1. A square has an area of $\frac{9}{4}$ ft^2. What is the area of a circle inscribed in the square?

A. $\frac{3}{4}\pi$ ft^2 B. $\frac{3}{2}\pi$ ft^2 C. $\frac{9}{4}\pi$ ft^2 D. $\frac{9}{16}\pi$ ft^2 E. NOTA

2. What is the maximum number of total intersections when 6 distinct circles are drawn in a plane?
A. 20   B. 30   C. 36   D. 42   E. NOTA

3. Two coplanar circles have radii of 23 ft and of 16 ft and their centers are 25 ft apart. Find the length of the common external tangent of the two circles.
A. 23 ft   B. 24 ft   C. 25 ft   D. $\sqrt{881}$ ft   E. NOTA

4. The circles are concentric, $\overline{AB}$ is the diameter of the larger circle, the chord $\overline{CD}$ is tangent to the smaller circle, and $CD = 6$. Find the area of the shaded region.


A. $\frac{9}{2}\pi$ B. 9π C. 6π D. 3π E. NOTA
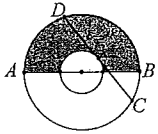
5. A cube has a surface area of 1000. What is the volume of a sphere inscribed in the cube?
A. $\frac{500}{3}\pi$ B. $\frac{500\sqrt{15}}{27}\pi$ C. $\frac{2700\sqrt{15}}{9}\pi$ D. $\frac{2500\sqrt{15}}{9}\pi$ E. NOTA

6. A circle passes through the points $(0, 0)$, $\left(0, 6\sqrt{2}\right)$, and $\left(3\sqrt{2}, 3\sqrt{2}\right)$. What is the sum of the area and circumference of this circle?
A. $18\pi + 6\sqrt{2}\pi$ B. $18\pi + 12\sqrt{2}\pi$ C. $72\pi + 6\sqrt{2}\pi$ D. $72\pi + 12\sqrt{2}\pi$ E. NOTA

7. Find the area of the circle.
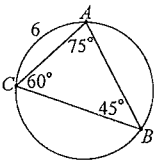
A. $\frac{96}{\pi}$ B. $\frac{48}{\pi}$ C. $\frac{144}{\pi}$ D. 36π E. NOTA

8. In rectangle $TIAK$, $\dfrac{\text{area of } \Delta TKL}{\text{area of quad } TIAL} = \dfrac{1}{6}$. Find $\dfrac{KL}{LA}$.
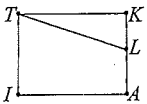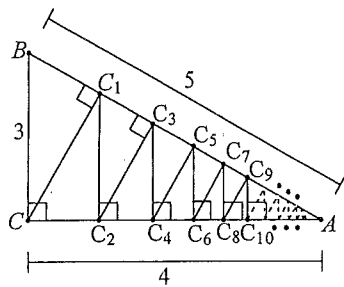

A. $\frac{2}{3}$ B. $\frac{3}{4}$ C. $\frac{1}{2}$ D. $\frac{2}{5}$ E. NOTA

9. In a triangle, the area is numerically equivalent to the perimeter. What is the radius of the circle inscribed in the triangle?
A. 2   B. 3   C. 4   D. 5   E. NOTA
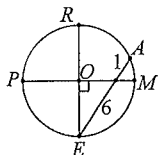
10. Quadrilateral $ABCD$ is a rectangle. Find BE.
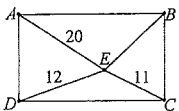
A. $\sqrt{377}$ B. $3\sqrt{47}$ C. 3   D. 19   E. NOTA

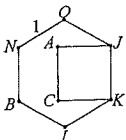11. Find the sum of $CC_1 + C_1C_2 + C_2C_3 + \cdots$

A. 4   **B.** 5   **C.** 12   **D.** 15   **E.** NOTA

12. Diameters $\overline{PM}$ and $\overline{RE}$ are perpendicular, and chord $\overline{EA}$ intersects $\overline{PM}$ at S with $ES = 6$ and $AS = 1$. If $k\pi$ is the area of circle O, then find k.

A. 96   **B.** 21   **C.** 36   **D.** 49   **E.** NOTA

13. Square $JACK$ is constructed in the interior of the regular hexagon $JONBIK$. If the hexagon's sides measure 1, find the area of $\triangle JON$.

A. $\dfrac{\sqrt{3}}{8}$ **B.** $\dfrac{\sqrt{3}-1}{4}$ **C.** $\dfrac{2\sqrt{3}-1}{4}$ **D.** $\dfrac{\sqrt{3}}{4}$ **E.** NOTA
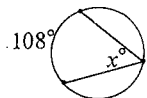
14. An ant is on the bottom edge of a right circular cone with base area π and slant height 6. What is the shortest distance that the ant has to travel to loop around the cone and come back to its starting position?

