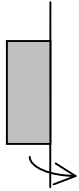


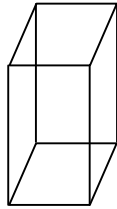
THETA GEOMETRY TOPICS TEST
FAMAT State Convention 2004

For all questions, E. NOTA means none of the above answers is correct.

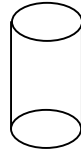
1. In the figure below, the shaded polygon is revolved about the axis counter-clockwise 360° . What figure is created as a result of the revolution?



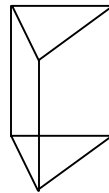
A.



B.



C.



D.



E. NOTA

2. Five people participate in a dance. The dance requires each person to shake hands with the other 4 people twice. How many handshakes occur at the dance?
- A. 8 B. 10 C. 16 D. 20 E. NOTA
3. Which of the following is not an angle that can be constructed?
- A. $7\frac{1}{2}^\circ$ B. $18\frac{3}{4}^\circ$ C. $22\frac{1}{2}^\circ$ D. 55° E. NOTA
4. Mary is the motorcycle officer of Euler State Park. She wishes to position herself at a point that is the same distance from each of three paths that are straight, intersecting, and not concurrent. To locate this point so that in an emergency she will be able to get to any one of the paths by the shortest route possible, she must find which point of concurrency?
- A. incenter B. circumcenter C. orthocenter D. centroid E. NOTA
5. A circle is inscribed in a regular hexagon. The area of the regular hexagon is $96\sqrt{3}$ square inches. Find the area of the circle.
- A. $16\pi\sqrt{3}$ in.² B. 48π in.² C. $64\pi\sqrt{3}$ in.² D. 64π in.² E. NOTA

6. Three line segments have length x , y , & $x + y$ so that x and y are real numbers greater than 0. Which of the following is true about the three segments?
- A. The segments may form an obtuse triangle.
 - B. The segments may form an acute triangle.
 - C. The segments may form a right triangle.
 - D. The segments may form a triangle, but more information is needed to determine whether it is obtuse, acute, or right.
 - E. NOTA
7. A five pointed star is drawn with points P, Q, R, S, & T being the vertices of the points of the star. Find $m\angle P + m\angle Q + m\angle R + m\angle S + m\angle T$.
- A. 180 B. 360 C. 540 D. 720 E. NOTA
8. Find the area to the nearest tenth square unit of a triangle on a rectangular coordinate plane with vertices A(-3,2), B(1,5), & C(4,-6).
- A. 26.5 B. 27.0 C. 53.0 D. 54.1 E. NOTA
9. Two concentric circles have diameters 16 and 20. Find the length of a chord of the larger circle that is tangent to the smaller circle.
- A. 12 B. 24 C. $4\sqrt{41}$ D. $8\sqrt{41}$ E. NOTA
10. A metal sphere with diameter 6 cm is dropped into a cylinder of water so that the metal sphere is completely submerged in the water. The radius of the cylinder is 5 cm, and the water level is 6 cm high before the metal sphere is placed into the container. How high is the water level of the cylinder after the metal sphere is placed into the container?
- A. $\frac{25}{36}$ cm B. $\frac{36}{25}$ cm C. $\frac{241}{36}$ cm D. $\frac{186}{25}$ cm E. NOTA
11. A square is inscribed in a circle with equation $x^2 + y^2 + 8x - 10y + 5 = 0$. Find the area bound between the square and the circle to the nearest square unit.
- A. 31 B. 39 C. 41 D. 49 E. NOTA
12. In a circle, a chord 12 cm long is parallel to a tangent and bisects the radius drawn to the point of tangency. How long is the radius?
- A. $2\sqrt{3}$ B. $4\sqrt{3}$ C. $8\sqrt{3}$ D. $12\sqrt{3}$ E. NOTA

