FAMAT Regional Competition
Geometry Individual Test **January**

NOTA defines None Of The Above; Figures not necessarily drawn to scale

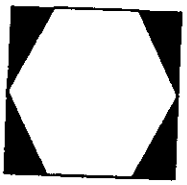
1. Find the length of the minor arc of the circle formed by the two 4 inch hands of a clock, when it is 2:45 p.m. *(All answers are in inches)*

A) $\frac{10\pi}{3}$ B) $\frac{14\pi}{3}$ C) $\frac{23\pi}{6}$ D) $\frac{25\pi}{6}$ E) NOTA

2. The measures of two supplementary angles $\angle A$ and $\angle B$ are given by $m\angle A = 4x + 2$ and $m\angle B = 6x + 3$. Find the ratio of $m\angle B$ to $m\angle A$.

A) $\frac{2}{3}$ B) $\frac{4}{5}$ C) $\frac{5}{4}$ D) $\frac{3}{2}$ E) NOTA

3. Given the figure below with a regular hexagon inscribed in a square of side length 7, find the area of the shaded region.



A) $49 - \frac{49\sqrt{3}}{48}$

B) $49 - \frac{49\sqrt{3}}{12}$

C) $49 - \frac{49\sqrt{3}}{8}$

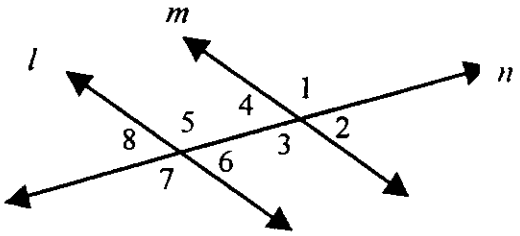
D) $49 - \frac{49\sqrt{3}}{2}$

E) NOTA

4. Which of the following *must* be true given the figure below with two parallel lines and a transversal?

I) $m\angle 1 = m\angle 7$
II) $m\angle 2 = m\angle 6$
III) $m\angle 1 = m\angle 4$

Note: $l \parallel m$

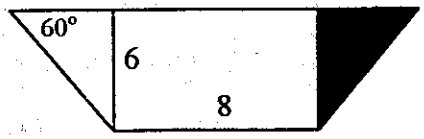


A) I & II only
B) II only
C) III only
D) I & III only
E) NOTA

5. Find the slope of the line connecting the points (3,7) and (1,1).

A) 0.5
B) 3
C) 4
D) 2.33
E) NOTA

6. The isosceles trapezoid below has a base of length 8 and height 6 as marked. Find the area of the shaded region.

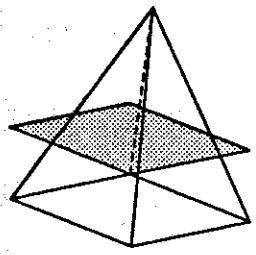


A) $3\sqrt{3}$
B) $4\sqrt{3}$
C) $6\sqrt{3}$
D) $7\sqrt{3}$
E) NOTA

7. Find the area of a rhombus with diagonals of length 10 and 5.

A) 12.5
B) 25
C) 75
D) 100
E) NOTA

8. The figure below shows a right pyramid cut by a plane passing parallel to the base. The original pyramid has a base side length of 6 and height 10. If the volume of the section below the plane is 70 and the base side length of the newly formed upper pyramid is 5, find the distance between the base of the original pyramid and the intersecting plane.



A) 2
B) 4
C) 6
D) 8
E) NOTA

9. Two similar right triangles ABC and DEF have hypotenuses of lengths 4 and 7, respectively. Find the ratio of the area of triangle ABC to the area of triangle DEF.

