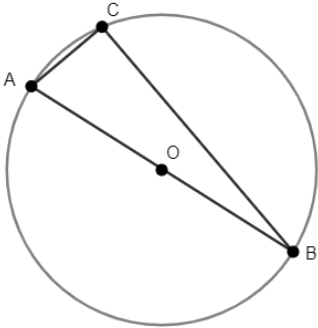


# Circles

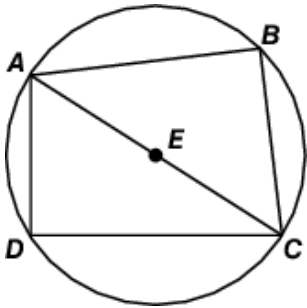
## Triangles and Quadrilaterals Inscribed in a Circle

1. Triangle  $ABC$  is inscribed in circle  $O$ . Segment  $AB$  is the diameter of the circle. If  $m\angle ABC = 17.5^\circ$ , what is the measure of  $\angle BAC$ ?



- A.  $m\angle BAC = 17.5^\circ$
- B.  $m\angle BAC = 72.5^\circ$
- C.  $m\angle BAC = 90^\circ$
- D.  $m\angle BAC = 107.5^\circ$

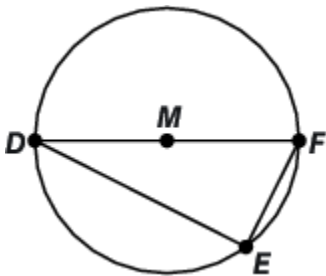
2. Points  $A, B, C,$  and  $D$  lie on circle  $E$  as shown in the figure below.



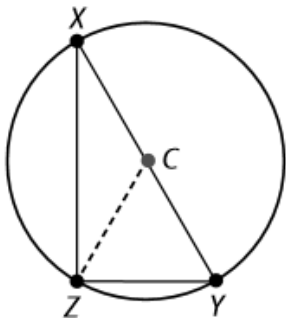
Which statement must be true about the figure?

- A.  $m\angle BCD = m\angle BAD = 90^\circ$
- B.  $m\angle ADC = m\angle ABC = 90^\circ$
- C.  $m\angle ABC = m\angle BCD = 90^\circ$
- D.  $m\angle BAD = m\angle ADC = 90^\circ$

3. In circle  $M$  shown below,  $m\angle DEF = (5x - 10)^\circ$ . What is the value of  $x$ ?



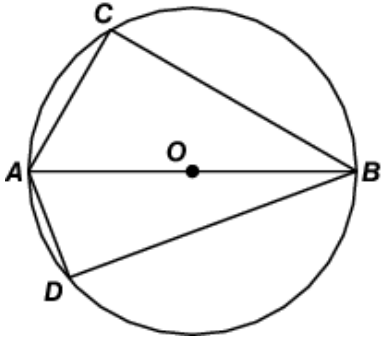

4. In the diagram,  $C$  is the center of the circle and  $\angle YXZ$  is inscribed in the circle. Which of the following statements are true? Select All that apply.



- A.  $\overline{CX} \cong \overline{CY}$
- B.  $\overline{CZ} \cong \overline{XY}$
- C.  $\triangle CXZ$  is isosceles.
- D.  $\triangle XYZ$  is acute.
- E.  $\overline{XY}$  is a diameter of circle  $C$ .

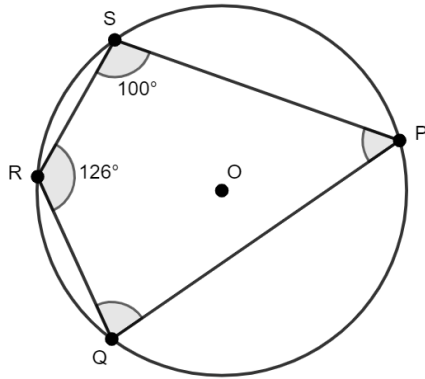
# Circles

5. In the figure below,  $\overline{AB}$  is the diameter of the circle with center  $O$ . If  $m\angle ABC = 30^\circ$  and  $m\angle CAD = 140^\circ$ , what is  $m\angle BAD$ ?



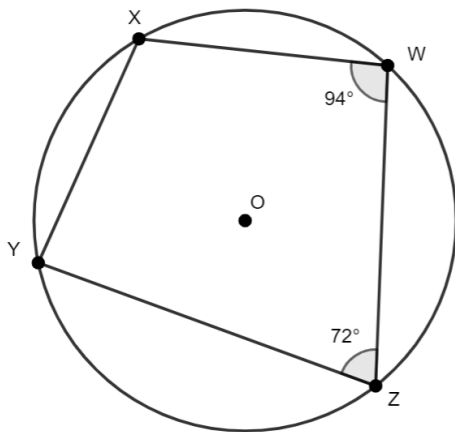
- A.  $60^\circ$
- B.  $70^\circ$
- C.  $80^\circ$
- D.  $110^\circ$

6. In the diagram below, quadrilateral  $PQRS$  is inscribed in circle  $O$ . Find  $m\angle P$  and  $m\angle Q$ .



- A.  $m\angle P = 54^\circ$  and  $m\angle Q = 80^\circ$
- B.  $m\angle P = 80^\circ$  and  $m\angle Q = 54^\circ$
- C.  $m\angle P = 100^\circ$  and  $m\angle Q = 126^\circ$
- D.  $m\angle P = 126^\circ$  and  $m\angle Q = 100^\circ$

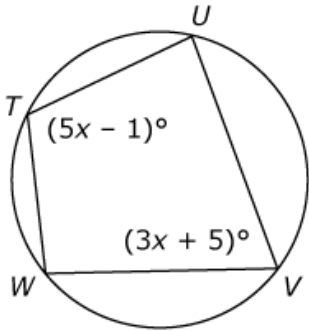
7. In the diagram below, quadrilateral  $WXYZ$  is inscribed in circle  $O$ . If  $m\angle W = 94^\circ$  and  $m\angle Z = 72^\circ$ , find  $m\angle X$  and  $m\angle Y$ .



