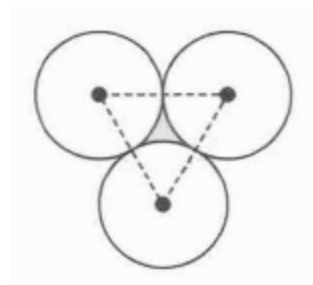


Shaded Region Problems

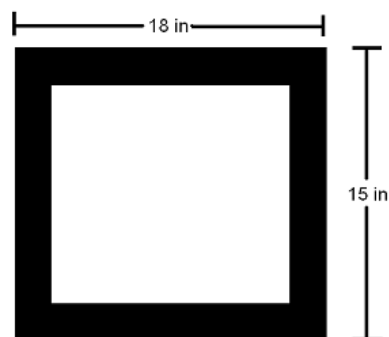
1. The figure shown above consists of three identical circles that are tangent to each other. If the area of the shaded region is $64\sqrt{3} - 32\pi$, what is the radius of each circle?

- (A) 4
- (B) 8
- (C) 16
- (D) 24
- (E) 32



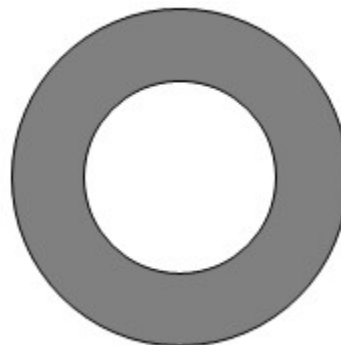
2. The shaded region in the figure above represents a rectangular frame with length 18 inches and width 15 inches. The frame encloses a rectangular picture that has the same area as the frame itself. If the length and width of the picture have the same ratio as the length and width of the frame, what is the length of the picture, in inches?

- A. $9\sqrt{2}$
- B. $\frac{3}{2}$
- C. $\frac{9}{\sqrt{2}}$
- D. $15(1 - \frac{1}{\sqrt{2}})$
- E. $\frac{9}{2}$



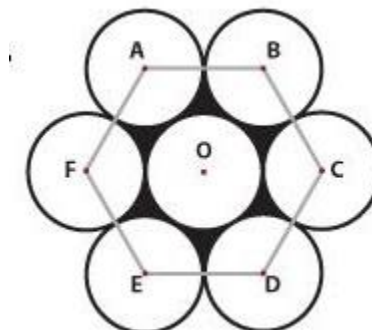
3. In the figure shown, if the area of the shaded region is 3 times the area of the smaller circular region, then the circumference of the larger circle is how many times the circumference of the smaller circle?

- A. 4
- B. 3
- C. 2
- D. $\sqrt{3}$
- E. $\sqrt{2}$



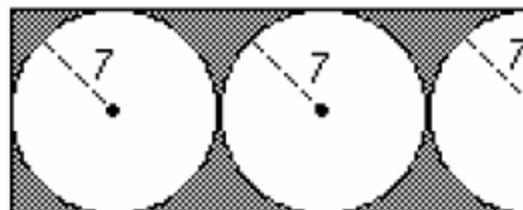
4. Regular hexagon ABCDEF has a perimeter of 36. O is the center of the hexagon and of circle O. Circles A, B, C, D, E, and F have centers at A, B, C, D, E, and F, respectively. If each circle is tangent to the two circles adjacent to it and to circle O, what is the area of the shaded region (inside the hexagon but outside the circles)?

- A. $108 - 18\pi$
- B. $54\sqrt{3} - 9\pi$
- C. $54\sqrt{3} - 18\pi$
- D. $108 - 27\pi$
- E. $54\sqrt{3} - 27\pi$



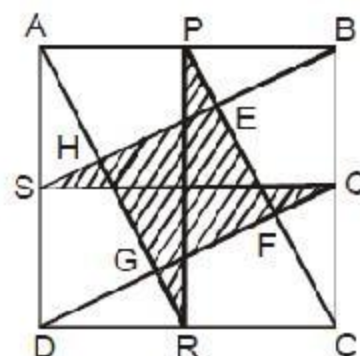
5. The rectangular region above contains two circles and a semicircle, each with a radius of 7. If $22/7$ is used as an approximation for π , then the area of the shaded region is approximately

