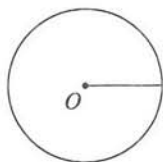


## CIRCLES



radius = 3

diameter = \_\_\_\_

circumference = \_\_\_\_

area = \_\_\_\_

radius = \_\_\_\_

diameter = \_\_\_\_

circumference =  $12\pi$

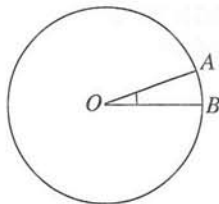
area = \_\_\_\_

radius = \_\_\_\_

diameter = 1

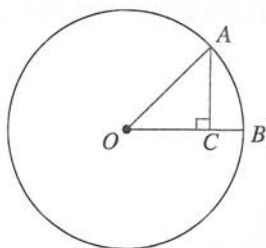
circumference = \_\_\_\_

area = \_\_\_\_



12. If the length of a minor arc formed by two radii of a circle is  $\frac{1}{20}$  of the circumference, what is the measurement of the arc in degrees?

- (A)  $30^\circ$   
 (B)  $24^\circ$   
 (C)  $18^\circ$   
 (D)  $12^\circ$   
 (E)  $6^\circ$



Note: Figure not drawn to scale.

16. In the figure above, the length of the minor arc  $AB$  is  $\frac{1}{12}$  of the circumference of the circle with center  $O$ . What is the measure of  $\angle OAC$ ?

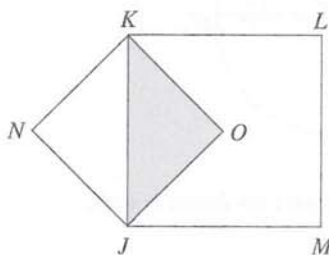
- (A)  $30^\circ$
- (B)  $40^\circ$
- (C)  $45^\circ$
- (D)  $50^\circ$
- (E)  $60^\circ$

22. If the circumference of Circle  $A$  is twice that of Circle  $B$ , then

$$\frac{\text{area of Circle } A}{\text{area of Circle } B} =$$

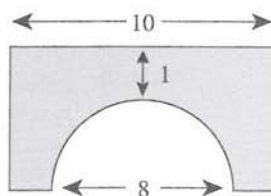
- (A)  $\frac{1}{2}$
- (B) 2
- (C) 4
- (D)  $2\pi$
- (E)  $4\pi$

## OVERLAPPING FIGURES, SHADED REGION, DRAW A LINE



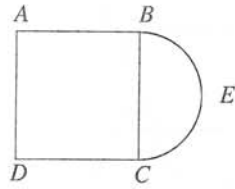
8. In the figure above, if  $JKLM$  and  $NKOJ$  are squares, the area of the shaded region is what fraction of the area of  $JKLM$ ?

- (A)  $\frac{1}{5}$   
 (B)  $\frac{1}{4}$   
 (C)  $\frac{1}{3}$   
 (D)  $\frac{1}{2}$   
 (E)  $\sqrt{2}$



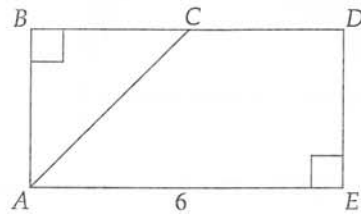
9. In the figure above, a rectangle is intersected by a semicircle. What is the perimeter of the shaded region?

- (A)  $22 + 4\pi$   
 (B)  $20 + 8\pi$   
 (C)  $40 + 4\pi$   
 (D)  $50 + 8\pi$   
 (E)  $100 + 16\pi$



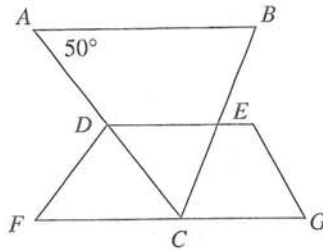
13. In the figure above, if square  $ABCD$  has a side of length 2, what is the area of semicircle  $BEC$ ?

