The University of the State of New York

241st High School Examination

SOLID GEOMETRY

Friday, January 20, 1928 — 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 angles, not in the same plane, have their sides respectively parallel and lying in the same direction, they are equal. [12½]

2 Prove that if one of two parallel lines is perpendicular to a plane, the other is also perpendicular to that plane. [12½]

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

4 Prove that the lateral area of a regular pyramid is equal to the product of the perimeter of its base and half its slant height. [12½]

5 Prove that in two polar triangles, each angle of one is measured by the supplement of the side lying opposite to it in the other. [12½]

Group II

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

6 *a* What is the locus of all points equidistant from the points of a given circle? [5½]

b What is the locus of all points equidistant from two parallel planes and at a given distance from a fixed point midway between the two given planes? [2, 2, 3]

7 Prove that any two diagonals of a parallelepiped bisect each other. [12½]

8 Prove that the sum of the interior angles of a spheric quadrilateral is more than four right angles and less than eight right angles. [5, 7½]

9 A hollow sphere of steel has its outer diameter equal to 24″ and its inner diameter equal to 20″. How many solid spheres of ½″ diameter can be made from the hollow sphere? [12½]

10 A right triangle has its three sides respectively equal to 15″, 20″ and 25″. Find the area of the surface and the volume of the solid generated by revolving the triangle through 360° about its hypotenuse as an axis. [6½, 6]

11 *a* The diagonal of a cube is $8\sqrt{3}$; find its volume. [4]

b The angles of a spheric triangle are 60°, 80° and 120° respectively; if the radius of the sphere is 9 feet, what is the area of the triangle in square feet? [8½]

12 State whether *each* of the following statements is true or false: [Write the letters *a*, *b*, *c*, *d*, *e* in a column and then write the word *true* or *false* after each letter.]

a Two planes each perpendicular to a third plane are parallel. [2½]

b A diagonal of a cube is greater than the sum of two of its edges. [2½]

c If a plane and a line not in that plane are each parallel to a second line, they are parallel to each other. [2½]

d The area of the base of any regular pyramid is less than its lateral area. [2½]

e If a cube and a sphere have equal volumes, the total surface of the cube is greater than the surface of the sphere. [2½]