

Write the standard equation of each circle.

8. center  $(2, -8)$ ;  $r = 9$

9. center  $(0, 3)$ ;  $r = 7$

11. center  $(5, -1)$ ;  $r = 12$

12. center  $(-6, 3)$ ;  $r = 8$

14. center  $(0, 0)$ ;  $r = 4$

15. center  $(-4, 0)$ ;  $r = 3$

← See Problem 1.

10. center  $(0.2, 1.1)$ ;  $r = 0.4$

13. center  $(-9, -4)$ ;  $r = \sqrt{5}$

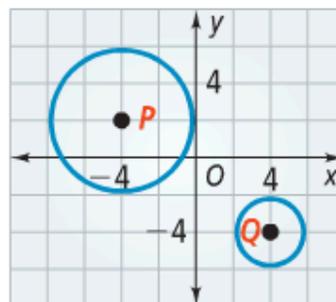
16. center  $(-1, -1)$ ;  $r = 1$

Write a standard equation for each circle in the diagram at the right.

17.  $\odot P$

18.  $\odot Q$

← See Problem 2.



Write the standard equation of the circle with the given center that passes through the given point.

19. center  $(-2, 6)$ ; point  $(-2, 10)$

20. center  $(1, 2)$ ; point  $(0, 6)$

21. center  $(7, -2)$ ; point  $(1, -6)$

22. center  $(-10, -5)$ ; point  $(-5, 5)$

23. center  $(6, 5)$ ; point  $(0, 0)$

24. center  $(-1, -4)$ ; point  $(-4, 0)$

Find the center and radius of each circle. Then graph the circle.

25.  $(x + 7)^2 + (y - 5)^2 = 16$

26.  $(x - 3)^2 + (y + 8)^2 = 100$

27.  $(x + 4)^2 + (y - 1)^2 = 25$

28.  $x^2 + y^2 = 36$

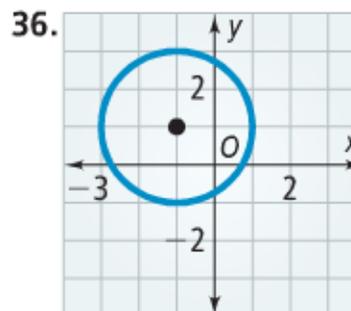
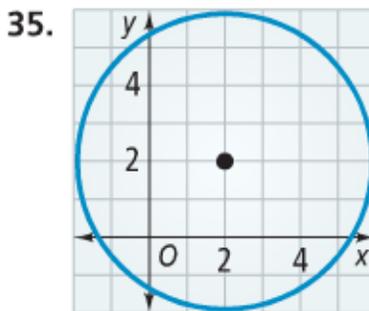
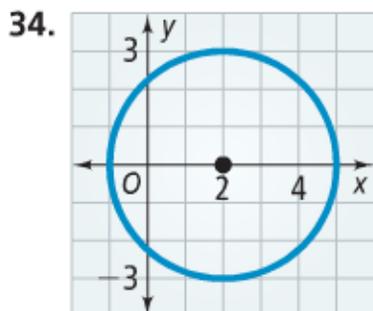
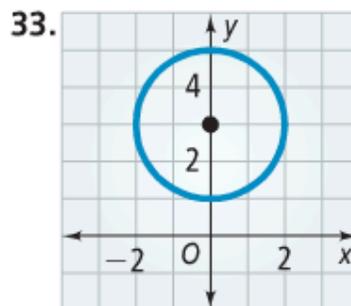
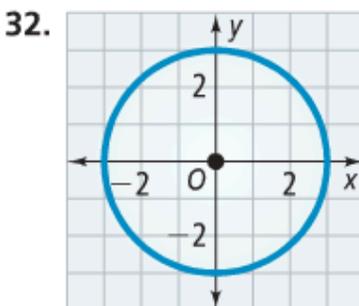
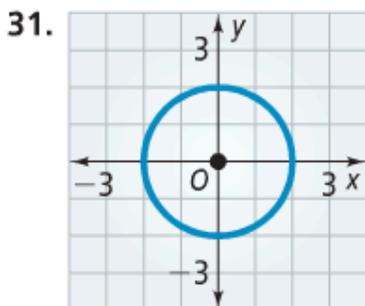
← See Problem 3.

**Public Safety** Each equation models the position and range of a tornado alert siren. Describe the position and range of each.

29.  $(x - 5)^2 + (y - 7)^2 = 81$

30.  $(x + 4)^2 + (y - 9)^2 = 144$

Write the standard equation of each circle.



Write an equation of a circle with diameter  $\overline{AB}$ .

37.  $A(0, 0), B(8, 6)$

38.  $A(3, 0), B(7, 6)$

39.  $A(1, 1), B(5, 5)$

40. **Reasoning** Describe the graph of  $x^2 + y^2 = r^2$  when  $r = 0$ .

Determine whether each equation is the equation of a circle. Justify your answer.

41.  $(x - 1)^2 + (y + 2)^2 = 9$

42.  $x + y = 9$

43.  $x + (y - 3)^2 = 9$

44. **Think About a Plan** Find the circumference and area of the circle whose equation is  $(x - 9)^2 + (y - 3)^2 = 64$ . Leave your answers in terms of  $\pi$ .