- A.  $m\angle X = 72^\circ$  and  $m\angle Y = 94^\circ$
- B.  $m\angle X = 94^\circ$  and  $m\angle Y = 72^\circ$
- C.  $m\angle X = 86^\circ$  and  $m\angle Y = 108^\circ$
- D.  $m\angle X = 108^\circ$  and  $m\angle Y = 86^\circ$

# Circles

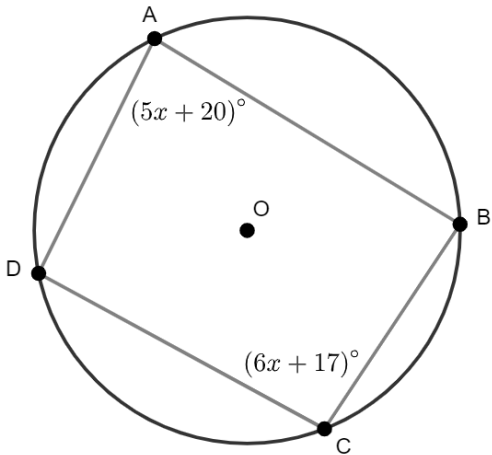
8. This diagram shows a circle and an inscribed quadrilateral, with angle measures represented by expressions.



Based on the diagram, what is  $m\angle V$ ?

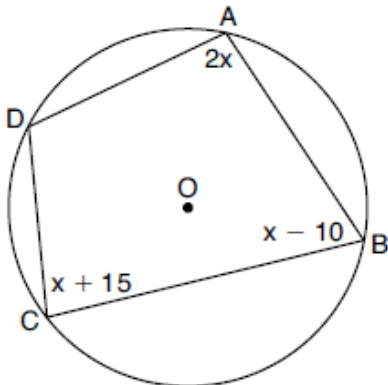
- A.  $68^\circ$
- B.  $71^\circ$
- C.  $109^\circ$
- D.  $136^\circ$

9. In the diagram below, quadrilateral  $ABCD$  is inscribed in circle  $O$ ,  $m\angle A = (5x + 20)^\circ$  and  $m\angle C = (6x + 17)^\circ$ . What are the measures of  $m\angle A$  and  $m\angle C$ ?



- A.  $m\angle A = 95^\circ$  and  $m\angle C = 85^\circ$
- B.  $m\angle A = 95^\circ$  and  $m\angle C = 95^\circ$
- C.  $m\angle A = 85^\circ$  and  $m\angle C = 85^\circ$
- D.  $m\angle A = 85^\circ$  and  $m\angle C = 95^\circ$

10. In the diagram below, quadrilateral  $ABCD$  is inscribed in circle  $O$ ,  $m\angle A = (2x)^\circ$ ,  $m\angle B = (x - 10)^\circ$ , and  $m\angle C = (x + 15)^\circ$ .

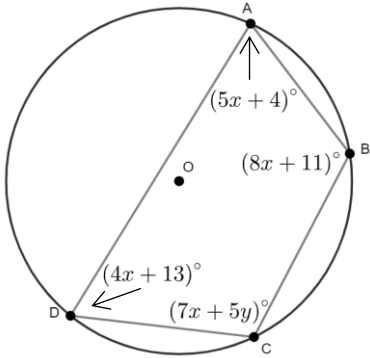


What is  $m\angle D$ ?

- A.  $55^\circ$
- B.  $70^\circ$
- C.  $110^\circ$
- D.  $135^\circ$

# Circles

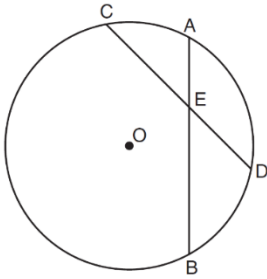
11. In the diagram below, quadrilateral  $ABCD$  is inscribed in circle  $O$ . If  $m\angle A = (5x + 4)^\circ$ ,  $m\angle B = (8x + 11)^\circ$ ,  $m\angle C = (7x + 5y)^\circ$ , and  $m\angle D = (4x + 13)^\circ$ , which of the following statements are true? Select All that apply.



- A.  $x = 13$
- B.  $y = 13$
- C.  $m\angle A = 69^\circ$
- D.  $m\angle B = 115^\circ$
- E.  $m\angle C = 111^\circ$
- F.  $m\angle D = 65^\circ$

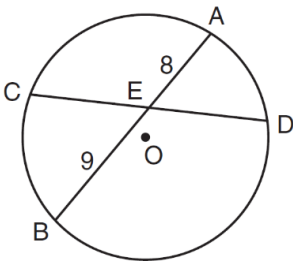
## Segment Relationships in Circles

12. In the diagram below of circle  $O$ , chords  $\overline{AB}$  and  $\overline{CD}$  intersect at  $E$ . If  $CE = 10$ ,  $ED = 6$ ,  $AE = 4$ , what is the length of  $\overline{EB}$ ?



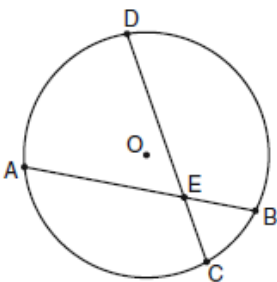
- A. 15
- B. 12
- C. 6.7
- D. 2.4

13. In the diagram below of circle  $O$ , chord  $\overline{AB}$  bisects chord  $\overline{CD}$  at  $E$ . If  $AE = 8$  and  $BE = 9$ , find the length of  $\overline{CE}$ .



