

SOLID GEOMETRY

Monday, June 18, 1922—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 a school year.

Name the author of the textbook you have used in your study of solid geometry.

Answer eight questions, including four from each group.

Group I

Answer four questions from this group.

1 Prove that if two straight lines are parallel, every plane passed through one of them and not coincident with the plane of the parallels is parallel to the other.

2 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.

3 Prove that the plane passed through two diagonally opposite edges of a parallelepiped divides it into two equivalent triangular prisms.

4 Prove that in two polar triangles each angle of one is measured by the supplement of the side lying opposite to it in the other.

5 Prove that a plane tangent to a sphere is perpendicular to the radius drawn to the point of contact.

Group II

Answer four questions from this group.

Formulas and results may be left in the form of π and radicals unless otherwise stated.

6 From any point within a dihedral angle perpendiculars are drawn to each of the faces. Prove that the angle formed by these two lines is supplementary to the plane angle of the dihedral.

7 Find correct to two decimal places the weight of a cast iron water pipe 12 feet long, outside diameter 2 inches, thickness of the iron $\frac{1}{2}$ of an inch, if the iron weighs 0.26 lb per cubic inch.

8 A right cylinder and a right cone of the same volume stand on the same circular base whose radius is 9 inches. The altitude of the cylinder is 4 inches. Find the lateral surface of that part of the cone which is above the cylinder.

9 What is the locus of points 6 inches from a given point and equidistant from two other given points? [No proof required.]

10 A light is 18 feet from the center of a sphere whose radius is 6 feet. Find the area of the illuminated surface.