- (A)  $4\pi$   
 (B)  $2\pi$   
 (C)  $\pi$   
 (D)  $\frac{\pi}{2}$   
 (E)  $\frac{\pi}{4}$



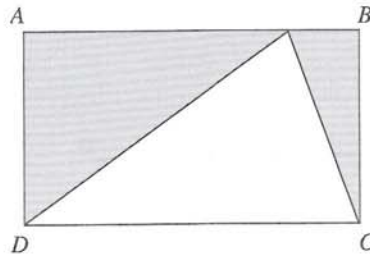
14. If the area of rectangle  $ABDE$  is 18, and  $C$  is the midpoint of  $BD$ , then the area of  $\triangle ABC$  is

- (A)  $3\sqrt{2}$   
 (B)  $4\frac{1}{2}$   
 (C) 6  
 (D) 9  
 (E) 18

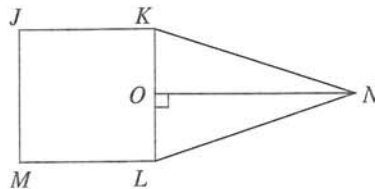


Note: Figure not drawn to scale

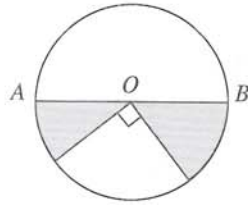
15. In the figure above, if  $AB \parallel DE \parallel FG$ , and  $DF = DC$ , what is the measure of  $\angle FDC$ ?
- (A)  $40^\circ$   
 (B)  $50^\circ$   
 (C)  $60^\circ$   
 (D)  $65^\circ$   
 (E)  $80^\circ$



16. If the area of rectangle  $ABCD$  is 24, what is the area of the shaded region?
- (A) 8  
 (B) 12  
 (C) 16  
 (D) 24  
 (E) It cannot be determined from the information given.

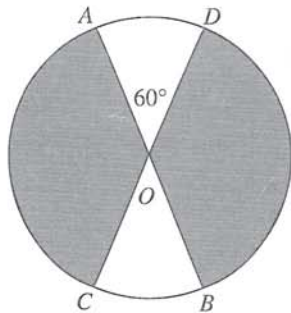


17. In the figure above,  $JKLM$  is a square and  $KLN$  is a triangle with area 12. If  $NO = 6$ , what is the area of  $JKNLM$ ?
- (A) 32 (B) 28 (C) 24 (D) 16 (E) 12



17. In the figure above, the circle with center  $O$  has radius 2. What is the area of the shaded region?

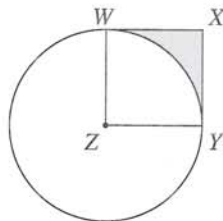
- (A)  $\frac{\pi}{8}$  (B)  $\frac{\pi}{4}$  (C)  $\frac{\pi}{2}$  (D)  $\pi$  (E)  $4\pi$



Note: Figure not drawn to scale

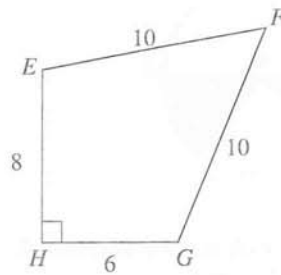
18. In the figure above, the circle with center  $O$  has a radius of 3. Which of the following gives the area of the shaded region?

- (A)  $6\pi$   
 (B)  $8\pi$   
 (C)  $9\pi$   
 (D)  $18\pi$   
 (E)  $24\pi$



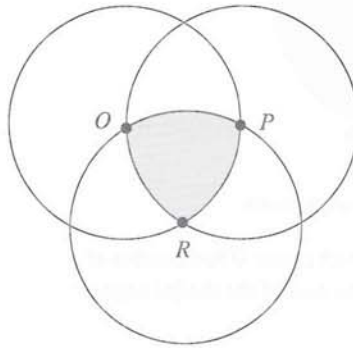
21. In the figure above, side  $XY$  of square  $WXYZ$  is equal to 2. If  $Z$  is the center of the circle, then what is the area of the shaded region?

- (A)  $4 - \pi$  (B)  $8 - 2\pi$  (C)  $16 - 4\pi$   
 (D)  $4 + 2\pi$  (E)  $8 + \pi$



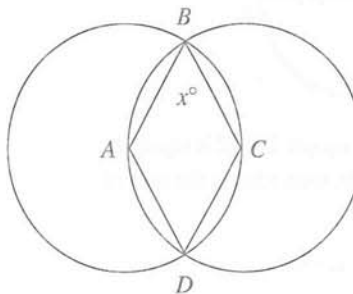
23. What is the area of quadrilateral  $EFGH$ ?