- (A) 105
- (B) 210
- (C) 380
- (D) 385
- (E) 405



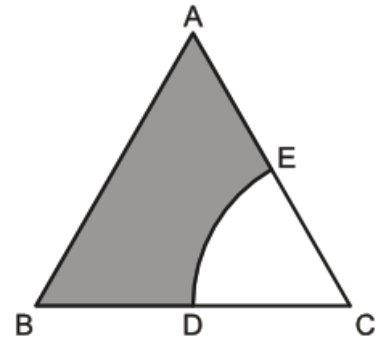
6. In the figure given below, ABCD is a square, and P, Q, R and S are the mid-points of the sides AB, BC, CD and AD respectively. The ratio of the area of the shaded region to the area of the square ABCD is

- A. $1/3$
- B. $1/4$
- C. $1/5$
- D. $1/6$
- E. $1/8$



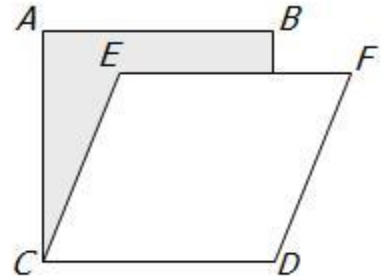
7. ABC is an equilateral triangle of area 3, and arc DE is centered at C. If E is the midpoint of AC, what is the area of the shaded region?

- A. $3 - \frac{\sqrt{3}\pi}{2}$
- B. $3 - \frac{\pi}{\sqrt{3}}$
- C. $3 - \frac{\pi}{2}$
- D. $3 - \frac{\pi}{2\sqrt{3}}$
- E. $3 - \frac{\pi}{6}$



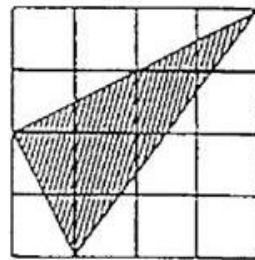
8. If ABCD is a square with area 625, and CEFD is a rhombus with area 500, then the area of the shaded region is

- A. 125
- B. 175
- C. 200
- D. 250
- E. 275

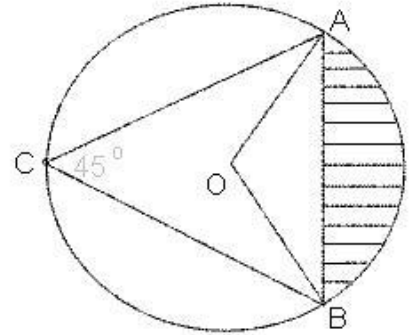


9. The area of each of the 16 square regions in the figure above is T . What is the area of the shaded region?

- A. $\frac{13T}{3}$
- B. $5T$
- C. $\frac{16T}{3}$
- D. $\frac{11T}{2}$
- E. $7T$

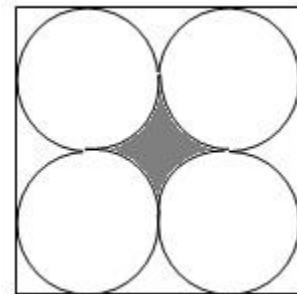


10. Triangle ABO is situated within the Circle with center O so that one vertex is at the center of the circle, O, and its other vertices are located on its perimeter. The perimeter of triangle ABO is $8 + \sqrt{32}\pi$. What is the area of the hatched portion of the circle, the portion bounded by line AB and arc AB?



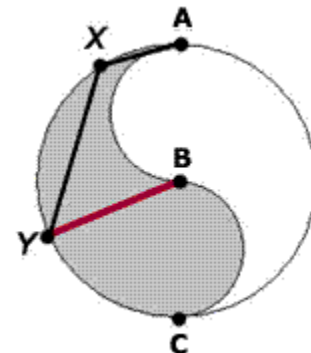
- A. $4\pi - 8$
- B. $8\pi - 4$
- C. $2\pi - 2$
- D. $3\pi - 3$
- E. $3\pi - 2$

11. Four identical circles are drawn in a square such that each circle touches two sides of the square and two other circles (as shown in the figure below). If the side of the square is of length 20 cm, what is the area of the shaded region?



- (A) $400 - 100\pi$
- (B) $200 - 50\pi$
- (C) $100 - 25\pi$
- (D) 8π
- (E) 4π

12. In the diagram, points A, B, and C are on the diameter of the circle with center B. Additionally, all arcs pictured are semicircles. Suppose angle YXA = 105 degrees. What is the ratio of the area of the shaded region above the line YB to the area of the shaded region below the line YB? (Note: Diagram is not drawn to scale and angles drawn are not accurate.)



