

1963  
SEVENTH ANNUAL MATHEMATICS CONTEST

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THE TENNESSEE MATHEMATICS TEACHERS' ASSOCIATION

PLANE GEOMETRY TEST

1963

Scoring Formula: 4R - W.

Prepared by:

J. Houston Banks  
Frank L. Celauro  
George Speed  
Department of Mathematics  
George Peabody College

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DIRECTIONS

Do not open this booklet until you are told to do so.

This is a test of your competence in Plane Geometry. For each problem there are listed 5 possible answers. You are to work the problems, determine the correct answer, and indicate your choice by making a heavy black mark in the correct place on the separate answer sheet provided. A sample follows:

1. The sum of the angles of a triangle is:

- (1)  $360^{\circ}$
- (2)  $45^{\circ}$
- (3)  $90^{\circ}$
- (4)  $180^{\circ}$
- (5)  $270^{\circ}$



The correct answer for the sample question is " $180^{\circ}$ ", which is answer (4); so you would answer this question by making a heavy black mark under space 4 as indicated above.

If you should change your mind about an answer, be sure to erase completely. Avoid wild guessing, as wrong answers count against you. Do not mark more than one answer for any problem. Make no stray marks of any kind on your answer sheet.

When told to do so, open your test booklet to page 2 and begin. When you have finished one page, go on to the next. The working time for the entire test is 80 minutes.

1. Which of the following is not a parallelogram?

- (1) Square
- (2) Rhombus
- (3) Line joining midpoints of successive sides of any quadrilateral
- (4) Rectangle
- (5) Trapezoid

2. Two triangles are similar if

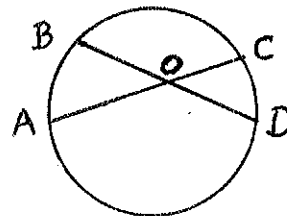
- (1) the difference between corresponding sides is constant.
- (2) two angles of one triangle are equal to two angles of the other triangle.
- (3) they each have a right angle.
- (4) the sum of the angles of each triangle equals  $180^\circ$ .
- (5) their perimeters are equal.

3. The legs of a right triangle are 5 and 12 units long. The length of the median to the hypotenuse is

- (1) 6.5
- (2) 6.8
- (3) 7.1
- (4) 7.4
- (5) 7.7

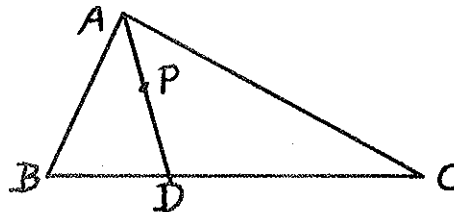
4. In the figure arc  $AB = 45^\circ$ , arc  $CD = 35^\circ$ , then angle  $AOB$  will be

- (1)  $40^\circ$
- (2)  $45^\circ$
- (3)  $35^\circ$
- (4)  $80^\circ$
- (5)  $10^\circ$



5. D is any point on the base BC of triangle ABC. Point P divides line segment AD such that  $AP/PD = 2/3$ . As D moves from B to C, the locus of P is

- (1) a circular arc with center A.
- (2) a chord of the circle inscribed in triangle ABC.
- (3) a chord of the circle circumscribed about triangle ABC.
- (4) a line parallel to BC.
- (5) none of the above answers.



6. The front wheels of a wagon are  $2\pi$  feet in circumference and the rear wheels are  $3\pi$  feet in circumference. How many feet has the wagon traveled when the front wheels have made five more revolutions than the rear wheels?
- (1)  $24\pi$
  - (2)  $30\pi$
  - (3)  $36\pi$
  - (4)  $48\pi$
  - (5)  $60\pi$
7. If two triangles are similar which one of the following will not be in the same ratio as the corresponding sides?
- (1) the bases
  - (2) the altitudes to the bases
  - (3) the areas
  - (4) the medians to the bases
  - (5) the radii of the inscribed circles
8. A square <sup>is</sup> inscribed in a circle whose diameter is 6. The area of the square is
- (1) 12
  - (2) 9
  - (3) 18
  - (4)  $6\sqrt{2}$
  - (5)  $6\sqrt{3}$
9. Which one of the following statements with regard to a circle is not correct?
- (1) An angle inscribed in a semicircle is a right angle.
  - (2) Two chords perpendicular to a third chord at its extremities are equal.
  - (3) If a quadrilateral is inscribed in a circle, the opposite angles are supplementary.
  - (4) A diameter subtends the largest inscribed angle.
  - (5) A chord perpendicular to another chord at its midpoint is always a diameter.
10. Given straight line segments  $AB = 8$  and  $BC = 6$  and angle  $A = 60^\circ$ . This given data will determine
- (1) one scalene triangle
  - (2) one isosceles triangle
  - (3) two different triangles
  - (4) no triangle
  - (5) none of the above answers