- A.  $2\sqrt{6}$
- B.  $6\sqrt{2}$
- C. 36
- D. 72

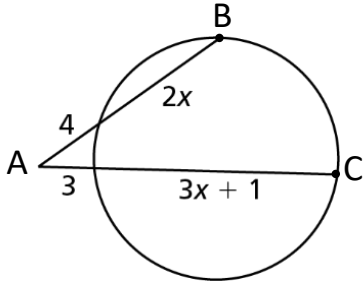
14. In the diagram below of circle  $O$ , chords  $\overline{AB}$  and  $\overline{CD}$  intersect at  $E$ ,  $DE = 2x + 8$ ,  $EC = 3$ ,  $AE = 4x - 3$ , and  $EB = 4$ . What is the value of  $x$ ?



- A. 1
- B. 3.6
- C. 5
- D. 10.25

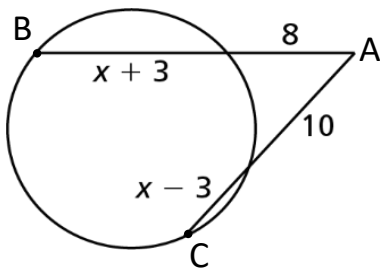
# Circles

15. Look at the figure below. If  $\overline{AB}$  and  $\overline{AC}$  are secants, what is the value of  $x$ ?



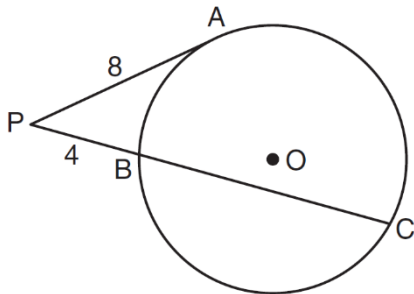
- A. -3
- B. 2
- C. 4
- D. 13

16. Look at the figure below. If  $\overline{AB}$  and  $\overline{AC}$  are secants, find  $AC$ .



- A. 9
- B. 16
- C. 18
- D. 20

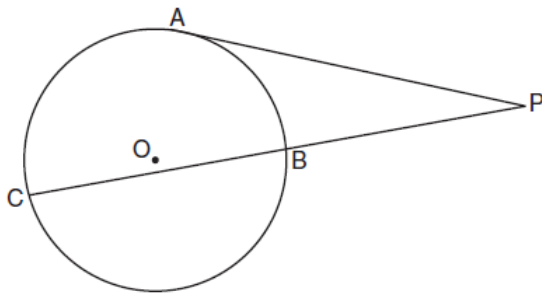
17. In the diagram below of circle  $O$ ,  $\overline{PA}$  is tangent to circle  $O$  at  $A$ , and  $\overline{PC}$  is a secant with points  $B$  and  $C$  on the circle.



If  $PA = 8$  and  $PB = 4$ , what is the length of  $\overline{BC}$ ?

- A. 20
- B. 16
- C. 15
- D. 12

18. In the diagram below, tangent  $\overline{PA}$  and secant  $\overline{PC}$  are drawn to circle  $O$  from external point  $P$ .

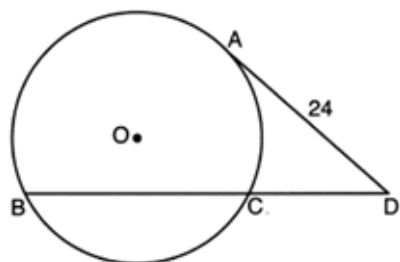


If  $PB = 4$  and  $BC = 5$ , what is the length of  $\overline{PA}$ ?

- A. 20
- B. 9
- C. 8
- D. 6

# Circles

19. Circle O is drawn below with secant  $\overline{BD}$ . The length of  $\overline{AD}$  is 24.

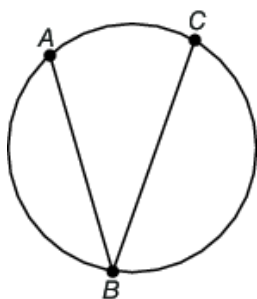


If the ratio of  $DC:CB$  is 4:5, what is the length of  $\overline{CB}$ ?

- A. 36
- B. 20
- C. 16
- D. 4

## Angle Relationships in Circles

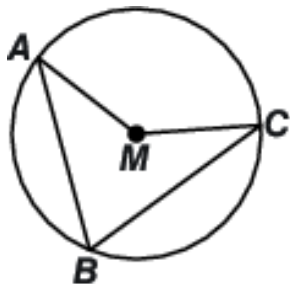
20. Use the circle shown to answer the question.



If  $m\widehat{AC} = 76^\circ$  and  $m\angle ABC = (2x - 12)^\circ$ , find the value of  $x$ .

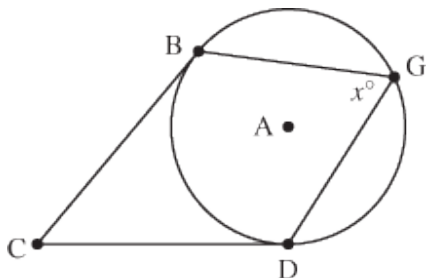
- A.  $x = 13$
- B.  $x = 25$
- C.  $x = 38$
- D.  $x = 44$

21. In circle  $M$ , below,  $m\angle AMC = (10x - 12)^\circ$  and  $m\angle ABC = (4x + 6)^\circ$ . What is the measure of  $\angle ABC$ ?



