NOTA denotes "None of These Answers." Good luck!

1. A square is inscribed in a larger square such that the sides of the outside square is divided into a ratio of 5:3. If the difference in area of the two squares is 15 square units, find the area of the smaller square.

   A. 17 B. 32 C. 9 D. 25 E. NOTA

2. Find the number of sides of a regular polygon with interior angles of 170°.

   A. 34 B. 36 C. 38 D. 40 E. NOTA

3. Which of the following cannot be the number of sides of a regular polygon with integer exterior angles?

   A. 8 B. 12 C. 16 D. 20 E. NOTA

4. Let SWAN be a parallelogram. If L is a point inside SWAN such that the area of triangle LAW is 15 square feet and the area of triangle LSN is 12 square feet, find the area of SWAN in square yards.

   A. 67 B. 54 C. 36 D. 6 E. NOTA

5. Edward tethers his giraffe to one of the outside corners of a 12 ft by 16 ft rectangular building. Edward's giraffe can't enter the building and the rope is 20 ft. How much area, in square feet, does Edward's giraffe have to roam? Assume that the dimensions of the giraffe are neglectable.

   A. 400 B. 420 C. 320 D. 340 E. NOTA

6. A circle is inscribed in a regular hexagon with sides of 8 inches. A square is then inscribed in the circle. Find the ratio of the area of the hexagon to the area of the square.

A. $\frac{\sqrt{6}}{2}$ B. $\frac{2}{3}$ C. $2\sqrt{3}$ D. $\sqrt{3}$ E. NOTA

7. A convex polygon has vertices at $(-11,7)$, $(12,2)$, $(-1,8)$, $(-3,-4)$, and $(6,-7)$. Find its area.

A. 2 B. 4 C. 385 D. 770 E. NOTA

8. Right triangle CAT has right angle at A. Point P is on AT such that $\frac{TP}{PA} = \frac{28}{5}$. If CP = 101 and CT = 165, find the length of CA.

A. 85 B. 99 C. 89 D. 93 E. NOTA

9. Circle O has equation $x^2 + 12x + y^2 - 6y + 8 = 0$. Find the length of a tangent segment from the point (5, 7) to circle O.

A. 10 B. 11 C. 12 D. 13 E. NOTA

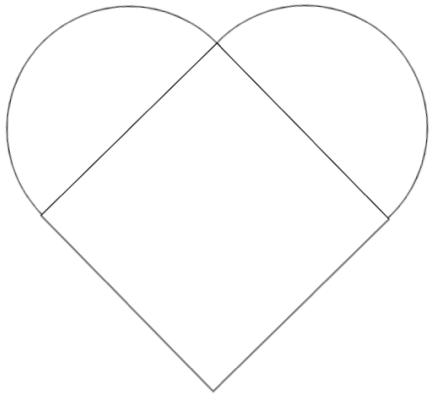
10. JASON is a pentagon inscribed in a circle, with the measure of arc SA equal to 80 degrees. Find $m\angle O + m\angle J$.

A. 206 B. 212 C. 216 D. 220 E. NOTA

11. Find the area of the triangle with side lengths of 7, 12, and $3\sqrt{5}$.

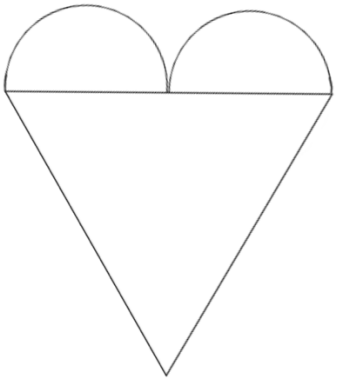
A. $6\sqrt{11}$ B. 20 C. $\sqrt{395}$ D. $5\sqrt{14}$ E. NOTA

12. Sydni has fallen in love and wants to prepare her crush a painted heart for Valentine's Day. How much paint, in square inches, does she need to completely cover the heart if it is similar to the diagram below (square with two semicircles) and the square has length of 6 inches?



A. 72 B. $48 + 36\pi$ C. $36 + 36\pi$ D. $36 + 9\pi$ E. NOTA

13. James also wishes to gift his love with a heart during a romantic dinner. However, he wants to be unique and creates a heart different from Sydni's using two semicircles and an equilateral triangle with sides of 4 inches, like the one shown below. How much paint, in square inches, would James need to paint his heart?



A. $4\sqrt{3} + 2\pi$ B. $4\sqrt{3} + 4\pi$ C. $8\sqrt{3} + 2\pi$ D. $8\sqrt{3} + 4\pi$ E. NOTA

14. What is the sum of the interior angles of a regular dodecagon?

A. 1800° B. 2340° C. 1980° D. 1620° E. NOTA

15. How many of the following statements are always true?
    I. A polygon is composed of at least 3 line segments.
    II. Rectangles are squares.
    III. Trapezoids are quadrilaterals.
    IV. A regular polygon has congruent sides.

