



UNDERSTAND

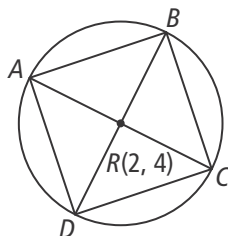
- 13. Construct Arguments** Write a proof of Theorem 9-1.
- 14. Mathematical Connections** What are the point(s) of intersection of $x^2 + y^2 = 25$ and $y = 2x - 5$? Graph both equations to check your answer.
- 15. Error Analysis** LaTanya was asked to determine if $(3\sqrt{5}, 4)$ lies on the circle with radius 7 centered at $(0, -2)$. What is her error?

$$\begin{aligned}x^2 + (y - 2)^2 &= 49? \\(3\sqrt{5})^2 + (4 - 2)^2 &= 49 \\45 + 4 &= 49\end{aligned}$$

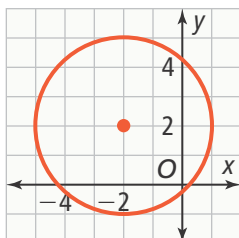
The point $(3\sqrt{5}, 4)$ lies on the circle with radius 7 and center $(0, -2)$.



- 16. Communicate Precisely** Describe the graph of $(x - a)^2 + (y - b)^2 = 0$.
- 17. Reason** If the area of square $ABCD$ is 50, what is the equation for $\odot R$?



- 18. Construct Arguments** The points (a, b) and (c, d) are the endpoints of a diameter of a circle. What are the center and radius of the circle?
- 19. Higher Order Thinking** Isabel says the graph shows the circle with center $(-2, 2)$ and radius 3. Nicky says the graph shows all possible centers for a circle that passes through $(-2, 2)$ with radius 3. Which student is correct? Explain.

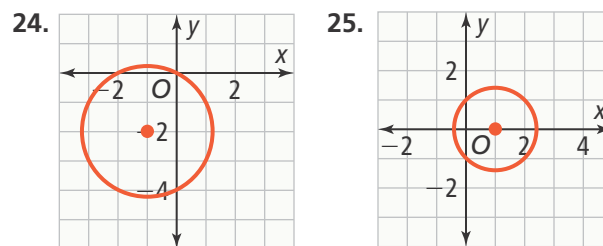


PRACTICE

For Exercises 20–23, find the center and radius for each equation of a circle. SEE EXAMPLE 1

20. $(x - 4)^2 + (y + 3)^2 = 64$
21. $(x + 2)^2 + y^2 = 13$
22. $(x + 5)^2 + (y + 11)^2 = 32$
23. $(x - 8)^2 + (y - 12)^2 = 96$

For Exercises 24 and 25, write the equation for the circle shown in each graph. SEE EXAMPLE 2



For Exercises 26–29, write the equation for each circle with the given radius and center. SEE EXAMPLE 2

26. radius: 4, center: $(5, 1)$
27. radius: 9, center: $(-3, 8)$
28. radius: $5\sqrt{5}$, center: $(2, -4)$
29. radius: $\sqrt{13}$, center: $(-5, -9)$

For Exercises 30–32, determine whether each given point lies on the circle with the given radius and center. SEE EXAMPLE 3

30. $(2, 4)$; radius: 4, center: $(-1, 1)$
31. $(\sqrt{17}, 8)$; radius: 9, center: $(0, 0)$
32. $(2, 0)$; radius: $\sqrt{10}$, center: $(3, -9)$

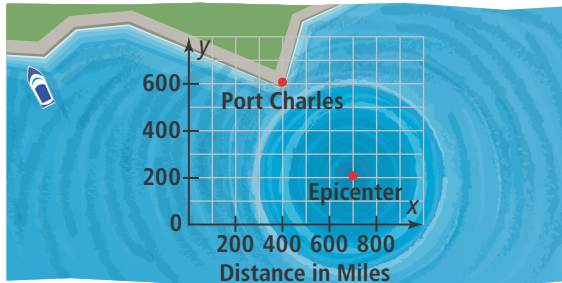
For Exercises 33–35, graph each equation.