- A.  $12^\circ$
- B.  $18^\circ$
- C.  $54^\circ$
- D.  $108^\circ$

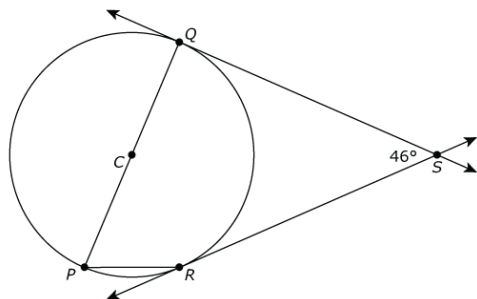
22. In Circle A, segments  $\overline{BC}$  and  $\overline{CD}$  are tangents to the circle at B and D, respectively. Angle  $BGD$  is an inscribed angle with a measurement of  $x^\circ$ . Which expression shows the relationship between  $m\angle BCD$  and  $m\angle BGD$ ?



- A.  $m\angle BCD = \frac{360-x}{2}$
- B.  $m\angle BCD = 360 - 2x$
- C.  $m\angle BCD = \frac{180-x}{2}$
- D.  $m\angle BCD = 180 - 2x$

## Circles

23. In the figure below, Circle  $C$  has tangent lines  $\overleftrightarrow{SR}$  and  $\overleftrightarrow{SQ}$  and diameter  $\overline{PQ}$ . If  $m\angle QSR = 46^\circ$ , what is the measure of  $\angle QPR$ ?



- A.  $23^\circ$
- B.  $44^\circ$
- C.  $46^\circ$
- D.  $67^\circ$

### Circles in the Coordinate Plane

24. Which equation represents the circle whose center is  $(-2, 3)$  and whose radius is 5?

- A.  $(x - 2)^2 + (y + 3)^2 = 5$
- B.  $(x + 2)^2 + (y - 3)^2 = 5$
- C.  $(x + 2)^2 + (y - 3)^2 = 25$
- D.  $(x - 2)^2 + (y - 3)^2 = 25$

25. Which equation represents the circle whose center is  $(7, -3)$  and whose radius is 4?

- A.  $(x - 7)^2 + (y + 3)^2 = 4$
- B.  $(x + 7)^2 + (y - 3)^2 = 4$
- C.  $(x + 7)^2 + (y - 3)^2 = 16$
- D.  $(x - 7)^2 + (y + 3)^2 = 16$

26. What is the equation of a circle with a center at  $(3, -1)$  and a diameter of 8?

- A.  $(x - 3)^2 + (y + 1)^2 = 16$
- B.  $(x - 3)^2 + (y + 1)^2 = 64$
- C.  $(x + 3)^2 + (y - 1)^2 = 16$
- D.  $(x - 3)^2 + (y - 1)^2 = 64$

27. What is the equation of a circle with center  $(2, 3)$  that passes through the point  $(5, 3)$ ?

- A.  $(x - 2)^2 + (y - 3)^2 = 3$
- B.  $(x - 5)^2 + (y - 3)^2 = 3$
- C.  $(x - 2)^2 + (y - 3)^2 = 9$
- D.  $(x - 5)^2 + (y - 3)^2 = 9$

## Circles

28. What is the equation of a circle with center  $(-2, 3)$  that passes through the point  $P(4, -3)$ ?

- A.  $(x + 2)^2 + (y - 3)^2 = 72$
- B.  $(x + 2)^2 + (y - 3)^2 = 36$
- C.  $(x - 2)^2 + (y + 3)^2 = 72$
- D.  $(x - 2)^2 + (y + 3)^2 = 36$

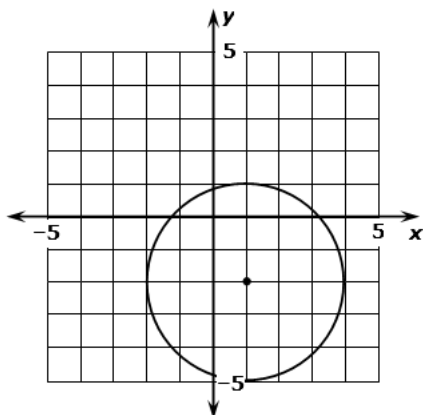
29. The points  $(1, 4)$  and  $(-3, 2)$  are the endpoints of a diameter of a circle. What is the standard equation of the circle?

- A.  $(x - 1)^2 + (y + 3)^2 = 5$
- B.  $(x - 1)^2 + (y + 3)^2 = \sqrt{5}$
- C.  $(x + 1)^2 + (y - 3)^2 = 5$
- D.  $(x + 1)^2 + (y - 3)^2 = \sqrt{5}$

30. On a coordinate plane, circle  $O$  has its center at the point  $(2, 3)$ . The point  $(-1, -1)$  is on circle  $O$ . Which of these statements are correct? Choose All that are correct.

- A. The radius of the circle can be found by doubling the distance between  $(2, 3)$  and  $(-1, -1)$ .
- B. The equation  $(x - 2)^2 + (y - 3)^2 = 5$  describes circle  $O$ .
- C. The radius of the circle can be found by finding the distance between  $(2, 3)$  and  $(-1, -1)$ .
- D. The diameter of the circle can be found by finding the distance between  $(2, 3)$  and  $(-1, -1)$ .
- E. The equation  $(x + 2)^2 + (y + 3)^2 = 5$  describes circle  $O$ .
- F. The equation  $(x - 2)^2 + (y - 3)^2 = 25$  describes circle  $O$ .

