

LESSON
17-1

Equation of a Circle

Practice and Problem Solving: A/B

The equation of a circle with center (h, k) and radius r is $(x - h)^2 + (y - k)^2 = r^2$.

Write the equation of each circle.

1. Circle X centered at the origin with radius 10

$(h, k) = (0, 0)$ $r = 10$

$$\begin{aligned} (x-h)^2 + (y-k)^2 &= r^2 \\ (x-0)^2 + (y-0)^2 &= 10^2 \\ x^2 + y^2 &= 100 \end{aligned}$$

2. Circle R with center $R(-1, 8)$ and radius 5

$(h, k) = (-1, 8)$ $r = 5$

$$\begin{aligned} (x-h)^2 + (y-k)^2 &= r^2 \\ (x-(-1))^2 + (y-8)^2 &= (5)^2 \\ (x+1)^2 + (y-8)^2 &= 25 \end{aligned}$$

3. Circle P with center $P(-5, -5)$ and radius $2\sqrt{5}$

$(h, k) = (-5, -5)$ $r = 2\sqrt{5}$

$$\begin{aligned} (x-h)^2 + (y-k)^2 &= r^2 \\ (x-(-5))^2 + (y-(-5))^2 &= (2\sqrt{5})^2 \\ (x+5)^2 + (y+5)^2 &= 20 \end{aligned}$$

4. Circle O centered at the origin that passes through $(9, -2)$

$(h, k) = (0, 0)$ $r = \sqrt{85}$

$$\begin{aligned} (x-h)^2 + (y-k)^2 &= r^2 \\ (x-0)^2 + (y-0)^2 &= (\sqrt{85})^2 \\ x^2 + y^2 &= 85 \end{aligned}$$

5. Circle B with center $B(0, -2)$ that passes through $(-6, 0)$

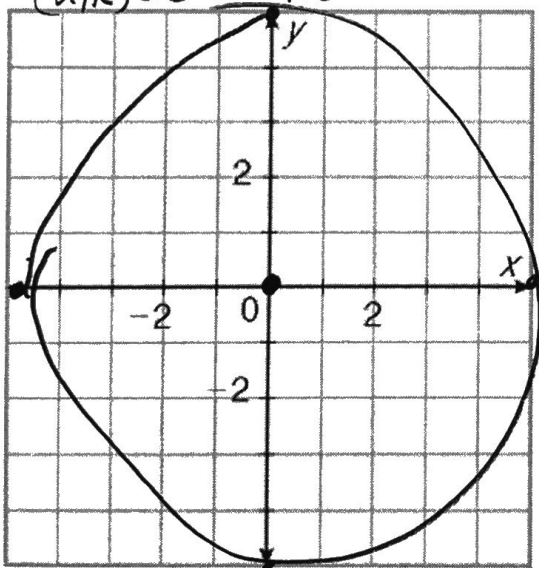
$(h, k) = (0, -2)$ $r = \sqrt{40}$

$$\begin{aligned} (x-h)^2 + (y-k)^2 &= r^2 \\ (x-0)^2 + (y-(-2))^2 &= (\sqrt{40})^2 \\ x^2 + (y+2)^2 &= 40 \end{aligned}$$

Graph each equation.

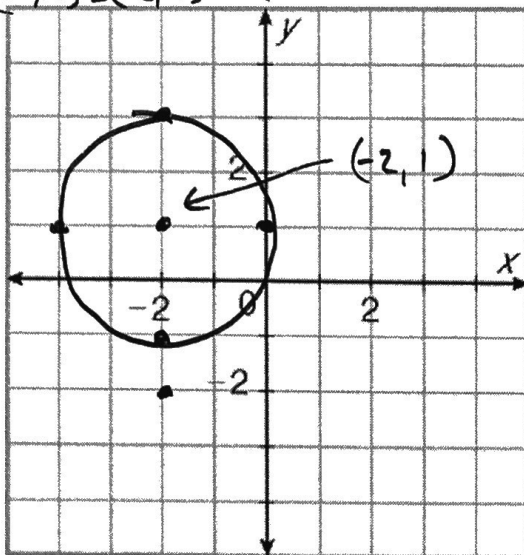
6. $x^2 + y^2 = 25$

$(h, k) = (0, 0)$ $r = 5$



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

$(h, k) = (-2, 1)$ $r = 2$



$d = \sqrt{85}$

$d = \sqrt{40}$

$(x-h)^2 + (y-k)^2 = r^2$

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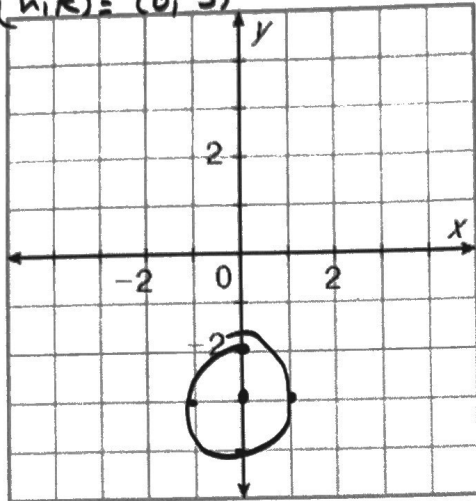
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8. $x^2 + (y+3)^2 = 1$

