The University of the State of New York

276TH HIGH SCHOOL EXAMINATION

SOLID GEOMETRY

Tuesday, August 22, 1939 — 8.30 to 11.30 a. m., only

Instructions

Do not open this sheet until the signal is given.

Group I

This group is to be done first and the maximum time allowed for it is one and one half hours,

If you finish group I before the signal to stop is given you may begin group II. However, it is advisable to look your work over carefully before proceeding, since *no credit will be given any answer in group I which is not correct and in its simplest form.*

When the signal to stop is given at the close of the one and one half hour period, work on group I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.

Groups II and III

Write at top of first page of answer paper to groups II and III (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in solid geometry previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1939, (*d*) author of textbook used.

The minimum time requirement is five recitations a week for half a school year. The summer school session will be considered the equivalent of one semester's work during the regular session or five recitations a week for half a school year.

For admission to· this examination attendance on at least 30 recitations in this subject in a registered summer high school in 1939 is required.

SOLID GEOMETRY

See instructions for groups II and III on page 1.

Group II

Answer three questions from this group.

21 Prove that all the perpendiculars that can be drawn to a given line at a given point lie in the plane perpendicular to the line at the point.   [10]

22 Prove that the sum of the angles of a spheric triangle is greater than 180° and less than 540°.   [10]

23 If plane MN and line AB outside MN are each perpendicular to line RS, prove that MN and AB are parallel.   [10]

24 Two planes intersect in line s.

   a What is the locus of points equidistant from the two planes?   [3]

   b What is the locus of points at a distance d from point P in s?   [3]

   c What is the locus of points that satisfy at the same time the conditions of both *a* and *b*?   [4]

Group III

Answer two questions from this group.

25 The sum of the sides of a spheric triangle on a sphere of radius 12 inches is 300°. Find the area of its polar triangle. [Answer may be left in terms of π.]   [10]

26 A certain city erected a tourist information booth in the form of a perisphere (sphere) and a trylon (regular triangular pyramid). The diameter of the perisphere was 10 feet. The trylon had a height of 20 feet and each side of the base was 6 feet. Find *each* of the following, correct to the *nearest square foot:*

   a The surface of the perisphere   [3]

   b The lateral surface of the trylon   [7]

27 An oblique prism has for its base a rectangle whose dimensions are a and b. A lateral edge c of the prism makes with its projection on the base an angle A.

   a Derive a formula for the volume V of the prism in terms of a, b, c and angle A.   [5]

   b Find, correct to the *nearest integer*, the value of V if $a = 4.3$, $b = 5.2$, $c = 15.4$ and angle $A = 71°$ [5]

SOLID GEOMETRY

Fill in the following lines:

Name of school...Name of pupil...

Detach this sheet and hand it in at the close of the one and one half hour period.

Group I

Answer all questions in this group. Each correct answer will receive 2½ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

Directions (questions 1–11) — Write on the dotted line at the right of each question the expression which when inserted in the corresponding blank will make the statement true.

1 If the ratio of the volumes of two similar polyhedrons is 8 : 27, the ratio of their lateral areas is ....   1............

2 Two boys made a conical tent having a radius of 6 feet and a height of 8 feet. They used ... square feet of material. [Make no allowance for waste; answer may be left in terms of π.]   2............

3 The volume of a pyramid having an altitude of 12 inches and a square base 4 inches on a side is ... cubic inches.   3............

4 A rectangular room is 20 feet by 16 feet by 8 feet. The distance from one corner to the diagonally opposite corner is ... feet. [Answer may be left in radical form.]   4............

5 Three parallel planes are cut by two lines. The lengths of the intercepted segments of one line are 3 inches and 5 inches. If the shorter segment of the second line is 2 inches, the longer segment is ... inches.   5............

6 If the perimeter of a right section of a prism is 4 inches and a lateral edge is 8 inches, the lateral area of the prism is ... square inches.   6............

7 A lune on the surface of a sphere of radius 9 inches has an angle of 40°. The area of the lune is ... square inches. [Answer may be left in terms of π.]   7............

8 If the radius of a cone is doubled and its altitude halved, its volume is multiplied by ....   8............

9 The locus of a line which moves so as always to make an angle of 25° with a fixed line at point P on that line is a ... surface.   9............

10 The radius of a sphere is 12½. If the area of a zone on the sphere is one fifth the area of the sphere, the altitude of the zone is ....   10............

11 If the height of a regular square pyramid is h and a base edge is $2e$, the lateral area of the pyramid, expressed as a function of h and e, is ....   11............

Directions (questions 12–20) — Indicate whether each statement is *always* true, *sometimes* true or *never* true by writing on the dotted line at the right the word *always, sometimes* or *never*.

12 Two planes perpendicular to a third plane are parallel to each other.   12............

13 The face angles of a trihedral angle may be in the ratio 1 : 2 : 3.   13............

[3]   [OVER]

14 The plane angle of a dihedral angle is a right angle.

15 The sum of the sides of a convex spheric polygon is less than 360°.

16 The volume of a cylinder is equal to the product of the area of its base and an element.

17 Any line which meets a plane obliquely meets one line in the plane at right angles.

18 If a line is parallel to each face of a dihedral angle, it is parallel to the edge of the dihedral angle.

19 If the projections of two straight lines on the same plane are parallel, the lines are parallel.

20 If two lines are perpendicular to each other, a plane containing one and only one of these lines is perpendicular to the other.

14............

15............

16............

17............

18............

19............

20............