A. π **B.** 2π **C.** $2\pi^2$ **D.** π^2 **E.** NOTA

15. A = volume of a sphere with radius 2

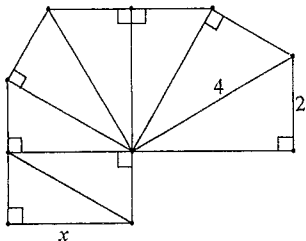B = number of distinct ways to arrange the letters in the word *PAPARAZZI*

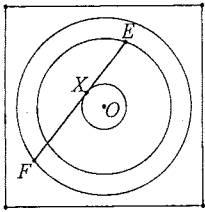C = value of x

Find $\dfrac{3AC}{B}$

A. $\dfrac{4}{35}\pi$ **B.** $\dfrac{2}{13}\pi$ **C.** π **D.** $\dfrac{12}{35}\pi$ **E.** NOTA

16. All of the right triangles shown are similar. Find the value of x.

A. 3   **B.** $2\sqrt{3}$ **C.** $\sqrt{3}$ **D.** $\dfrac{3\sqrt{3}}{2}$ **E.** NOTA

17. Mr. Taylor has a dartboard formed from 3 concentric circles with radii of 5, 12, and 15. Find the length of chord $\overline{EF}$, given that $\overline{EF}$ is tangent to the smallest circle.
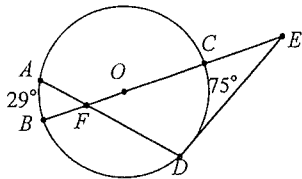

A. $13+5\sqrt{10}$ B. $5\sqrt{10}$ C. 13   D. 30   E. NOTA

18. $\triangle ABC$ is inscribed in a circle such that A and B are the endpoints of a diameter. $\overline{CD}$ is the altitude drawn to $\overline{AB}$. If $AC = 15$ and $BD = 16$, compute the value of $\dfrac{(AD)(BC)}{CD} - 3$.
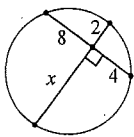
A. 15   B. 12   C. 25   D. 9   E. NOTA

19. In $\odot O$, $\overline{BC}$ is a diameter, $m\overset{\frown}{CD} = 75°$ and $m\overset{\frown}{AB} = 29°$. Find $m\angle EDA$.
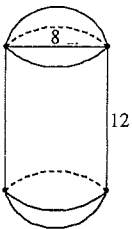

A. 99°   B. 105°   C. 113°   D. 136°   E. NOTA

20. Find x.

A. 10   B. 8   C. 12   D. 16   E. NOTA

21. Find the surface area of the figure. The diameter of the base of the cylinder is 8 and the height of the cylinder is 12. The cylinder has a hemisphere attached to each base.

A. 32π B. 576π C. 160π D. 448π E. NOTA

22. Robert Griffin III is tied to the outside edge of a 7 in. by 17 in. barn with a 12 in. rope. What is the largest area in which he can graze?

A. 108π in^2 B. $\dfrac{313}{4}\pi$ in^2 C. 144π in^2 D. $\dfrac{457}{4}\pi$ in^2 E. NOTA

23. A cone has a slant height of $\sqrt{13}$ and a radius of 2. The length of the sides of a regular hexagon is equal to the volume of the cone divided by π. Find the area of the hexagon.

A. $24\sqrt{3}$ B. $12\sqrt{3}\ \pi$ C. $12\sqrt{3}$ D. $24\sqrt{3}\ \pi$ E. NOTA

24. Silin has been drawing guinblobs since seventh grade. If a guinblob consists of a hemisphere and a cylinder both with radius 27, then what is the surface area of a guinblob if the height of the guinblob is 50? (The eyes, nose, and tummy are for decorative purposes only; they do not contribute to the surface area.)
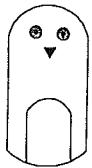
A. 2336π B. 2700π C. 3429π D. 2335.5π E. NOTA
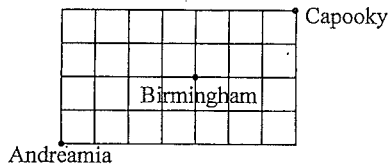
25. If a is the radius of a circle, find the area of the circle.
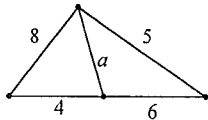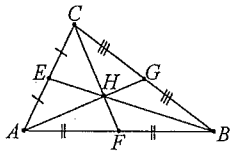
A. $\dfrac{112}{5}\pi$ B. $\dfrac{122}{5}\pi$ C. 23π D. 17π E. NOTA

PLEASE WRITE YOUR NAME, COMPLETE SCHOOL NAME, AND TIE-BREAKER ANSWERS ON THE BACK OF THE SCANTRON FORM. DENOTE EACH TIE-BREAKER AS "T1," "T2," and "T3."

T1. How many paths are there from Andremia to Capooky avoiding Birmingham if you can travel only up and to the right?

T2. $BE = 2x^2 - 5x - 12$ and $BH = x^2 - 15$. Find BE.

T3. How many distinct ways can you arrange the letters in TODDTAYLOR?

YOU MAY KEEP THIS COPY OF THE EXAM.