13. Find the area of the figure bounded by $\begin{cases} y = 5x \\ y = 30 - 5x \\ y = 5 \\ y = 0 \end{cases}$.

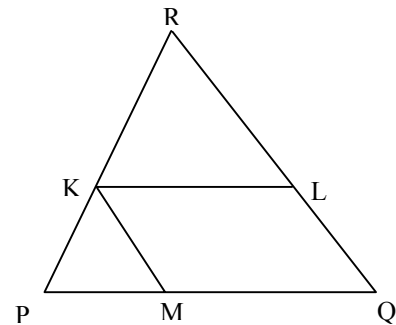
A. 22.5 B. 25 C. 45 D. 50 E. NOTA

14. Find the coordinates of the centroid of a triangle with vertices located at $(-4,-5)$, $(2,-2)$, and $(5,4)$.

A. $(1,-1)$ B. $(14,-14)$ C. $(-\frac{11}{2}, \frac{11}{2})$ D. $(\frac{11}{2}, -\frac{11}{2})$ E. NOTA

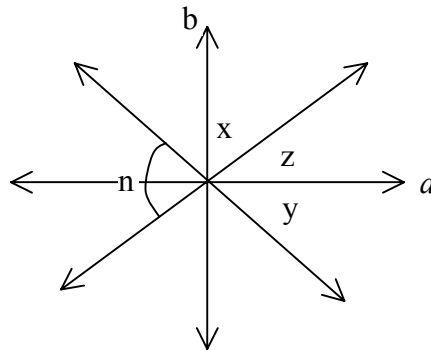
15. Given the figure with $\triangle PMK \sim \triangle KLR$. If $KR = 8$, $KP = 4$, $RL = 15$, and the altitude from K to RL is 6, what is the area of quadrilateral $KMQR$?

A. 67.5
B. 90
C. 135
D. 180
E. NOTA



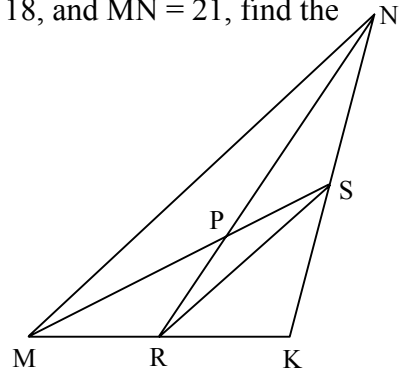
16. In the figure below, $a \perp b$ and $n = 75^\circ$. What is the value of $x - y$?

A. 15
B. 20
C. 30
D. 45
E. NOTA



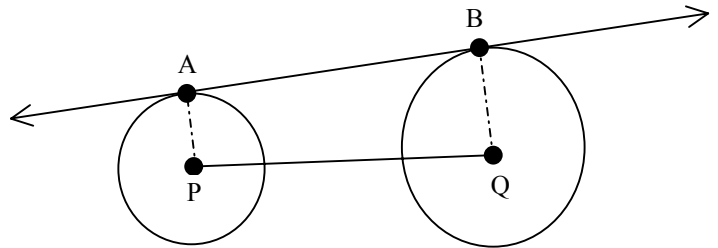
17. In $\triangle MNK$, \overline{MS} and \overline{NR} are medians. If $MS = 15$, $NR = 18$, and $MN = 21$, find the perimeter of $\triangle PRS$.

A. 21.5
B. 33
C. 43
D. 66
E. NOTA



18. \overline{AB} is tangent to circle P and circle Q at points of tangency A and B. $PQ = 12$ and the radii of circle P and circle Q are 5 and 6 respectively. Find the distance AB, to the nearest hundredth.

- A. 11.00
 B. 11.75
 C. 11.96
 D. 12.04
 E. NOTA



19. In a regular octagon DEMOCRAT, if each side of the octagon is length 1, what is the length of the diagonal connecting points D and O?

- A. $1 + \frac{\sqrt{2}}{4}$ B. $1 + \sqrt{2}$ C. $2 + \sqrt{2}$ D. 3 E. NOTA

20. It was believed by the ancient Greeks that the golden rectangle has the most pleasing form to the eye of all rectangles. In a golden rectangle, if w is its width and l is its length, then the ratio of its width to its length is l to $w + l$. Find the length of a golden rectangle with a width of 3 inches.

