

The University of the State of New York

312TH HIGH SCHOOL EXAMINATION

PLANE GEOMETRY

Monday, June 18, 1951 — 9.15 a. m. to 12.15 p. m., only

Instructions

Part I is to be done first and the maximum time allowed for it is one and one half hours. At the end of that time, this part of the examination must be detached and will be collected by the teacher. If you finish part I before the signal to stop is given, you may begin part II.

Write at top of first page of answer paper to parts 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 four or five recitations a week for a school year.

Part II

Answer three questions from part II.

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

27 Prove that if two chords intersect within a circle, the product of the segments of one is equal to the product of the segments of the other. [10]

28 In triangles ABC and $A'B'C'$, side AB equals $A'B'$, side BC equals $B'C'$ and median CM equals median $C'M'$. Prove

a triangles MBC and $M'B'C'$ are congruent [6]

b triangles ABC and $A'B'C'$ are congruent [4]

29 The bisector of angle A of triangle ABC intersects BC at D . Prove

a angle ADC is greater than angle DAC [7]

b AC is greater than DC [3]

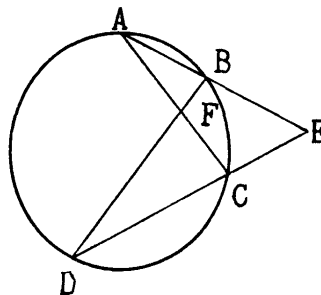
Part III

Answer one question from part III.

30 In the accompanying figure, arc $AB =$ arc $BC = 50^\circ$. Arcs CD and DA are in the ratio 2:3.

a Find the number of degrees in arc CD and in arc DA . [4]

b Chords AB and DC extended intersect at E , and chords AC and BD intersect at F . Find the number of degrees in angles AFB , BEC and FCE . [6]



[1]

[OVER]

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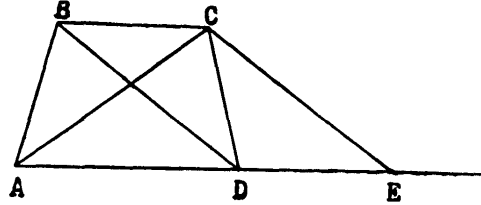
- 31 Chord AB of a circle is 7.66 inches from the center and arc AB is 80° . Find
 a the radius of the circle [5]
 b the area of the circle [Use $\pi = 3.14.$] [2]
 c the length of the minor arc AB [Answer may be left in terms of $\pi.$] [3]

Part IV

Answer one question from part IV.

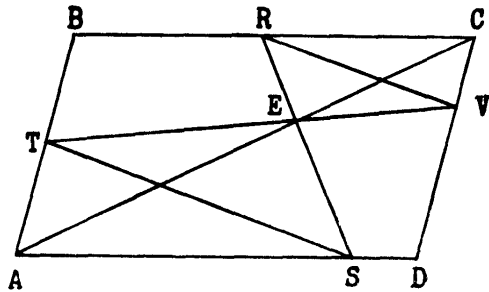
- 32 Given trapezoid $ABCD$ with diagonal AC equal to diagonal BD . Through C a line is drawn parallel to BD intersecting base AD extended at E . Prove

- a $AC = CE$ [4]
 b triangle ACD is congruent to triangle ABD [5]
 c $AB = DC$ [1]



- 33 Given parallelogram $ABCD$ with E a point on diagonal AC . Lines through E intersect BC at R , AD at S , AB at T and CD at V . Prove

- a $AE:EC = TE:EV$ [3]
 b $AE:EC = SE:ER$ [2]
 c triangle TES is similar to triangle REV [3]
 d TS is parallel to RV [2]



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Fill in the following lines:

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

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed.

