The University of the State of New York

213TH HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Monday, June 14, 1915—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.

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

Answer seven questions, selecting three from group I and two from each of the other two groups.

Group I

1 Prove that if a straight line is perpendicular to a plane, every plane passed through the line is perpendicular to the given plane. [12]

2 Prove that the sum of any two face angles of a trihedral angle is greater than the third face angle. [12]

3 Prove that the intersection of two spheric surfaces is a circle whose plane is perpendicular to the line which joins the centers of the spheres and whose center is in that line. [12]

4 Prove that two triangles on the same sphere are either equal or symmetrical when the three angles of one are respectively equal to the three angles of the other. [12]

Group II

5 Prove that if a line is parallel to one plane and perpendicular to another, the two planes are perpendicular to each other. [16]

6 If the projections of a number of points on a given plane lie in a line, prove that the points lie in a plane. [16]

7 P–ABC is a trihedral angle with $PA = PB = PC$. O is any point other than P equidistant from A, B and C. Prove that any point in the line PO is equidistant from the edges. [16]

Group III

8 A square, each of whose sides is 12, always lies with its vertices on the surface of a sphere whose radius is 20; how far from the center of the sphere is the plane of the square? [16]

9 *a* A frustum of a pyramid is cut from a pyramid the perimeter of whose base is 60 inches and whose altitude is 15 inches; what is the altitude of the frustum if the perimeter of its upper base is 40 inches? [8]

b How must the dimensions of a cylinder be increased in order to form a similar cylinder whose total surface shall be 9 times that of the original cylinder? [8]

10 A cylinder whose altitude is equal to its diameter is inscribed in a sphere whose radius is r; compare the total surface of the cylinder with that of the sphere. [16]