31. A circle is drawn on the coordinate plane below. What is the equation of the circle shown?

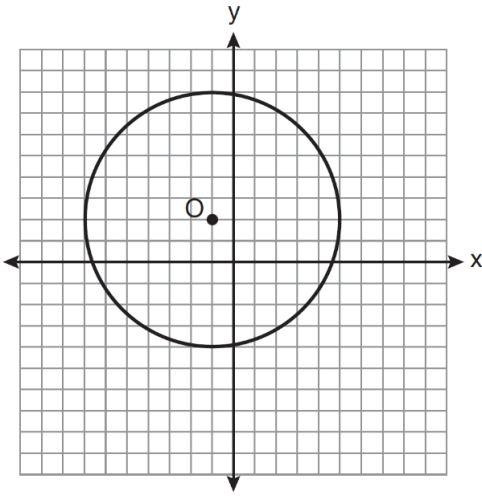


- A.  $(x - 1)^2 + (y - 2)^2 = 9$
- B.  $(x + 1)^2 + (y + 2)^2 = 9$
- C.  $(x + 1)^2 + (y - 2)^2 = 3$
- D.  $(x - 1)^2 + (y + 2)^2 = 3$



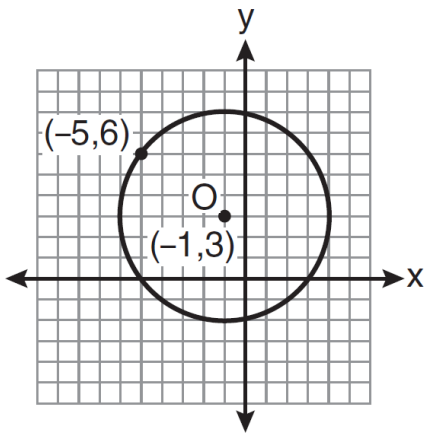
## Circles

32. Write an equation for circle  $O$  shown on the graph below.



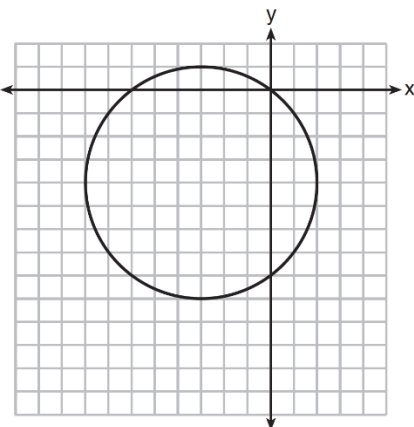
- A.  $(x - 1)^2 + (y + 2)^2 = 6$
- B.  $(x + 1)^2 + (y - 2)^2 = 6$
- C.  $(x + 1)^2 + (y - 2)^2 = 36$
- D.  $(x - 1)^2 + (y + 2)^2 = 36$

33. Write an equation for circle  $O$  shown on the graph below.



- A.  $(x + 1)^2 + (y - 3)^2 = 5$
- B.  $(x + 1)^2 + (y - 3)^2 = 25$
- C.  $(x + 5)^2 + (y - 6)^2 = 5$
- D.  $(x + 5)^2 + (y - 6)^2 = 25$

34. What is an equation of the circle shown in the graph below?

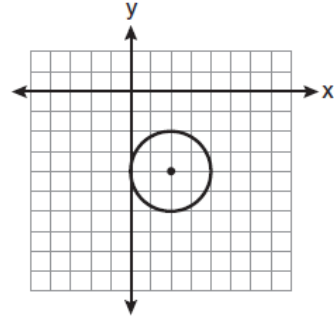
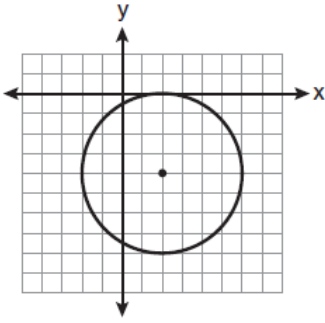


- A.  $(x - 3)^2 + (y - 4)^2 = 25$
- B.  $(x + 3)^2 + (y + 4)^2 = 25$
- C.  $(x - 3)^2 + (y - 4)^2 = 10$
- D.  $(x + 3)^2 + (y + 4)^2 = 10$

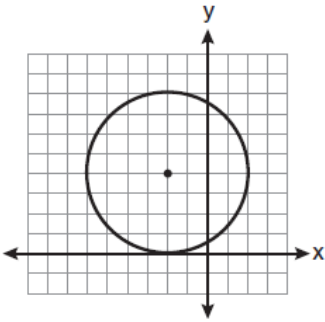
# Circles

35. Which graph represents a circle with the equation  $(x - 2)^2 + (y + 4)^2 = 4$ ?

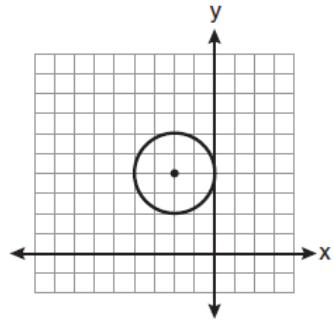
A.



B.

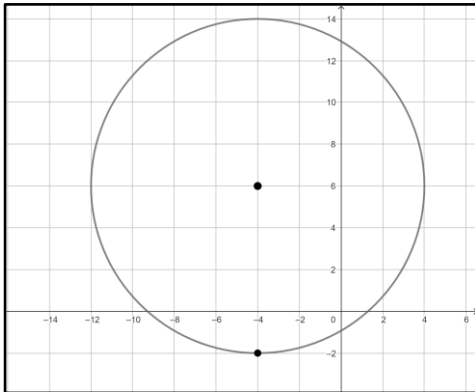


C.

