Geometry Topic Test
FAMAT State Convention 2000

<u>If none of the answers given is correct, choose NOTA.</u>
Figures are not drawn to scale.

1. In ΔFGH, $\overline{GJ}$ bisects $\angle FGH$, J is on $\overline{FH}$. FG = 10, GH = 8, FH = 12.6, find FJ.

   A. 5.6 B. 7 C. $\sqrt{51}$ D. $2\sqrt{41}$ E. NOTA

2. Two angles are complementary and their measures have a ratio of 5:13. Find the measure of the supplement of the smaller angle.

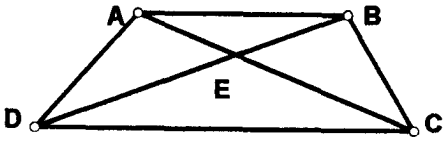
   A. 5 B. 115 C. 155 D. 175 E. NOTA

3. A circle can be inscribed in an equilateral triangle, each of whose sides has length 10. What is the area of the inscribed circle?

   A. $\frac{25}{3}\pi$ B. 25π C. $\frac{100}{3}\pi$ D. 100π E. NOTA

4. In trapezoid ABCD, with diagonals intersecting at E, AE = 30, BE = 24, and CE = 40. Find DE.

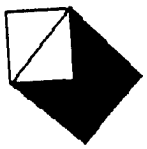
   A. 32 B. 46 C. 50 D. 64



5. The figure at the right contains two squares. A side of the smaller square is a. The shaded area in square units is

   A. $\frac{3}{4}a^2$ B. $\frac{3}{2}a^2$ C. $3a^2$

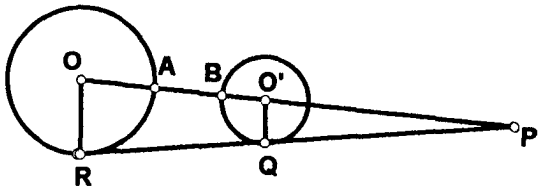
   D. $a^2(\sqrt{2}-1)$ E. NOTA



6. The medians of a right triangle that are drawn from the vertices of the acute angles have lengths of $2\sqrt{13}$ and $\sqrt{73}$. Find the length of the hypotenuse.

   A. 7 B. 10 C. 14 D. $4\sqrt{13}$ E. NOTA

7. $\overline{PR}$ is a common external tangent to circles O and O'. PQ = 3, QR = 9, and OR = 5. A and B are points on circles O and O', respectively, and are on $\overline{PO}$. Find AB.

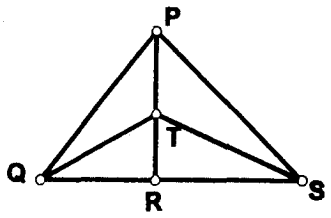


   A. $1\frac{1}{2}$ B. $2\frac{1}{2}$ C. $3\frac{1}{4}$ D. $3\frac{1}{2}$ E. NOTA

8. The total surface area of a right circular cylinder is 16π, and the sum of its height and base radius is 8. Find the volume of the cylinder.

A. π B. 7π C. 16π D. no such cylinder E. NOTA

9. In ΔQTS, base $\overline{QS}$ is 15. If altitude $\overline{RT}$ is extended 4 units to P, what is the area, in square units, of quadrilateral QTSP?



A. 30 B. 60 C. 90 D. 120 E. NOTA

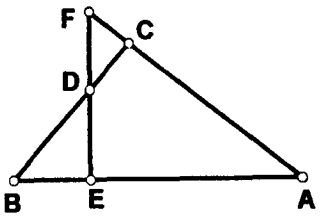
10. A straight line, $y = 1$, intersects the circle $x^2 + y^2 = 4$, at points A and B. How many degrees in minor $\overset{\frown}{AB}$?

A. 30 B. 60 C. 90 D. 120 E. NOTA

11. If the hypotenuse of an isosceles right triangle has length 8, the area of the triangle, in square units, is

A. 8 B. 12 C. 16 D. 32 E. NOTA

12. ΔABC is isosceles with AC = BC = 8. $\overline{AC}$ is extended 3 inches to F. $\overline{FE} \perp \overline{BA}$ and $\overline{FE}$ intersects $\overline{BC}$ at D. Find the length of $\overline{BD}$.



A. 3 B. $2\sqrt{6}$ C. 5 D. $5\frac{1}{2}$ E. NOTA

13. When the circumference of a toy ballon in the shape of a circle is increased from 20 inches to 25 inches, the radius, in inches, is increased by

A. $\frac{5}{2\pi}$ B. $\frac{5}{\pi}$ C. 2.5 D. 5 E. NOTA

14. A right circular cone with base radius R contains $\frac{3}{4}$ of the volume of a right circular cylinder with base R. Thus, the height of the cone is

A. 1.75 times the height of the cylinder
B. 2 times the height of the cylinder
C. 2.25 times the height of the cylinder
D. 4 times the height of the cylinder
E. NOTA

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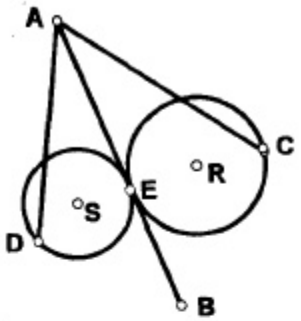
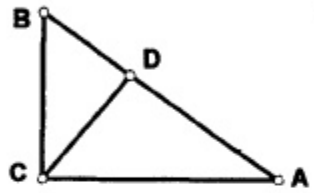
15. Circles R and S are both tangent to $\overleftrightarrow{AB}$ at E. Secant $\overline{AC}$ has external and internal segments 3 and 6, respectively. Secant $\overline{AD}$ has external and internal segments of 4 and x, respectively. What is the value of x?