- A. $\frac{-3 + \sqrt{5}}{2}$ B. 3 C. $\frac{3 + 3\sqrt{3}}{2}$ D. $\frac{3 + 3\sqrt{5}}{2}$ E. NOTA

21. Find the equation of the line that is a perpendicular bisector of the line segment with endpoints (2,6) and (8,14).

- A. $4x - 3y = -10$ B. $3x - 4y = -25$ C. $3x + 4y = 55$
 D. $4x + 3y = 50$ E. NOTA

22. Find the volume of a regular octahedron with edge length 3 in.

- A. $9\sqrt{2}$ in.³ B. $9\sqrt{3}$ in.³ C. $18\sqrt{2}$ in.³ D. $18\sqrt{3}$ in.³ E. NOTA

23. What reason is missing in line 2 of the proof below?

Given: Kite ABCD with $\overline{AB} \cong \overline{AD}$, $\overline{BC} \cong \overline{CD}$, & diagonal \overline{AC}
 Prove: $\triangle ABC \cong \triangle ADC$

- | | |
|--|------------------------------|
| (1) Kite ABCD with $\overline{AB} \cong \overline{AD}$, $\overline{BC} \cong \overline{CD}$,
& diagonal \overline{AC} | (1) Given |
| (2) $\overline{AC} \cong \overline{AC}$ | (2) ? |
| (3) $\triangle ABC \cong \triangle ADC$, Q.E.D. | (3) SSS Congruence Postulate |

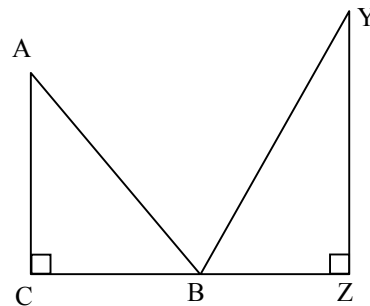
- A. Reflexive Property of Congruence
- B. Symmetric Property of Congruence
- C. Transitive Property of Congruence
- D. Corresponding Parts of Congruent Triangles are Congruent
- E. NOTA

24. Find the surface area of a right cone with radius of base 6 and height 8.

- A. 36π
- B. 60π
- C. 96π
- D. 132π
- E. NOTA

25. In the figure below, $AC = 4$, $CZ = 8$, $YZ = 12$, and the perimeter of $\triangle ACB$ is 12. Find $AB + BY$.

- A. 15
- B. 16
- C. 17
- D. 18
- E. NOTA



26. Line m passes through the origin and has a slope greater than 1. If a is the angle in quadrant I formed between line m and the y -axis, what is true about a ?

- A. $0 < a < 45$
- B. $a = 45$
- C. $45 < a < 90$
- D. $a > 90$
- E. NOTA

27. What is a valid conclusion given the following:
 $T \rightarrow S$
 $U \rightarrow \sim S$?
 $R \rightarrow T$
 U

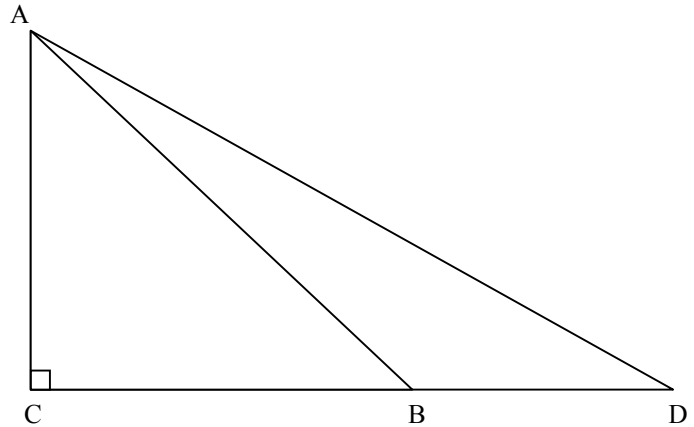
- A. $\sim R$
- B. R
- C. S
- D. T
- E. NOTA

28. If a clock with hour and minute hands reads 12:55, find the angle between the hour and minute hands 10 minutes later.

- A. 1.5° B. 2.5° C. 3.5° D. 4.5° E. NOTA

29. If $BC = 10$, $BD = 6$, and $m\angle ABC = 25^\circ$, find $m\angle D$ to the nearest degree.

- A. 16
 B. 17
 C. 18
 D. 19
 E. NOTA



30. Which of the following statements must be false?

- A. All rhombi are parallelograms.
 B. The area of a trapezoid is the product of its height and the length of its midsegment.
 C. Three noncollinear points determine a plane.
 D. Two lines that never intersect are parallel.
 E. NOTA