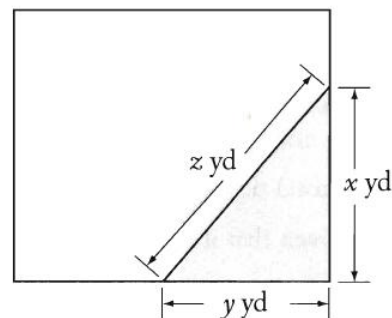
- (A) $\frac{3}{4}$
- (B) $\frac{5}{6}$
- (C) 1
- (D) $\frac{7}{5}$
- (E) $\frac{9}{7}$

13. In the xy - plane, a triangle has vertexes $(0,0)$, $(4,0)$ and $(4,5)$. If a point (x,y) is selected at random from the triangular region, What is the probability that $x-y>0$?

- A. $1/5$
- B. $1/3$
- C. $1/2$
- D. $2/3$
- E. $4/5$

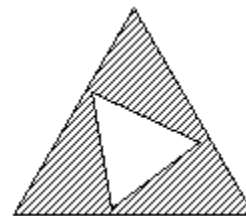
14. The shaded portion of the rectangular lot shown above represents a flower bed. If the area of the bed is 24 square yards and $x = y + 2$, then z equals

- (A) $\sqrt{13}$
- (B) $2\sqrt{13}$
- (C) 6
- (D) 8
- (E) 10



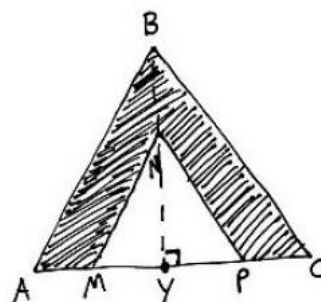
15. The triangles in the figure above are equilateral and the ratio of the length of a side of the larger triangle to the length of a side of the smaller triangle is $2/1$. If the area of the larger triangular region is K , what is the area of the shaded region in terms of K ?

- (A) $3/4K$
- (B) $2/3K$
- (C) $1/2K$
- (D) $1/3K$
- (E) $1/4K$



16. In the figure above, triangles ABC and MNP are both isosceles. AB is parallel to MN , BC is parallel to NP , the length of AC is 7 and the length of BY is 4. If the area of the unshaded region is equal to the area of the shaded region, what is the length of MP ?

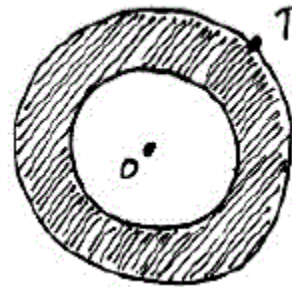
- A. $2\sqrt{2}$
- B. $2\sqrt{7}$
- C. $\frac{2\sqrt{3}}{3}$
- D. $\frac{7\sqrt{2}}{2}$



E. $\frac{7\sqrt{3}}{3}$

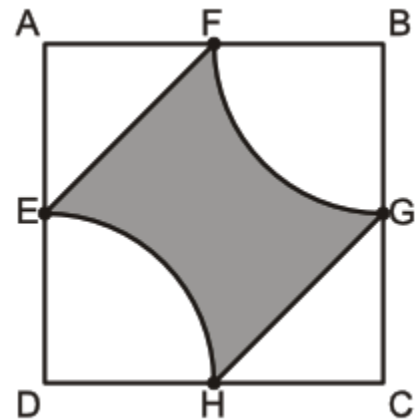
17. The shaded region in the figure above represents a circular tire. If the distance from point O to point T is 18 inches and the area of the shaded region is equal to the area of the unshaded region, what is the radius of the unshaded region, in inches?

- (A) $\frac{9}{2}\sqrt{2}$
 (B) $\frac{9}{2}\sqrt{2}$
 (C) 9
 (D) $9\sqrt{2}$
 (E) $9\sqrt{3}$



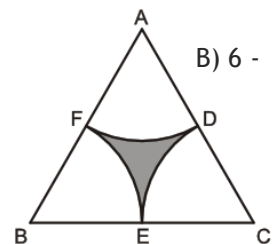
18. H, G, F and E are midpoints of the sides of square ABCD. Arcs FG and EH are centered at B and D respectively, as shown above. If the side of the square ABCD is 4, what is the area of the shaded region HEFG?

- A) $4(3 - \pi)$
 B) $2(4 - \pi)$
 C) $4(4 - \pi)$
 D) $2(6 - \pi)$
 E) $8(1 + \pi)$



19. Arcs DE, EF, FD are centered at C, B and A, in equilateral triangle ABC, as shown above. If the area of the triangle is 6, what is the area of the shaded region formed by the intersection of the arcs and the triangle?

