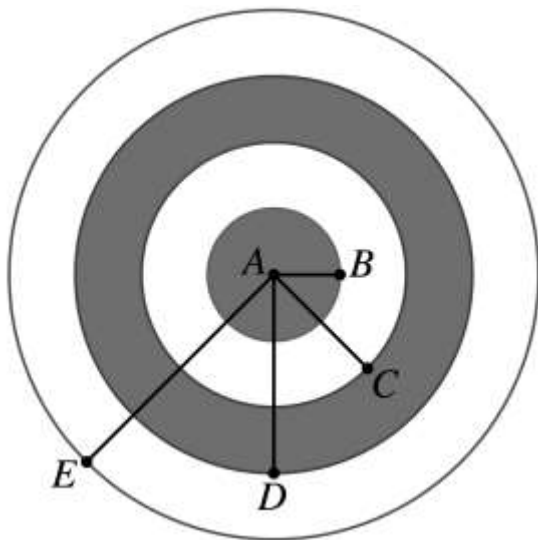## Geometry (Advanced)

1. The concentric circles shown below all have a center point of A. Radii $\overline{AB} = 2$, $\overline{AC} = 4$, $\overline{AD} = 6$, and $\overline{AE} = 8$. What is the total area of the white rings?


  A. 19π
  B. 25π
  C. 34π
  D. 40π
  E. 48π

2. Savannah, a seamstress, is sewing a pillowcase. She creates the pillowcase by folding a piece of rectangular fabric in half and cutting out a circular pattern. This process creates two circular cutouts. She will sew them together by folding the fabric under and sewing down 1" of fabric around the circumference of the circle to make the pillowcase. Savannah wants the pillowcase to have a 24" diameter after folding under the 1" edge. What are the smallest possible dimensions of the original rectangular piece of fabric in order for Savannah to have enough fabric for her pillowcase?
  A. 24" × 24"
  B. 26" × 26"
  C. 52" × 26"
  D. 52" × 25"
  E. 48" × 52"

3. In the figure below, line $\overline{LM}$ has equation $2y + x = 4$ and intersects $\overline{JK}$ at a point on the x-axis. $\angle a$ and $\angle b$ are congruent. What is the slope of $\overline{JK}$?
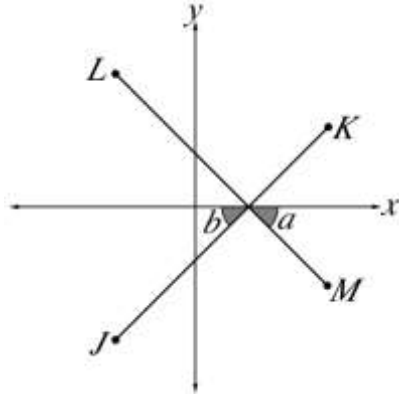

    A. -2

    B. $-\dfrac{1}{2}$

    C. $\dfrac{1}{2}$

    D. 2

    E. Cannot be determined from given information

4. Ray BD bisects $\angle ABC$, the measure of $\angle ABC$ is $9x°$, and the measure of $\angle ABD$ is $(3x + 18)°$. What is the measure of $\angle DBC$?
    A. $12°$
    B. $54°$
    C. $60°$
    D. $72°$
    E. $108°$

5. The equation $(x - 5)^2 + (y - 6)^2 = 25$ is that of a circle that lies in the standard (x,y) coordinate plane. One endpoint of a diameter of the circle has coordinates $(9,9)$. What are the coordinates of the other endpoint of that diameter?
    A. $(1,3)$
    B. $(2,4)$
    C. $(2,9)$
    D. $(5,6)$
    E. $(13,12)$

6. The 3 lines with equations $y = 0$, $x = 1$, and $y = 2x$ bound a unique triangular region in the (x, y) coordinate plane. Which of the following descriptions is the best classification of this triangle?

A. Equilateral
B. Acute isosceles
C. Right isosceles
D. Acute scalene
E. Right scalene

7. The intersection of two lines forms 4 angles: $\angle A, \angle B, \angle C,$ and $\angle D$. The measure of $\angle B$ is 8 times the measure of $\angle A$. Which of the following values is closest to the measure of $\angle A$?

A. $10°$
B. $12.5°$
C. $15°$
D. $20°$
E. $25°$

8. The bottom of a swimming pool, shown below, has an area of 560 square feet and a perimeter of 125 ft. The swimming pool has a uniform depth of 7 ft of water, and the given lengths are in feet. If it can be determined, what is the volume of water, in cubic feet, that the pool contains?
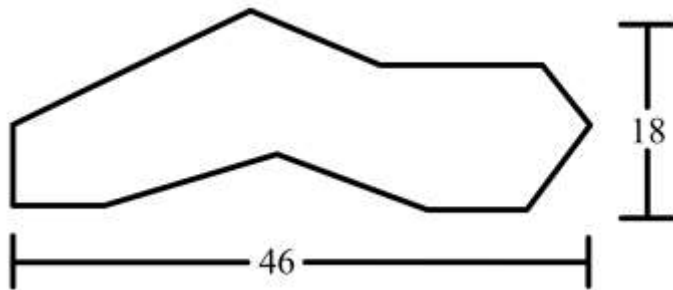

