1920 High School Examination

SOLID GEOMETRY

Monday, June 17, 1907—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 if two planes are perpendicular to each other, a straight line drawn perpendicular to one at any point of their intersection lies in the other.

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

3 Prove that if two parallel planes are intersected by a third plane the lines of intersection are parallel.

4 Prove that if a pyramid is cut by a plane parallel to its base the section is a polygon similar to the base.

Group II

5 The area of the lower base of the frustum of a pyramid is 5 square inches, the area of the upper base is 4 square inches and the altitude of the frustum is 2 inches; find the altitude of the complete pyramid.

6 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.

7 A tank in the form of the frustum of a right cone is 18 feet in diameter at the bottom, 16 feet at the top and 14 feet deep; find its capacity in cubic feet.

8 A ball a foot in diameter weighs 250 pounds; find the diameter of a ball of the same material that weighs 24 pounds.

Group III

9 Prove that if a line and a plane are perpendicular to the same plane, they are parallel.

10 Determine a point in a plane which shall be equally distant from three given points in space.

11 Prove that any straight line drawn through the point of intersection of the diagonals of a parallelepiped and terminating in the opposite faces is bisected at that point.

12 Prove that the volume of a right circular cylinder is equal to the product of the lateral area by half the radius.