The University of the State of New York

229TH HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Monday, June 18, 1923—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 1.

Group I

Do not answer more than four questions from this group.

1 Prove that if two straight lines are cut by three parallel planes the corresponding segments are proportional. [$12\frac{1}{2}$]

2 Prove that the sum of any two face angles of a trihedral angle is greater than the third face angle. [$12\frac{1}{2}$]

3 Prove that if a pyramid is cut by a plane parallel to its base,

a the edges and altitude are divided proportionally; [6]

b the section is a polygon similar to the base. [$6\frac{1}{2}$]

4 Prove that the angle formed by two arcs of great circles is equal to the angle between the planes of the circles and is measured by the arc of a great circle described from its vertex as a pole and included between its sides (produced if necessary). [2, $10\frac{1}{2}$]

5 Prove that two symmetric spheric triangles on the same sphere are equivalent. [$12\frac{1}{2}$]

Group II

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

6 Find the volume of the frustum of a regular hexagonal pyramid the sides of whose bases are 20 feet and 10 feet respectively and whose altitude is 16 feet. [$12\frac{1}{2}$]

7 Find the number of square feet in the surface of a spheric triangle if its angles are 35°, 85° and 110° and if the radius of the sphere is 40 feet. [$12\frac{1}{2}$]

8 What is the locus of points in space equidistant from the three vertices of a given triangle? [$12\frac{1}{2}$]

9 Prove that if a straight line and a plane are perpendicular to the same plane, the straight line and plane are parallel. [$12\frac{1}{2}$]

10 An equilateral triangle with a side s and with its inscribed circle revolves about an altitude. Find in terms of s the total area and the volume generated by (a) the triangle, (b) the circle inscribed in the triangle. [6, $6\frac{1}{2}$]

11 Given a cone of revolution of altitude h; find in terms of h how far from the vertex two planes must be passed parallel to the base to divide the cone into three equivalent parts. [$12\frac{1}{2}$]