The University of the State of New York

233d High School Examination

SOLID GEOMETRY

Monday, June 15, 1925 — 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 five recitations a week for half a school year, or the equivalent.

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

Answer eight questions, including not more than four from group I.

Group I

Do not answer more than four questions from this group.

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 plane. [12½]

2 Prove that the sum of any two face angles of a trihedral angle is greater than the third face angle. [12½]

3 Prove that the plane passed through two diagonally opposite edges of a parallelepiped divides it into two equal (equivalent) triangular prisms. [12½]

4 Prove that the volumes of similar cylinders of revolution are proportional to the cubes of their respective altitudes or radii. [12½]

5 Prove that a spheric angle is measured by the arc of a great circle described from its vertex as a pole and included between its sides, produced if necessary. [12½]

Group II

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

6 A straight line intersects a plane at right angles. Find the locus of all points in space equally distant from the line and the plane. [12½]

7 Given two parallel planes and a point between them. Through this point three lines not in the same plane are drawn intersecting each of the parallel planes. Prove that the intersections in each plane are the vertices of two similar triangles. [12½]

8 Prove that if three planes intersecting in three straight lines are all perpendicular to a fourth plane, their lines of intersection are parallel. [12½]

9 A regular triangular pyramid has each lateral edge equal to 5 and each base edge equal to 6. Find its volume and its total surface. [7, 5½]

10 A great circle of a given sphere forms one base of a right cylinder, while the other base of the cylinder is tangent to the sphere. Find the ratio of the total surfaces of the two solids and the ratio of their volumes. [8, 4½]

11 *a* Find the ratio of the area of that portion of the earth's surface included between the meridians 15° W. longitude and 45° W. longitude to the portion included between the meridians 120° W. longitude and 135° E. longitude. [4½]

b The sides of a spheric triangle are 68°, 52° and 37°. Find the area of the polar triangle in square inches if the radius of the sphere is 10". [8]

12 The top and bottom diameters of a tub are 30" and 24" respectively and its depth is 10". How many gallons of water are there in the tub when it is filled to a depth of 8"? [12½]

[1 gal. = 231 cu. in.]