is 8" and width 6". Find the volume of the pyramid if each lateral edge is 13".

10 Prove that if a trihedral angle has three right dihedral angles, all its face angles are right angles.

11 Prove that one half the earth's surface lies between the planes of two small circles, one 30° north of the equator and the other 30° south of the equator.