- (A)  $24 + 25\sqrt{3}$
- (B)  $24 + 50\sqrt{3}$
- (C)  $48 + 50\sqrt{3}$
- (D) 72
- (E) It cannot be determined from the information given.



24. In the figure above,  $O$ ,  $P$ , and  $R$  are the centers of three circles, each with radius 2. What is the perimeter of the shaded region?

- (A)  $\frac{2\pi}{3}$
- (B)  $\pi$
- (C)  $\frac{4\pi}{3}$
- (D)  $2\pi$
- (E)  $\frac{8\pi}{3}$



25. In the figure above, if  $A$  and  $C$  are the centers of the two circles, then  $x =$

- (A) 30
- (B) 40
- (C) 45
- (D) 60
- (E) 90

# POINTS ON A LINE

6. Points  $X$ ,  $Y$ , and  $Z$  lie on a line such that point  $Y$  is between points  $X$  and  $Z$ . If  $XZ = 10$  and  $YZ = 3$ , then  $XY =$
- (A) 3  
 (B) 4  
 (C) 7  
 (D) 13  
 (E) 30

19. Points  $D$ ,  $E$ ,  $F$ , and  $G$  lie on a line in that order.  $F$  is the midpoint of  $DG$  and  $E$  is the midpoint of  $DF$ . If  $DG = 32$ , what is the value of  $EF$ ?



19. If points  $A$  and  $B$  are placed to the left of point  $C$  on line  $l$  such that  $5BC = 2AB$ , what is  $\frac{BC}{AC}$ ?

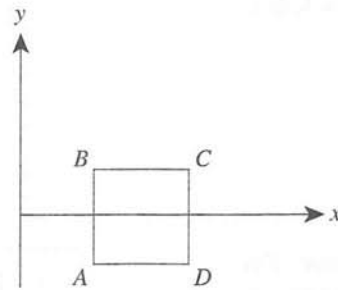
- (A)  $\frac{2}{7}$   
 (B)  $\frac{2}{5}$   
 (C)  $\frac{5}{2}$   
 (D)  $\frac{7}{2}$   
 (E) It cannot be determined from the information given.
21. Points  $S$  and  $U$  are the endpoints of a line segment. Point  $R$  is the midpoint of  $SU$  and point  $T$  lies on the same line such that  $TR = 6$  and  $TU = 14$ . What is one possible value of  $ST$ ?

|                       |                                  |                                  |                       |
|-----------------------|----------------------------------|----------------------------------|-----------------------|
|                       |                                  |                                  |                       |
| <input type="radio"/> | <input checked="" type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> |
|                       | 0                                | 0                                | 0                     |
| 1                     | 1                                | 1                                | 1                     |
| 2                     | 2                                | 2                                | 2                     |
| 3                     | 3                                | 3                                | 3                     |
| 4                     | 4                                | 4                                | 4                     |
| 5                     | 5                                | 5                                | 5                     |
| 6                     | 6                                | 6                                | 6                     |
| 7                     | 7                                | 7                                | 7                     |
| 8                     | 8                                | 8                                | 8                     |
| 9                     | 9                                | 9                                | 9                     |

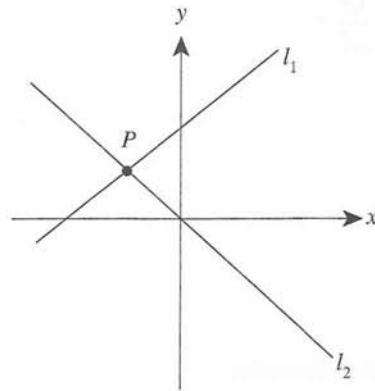
|                       |                                  |                                  |                       |
|-----------------------|----------------------------------|----------------------------------|-----------------------|
|                       |                                  |                                  |                       |
| <input type="radio"/> | <input checked="" type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> |
|                       | 0                                | 0                                | 0                     |
| 1                     | 1                                | 1                                | 1                     |
| 2                     | 2                                | 2                                | 2                     |
| 3                     | 3                                | 3                                | 3                     |
| 4                     | 4                                | 4                                | 4                     |
| 5                     | 5                                | 5                                | 5                     |
| 6                     | 6                                | 6                                | 6                     |
| 7                     | 7                                | 7                                | 7                     |
| 8                     | 8                                | 8                                | 8                     |
| 9                     | 9                                | 9                                | 9                     |