A) $\frac{2}{\sqrt{7}}$
B) $\frac{4}{7}$
C) $\frac{16}{49}$
D) Not enough information
E) NOTA

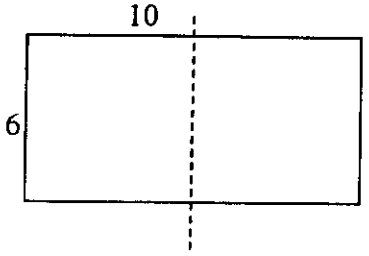
10. Which of the following accurately describes a pair of skew lines?

A) colinear B) coplanar C) intersecting D) parallel E) NOTA

11. A sphere is to be completely enclosed in a cylinder that has volume of 720π and height of 20. Find the maximum possible volume of this sphere.

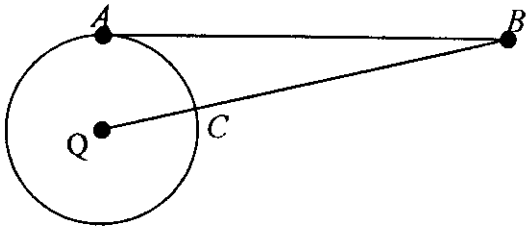
A) 72π
B) 144π
C) 288π
D) 360π
E) NOTA

12. The rectangle below with sides of length 6 and 10 is rotated about the central axis as shown. Find the volume of the resulting figure.



A) 60π
B) 150π
C) 300π
D) 600π
E) NOTA

13. The figure below has $\overline{AB}$ tangent to circle Q of radius 5 and line BC passing through its center. If AB = $4\sqrt{6}$, then find BC.



A) 4
B) 5
C) 6
D) 7
E) NOTA

14. An inscribed angle of measure 40° intercepts an arc. This arc and the two radii of length 7 define a sector. Find the area of this sector.

A) $\frac{14\pi}{9}$
B) $\frac{28\pi}{9}$
C) $\frac{89\pi}{8}$
D) $\frac{98\pi}{9}$
E) NOTA

15. The points A, B, C, D, and E are collinear, in that order. D is the midpoint of $\overline{AE}$, C is the midpoint of $\overline{AD}$, and B is the midpoint of $\overline{AC}$. Which of the following is/are true?

I) AB + BC = AC
II) AB + 3BC = AD
III) AE – AC = CE

A) I only B) II & III only C) I & II only D) I, II, & III E) NOTA

16. Given a triangle with sides of length 5, 12, and x, which of the following *could* be a length of the third side?

A) 5 B) 7 C) 9 D) 19 E) NOTA

17. Three sides of a triangle measure 3x + 2, 4x – 7, and 2x + 10. What value(s) of "x" would make this triangle isosceles?

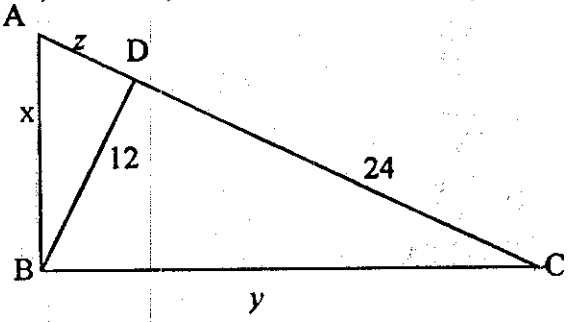
A) {8, 9} B) {8.5, 9} C) {8, 8.5, 9} D) {8, 8.5, 9, 9.5} E) NOTA

18. A circle with a radius of r is inscribed in a regular hexagon. Find the area of the hexagon in terms of r.

A) $r^2\sqrt{3}$
B) $\frac{\sqrt{3}}{3}r^2$
C) $2r^2\sqrt{3}$
D) $\frac{\sqrt{3}}{4}r^2$
E) NOTA

19. Given the figure below with $\overline{BD} \perp \overline{AC}$, $\overline{AB} \perp \overline{BC}$, DC = 24, and BD = 12, find $x + y + z$.

