The University of the State of New York

276TH HIGH SCHOOL EXAMINATION

PLANE 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, III and IV

Write at top of first page of answer paper to groups II, III and IV (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in plane 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 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 those pupils who have met the time requirement the minimum passing mark is 65 credits; for all others 75 credits.

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

See instructions for groups II, III and IV on page 1.

Group II

Answer two questions from this group.

26 Prove that if from a point outside a circle a tangent and a secant are drawn to the circle, the tangent is the mean proportional between the secant and its external segment. [10]

27 $ABCD$ is a square. Points E and F are taken on AD and CD respectively so that lines BE and BF form angles of 15° with AB and BC. If EF is drawn, prove that triangle EBF is equilateral. [10]

28 Prove that the area of a regular polygon is equal to one half the product of its perimeter and its apothem. [10]

Group III

Answer two questions from this group.

29 A trapezoid has bases of 12 inches and 20 inches and one leg of 10 inches. The angle between that leg and the longer base is 70°.

a Find, correct to the *nearest tenth of an inch,* the altitude of the trapezoid. [7]

b Find the area of the trapezoid. [3]

30 The width of a circular track is 10 feet. The length of the track's inner edge is 628 feet.

a Find the radius of this inner edge. [Use $\pi = 3.14$] [3]

b Find the area of the track. [7]

31 Find the apothem of a regular hexagon whose area is $24\sqrt{3}$. [10]

Group IV

Answer one question from this group.

32 Construct a triangle, given the sum of two sides, the angle included by the same two sides and the altitude on one of these sides. [10]

33 Two circles intersect in A and B and the common chord AB is 10 inches in length. The line segment joining the centers cuts the circles in P and Q. If distance PQ is 3 inches and the radius of one circle is 13 inches, find the radius of the other circle. [10]

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 2 credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

Directions (questions 1–12) — Indicate the correct answer to *each* question by writing on the dotted line at the right the letter *a*, *b* or *c*.

1 If two parallel lines are cut by a transversal, the interior angles on the same side of the transversal are always (*a*) complementary, (*b*) supplementary or (*c*) equal. 1.....

2 If the opposite sides of a quadrilateral are equal, the figure must be (*a*) a parallelogram, (*b*) a rectangle or (*c*) a rhombus. 2.....

3 If one line forms two equal adjacent angles with another, each angle is (*a*) a right angle, (*b*) a straight angle or (*c*) an obtuse angle. 3.....

4 If the number of sides of a polygon increases, the sum of the exterior angles of the polygon (*a*) increases, (*b*) decreases or (*c*) remains the same. 4.....

5 Two secants drawn from an external point to a circle intercept arcs of 90° and 40°. The number of degrees in the angle formed is (*a*) 65°, (*b*) 50° or (*c*) 25°. 5.....

6 If the diagonals of a rhombus are 8 and 12, the area of the rhombus is (*a*) 24, (*b*) 48 or (*c*) 96. 6.....

7 If two circles intersect, the distance between their centers is (*a*) equal to the sum of their radii, (*b*) less than the sum of their radii or (*c*) greater than the sum of their radii. 7.....

8 Any triangle may be divided into two triangles equal in area by drawing (*a*) an altitude, (*b*) an angle bisector or (*c*) a median. 8.....

9 If one acute angle of a right triangle is double the other, the ratio of the shorter leg to the hypotenuse is (*a*) $1:\sqrt{3}$, (*b*) $1:2$ or (*c*) $\sqrt{3}:1$ 9.....

10 If in right triangle ABC, AB is the hypotenuse and CD is the altitude upon the hypotenuse, then (*a*) $(AC)^2 = AD \times AB$, (*b*) $(AC)^2 = AD \times DC$ or (*c*) $(AC)^2 = AD \times DB$ 10.....

11 The locus of points at a given distance from a given straight line is (*a*) a circle, (*b*) one straight line or (*c*) two parallel lines. 11.....

12 The radius of a circle inscribed in an equilateral triangle is equal to (*a*) $\frac{1}{3}$ the altitude of the triangle, (*b*) $\frac{2}{3}$ the altitude of the triangle or (*c*) $\frac{1}{2}$ the altitude of the triangle. 12.....

Directions (questions 13–22) — 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.

13 If the legs of a right triangle are 9 and 12, the area of the triangle is .... 13.....

14 If the area of a circle is 49π, the circumference in terms of π is .... 14.....

15 The hypotenuse of a right triangle is 17 and one leg is 8; the length of the other leg is .... 15.....

16 If the line segment joining the mid-points of two sides of a triangle is 8 inches, then the length of the third side of the triangle is ... inches. 16.....

[OVER]

17 If two lines are perpendicular to the same line, they are ... to each other. 17.....

18 In triangle ABC, $\angle C = 90°$, $AB = 15$ feet and $AC = 9$ feet. Angle A, correct to the *nearest degree*, is .... 18.....

19 In isosceles triangle ABC in which $AC = BC$, if one angle is obtuse, it must be angle .... 19.....

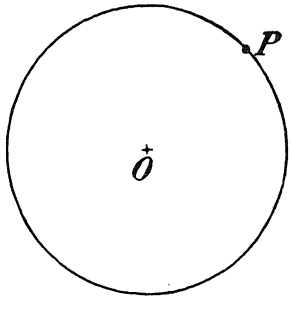
20 Point D is 3 from the center of a circle whose radius is 5. The product of the segments of any chord drawn through D is .... 20.....

21 The locus of the mid-points of all chords of a given length in a circle is a .... 21.....

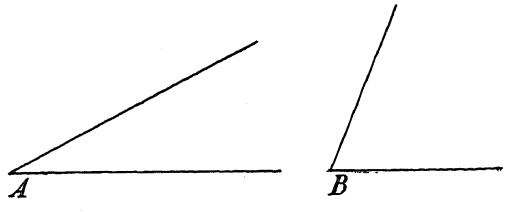
22 Two triangles are similar and the area of the first is 4 times the area of the second. If a side of the first triangle is 8, the corresponding side of the second triangle is .... 22.....

Directions (questions 23–25) — Leave all construction lines on the paper.

23 Construct a tangent to circle O at point P on the circle.



24 Angles A and B are two angles of triangle ABC. Construct angle C.



25 Given $\angle BCA = 90°$; construct an angle of 75° with vertex at C and with CB as one of its sides.