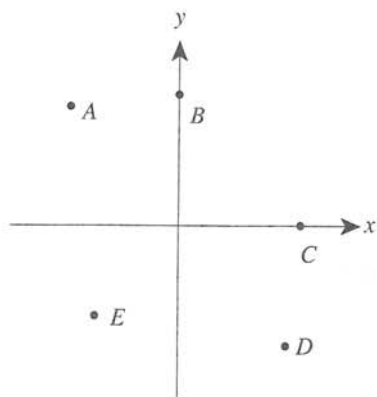
## COORDINATE GEOMETRY



3. In the figure above,  $ABCD$  is a square, with points  $B$  and  $C$  located at  $(3, 2)$  and  $(8, 2)$  respectively. Which of the following points does NOT fall within square  $ABCD$ ?
- (A)  $(5, 0)$   
 (B)  $(-1, 4)$   
 (C)  $(7, -2)$   
 (D)  $(4, 1)$   
 (E)  $(4, -1)$

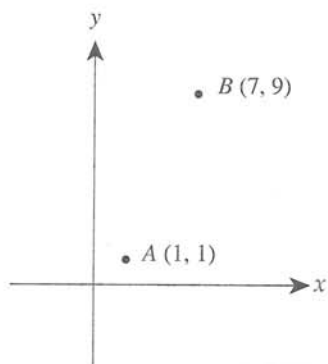


4. In the figure above, which of the following could be the coordinates of point  $P$ ?
- (A)  $\left(5, -\frac{5}{2}\right)$   
 (B)  $\left(-5, \frac{5}{8}\right)$   
 (C)  $(0, 4)$   
 (D)  $\left(\frac{2}{3}, \frac{1}{3}\right)$   
 (E)  $(2, 1)$

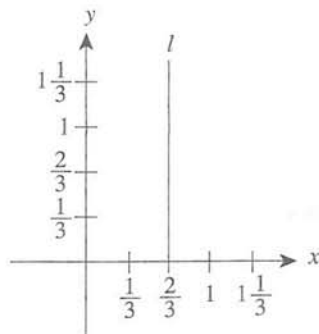


7. Which of the points in the figure above could have coordinates  $(a, b)$  such that  $a = b$ ?

(A)  $A$   
 (B)  $B$   
 (C)  $C$   
 (D)  $D$   
 (E)  $E$

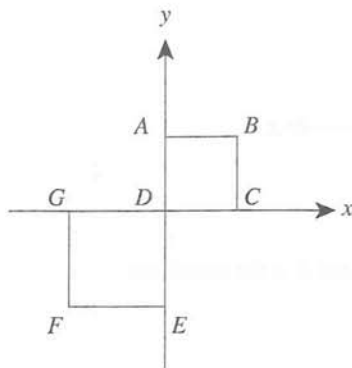


9. The distance between points  $A$  and  $B$  in the coordinate plane above is
- (A) 5  
 (B) 10  
 (C) 12  
 (D) 14  
 (E) 16
12. A circle with center  $(0,0)$  and radius 8 will pass through all of the following points EXCEPT
- (A)  $(-8, 0)$   
 (B)  $(0, -8)$   
 (C)  $(0, 8)$   
 (D)  $(8, 0)$   
 (E)  $(8, 8)$



13. In the figure above, line  $l$  is parallel to the  $y$ -axis. All of the following points lie on line  $l$  EXCEPT

- (A)  $\left(\frac{2}{3}, -10\right)$   
 (B)  $\left(1, \frac{2}{3}\right)$   
 (C)  $\left(\frac{2}{3}, \frac{1}{3}\right)$   
 (D)  $\left(\frac{2}{3}, \frac{2}{3}\right)$   
 (E)  $\left(\frac{2}{3}, 1\right)$



19. In the figure above,  $G$ ,  $D$ , and  $C$  are points on the  $x$ -axis,  $A$ ,  $D$ , and  $E$  are points on the  $y$ -axis, and squares  $ABCD$  and  $DEFG$  have areas of 16 and 25, respectively. What is the length of line segment  $BF$ ?