11. In triangle PQR, if angle Q is greater than angle P, it follows that side

- (1) PQ is greater than QR
- (2) QR is greater than PQ
- (3) PR is greater than QR
- (4) QR is greater than PR
- (5) PR is greater than PQ

12. The angles of a triangle are in the ratio of 3:5:7. The largest angle has

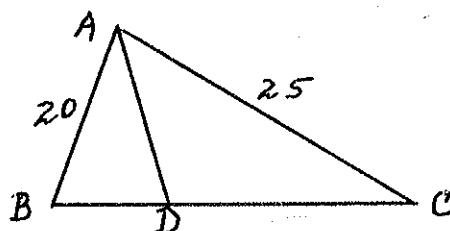
- (1)  $91^\circ$
- (2)  $84^\circ$
- (3)  $63^\circ$
- (4)  $70^\circ$
- (5)  $77^\circ$

13. The circumference of a circle is 72. The length of an arc of  $15^\circ$  is

- (1) 3
- (2)  $24/5$
- (3)  $\pi$
- (4) 6
- (5) 5

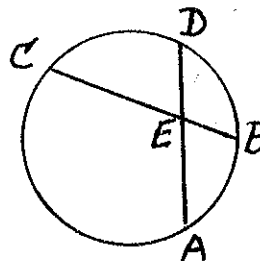
14. In the figure AD bisects angle A. If  $AB = 20$ ,  $AC = 25$ , and  $BC = 27$ , then BD equals

- (1) 12.0
- (2) 9.0
- (3) 13.5
- (4) 10.5
- (5) 11.0



15. In the figure, if  $EB = 4$ , and  $CE = 8$ , and  $ED = 5$ , then AE equals

- (1) 6.4
- (2) 7.2
- (3) 8.0
- (4) 9.6
- (5) 10.0



16. The length of a rectangle is three times the width. If the perimeter is 48, the area is

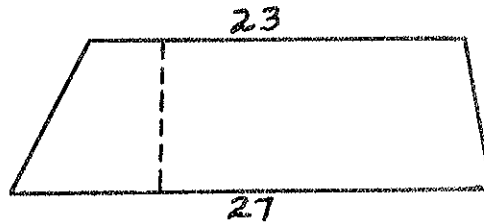
- (1) 108
- (2) 96
- (3) 72
- (4) 120
- (5) 105

17. The areas of two circles are in the ratio of three to one. If the radius of the larger circle is 6, the radius of the smaller circle is

- (1) 1.5
- (2)  $\sqrt{3}$
- (3) 2.0
- (4)  $2\sqrt{3}$
- (5) 2.5

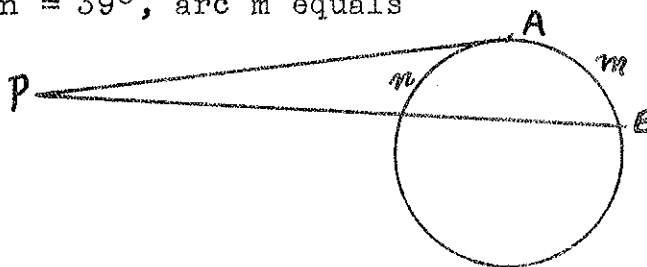
18. If the two parallel sides of a trapezoid are 23" and 27" and the area is 250 sq. in., the distance between the parallel sides is

- (1) 10.0"
- (2) 5.0"
- (3) 13.5"
- (4) 15.0"
- (5) 8.0"



19. In the figure, AP is tangent to the circle and PB is a secant. If angle P =  $13^\circ$  and arc n =  $39^\circ$ , arc m equals

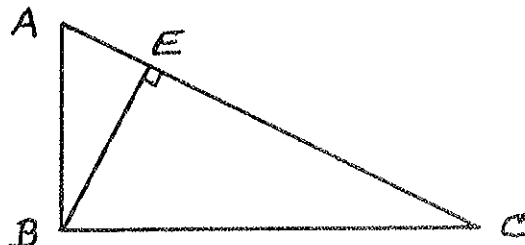
- (1)  $52.0^\circ$
- (2)  $55.5^\circ$
- (3)  $58.0^\circ$
- (4)  $62.5^\circ$
- (5)  $65.0^\circ$



