The University of the State of New York

220TH HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Monday, January 20, 1919—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 eight questions.

1 If two lines are perpendicular to the same plane, they are parallel.

2 If each of two intersecting planes is perpendicular to a third plane, their intersection is also perpendicular to that plane.

3 State and prove the formula for the volume of a triangular pyramid.

4 If a pyramid is cut by a plane parallel to its base (*a*) the edges and the altitude are divided proportionally, (*b*) the section is a polygon similar to the base. Give proof of both statements.

5 Prove that the area of a sphere is equal to four times the area of a great circle.

6 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).

7 How many spherical shot, each .32 of an inch in diameter, can be cast from a piece of lead pipe 15 inches long, 2 inches in exterior diameter and $\frac{1}{8}$ of an inch thick, if no allowance is made for waste?

8 A silver cup in the form of a conical frustum is to be plated inside with gold; the upper diameter of the cup is 7 inches, the diameter of the base is 5 inches and the height of the cup is 10 inches. How many square inches of gold plating will be required for the inside of the cup?

9 A house is 30 feet square and 25 feet high; its roof has the form of a square pyramid 10 feet high. Find the entire surface and the volume of the house.

10 A sphere is inscribed in a right circular cylinder. Prove that (*a*) the total areas of the two solids have the ratio 2 : 3, (*b*) the volumes of the two solids have the ratio 2 : 3. [Theorem due to Archimedes.]

11 A hexagonal nut has the form of a regular hexagonal prism throughout which a cylindric hole is bored from base to base. If the base edge is b and the height h, find the formula for the volume of the nut when the diameter of the hole equals the base edge.

12 A right triangle whose legs are 6 inches and 8 inches in length revolves about the hypotenuse as an axis. Find the area and the volume of the resulting solid.