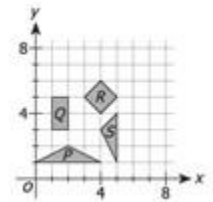
- A) $6 - \frac{\sqrt{3}}{3}\pi$
 $\frac{\sqrt{3}}{2}\pi$



- C) $\frac{\pi}{\sqrt{3}}$
 D) $6 - \sqrt{3}\pi$
 E) $\frac{\pi}{6}$

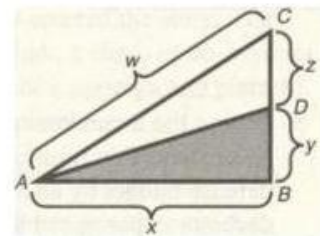
20. In the rectangular coordinate system above, for which of the shaded regions is the area 2?

- A. None
 B. Q Only
 C. Q and R
 D. P, Q and R
 E. P, Q, R and S



21. If the shaded area is one half the area of the triangle ABC and angle ABC is a right angle, then the length of the line segment AD is:

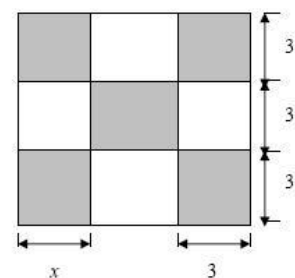
- A. $\frac{1}{2} * w$
 B. $\frac{1}{2} * (w+x)$
 C. $\sqrt{2x^2 + z^2}$
 D. $\sqrt{w^2 - 3y^2}$
 E. $y^2 + z^2$



22. The figure above represents a square garden that is divided into 9 rectangular regions with indicated dimensions in meters. The shaded regions are planted with peas, and the unshaded regions are planted with tomatoes. If the sum of the areas of the regions planted with peas is equal to the sum of the areas of the regions planted with tomatoes, what is the value of x?

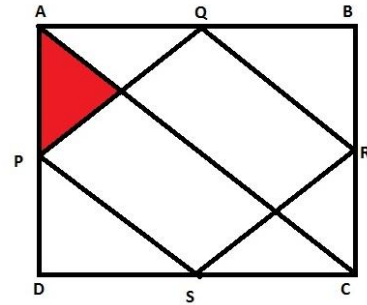
- A. 0.5
 B. 1
 C. 1.5
 D. 2
 E. 2.5

Q8:



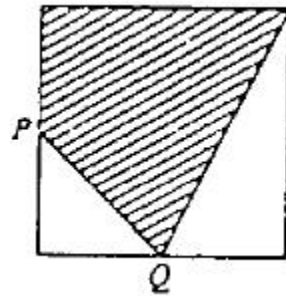
23. Square PQRS is inscribed in the square ABCD whose perimeter is four. What is the area of the shaded region:

- A: $\frac{1}{12}$
 B: $\frac{\sqrt{2}}{8}$
 C: $\frac{1}{16}$
 D: $\frac{1}{8}$
 E: $\frac{\sqrt{2}}{16}$



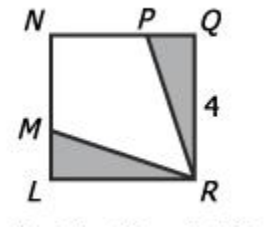
24. What fraction of the square region in the figure above is shaded?

- (1) The area of the square region is 36
 (2) P and Q are midpoints of two sides of the square as shown.



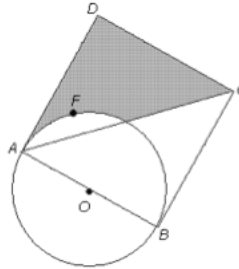
25. Points M and P lie on square LNQR, and $LM = PQ$. What is the length of the line segment PQ?

- (1) $PR = \frac{4\sqrt{10}}{3}$
 (2) The ratio of the area of the unshaded region to the total area of the shaded region is 2 to 1.



26. What is the area of the shaded region above, if ABCD is a square and line segment AB is a diameter of the circle with center O?

- (1) The radius of the circle with center O is 4.
- (2) The area of triangle ADC is 32.



27. Equilateral triangle BDF is inscribed in equilateral triangle ACE, as shown in the figure above. The shaded region is what fraction of the area of the triangle ACE?

- (1) Angle DFE is 90°
- (2) The length of AF is $10\sqrt{3}$