A. 3,560
B. 3,620
C. 3,780
D. 3,920
E. Cannot be determined from the given information.

9. Which of the following expressions represents the area, in square coordinate units, of ΔRST shown in the standard (x, y) coordinate plane below?
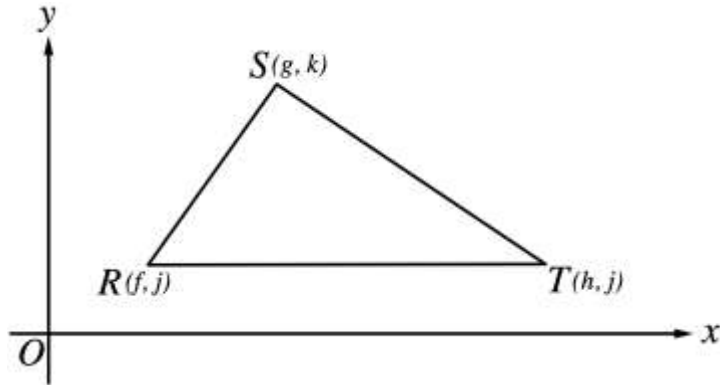

A. $\frac{1}{2}(h-f)(k-j)$

B. $\frac{1}{2}h(j-g)$

C. $\frac{1}{2}k(h-f)$

D. $\frac{1}{2}((k-j)^2 + (g-f)^2)((k-j)^2 + (g-h)^2)$

E. $\frac{1}{2}\left(\sqrt{(k-j)^2 + (g-f)^2}\right)\left(\sqrt{(k-j)^2 + (g-h)^2}\right)$

10. How long in centimeters is one side of a square whose perimeter is equal to the circumference of a circle with a radius of 4 centimeters?

A. $\frac{\pi}{2}$

B. π

C. 2π

D. 4π

E. 8π

11. Each side of a cube is 2 centimeters long. How long is the major diagonal of the cube? (Note: the major diagonal of a cube extends from the bottom left corner to the upper right corner)

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

12. As shown in the figure below, D is the center of the circle, and $\triangle ABD$ intersects the circle at C and F. Point C is the midpoint of $\overline{BD}$, which is 16 centimeters long. The shaded region inside the circle and outside the triangle has an area of 60π square centimeters. What is the measure of $\angle A$?
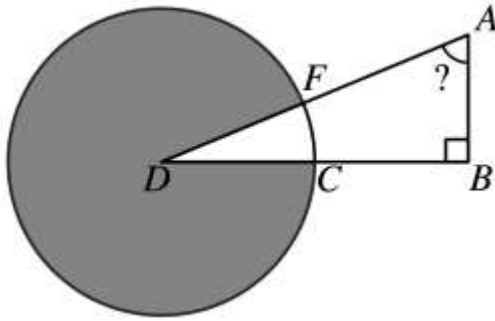

A. 45°
B. 52.5°
C. 60°
D. 67.5°
E. 72°

13. One vertex of a square lies on a circle, and the opposite vertex is the center of the circle. If the area of the circle minus the area of the square is $40\pi - 20$, what is the perimeter of the square?
A. 20
B. 28
C. 98
D. $4\sqrt{5}$
E. $8\sqrt{5}$

14. In the figure below, the circle has center P. What is the area of the shaded region?
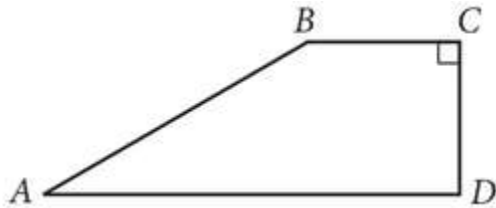
A. $\frac{18}{3}\pi$