- (A) 9  
 (B)  $9\sqrt{2}$   
 (C)  $10\sqrt{3}$   
 (D)  $20\sqrt{2}$   
 (E) 41

## SLOPE

10. What is the slope of a line drawn from the origin to the point  $(-2, -3)$ ?

(A)  $-\frac{3}{2}$

(B)  $\frac{3}{2}$

(C)  $\frac{2}{3}$

(D)  $-\frac{2}{3}$

(E) 1

10. What is the slope of a line that contains points  $A\left(\frac{1}{2}, -5\right)$

and  $B\left(6, -\frac{1}{2}\right)$ ?

(A) -1

(B) 0

(C)  $\frac{9}{11}$

(D)  $5\frac{1}{2}$

(E) 11

15. If a line contains three points with coordinates  $(5, -3)$ ,  $(8, 3)$ , and  $(z, 7)$ , what is the value of  $z$ ?

(A) 13

(B) 10

(C) 3

(D) 1

(E) -5

18. Line  $l$  contains the point  $(2, 3)$  and has a slope of  $\frac{3}{4}$ .

Which of the following points must line  $l$  contain?

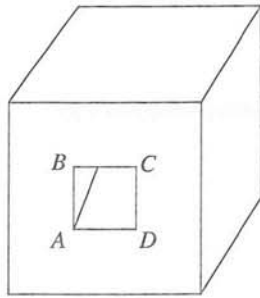
- (A)  $(0, 6)$
- (B)  $(3, 4)$
- (C)  $(10, 9)$
- (D)  $(5, 7)$
- (E)  $(0, 0)$

19. If  $l_1$  contains point  $A(0, 3)$  and has a slope of  $\frac{2}{3}$ , which of the following points does  $l_1$  NOT contain?

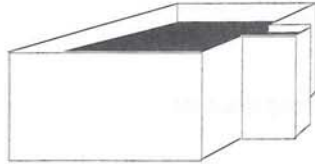
- (A)  $(3, 5)$
- (B)  $\left(\frac{3}{2}, 4\right)$
- (C)  $(0, 2)$
- (D)  $\left(-4, \frac{1}{3}\right)$
- (E)  $(-6, -1)$

## VOLUME/SURFACE AREA

4. What is the volume of a rectangular box with dimensions 2 by 3 by 4?
- (A) 54  
(B) 27  
(C) 24  
(D) 14  
(E) 9
5. If a cube with edge 6 has the same volume as a rectangular box that is  $2 \times 3 \times h$ , then  $h =$
- (A) 36  
(B) 24  
(C) 18  
(D) 6  
(E) 3
13. The volume of a cube with edge 4 is how many times the volume of a cube with edge 2?
- (A) 2  
(B) 4  
(C) 8  
(D) 16  
(E) 64
17. A man is going to build a rectangular box with dimensions of  $2x$ ,  $3x$ , and  $5x$ , where  $x$  is an integer. Which of the following statements about the volume of the box must be true?
- I. It is an even number.  
II. Its units digit is 0.  
III. It is a multiple of 6.
- (A) I only  
(B) II only  
(C) I and II only  
(D) I and III only  
(E) I, II, and III



19. The figure above represents a cube with side 4.  $ABCD$  represents the rim of a square hole with side 1 that extends through the center of the cube. What is the volume of the solid figure?
- (A) 12 (B) 16 (C) 60 (D) 63 (E) 64



23. The figure above shows a tank with a total volume of  $q$ . If the tank is currently  $r\%$  full in terms of  $q$  and  $r$ , what fraction of the tank is unfilled?

- (A)  $\frac{100-r}{q}$
- (B)  $\frac{100}{100-r}$
- (C)  $\frac{100-q}{100r}$
- (D)  $\frac{100-r}{100}$
- (E)  $\frac{q-r}{100}$