20. In the figure AE = 2, BE = 4, then CE equals

- (1) 8.0
- (2) 10.0
- (3) 6.5
- (4) 11.0
- (5) 9.0

$$\angle ABC = 90^\circ$$

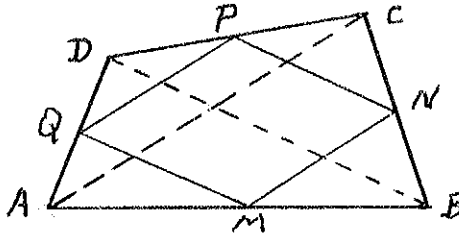


21. Each angle of a regular polygon is  $144^\circ$ . How many sides does the polygon have?

- (1) 12
- (2) 9
- (3) 24
- (4) 10
- (5) None of the above answers

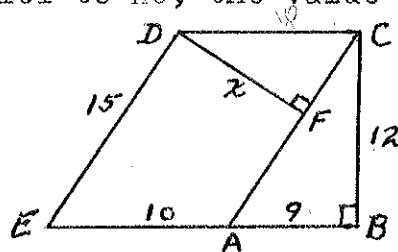
22. ABCD is any quadrilateral. MNPQ are midpoints of the sides. If diagonals  $AC = 12$  and  $ED = 13$ , the perimeter of MNPQ equals

- (1) 24
- (2) 25
- (3) 26
- (4) 36
- (5) 39



23. In the figure, if ED is parallel to AC, the value of  $x$  is

- (1) 7.5
- (2) 8.0
- (3) 8.5
- (4) 9.0
- (5) 9.5

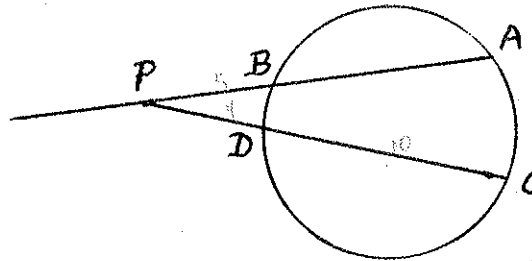


24. The diagonals of a rhombus are 6 and 10. Its area is

- (1) 60
- (2) 45
- (3) 36
- (4) 30
- (5) 20

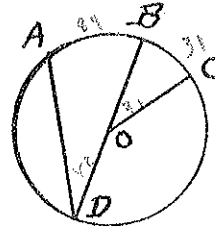
25. In the figure, if  $PD = 4$ ,  $DC = 10$ ,  $PB = 5$ , then AB equals

- (1) 6.0
- (2) 6.2
- (3) 6.4
- (4) 6.6
- (5) 6.8



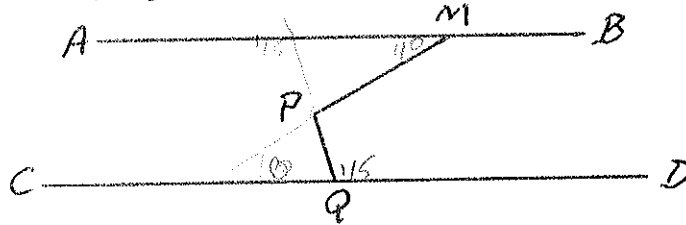
26. In the figure,  $O$  is the center of the circle. Angle  $ADB = 42^\circ$  and angle  $BOC = 31^\circ$ . The number of degrees in arc  $ABC$  is

- (1)  $115^\circ$
- (2)  $73^\circ$
- (3)  $36.5^\circ$
- (4)  $22^\circ$
- (5)  $33^\circ$



27. In the figure,  $AB$  is parallel to  $CD$ . If angle  $AMP = 40^\circ$  and angle  $DQP = 115^\circ$ , angle  $MPQ$  equals

- (1)  $90^\circ$
- (2)  $95^\circ$
- (3)  $100^\circ$
- (4)  $105^\circ$
- (5)  $100^\circ$



28. Which one of the following statements is not correct?

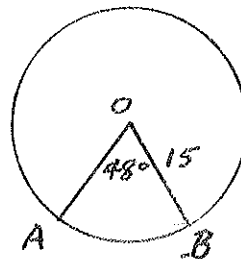
- (1) The line of centers of two intersecting circles is perpendicular to their common chord.
- (2) In the same or equal circles the greater of two unequal chords lies nearer the center.
- (3) The tangents drawn from an external point to a circle are always equal.
- (4) If two circles are tangent, their line of centers passes through the point of contact.
- (5) A tangent line can always be drawn from a given point to a given circle.

29. The center of a circle circumscribed about a triangle is the

- (1) intersection of the medians.
- (2) intersection of the altitudes.
- (3) intersection of the perpendicular bisectors of the sides.
- (4) midpoint of the median to the hypotenuse.
- (5) intersection of the angle bisectors.