A. $2\frac{3}{4}$ B. $3\sqrt{2}$ C. $3\sqrt{5}$ D. $4\frac{1}{2}$ E. NOTA

16. In right triangle ABC, $\overline{CD}$ is an altitude to hypotenuse $\overline{AB}$. $AC = 6$, $AD = x$, and $BD = x + 1$. Find the value of x.

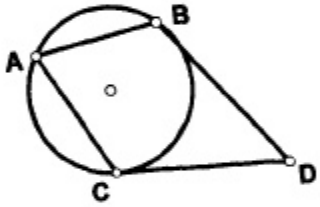


A. 3 B. $3\sqrt{3}$ C. 4 D. $4\sqrt{3}$ E. NOTA

17. The longer diagonal of a rhombus is twice the shorter diagonal. If k represents the length of the shorter diagonal, then the perimeter of the rhombus is

A. $\frac{k\sqrt{5}}{2}$ B. $k\sqrt{5}$ C. $2k\sqrt{5}$ D. $4k\sqrt{5}$ E. NOTA

18. In the given circle, $\angle BAC$ is an inscribed angle and $\overleftrightarrow{DC}$ and $\overleftrightarrow{BD}$ are tangents. $m\angle D = 48$, find $m\angle BAC$.



A. 42 B. 48 C. 66 D. 96 E. NOTA

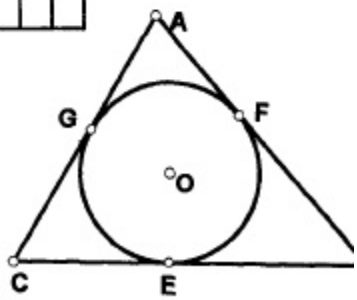
19. A square has a diagonal of x, and a circle has a diameter of y. If the square and the circle have equal areas, what is the ratio of x: y?

A. 1:1 B. π:2 C. π^2:4 D. $\sqrt{2\pi}$: 2 E. NOTA

20. The square has been divided into five congruent rectangles. If the perimeter of one of the rectangles is 30, what is the perimeter of the square?

A. 150 B. 100 C. 50 D. 24 E. NOTA

21. Circle O is inscribed in ΔABC and F, G, and E are points of tangency. If $AB = 9$, $BC = 13$, and $AC = 10$, what is the length of tangent $\overline{AF}$?

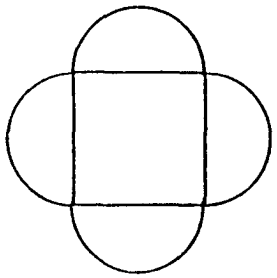


A. 2 B. 4 C. $4\frac{1}{2}$ D. $5\frac{1}{3}$ E. NOTA

22. The length of $\overset{\frown}{AB}$ on a given circle is $\frac{1}{4}$ the circumference of the circle. If the length of the chord $\overline{AB}$ is 8, what is the area of the circle?

A. 2π B. 8π C. 16π D. 32π E. NOTA

23. Which formula will compute the perimeter of the shape shown to the right? (A square with a side x and four semicircles)



A. $2\pi x$ B. πx^2 C. $x^2 + 2\pi x$
D. $4\pi x + 4x$ E. NOTA

24. The length of the diagonal of a square is $a + b$. The area of the square is
A. $\frac{1}{2}(a+b)^2$ B. $(a+b)^2$ C. $a^2 + b^2$
D. $\frac{1}{2}(a^2 + b^2)$ E. NOTA

25. In right triangle ABC with right angle at C, D is a point on $\overline{AC}$ and E is on $\overline{AB}$ so $\overline{DE} \parallel \overline{AB}$ and AB = 20, BC = 12, and AD = 10. Find DE.
A. 6 B. $7\frac{1}{2}$ C. 10 D. $10\frac{2}{3}$ E. NOTA

26. In ΔABC, $m\angle A = 60, m\angle B = 45$. If AC = 8, how long is AB?
A. 4 B. $4\sqrt{3}$ C. $8\sqrt{3}$ D. 16 E. NOTA

27. As the number of sides of a polygon increases from 3 to n, the sum of the exterior angles formed by extending each side in succession
A. increases B. decreases C. remains constant D. cannot be predicted E. NOTA

28. A square and a regular hexagon are inscribed in the same circle. Find the ratio of the area of the square to the area of the hexagon.
A. $\sqrt{2}:1$ B. 2:1 C. $2\sqrt{3}:3$ D. $4\sqrt{3}:9$ E. NOTA

29. Exactly how many revolutions does a wheel with diameter of 14 cm make when it rolls 20 meters?
A. $\frac{500}{7\pi}$ B. $\frac{500}{11}$ C. $\frac{1000}{11\pi}$ D. $\frac{1000}{7\pi}$ E. NOTA

30. The radius of a sphere is equal to the diagonal of a face of a cube. Find the ratio of the volume of the sphere to the volume of the cube.
A. $4\pi:1$ B. $4\pi:3$ C. $4\pi\sqrt{3}:1$ D. $8\pi\sqrt{2}:3$ E. NOTA