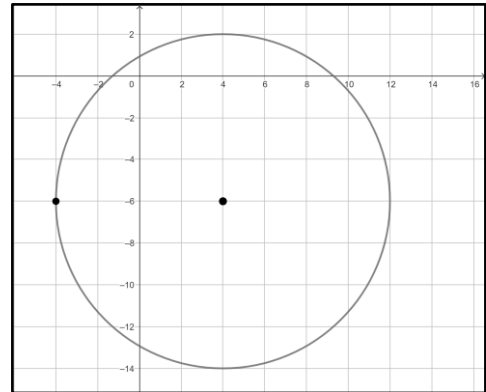


36. Which graph represents a circle with the equation  $(x + 4)^2 + (y - 6)^2 = 16$ ?

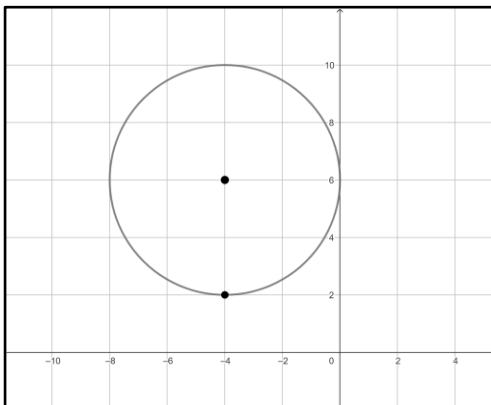
A.



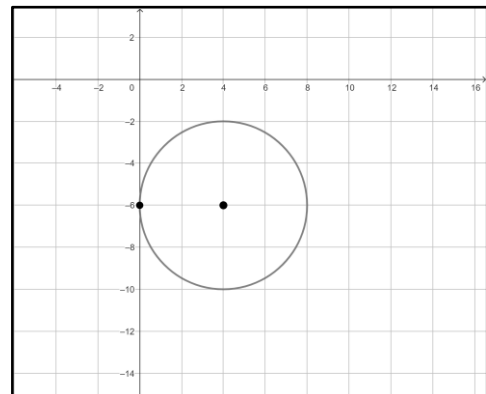
B.



C.



D.



## Circles

37. The equation of a circle is  $x^2 + (y - 7)^2 = 16$ . What are the center and radius of the circle?

- A. Center  $(0, -7)$  and radius 4
- B. Center  $(0, -7)$  and radius 16
- C. Center  $(0, 7)$  and radius 4
- D. Center  $(0, 7)$  and radius 16

38. The equation of a circle is  $(x - 5)^2 + (y + 3)^2 = 10$ . What are the center and radius of the circle?

- A. Center  $(-5, -3)$  and radius 10
- B. Center  $(5, -3)$  and radius  $\sqrt{10}$
- C. Center  $(-5, 3)$  and radius 10
- D. Center  $(5, 3)$  and radius  $\sqrt{10}$

39. What are the center and the radius of the circle whose equation is  $(x - 3)^2 + (y + 3)^2 = 36$ ?

- A. Center  $(3, -3)$  and radius 6
- B. Center  $(-3, 3)$  and radius 6
- C. Center  $(3, -3)$  and radius 36
- D. Center  $(-3, 3)$  and radius 36

40. What are the coordinates of the center and the length of the radius of the circle whose equation is shown below?

$$x^2 + y^2 + 2x - 16y + 49 = 0$$

- A. Center  $(1, -8)$  and radius 4
- B. Center  $(-1, 8)$  and radius 4
- C. Center  $(1, -8)$  and radius 16
- D. Center  $(-1, 8)$  and radius 16

41. What are the coordinates of the center and the length of the radius of the circle whose equation is shown below?

$$x^2 + y^2 - 12y - 20.25 = 0$$

- A. Center  $(0, 6)$  and radius 7.5
- B. Center  $(0, -6)$  and radius 7.5
- C. Center  $(0, 12)$  and radius 4.5
- D. Center  $(0, -12)$  and radius 4.5

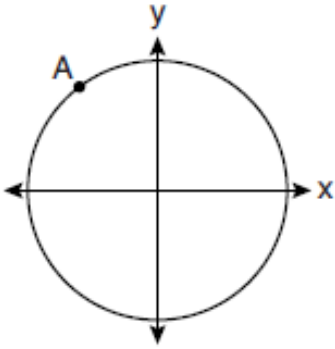
# Circles

42. The equation shown below represents a circle. Which statement describes the key features of the circle that can be determined from the equation?

$$x^2 + 10x + y^2 - 2y + 22 = 0$$

- A. The circle has a center at  $(-5, 1)$  and radius of 4 units.
- B. The circle has a center at  $(5, -1)$  and radius of 4 units.
- C. The circle has a center at  $(-5, 1)$  and radius of 2 units.
- D. The circle has a center at  $(5, -1)$  and radius of 2 units.

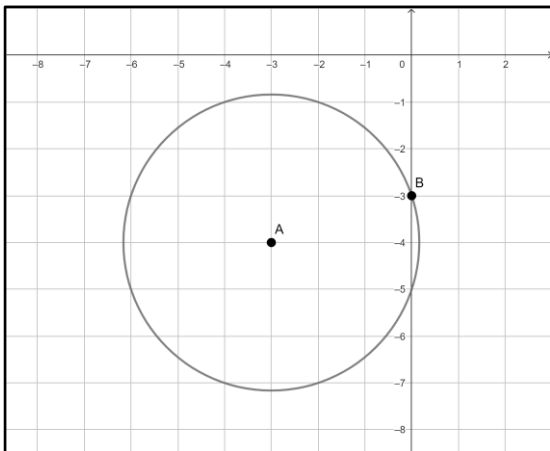
43. A circle centered at the origin passes through  $A(-3, 4)$ .



What is the equation of the line tangent to the circle at  $A$ ?