30. The radius of the indicated circle is 15. Arc  $AB$  subtends a  $48^\circ$  angle at the center. The area of sector  $AOB$  is

- (1)  $36\pi$
- (2)  $30\pi$
- (3)  $24\pi$
- (4)  $18\pi$
- (5)  $12\pi$



31. The radii of two concentric circles are 5 and 13. A chord of the larger circle is tangent to the smaller circle. The length of this chord is

- (1) 18
- (2) 23
- (3) 24
- (4) 25
- (5) 30

32. The area of a triangle having sides equal to 5, 6, 7 is

- (1)  $6\sqrt{6}$
- (2)  $5\sqrt{5}$
- (3)  $7\sqrt{7}$
- (4)  $7\sqrt{5}$
- (5)  $5\sqrt{6}$

33. The locus of the centers of all circles tangent simultaneously to sides AB and AC of triangle ABC is the

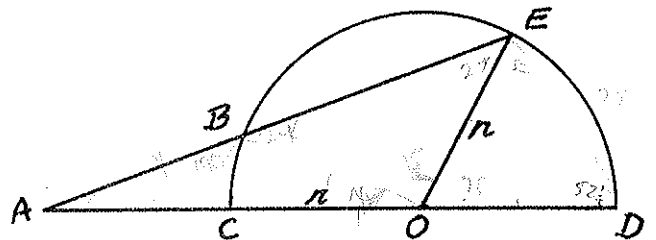
- (1) perpendicular bisector of BC
- (2) median from A to BC extended
- (3) bisector of angle A
- (4) circle having BC as diameter
- (5) circle inscribed in triangle ABC

34. A circle of radius 10 is circumscribed about a triangle ABC. If  $AB = BC = 10$ , then the area of the triangle is

- (1) 50
- (2)  $25\sqrt{3}$
- (3)  $25\sqrt{2}$
- (4) 40
- (5) None of the above answers

35. In the figure,  $CO = r$  is the radius of a semicircle CBED. ABE is a straight line with  $AB = r$ . If angle  $EOD = 75^\circ$ , angle BAC equals

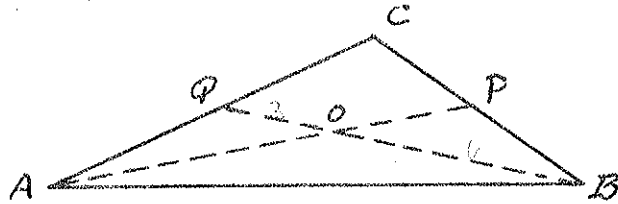
- (1)  $15^\circ$
- (2)  $20^\circ$
- (3)  $25^\circ$
- (4)  $30^\circ$
- (5) None of the above answers





36. In the triangle  $AEC$ , point  $O$  is the intersection of the medians  $AP$  and  $BQ$ . If  $OQ = 3$ , then  $OB$  equals.

- (1) 3.0
- (2) 3.5
- (3) 4.5
- (4) 5.5
- (5) 6.0

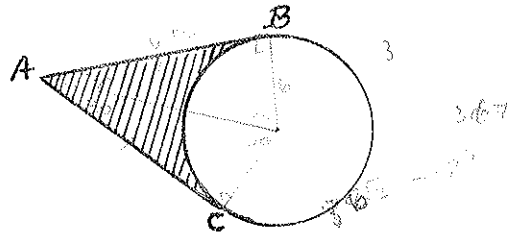


37. The largest possible area of a right triangle with hypotenuse 10 is

- (1) 100
- (2) 50
- (3) 25
- (4)  $10\sqrt{2}$
- (5) None of the above answers

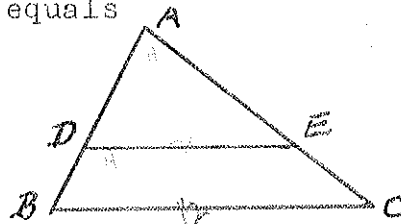
38. In the figure, lines  $AB$  and  $AC$  are tangents to the circle of radius 6 and angle  $BAC = 60^\circ$ . The area of the shaded region is

- (1)  $36\sqrt{3} - 12\pi$
- (2)  $12(\sqrt{3} - \pi)$
- (3)  $10\sqrt{6} + 2\sqrt{3} - 12\pi$
- (4)  $54 - 9\pi$
- (5) None of the above answers



39. In the figure, the area of triangle  $ADE$  equals the area of the trapezoid  $BDEC$ . If  $BC = 12$ , then  $DE$  equals

- (1) 6
- (2) 36
- (3)  $9\sqrt{3}$
- (4)  $6\sqrt{2}$
- (5) None of the above answers



40. Each side of the given triangle equals  $k$ .  $P$  is any point inside the triangle. The sum of the perpendicular distances from  $P$  to each of the three sides equals

- (1)  $k$
- (2)  $k\sqrt{2}/2$
- (3)  $k\sqrt{3}/2$
- (4)  $k\sqrt{3}$
- (5)  $k\sqrt{2}$