- 1 The hypotenuse of a right triangle is 17 and one leg is 8. Find the other leg. 1.....
- 2 Express the diagonal of a square in terms of its side s . 2.....
- 3 Corresponding sides of two similar polygons are in the ratio 3:5. Find the ratio of their areas. 3.....
- 4 Express the circumference of a circle in terms of its diameter d . 4.....
- 5 The diagonals of a rhombus are 6 and 12. Find its area. 5.....
- 6 In parallelogram $ABCD$, side AB is 10, side AD is 8 and angle A is 30° . Find the area of the parallelogram. 6.....
- 7 The legs of a right triangle are 5 and 8. Find the area of the triangle. 7.....
- 8 Find the area of a trapezoid whose bases are 12 and 20 and whose altitude is 5. 8.....
- 9 The perimeter of a regular polygon is 40 and its apothem is 6. Find the area of the polygon. 9.....
- 10 The sides of a right triangle are 3, 4 and 5. Express as a common fraction the sine of the smallest angle. 10.....
- 11 A tangent and a secant are drawn to a circle from an external point. If the tangent is 12 and the external segment of the secant is 8, find the entire secant. 11.....
- 12 CD is the altitude on the hypotenuse of right triangle ACB . If $AD = 9$ and $AB = 13$, find CD . 12.....
- 13 AB is tangent to circle O at B and chord BC is drawn forming an angle of 50° . Find the number of degrees in arc BC . 13.....
- 14 Is statement B the converse of statement A ? [Answer *yes* or *no*.]
 - A If two sides of a triangle are equal, the angles opposite these sides are equal.
 - B The base angles of an isosceles triangle are equal. 14.....

Directions (questions 15–18) — If the blank space in each of the following statements is replaced by one of the words *always*, *sometimes* or *never*, the resulting statement will be true. Select the word that will correctly complete *each* statement and write this word on the line at the right.

- 15 If two triangles have a side and any two angles of one equal to the corresponding parts of the other, the triangles are ... congruent. 15.....
- 16 An altitude of a triangle divides it into two triangles which are ... similar. 16.....

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17 The line joining the mid-points of the legs of a trapezoid divides it into two trapezoids which are ... equal. 17.....

18 In any circle if two chords are unequal, the longer chord is ... nearer the center of the circle. 18.....

Directions (questions 19-24) — Indicate the correct answer to *each* question by writing on the line at the right the letter *a*, *b* or *c*.

19 The locus of points at a given distance from a given straight line is (a) a circle (b) one straight line (c) two parallel lines 19.....

20 If a median of a triangle is equal to one half of the side to which it is drawn, the triangle must be (a) isosceles (b) right (c) equiangular 20.....

21 If the point of intersection of the altitudes of a triangle is outside the triangle, the triangle is (a) acute (b) right (c) obtuse 21.....

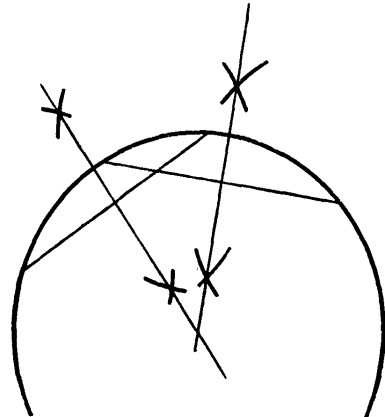
22 If the diagonals of a parallelogram are equal, the parallelogram must be a (a) rectangle (b) square (c) rhombus 22.....

23 In *a*, *b* and *c* below, the same four terms are arranged in different orders. Which of these orders represents the sequence in which the *definitions* of these four terms should be given?
a polygon, triangle, right triangle, hypotenuse
b hypotenuse, polygon, right triangle, triangle
c triangle, polygon, hypotenuse, right triangle 23.....

24 To find the center of the circle of which the given arc is a part, the perpendicular bisectors of two chords of the arc are constructed as shown in the accompanying diagram.

Which of the following theorems is the one used to *prove* that the intersection of these bisectors is the required point?

- a* A diameter perpendicular to a chord bisects the chord.
- b* A diameter which bisects a chord, not a diameter, is perpendicular to the chord.
- c* The perpendicular bisector of a chord of a circle passes through the center of the circle.



24.....

25 Given circle *O* and point *P* on the circle. Construct a line tangent to the circle at *P*.