- A.  $y - 4 = \frac{4}{3}(x + 3)$
- B.  $y - 4 = \frac{3}{4}(x + 3)$
- C.  $y + 4 = \frac{4}{3}(x - 3)$
- D.  $y + 4 = \frac{3}{4}(x - 3)$

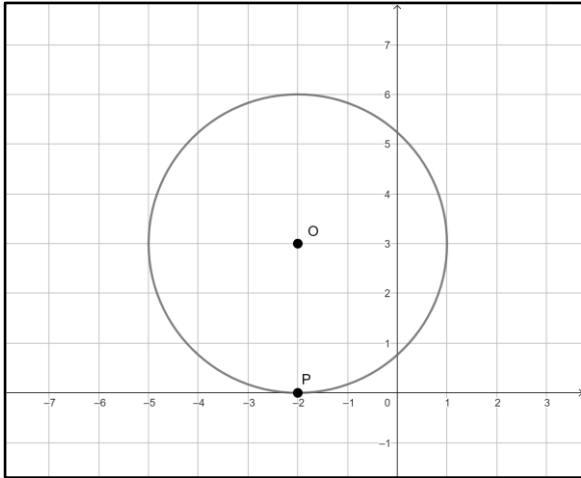
44. In the diagram below of circle  $A$ , point  $B$  is a point on the circle. What is the equation of the line tangent to the circle at point  $B$ ?



- A.  $y = -\frac{1}{3}x - 3$
- B.  $y = \frac{1}{3}x - 3$
- C.  $y = -3x - 3$
- D.  $y = 3x - 3$

# Circles

45. On a coordinate plane, circle  $O$  has its center at the point  $(-2, 3)$ . The point  $P(-2, 0)$  is on circle  $O$ . Which of these statements are correct? Choose All that are correct.



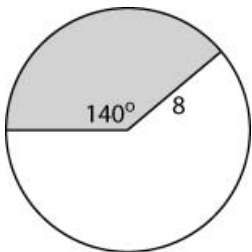
- A. The equation of the circle is  $(x + 2)^2 + (y - 3)^2 = 9$
- B. The domain of the circle is  $-5 \leq x \leq 1$
- C. The range of the circle is  $-2 \leq y \leq 6$
- D. The line  $y = 0$  is tangent to circle  $O$  at  $P$ .
- E. The point  $(0.75, 4)$  is on the circle.
- F. The area of the circle is approximately 254.47 square units.

46. The border of circular garden can be modeled by the equation  $(x + 6)^2 + (y - 4)^2 = 36$ . Select All the true statements.

- A. The center of the circle is  $(-6, 4)$ .
- B. The diameter of the circle is 18.
- C. The point  $(-6, 10)$  is on the circle.
- D. The domain of the circle is  $-12 \leq x \leq 0$ .
- E. The range of the circle is  $-2 \leq y \leq 10$ .
- F. The circumference of the circle is  $12\pi$ .

## Circumference and Area

47. The diagram shows a  $140^\circ$  sector in a circle of radius 8 units.



What is the approximate area of the shaded sector?

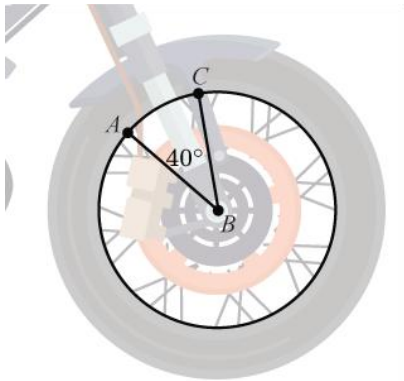
- A. 26 square units
- B. 67 square units
- C. 78 square units
- D. 156 square units

# Circles

48. A circle has a diameter of 30 centimeters. A sector has a central angle of 240 degrees. What is the area of the sector? Leave your answer in terms of  $\pi$ .

- A.  $75\pi \text{ cm}^2$
- B.  $150\pi \text{ cm}^2$
- C.  $225\pi \text{ cm}^2$
- D.  $600\pi \text{ cm}^2$

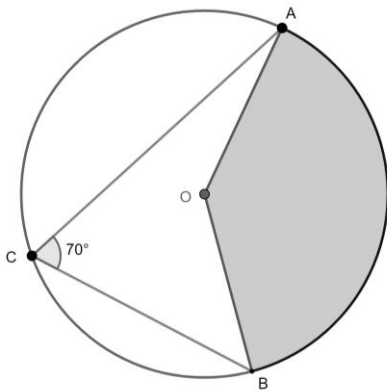
49. The wheel of a motorcycle is shown.



If the radius  $AB$  is 12 inches, and the measure of central angle  $ABC$  is  $40^\circ$ , what is the approximate area of sector  $ABC$ ? Use 3.14 for  $\pi$ .

- A.  $12.56 \text{ in}^2$
- B.  $50.24 \text{ in}^2$
- C.  $113.04 \text{ in}^2$
- D.  $452.16 \text{ in}^2$

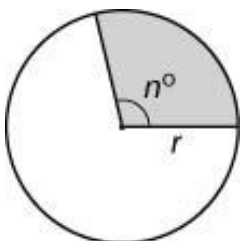
50. In the diagram below of circle  $O$ ,  $\overline{AC}$  and  $\overline{BC}$  are chords, and  $m\angle ACB = 70^\circ$ .



If  $OA = 9$ , the area of the shaded sector  $AOB$  is

- A.  $3.5\pi$
- B.  $7\pi$
- C.  $15.75\pi$
- D.  $31.5\pi$

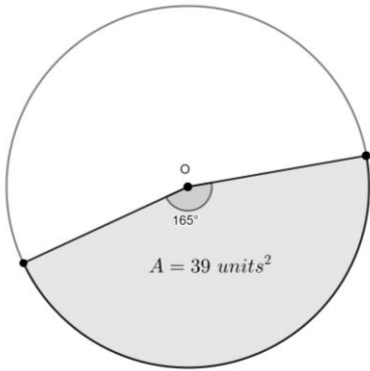
51. Which equation could be used to solve for  $A$ , the area of the shaded sector in the circle below?