SEE EXAMPLES 4 AND 5

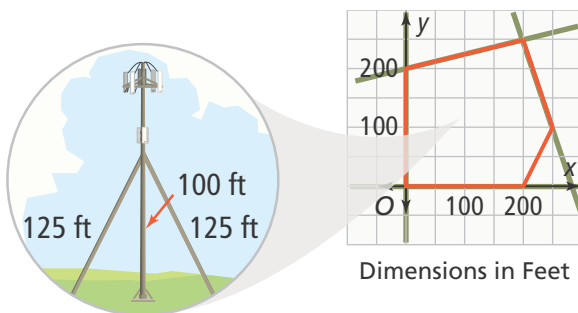
33. $(x - 5)^2 + (y + 1)^2 = 4$
34. $x^2 + (y - 1)^2 = 16$
35. $(x + 3)^2 + (y + 4)^2 = 9$
36. The point $(2, b)$ lies on the circle with radius 5 and center $(-1, -1)$. What are the possible values of b ?
37. Is $(7, 2)$ inside, outside, or on the circle $(x - 4)^2 + y^2 = 25$? Explain.

APPLY

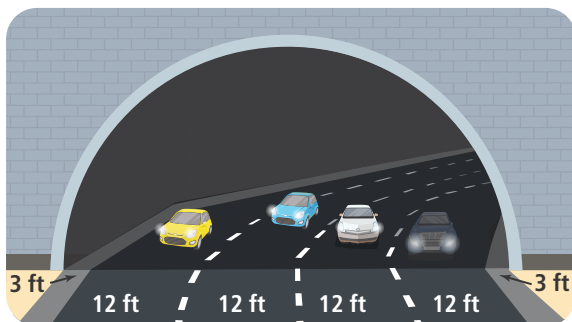
38. **Model With Mathematics** After an earthquake, a circle-shaped tsunami travels outward from the epicenter at an average speed of 420 miles per hour. If the earthquake with the epicenter shown occurred at 5:48 A.M., at what time will the tsunami reach Port Charles? Justify your answer.



39. **Make Sense and Persevere** A cell phone tower is attached to the ground as shown. A circular security fence must be placed around the tower 10 feet from where the guy wires are attached to the ground. Can a cell phone tower be placed in the location shown? If so, what are possible coordinates of the tower?

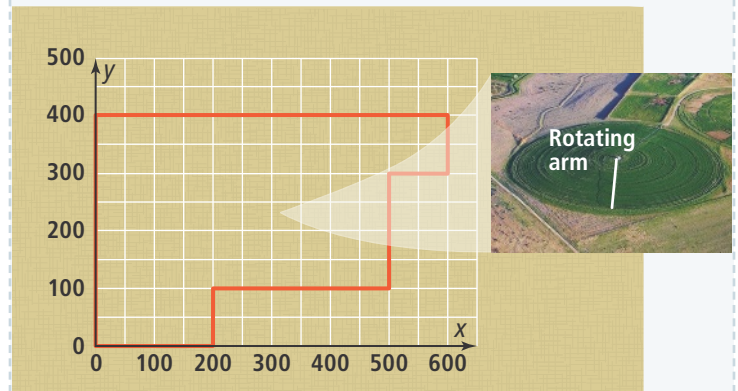


40. **Reason** Semitrailer trucks can be up to 14 feet tall. Should they be allowed in the outer lanes of the semicircular tunnel? Explain.



ASSESSMENT PRACTICE

41. A circle has center $(0, 0)$ and passes through the point $(-5, 2)$. Which other points lie on the circle? Select all that apply.
- Ⓐ $(0, 6)$ Ⓓ $(-5, -2)$
 Ⓑ $(\sqrt{11}, 3\sqrt{2})$ Ⓔ $(4, -\sqrt{13})$
 Ⓒ $(2, 5)$ Ⓕ $(-\sqrt{29}, 0)$
42. **SAT/ACT** Which equation represents the circle with center $(-3, 7)$ and radius 9?
- Ⓐ $(x + 3)^2 + (y - 7)^2 = 3^2$
 Ⓑ $(x - 3)^2 + (y + 7)^2 = 9^2$
 Ⓒ $(x - 7)^2 + (y + 3)^2 = 9^2$
 Ⓓ $(x + 3)^2 + (y - 7)^2 = 9^2$
 Ⓔ $(x + 7)^2 + (y - 3)^2 = 3^2$
43. **Performance Task** A farmer can use up to four rotating sprinklers for the field shown. He has ten 50-meter sections that can be combined to form rotating arms with lengths from 50 m to 500 m. The irrigation circles cannot overlap and must not extend beyond the edges of the field. The distance between grid lines is 50 m.



Part A Design an irrigation system for the field that irrigates as much of the field as possible. Draw a sketch of your system. For each sprinkler, give the coordinates of the center of the sprinkler, the radius, and the equation.

Part B What is the total area of the field? What is the total area irrigated by your system? What percent of the field does your system irrigate?