A) $18\sqrt{5}+6$
B) $9\sqrt{5}+3$
C) $18\sqrt{5}+12$
D) $24\sqrt{5}+6$
E) NOTA



20. A cone of solid ice has radius 6 inches and a height of 12 inches. This cone is to be melted and stored in gaseous form in a spherical container. If the ratio of the volumes of solid ice to its gaseous form is $1:\frac{6}{5}$, find the radius this spherical container to the nearest whole inch?

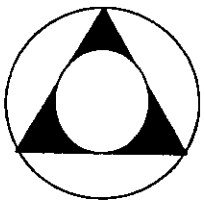
(Note: Assume that this gas cannot be compressed)

A) 4 B) 5 C) 6 D) 7 E) NOTA

21. A hexagon of area $\frac{27\sqrt{3}}{2}$ is within a triangle such that three sides of the hexagon lie on the equilateral triangle. Find the area of the triangle.

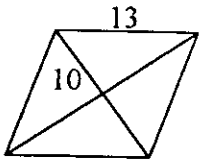
A) $\frac{49\sqrt{3}}{2}$
B) $\frac{64\sqrt{3}}{3}$
C) $\frac{81\sqrt{3}}{4}$
D) $20\sqrt{3}$
E) NOTA

22. Given the figure below with a circumscribed circle of area 49π, find the area of the inscribed equilateral triangle.



A) $\frac{49\sqrt{3}}{4}$
B) $\frac{49\sqrt{3}}{16}$
C) $\frac{147\sqrt{3}}{4}$
D) $\frac{147\sqrt{3}}{16}$
E) NOTA

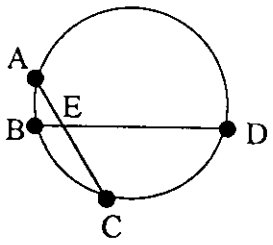
23. Find the area of the rhombus with side length 13 and a shorter diagonal of length 10 as shown below.



A) 60
B) 80
C) 120
D) 240
E) NOTA

24. Given the circle below with AE = 4, CA = 12, and BE = 2, find BD.

Note: Point E is the intersection of the two chords shown



A) 14
B) 16
C) 18
D) 20
E) NOTA

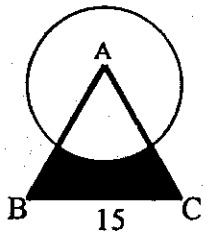
25. Two points located at (2, 7) and (8, 16) are to be used as vertices of a triangle. Which of the following points *cannot* be used as the third vertex?

A) (5, 9) B) (4, 2) C) (1, 5) D) (6, 13) E) NOTA

26. Find the circumference of the great circle of a sphere that has a volume of 288π.

A) 6π B) 12π C) 24π D) 36π E) NOTA

27. Find the area of the shaded region in the figure below given that circle A has radius 9 and the side length of equilateral triangle ABC is 15.



A) $\frac{225\sqrt{3}}{4} - \frac{27\pi}{2}$

B) $\frac{225\sqrt{3}}{4} - 81\pi$

C) $32\sqrt{3} - \frac{27\pi}{2}$

D) $\frac{225\sqrt{3}}{4} - 81\pi$

E)NOTA

28. Which of the following is the midpoint of a line segment with endpoints located at (4, 7) and (0, 11)?

A) (2, 9) B) (9, 2) C) (1,8) D) (8, 1) E) NOTA

29. What is the equation in standard form of a line parallel to $3x + 4y = -7$ and passing through the point (2, 5)?

A) $3x + 4y = 26$
B) $3x + 4y = 23$
C) $4x - 3y = -7$
D) $4x - 3y = 14$
E) NOTA

30. Find the area of a triangle with side lengths of 5, 7, and 9.

A) $3\sqrt{11}$ B) $\frac{21\sqrt{11}}{4}$ C) $\frac{3\sqrt{11}}{3}$ D) $\frac{3\sqrt{11}}{4}$ E) NOTA