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MARCH REGIONAL COMPETITION - GEOMETRY INDIVIDUAL

1. Three parallel lines are intersected by a transversal, which of the following statements **must** be true?

   A. The parallel lines cut the transversal into congruent segments.

   B. The transversal is perpendicular to all three parallel lines.

   C. The transversal may not intersect the parallel lines.

   D. All angles formed by the transversal and the parallel lines are congruent.

   E. No correct answer given.

2. Three congruent coplanar circles are externally tangent. If the diameter of each circle is 20 meters, what is the area of the equilateral triangle formed by connecting the points of tangency?

   A. $25\sqrt{3}$ square meters.

   B. $50\sqrt{3}$ square meters.

   C. $75\sqrt{3}$ square meters.

   D. $100\sqrt{3}$ square meters.

   E. No correct answer given.

3. Points M, N, and P are the midpoints of sides $\overline{JK}$, $\overline{KL}$, and $\overline{LJ}$ of Δ JKL respectfully. If length of $\overline{JK}$ is twice the length of $\overline{KL}$, and $\overline{LJ}$ is the average of the lengths of $\overline{JK}$ and $\overline{KL}$, then which of the following statements is **NOT** always true?

   A. The four small triangles formed by connecting the midpoints of the sides are all congruent.

   B. The quadrilateral JMNP is a parallelogram.

   C. The quadrilateral PMKL is an isosceles trapezoid.

   D. The largest side of Δ MNP is $\overline{NP}$.

   E. No correct answer given.

4. Which lines or segments of a triangle are concurrent in a point equally distant from the vertices of the triangle?

   A. The angle bisectors.

   B. The altitudes.

   C. The medians.

   D. The perpendicular bisectors of the sides.

   E. No correct answer given.

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5. What is the area of an equilateral triangle with a perimeter of 72 cm?

   A. $24\sqrt{3}$ cm^2

   B. $72\sqrt{3}$ cm^2

   C. $96\sqrt{3}$ cm^2

   D. $144\sqrt{3}$ cm^2

   E. No correct answer given.

6. Which of the following **cannot** be the measure of a central angle of a regular polygon?

   A. 45°

   B. 36°

   C. 75°

   D. 120°

   E. No correct answer given.

7. The base of a right prism is a regular hexagon with a radius of 9 cm. If the altitude of the prism is 8 cm long, what is the lateral surface area?

   A. $72\sqrt{3}$ cm^2

   B. 216 cm^2

   C. 360 cm^2

   D. 432 cm^2

   E. No correct answer given.

8. The vertices of square PQRS has coordinates P(2, 3), Q(7, -9), R(-5, -14), and S(-10, -2). What is the length of a diagonal?

   A. $5\sqrt{2}$

   B. $12\sqrt{2}$

   C. $13\sqrt{2}$

   D. $17\sqrt{2}$

   E. No correct answer given.

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9. In ΔXYZ, $\angle Y$ is a right angle. The altitude $\overline{WY}$ to the side $\overline{XZ}$, is constructed. Which of the following segments is **not** a geometric mean segment to other segments in the figure described above?

   A. $\overline{XY}$

   B. $\overline{YZ}$

   C. $\overline{ZX}$

   D. $\overline{WY}$

   E. No correct answer given.

10. How many diagonals are there in a convex polygon with 33 sides?

    A. 1089

    B. 960

    C. 495

    D. 480

    E. No correct answer given.

11. Given the perimeter, you can always find the area of a:

    A. triangle

    B. parallelogram

    C. trapezoid

    D. rectangle

    E. No correct answer given.

12. A rhombus has one side with a length of 25 inches and one diagonal with a length of 40 inches. The area of the rhombus is:

    A. 400 square inches

    B. 500 square inches

    C. 600 square inches

    D. 1000 square inches

    E. No correct answer given.

13. The vertices of a quadrilateral are located at (2, 3), (-4, -5), (-4, -15), and (2, -7). The best description is:

    A. trapezoid

    B. parallelogram

    C. rhombus

    D. rectangle

    E. No correct answer given.

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14. An isosceles triangle with a base of 16 cm and a perimeter of 40 cm, has an area of:

    A. 24 cm^2

    B. 32 cm^2

    C. $16\sqrt{5}$ cm^2

    D. $32\sqrt{5}$ cm^2

    E. No correct answer given.

15. The lengths of two sides of an acute triangle are 8 inches and 12 inches, the length of the third side might be:

    A. $2\sqrt{102}$ inches

    B. 15 inches

    C. 14 inches

    D. 4 inches

    E. No correct answer given.

16. The legs of a right triangle have lengths of 18 meters and 24 meters. The length of the median to the hypotenuse has a length of:

    A. 12 meters

    B. 15 meters

    C. 20 meters

    D. There is not enough information to determine the answer.

    E. No correct answer given.

17. A cone and a cylinder have the same lateral area. What must be true about the radii of the two solids?

    A. The radius of the cylinder is twice that of the cone.

    B. The radii are equal.

    C. The radius of the cone is one-fourth that of the cylinder.

    D. There is not enough information to determine the answer.

    E. No correct answer given.

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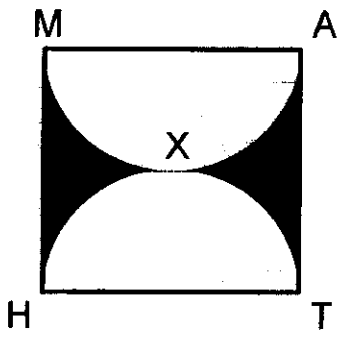
18. In the figure below, MATH is a square, while the arcs MXA and TXH are semicircles. If HM = 2 feet, what is the area of the shaded region?



A. $4 + \pi$ square feet

B. $4 - \pi$ square feet

C. $2 + \pi$ square feet

D. $2 - \pi$ square feet

E. No correct answer given.

19. Which of the following **cannot** be inscribed within a circle?

A. square

B. isosceles trapezoid

C. non-rectangular rhombus

D. non-isosceles triangle

E. No correct answer given.

20. If a diagonal of a quadrilateral divides the quadrilateral into two congruent triangles, then which of the following must be true about the quadrilateral?

A. It is a square.

B. It is a rectangle.

C. It is a rhombus.

D. It is a parallelogram.

E. No correct answer given.

21. Two sides of a triangle have lengths of 20 meters and 50 meters. If their included angle has a measure of 60°, then the area of the triangle is:

A. 250 square meters

B. 500 square meters

C. $250\sqrt{3}$ square meters

D. $500\sqrt{3}$ square meters

E. No correct answer given.

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22. The median to the hypotenuse of a right triangle divides the triangle into two triangles that are both:

    A. acute

    B. obtuse

    C. scalene

    D. isosceles

    E. No correct answer given.

23. Quadrilateral EASY is inscribed in circle O. If $m\angle E = 75°$, and the measure of the arc EA is 125°, then what is the measure of the arc YE?

    A. 85°

    B. 150°

    C. 200°

    D. 275°

    E. No correct answer given.

24. A plane **cannot** be determined by:

    A. two perpendicular lines

    B. a triangle

    C. two intersecting planes

    D. two parallel lines

    E. No correct answer given.

25. If the lengths of two corresponding sides of two similar triangles are 24 inches and 42 inches, and the area of the smaller triangle is 80 square inches, then the area of the larger triangle is:

    A. $45\frac{5}{7}$ square inches

    B. 245 square inches

    C. 1680 square inches

    D. 3360 square inches

    E. No correct answer given.

26. The supplement of a specific angle is 12 less than four times its complement. What is the measure of the specific angle?

    A. 34°

    B. 56°

    C. 78°

    D. 124°

    E. No correct answer given.

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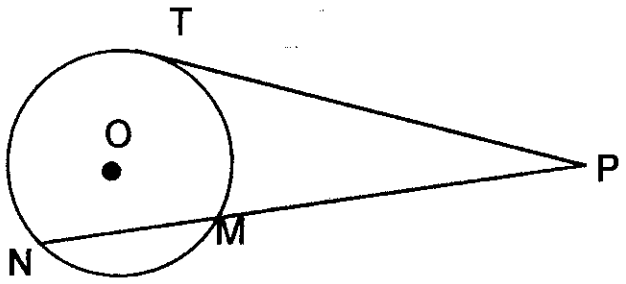
27. In the figure below, $\overline{PT}$ is a tangent segment to circle O at T. $\overline{PN}$ is a secant segment intersecting the circle also at point M. If PT = 24 meters and PM = 16 meters, then the length of $\overline{MN}$ is:



A. 36 meters

B. 32 meters

C. 20 meters

D. 16 meters

E. No correct answer given.

28. What is the area of an equilateral triangle whose radius is $4\sqrt{3}$ centimeters?

A. $12\sqrt{3}$ square centimeters

B. $18\sqrt{3}$ square centimeters

C. $36\sqrt{3}$ square centimeters

D. $48\sqrt{3}$ square centimeters

E. No correct answer given.

29. Δ APE and square TOLD have equal areas. The base of Δ APE, $\overline{AP}$, is equal in length to a side of square TOLD. If LD = 30 inches, what is the length of the altitude to the base $\overline{AP}$?

A. 60 inches

B. $30\sqrt{3}$ inches

C. 30 inches

D. 15 inches

E. No correct answer given.

30. The area of circle O is 56 cm^2. The measure of the minor arc AB of circle O is 45°. Find the area of the sector AOB of circle O.

A. 7 cm^2

B. $2\sqrt{14}$ cm^2

C. 7π cm^2

D. 8π cm^2

E. No correct answer given.