    A. 1 B. 2 C. 3 D. 4 E. NOTA

16. How many of the following statements are always true for circles?
    I. Tangents meet the circle at only one point.
    II. The diameter passes through the center.
    III. A secant is contained entirely within the circle.
    IV. Chords do not pass through the center.

    A. 1 B. 2 C. 3 D. 4 E. NOTA

17. Concentric circles Dora and Gloria are drawn on a piece of paper. If Dora has radius of length 25 and Gloria has radius of length 7, find the length of a chord of Dora that is tangent to Gloria.

    A. 48 B. 24 C. 54 D. 27 E. NOTA

18. Circle A has a radius of length 6 and point L is 10 units away from the center of circle A. Tangent segments $\overline{LB}$ and $\overline{LC}$ are drawn where B and C are the points of tangency. A third tangent line of circle A is drawn and intersects $\overline{LB}$ and $\overline{LC}$ at D and E respectively. Find the perimeter of triangle LED.

    A. 16 B. 15 C. 14 D. 13 E. NOTA

19. Find the number of diagonals in an octagon.

    A. 14 B. 16 C. 20 D. 27 E. NOTA

20. The centers of two circles are 85 units apart. If the radii are 2 and 15 units, what is the length of a common external tangent?

    A. $75\sqrt{3}$ B. 75 C. 84 D. $84\sqrt{2}$ E. NOTA

21. A right triangle LAY has hypotenuse of length 73. A circle inscribed in LAY and splits the hypotenuse into lengths of 33 and 40 at the point of tangency. Find the area of LAY.

A. 1240 B. 1280 C. 1320 D. 1360 E. NOTA

22. A circle has chords MD and PN that intersect at point U. If $MU = 15$, $PU = 10$, and $UN = UD + 7$, find the length of MD.

A. 35 B. 26 C. 31 D. 29 E. NOTA

23. In isosceles triangle ROB, $RO = RB = 13$ and $OB = 10$. A rectangle is inscribed in ROB; find the maximum area of the rectangle.

A. 24 B. 30 C. 36 D. 40 E. NOTA

24. Eileen draws a circle inscribed in a square with side lengths of 4 feet. She then draws two other circles in opposite corners of the square so that they are each tangent to two sides of the square and externally tangent to the bigger circle. She continues drawing these circles infinitely, each tangent to two sides of the square and the next biggest circle. What is the sum of the circumferences of all of the circles?

A. $4\pi\sqrt{2}$ B. 4π C. $3\pi\sqrt{2}$ D. 3π E. NOTA

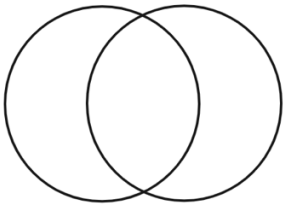
25. In triangle ZLU, ZL = 4, ZU = 6, and LU = 8. Find the area of the incircle of ZLU.

A. $\frac{7\pi}{2}$ B. $\frac{7\pi}{3}$ C. $\frac{5\pi}{2}$ D. $\frac{5\pi}{3}$ E. NOTA

26. Regular hexagon FWAZER has side lengths of 10. If every other midpoint is connected to form an equilateral triangle, find the area of the triangle.

A. $\frac{225\sqrt{3}}{4}$ B. $25\sqrt{3}$ C. $75\sqrt{3}$ D. $\frac{125\sqrt{3}}{4}$ E. NOTA

27. Two congruent circles with radii 12 are drawn so that each circle passes through the center of the other. Find the area of the intersection.

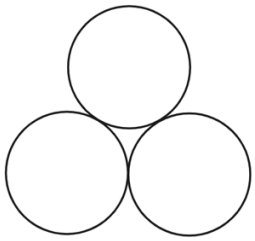


A. $96\pi - 72\sqrt{3}$ B. 72π
C. $144\pi - 36\sqrt{3}$ D. $84\pi - 56\sqrt{3}$ E. NOTA

28. In triangle ABC with point D lying on side BC, side AC is congruent to segment CD. If the measure of angle CAB minus the measure of angle ABC equals 30, what is the measure of angle DAB?

A. 15 B. 30 C. 45 D. 115 E. NOTA

29. Three congruent circles with radii 3 are drawn such that all three are tangent to the other two. Find the area of the small enclosed region in between all three circles.



A. $9\sqrt{3} - \frac{9\pi}{2}$ B. $4\pi - \frac{5\sqrt{3}}{2}$
C. 2π D. $6\sqrt{3} - 3\pi$ E. NOTA

30. Good job for making it it this far! For this last question, find the sum of angles N and W of quadrilateral SNOW that is inscribed in a circle.

A. 360° B. 180° C. 100° D. 90° E. NOTA