B. $18\pi - 27\sqrt{3}$

C. $\frac{1}{3}(27\sqrt{3} - 18\pi)$

D. $\frac{1}{3}(18\pi - 27\sqrt{3})$

E. $\frac{1}{3}(27\pi - 18\sqrt{3})$
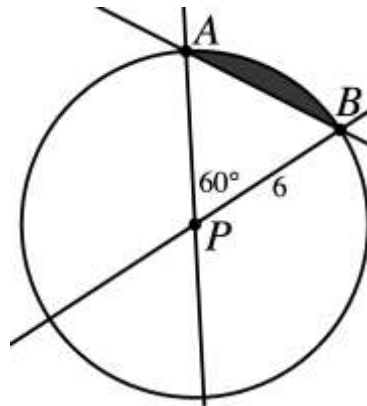
15. In the figure below, $MN = MP$, $NO = OP$, $NQ = 3$, $NO = 7$, and $MO = 12$. What is the area of triangle MNP?
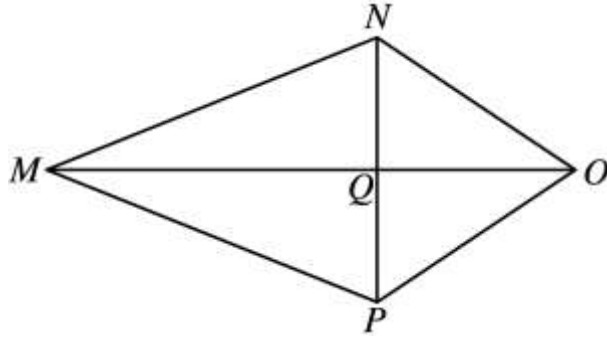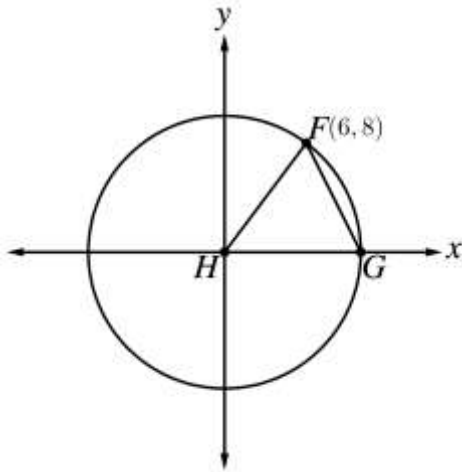

A. $60 - 10\sqrt{10}$
B. $48 - 8\sqrt{10}$
C. $36 - 6\sqrt{10}$
D. $24 - 4\sqrt{10}$
E. $12 - 2\sqrt{10}$

16. In quadrilateral $ABCD$ below, $\overline{AD} \parallel \overline{BC}$ and $AB = \sqrt{2}CD$. What is the measure of angle B?


A. $165°$
B. $150°$
C. $135°$
D. $90°$
E. $45°$

17. In the xy-plane below, points F and G are on the circle with center H. What is the length of $\overline{FG}$?


F(6, 8)

y

H G x

A. 6
B. 10
C. 12
D. $4\sqrt{5}$
E. $5\sqrt{4}$

18. The figure below represents Alicia's position, O, on a map relative to her school, S, and the highway, $\overline{LM}$, that passes nearby. If the distances shown in the diagram are in kilometers, and $\overline{LS}$ and $\overline{MS}$ form a right triangle at S, what is the length, in kilometers, of $\overline{OP}$, the shortest distance between Alicia's position and the highway?
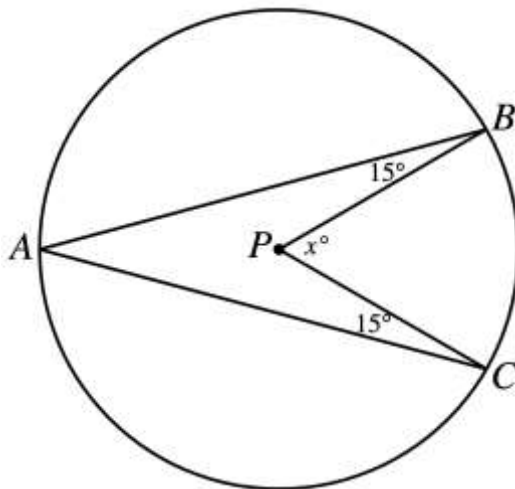

L

10

P

O

6

A. 6
B. 5.7
C. 5.4
D. 5.1
E. 4.8

S M

12
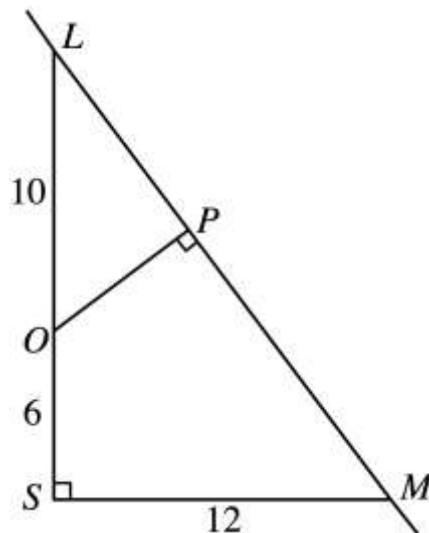
19. Point O is the center of the circle shown. Line segment ED is tangent to the circle at point C, and the measure of minor arc BC is 60°. What is the measure of angle CDO?
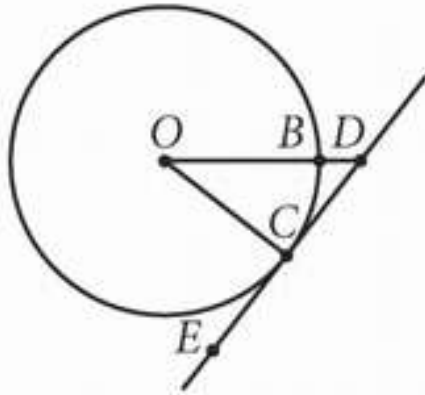
A. 20°
B. 30°
C. 50°
D. 60°
E. 90°

20. Point P is the center of the circle shown. What is the value of x ?

A. 20°
B. 30°
C. 40°
D. 50°
E. 60°