- What essential information do you need?
- What formulas will you use?

45. Write an equation of a circle with area  $36\pi$  and center  $(4, 7)$ .

46. What are the  $x$ - and  $y$ -intercepts of the line tangent to the circle  $(x - 2)^2 + (y - 2)^2 = 5^2$  at the point  $(5, 6)$ ?

47. For  $(x - h)^2 + (y - k)^2 = r^2$ , show that  $y = \sqrt{r^2 - (x - h)^2} + k$  or  $y = -\sqrt{r^2 - (x - h)^2} + k$ .

Sketch the graphs of each equation. Find all points of intersection of each pair of graphs.

48.  $x^2 + y^2 = 13$

$y = -x + 5$

49.  $x^2 + y^2 = 17$

$y = -\frac{1}{4}x$

50.  $x^2 + y^2 = 8$

$y = 2$

51.  $x^2 + y^2 = 20$

$y = -\frac{1}{2}x + 5$

52.  $(x + 1)^2 + (y - 1)^2 = 18$

$y = x + 8$

53.  $(x - 2)^2 + (y - 2)^2 = 10$

$y = -\frac{1}{3}x + 6$

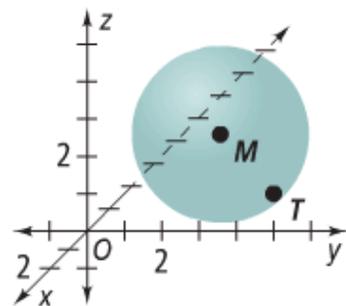
**Graphing Calculator** Use a graphing calculator to convince yourself that the given line is not tangent to the circle  $x^2 + y^2 = 25$ . Explain what you did.

54.  $y = -5x + 26$

55.  $3x + 5y = 29$

56. **Writing** Why it is not possible to conclude that a line and a circle are tangent by viewing their graphs?

57. **Geometry in 3 Dimensions** The equation of a sphere is similar to the equation of a circle. The equation of a sphere with center  $(h, j, k)$  and radius  $r$  is  $(x - h)^2 + (y - j)^2 + (z - k)^2 = r^2$ .  $M(-1, 3, 2)$  is the center of a sphere passing through  $T(0, 5, 1)$ . What is the radius of the sphere? What is the equation of the sphere?



58. The concentric circles  $(x - 3)^2 + (y - 5)^2 = 64$  and  $(x - 3)^2 + (y - 5)^2 = 25$  form a ring. The lines  $y = \frac{2}{3}x + 3$  and  $y = 5$  intersect the ring, making four sections. Find the area of each section. Round your answers to the nearest tenth of a square unit.

59. **Nautical Distance** A close estimate of the radius of Earth's equator is 3960 mi.
- Write the equation of the equator with the center of Earth as the origin.
  - Find the length of a  $1^\circ$  arc on the equator to the nearest tenth of a mile.
  - History** Columbus planned his trip to the East by going west. He thought each  $1^\circ$  arc was 45 mi long. He estimated that the trip would take 21 days. Use your answer to part (b) to find a better estimate.

## Standardized Test Prep

60. What is an equation of a circle with radius 16 and center  $(2, -5)$ ?

(A)  $(x - 2)^2 + (y + 5)^2 = 16$

(C)  $(x + 2)^2 + (y - 5)^2 = 256$

(B)  $(x + 2)^2 + (y - 5)^2 = 4$

(D)  $(x - 2)^2 + (y + 5)^2 = 256$

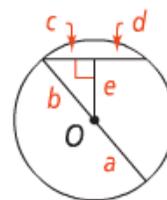
61. What can you NOT conclude from the diagram at the right?

(F)  $c = d$

(H)  $a = b$

(G)  $c^2 + e^2 = b^2$

(I)  $e = d$



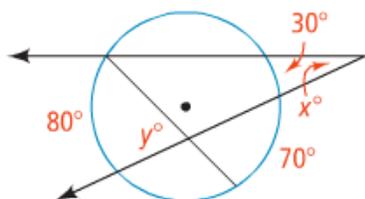
62. Are the following statements equivalent?

- In a circle, if two central angles are congruent, then they have congruent arcs.
- In a circle, if two arcs are congruent, then they have congruent central angles.

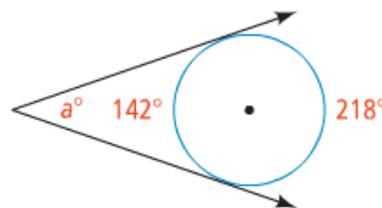
## Mixed Review

Find the value of each variable.

63.



64.



◀ See Lesson 12-4.

For the given vectors  $\vec{a}$  and  $\vec{c}$ , write the sum  $\vec{a} + \vec{c}$  as an ordered pair.

◀ See Lesson 8-5.

65.  $\vec{a} = \langle -2, 5 \rangle$  and  $\vec{c} = \langle 8, 7 \rangle$

66.  $\vec{a} = \langle -3, -4 \rangle$  and  $\vec{c} = \langle -2, 6 \rangle$

67.  $\vec{a} = \langle 3, 1 \rangle$  and  $\vec{c} = \langle 1, 3 \rangle$

68.  $\vec{a} = \langle 9, -6 \rangle$  and  $\vec{c} = \langle 2, -1 \rangle$