The University of the State of New York
Examination for Qualifying Certificates
SOLID GEOMETRY
Monday, September 12, 1927 — 1.15 to 4.15 p. m., only

Answer eight questions. Irrational results may be left in the form of π and radicals unless otherwise stated. Papers entitled to less than 75 credits will not be accepted.

1 Prove that if a line is perpendicular to each of two other lines at their point of intersection, it is perpendicular to the plane of the two lines.

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

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

4 Prove that every section of a sphere made by a plane is a circle.

5 Given a line l and a fixed point A in l; describe the locus of points P in space such that AP always makes an angle of $m°$ with l.

6 The slant height of a wooden cone and the diameter of its base are each 12 inches; find the volume of the largest sphere that can be cut from the cone.

7 Find the number of square yards of canvas in a conical tent 12 feet in diameter and 8 feet high.

8 The altitude of a cylinder of revolution is 8 inches and the radius of the base is 6 inches; find the surface of the sphere circumscribing the cylinder.

9 The edge of a regular tetrahedron is a; express in terms of a the slant height, altitude and volume of the tetrahedron.

10 V is the vertex of a pyramid whose base is a rectangle $ABCD$ and whose lateral edge VA is perpendicular to the base; $AB = 6''$, $BC = 8''$, $VA = 10''$. Find the volume of the pyramid cut off by a plane parallel to the base and 4'' from it.

11 A plane is passed through the mid-point of the common perpendicular to two non-coplanar lines in space parallel to each line. Show that every straight line drawn from a point in one of the lines to a point in the other is bisected by the plane.