- A.  $A = \frac{n}{360} \cdot \pi r^2$
- B.  $A = \frac{n}{360} \cdot 2\pi r$
- C.  $A = n + \pi r^2$
- D.  $A = n\pi r^2$

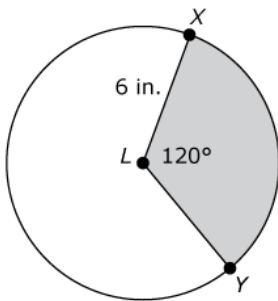
# Circles

52. The diagram shows a  $165^\circ$  sector with area of  $39 \text{ units}^2$  in circle  $O$ . What is the radius of Circle  $O$ ?



- A.  $r = 3.5$
- B.  $r = 5.2$
- C.  $r = 6.2$
- D.  $r = 12.4$

53. This diagram shows circle  $L$ , central angle  $XYL$ , and some of their measurements.

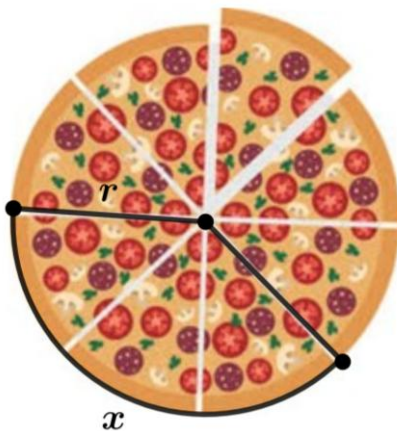


Part A: Which of the following is closest to the area, in square inches, of the shaded sector of circle  $L$ ?

- A. 9.4
- B. 18.8
- C. 28.3
- D. 37.7

Part B: What is the length, to the nearest tenth of an inch of arc  $XY$ ?

54. A circular pizza has a diameter of 14 inches and is divided into 8 equal slices as shown. An engineer is asked to create a box that hold 3 pizza slices.

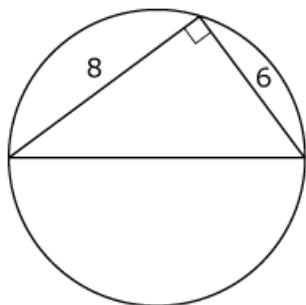


What should be the minimum measurement of the arc of the box, labeled  $x$ , to ensure it holds all of the slices? Round answer to the nearest whole number.

 inches

# Circles

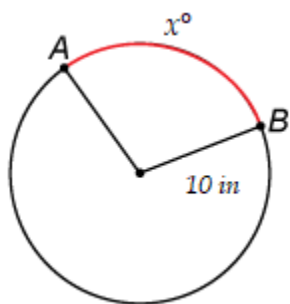
55. This diagram shows a circle with an inscribed right triangle and some of its measurements, in units.



Based on the diagram, what is the circumference, in units, of the circle?

- A.  $5\pi$
- B.  $10\pi$
- C.  $14\pi$
- D.  $25\pi$

56. Consider the circle with a radius of 10 inches and a central angle that subtends an arc of  $x^\circ$ .



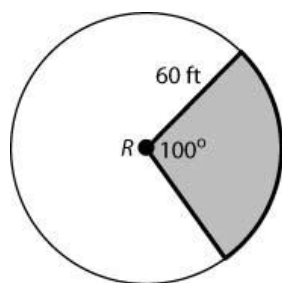
Select the proportion that can be used to find the length of arc  $AB$ .

- A.  $\frac{x^\circ}{360^\circ} = \frac{2(10)\pi}{\text{length of arc } AB}$
- B.  $\frac{360^\circ}{x^\circ} = \frac{\text{length of arc } AB}{2(10)\pi}$
- C.  $\frac{x^\circ}{2(10)\pi} = \frac{\text{length of arc } AB}{110^\circ}$
- D.  $\frac{x^\circ}{\text{length of arc } AB} = \frac{360^\circ}{2(10)\pi}$

57. A student draws a circle with a radius of 5 inches and highlights an arc on the circle that measures 18.5 inches. What is the degree measure of this central angle, to the nearest degree?

- A.  $72^\circ$
- B.  $85^\circ$
- C.  $212^\circ$
- D.  $306^\circ$

58. A gardener planted new grass in the shaded area shown in the diagram below. In the diagram, point  $R$  is the center of a circle.



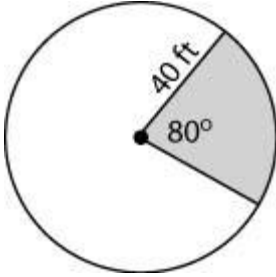
The gardener puts a rope around the entire perimeter of the shaded area. To the nearest foot, what is the length of the rope?

- A. 105 feet
- B. 172 feet
- C. 225 feet
- D. 329 feet



# Circles

59. A sector of a circular theater is being reserved for season ticket holders. This sector is represented as the shaded portion of the diagram below.



Part A: Find the length of roping needed to extend across the back of this section of the theater. Round to the nearest hundredth of a foot.

*ft.*

Part B: Each seat in the theater occupies approximately 7 square feet of the floor space. About how many seats are there in the section for season ticket holders?

*seats*

Part C: On opening night for a play, there are 221 reservations for season ticket holders. The theater manager decides to expand the sector by creating a larger central angle. What is the measure, to the nearest degree, of the new central angle?

60. A tile manufacturer wants to create a set of flat, circular tiles that are painted in various colors. A sector of the tile has a radius of 4 inches and a central angle measure of 65 degrees.

Part A: Find the area of the sector of the tile. Round your answer to the nearest square inch.

*in<sup>2</sup>*

Part B: The cost to the manufacturer to paint the tiles is \$0.07 per square inch. How much will it cost the manufacturer to paint a set of 250 tiles? Round your answer to the nearest dollar.

*dollars*