

The University of the State of New York

275TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Tuesday, June 20, 1939 — 9.15 a. m. to 12.15 p. 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) name of school where you have studied, (b) number of weeks and recitations a week in plane geometry, (c) author of textbook used.

The minimum time requirement is five recitations a week for a school year.

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

Group II

Answer two questions from this group.

26 Prove that the diagonals of a parallelogram bisect each other. [10]

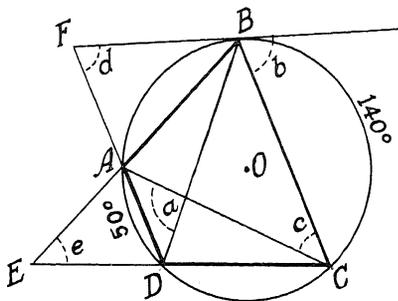
27 O is the mid-point of base AB of isosceles triangle ABC . AC and BC are extended through C to points E and D so that CE is equal to CD . Lines DO and EO are drawn. Prove: $DO = EO$ [10]

28 Prove that if two triangles have an angle of one equal to an angle of the other and the sides including these angles proportional, the triangles are similar. [10]

Group III

Answer two questions from this group.

29 $ABCD$ is a quadrilateral inscribed in circle O . Chord $BA =$ chord CD , and BA and CD extended meet in point E . A tangent at B intersects DA extended in point F . Diagonals BD and AC are drawn. Arc $AD = 50^\circ$ and arc $BC = 140^\circ$. Find the number of degrees in angle a , angle b , angle c , angle d and angle e . [10]



30 In a circle a chord AB intercepts an arc of 100° . If the radius of the circle is 10.0 inches, find, correct to the nearest inch, the length of this chord. [10]

31 In the isosceles trapezoid $ABCD$, angle A is 45° ; the longer base AB is 17 and the shorter base is 7. Find

- a The area of the trapezoid [5]
- b The length of the diagonal BD [5]

Group IV

Answer one question from this group.

32 Consider each of the following statements and tell whether it is always true, sometimes true or never true. Give reasons for your answers.

- a A trapezoid inscribed in a circle is isosceles. [$\frac{1}{2}$, 2]
 - b The center of the circle circumscribed about a triangle lies within the triangle. [$\frac{1}{2}$, 2]
 - c If two triangles have two sides and an angle of one equal to the corresponding parts of the other, then the triangles are congruent. [$\frac{1}{2}$, 2]
 - d In triangle ABC , AB is greater than AC . If the bisectors of angles B and C intersect in D , then DC is greater than BD . [$\frac{1}{2}$, 2]
- 33 a Construct triangle ABC , given side b , the altitude on side b and the median to side b . [8]
- b Is it possible to construct the triangle if the altitude is (1) greater than the median, (2) equal to the median? [1, 1]

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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 1-11) — Indicate the correct answer to each question by writing on the dotted line at the right the letter *a*, *b* or *c*.

- 1 A central angle of 60° intercepts an arc of (a) 30° , (b) 60° or (c) 120° . 1.....
- 2 The opposite angles of a quadrilateral inscribed in a circle are always (a) equal, (b) complementary or (c) supplementary. 2.....
- 3 The difference between the supplement and the complement of an angle is (a) an acute angle, (b) a right angle or (c) an obtuse angle. 3.....
- 4 If the areas of two similar triangles are in the ratio 1:4, then any two corresponding sides of these triangles are in the ratio (a) 1:4, (b) 1:2 or (c) 1:16. 4.....
- 5 The center of the circle inscribed in a triangle is always the intersection of (a) the bisectors of two of its angles, (b) two of its altitudes or (c) the perpendicular bisectors of two of its sides. 5.....
- 6 A circle can always be circumscribed about (a) an equiangular polygon, (b) an equilateral polygon or (c) a regular polygon. 6.....
- 7 The altitude drawn to the hypotenuse of a right triangle divides the triangle into two triangles which are always (a) congruent, (b) similar or (c) equal in area. 7.....
- 8 The sum of the interior angles of a polygon of n sides is (a) n straight angles, (b) 2 straight angles or (c) $(n - 2)$ straight angles. 8.....
- 9 Each of the following sets of numbers can be used as the sides of a triangle: (a) 4", 8", 9"; (b) 7", 24", 25"; (c) 6", 9", 10". Which set would form a right triangle? 9.....
- 10 If in triangle ABC , CD is the altitude upon AB , then (a) $CD = AD \sin A$, (b) $CD = AD \cos A$ or (c) $CD = AD \tan A$. 10.....
- 11 The formula for the area A of an equilateral triangle in terms of its side s is (a) $A = \frac{s}{2} \sqrt{3}$, (b) $A = \frac{s^2}{2} \sqrt{3}$ or (c) $A = \frac{s^2}{4} \sqrt{3}$ 11.....

Directions (questions 12-22) — 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.

- 12 AB , the hypotenuse of right triangle ABC , is 10. If angle A is 30° , then BC is 12.....
- 13 ABC is an isosceles triangle in which AC equals BC and one of the angles is obtuse. The longest side is opposite angle 13.....
- 14 Two chords intersect within a circle. The segments of one chord are 8 and 3. If one segment of the second chord is 6, then the other segment is 14.....
- 15 If the diameter of a circle is 10, then the circumference in terms of π is 15.....

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- 16 The formula for the area A of a trapezoid in terms of its altitude h and its bases b and b' is $A = \dots$ 16.....
- 17 The perimeter of a regular polygon is 24. If its apothem is 3, then its area is \dots 17.....
- 18 In a right triangle the length of one leg is 20 inches and the length of the hypotenuse is 25 inches. The length of the longer segment of the hypotenuse made by the altitude upon it is \dots inches. 18.....
- 19 The locus of the midpoints of all radii of a given circle is a \dots 19.....
- 20 If the diagonals of a parallelogram are unequal and bisect the angles through which they are drawn, then the figure must be a \dots 20.....
- 21 The radius of a circle is 6. The angle of a sector of this circle is 60° . The area of the sector in terms of π is \dots 21.....
- 22 AB is a diameter of a circle, AC is a chord and arc AC contains 100° . Angle BAC contains \dots degrees. 22.....

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

23 Construct the locus of points equidistant from the two given points A and B .

A
·

· B

C ·

24 Construct a line parallel to line AB through point C .



25 Construct the mean proportional between line segments a and b .