$(h, k) = (0, -3)$

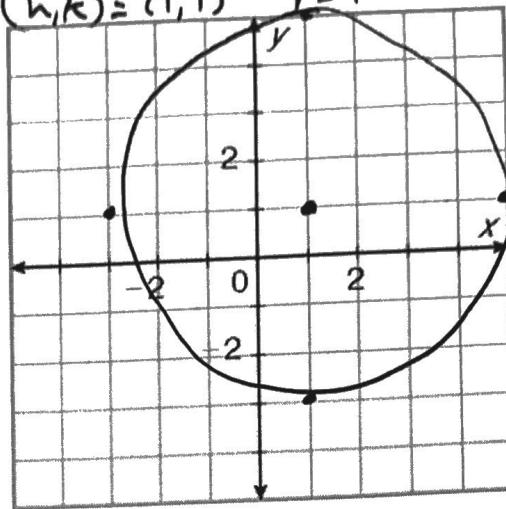
$r = 1$



9. $(x-1)^2 + (y-1)^2 = 16$

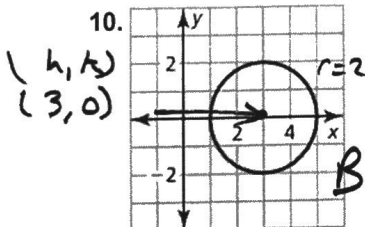
$(h, k) = (1, 1)$

$r = 4$



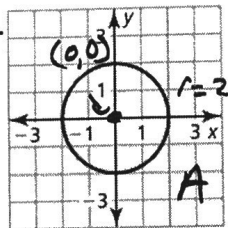
In Exercises 10 - 12, match each graph with its equation.

10.



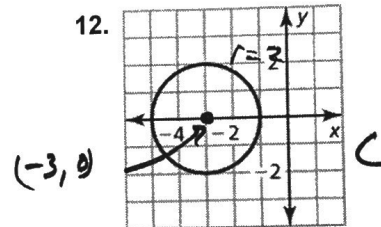
A. $x^2 + y^2 = 4$

11.



B. $(x-3)^2 + y^2 = 4$

12.



C. $(x+3)^2 + y^2 = 4$

13. After an earthquake, you are given seismograph readings from three locations where the coordinates are miles.

The epicenter is 5 miles away from $A(2, 1)$.

The epicenter is 6 miles away from $B(-2, -2)$.

The epicenter is 4 miles away from $(-6, 4)$.

- Graph three circles in one coordinate plane to represent the possible epicenter locations determined by each of the seismograph readings.
- What are the coordinates of the epicenter?
- People could feel the earthquake up to 9 miles from the epicenter. Could a person at $(4, -5)$ feel it? Explain.

Write the equation of each circle.

14. center at (9, 0), radius 5

$$(x-9)^2 + y^2 = 25$$

15. center at (3, 1), diameter 14

$$(x-3)^2 + (y-1)^2 = 49$$

16. center at origin, passes through (2, 2)

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

17. center at (-5, 3), passes through (1, -4)

$$(x+5)^2 + (y-3)^2 = 85$$

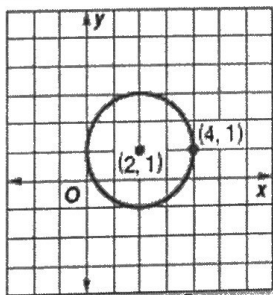
18. center at (6, 1), radius 7

$$(x-6)^2 + (y-1)^2 = 49$$

19. center at (-2, 0), diameter 16

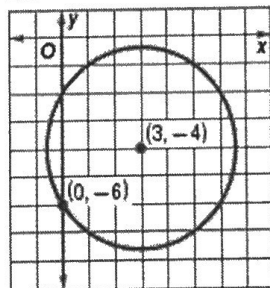
$$(x+2)^2 + y^2 = 64$$

20.



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

21.



$$(x-3)^2 + (y+4)^2 = 13$$

22. Describe and correct the error in writing the equation of a circle.

Be careful when SUBSTITUTING
VALUES.

$$(x-h)^2 + (y+k)^2 = r^2$$

$$(x-(-3))^2 + (y-(-5))^2 = (3)^2$$

$$(x+3)^2 + (y+5)^2 = 9$$

An equation of a circle with
center (-3, -5) and radius 3
is $(x-3)^2 + (y-5)^2 = 9$.



23. Different-sized engines will launch model rockets to different altitudes. The higher a rocket goes, the larger the circle of possible landing sites becomes. Under normal wind conditions, the landing radius is three times the altitude of the rocket.

- a. Write the equation of the landing circle for a rocket that travels 300 feet in the air.

$$3 \cdot 300 = 900$$

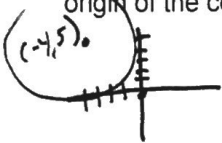
$$x^2 + y^2 = 810,000$$

- b. What would be the radius of the landing circle for a rocket that travels 1000 feet in the air? Assume the center of the circle is at the origin.

$$r = 3,000 \text{ ft}$$

24. Pizza and Subs offers free delivery within 6 miles of the restaurant. The restaurant is located 4 miles west and 5 miles north of Mary's house.

- a. Write and graph an equation to represent this situation if Mary's house is at the origin of the coordinate system.



$$(x + 4)^2 + (y - 5)^2 = 36$$

- b. Can Mary get free delivery if she orders pizza from Pizza and Subs? Explain.

EVERYONE IN CIRCLE GETS FREE DELIVERY. BUT MARY IS JUST OUTSIDE $\sqrt{6}$ CIRCLE SO NO.