

# Circle Code

Read, write, graph, and interpret circle equations.

**HIGH SCHOOL • MA.912.GR.7.3**

**MA.912.GR.7.3** "Graph and solve mathematical and real-world problems that are modeled with an equation of a circle. Determine and interpret key features in terms of the context."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## CIRCLE EQUATION FEATURES

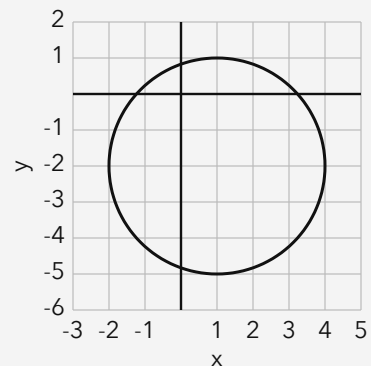
A circle with center  $(h, k)$  and radius  $r$  has equation  $(x - h)^2 + (y - k)^2 = r^2$ . Read the center from the horizontal and vertical shifts, then use the radius to graph points above, below, left, and right of the center. In a context, the center names the location and the radius names the greatest distance from that location.

## WORKED EXAMPLE

Use the graph to write the equation of the circle.

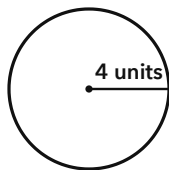
1. The center is  $(1, -2)$ .
2. The radius is 3 units.
3. Substitute  $h = 1$ ,  $k = -2$ , and  $r = 3$  into the circle equation.

**Answer:**  $(x - 1)^2 + (y + 2)^2 = 9$



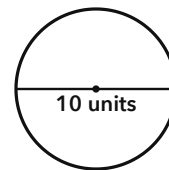
## PRACTICE 6 problems

- 1** The circle shown is centered at the origin. Write its equation.



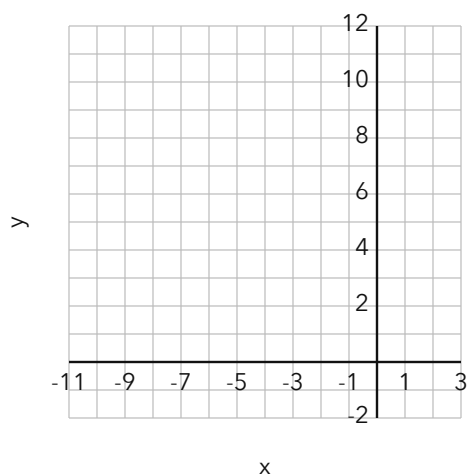
ANSWER \_\_\_\_\_

- 2** The circle shown is centered at the origin. Write its equation.



ANSWER \_\_\_\_\_

- 3** Graph  $(x + 4)^2 + (y - 5)^2 = 36$  on the grid. State the center and radius.



**ANSWER** \_\_\_\_\_  
\_\_\_\_\_

- 5** Does the point  $(11, -4)$  lie on the circle  $(x - 6)^2 + (y + 4)^2 = 25$ ? Show the substitution.

**ANSWER** \_\_\_\_\_  
\_\_\_\_\_

- 4** Write  $x^2 - 10x + y^2 + 8y + 16 = 0$  in standard circle form. Then state the center and radius.

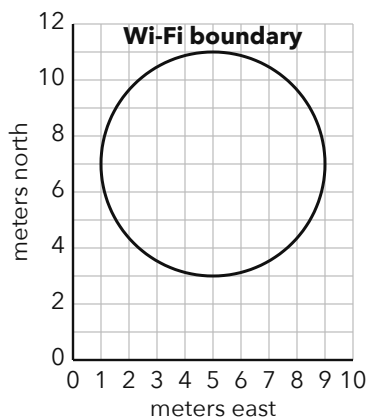
**ANSWER** \_\_\_\_\_  
\_\_\_\_\_

- 6** A circle has center  $(-4, 5)$  and passes through  $(4, 5)$ . Write its equation.

**ANSWER** \_\_\_\_\_

**APPLY IT** Show your work

- 1** A school Wi-Fi hub is located at the center of the circular coverage region shown on the coordinate grid. Each grid unit represents 1 meter. State the hub's coordinates, the coverage radius, and an equation for the boundary of the coverage region.



**ANSWER** \_\_\_\_\_

- 2** A robotics club programs a drone to stay in the circular flight zone  $(x + 6)^2 + (y - 7)^2 = 100$ , where coordinates are measured in meters. Interpret the center and radius. Is a drone at (0, 15) inside the zone, on the boundary, or outside the zone?

WORK SPACE

**ANSWER** \_\_\_\_\_

**CHALLENGE** One step up

A circular skate track has its center on the  $y$ -axis and passes through  $(0, 12)$ ,  $(4, 4)$ , and  $(-4, 4)$ . Find the center, radius, and equation of the track. Explain how the points determine your answer.

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WORK SPACE AND ANSWER

## PART 1 · PRACTICE

| # | PROBLEM                                                                                           | ANSWER                                                                                                                                                              |
|---|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | The circle shown is centered at the origin. Write its equation.                                   | $x^2 + y^2 = 16$                                                                                                                                                    |
| 2 | The circle shown is centered at the origin. Write its equation.                                   | $x^2 + y^2 = 25$                                                                                                                                                    |
| 3 | Graph $(x + 4)^2 + (y - 5)^2 = 36$ on the grid. State the center and radius.                      | <b>Circle centered at <math>(-4, 5)</math> with radius 6, through <math>(-10, 5)</math>, <math>(2, 5)</math>, <math>(-4, -1)</math>, and <math>(-4, 11)</math>.</b> |
| 4 | Write $x^2 - 10x + y^2 + 8y + 16 = 0$ in standard circle form. Then state the center and radius.  | <b><math>(x - 5)^2 + (y + 4)^2 = 25</math>; center: <math>(5, -4)</math>, radius: 5</b>                                                                             |
| 5 | Does the point $(11, -4)$ lie on the circle $(x - 6)^2 + (y + 4)^2 = 25$ ? Show the substitution. | <b>Yes; <math>(11 - 6)^2 + (-4 + 4)^2 = 25</math></b>                                                                                                               |
| 6 | A circle has center $(-4, 5)$ and passes through $(4, 5)$ . Write its equation.                   | <b><math>(x + 4)^2 + (y - 5)^2 = 64</math></b>                                                                                                                      |

## PART 2 · APPLY IT

- Hub:  $(5, 7)$ ; radius: 4 meters;  $(x - 5)^2 + (y - 7)^2 = 16$**  The center of the graph is  $(5, 7)$ . The boundary is 4 units from the center, so  $r^2 = 16$ .
- Center:  $(-6, 7)$ , the zone's center location; radius: 10 meters, the maximum allowed distance. The drone is on the boundary.** Substituting  $(0, 15)$  gives  $6^2 + 8^2 = 100$ . Because this equals  $r^2$ , the drone is on the boundary.

## CHALLENGE

**Center:  $(0, 7)$ ; radius: 5; equation:  $x^2 + (y - 7)^2 = 25$ . The center is on the y-axis, and it must be equally distant from  $(0, 12)$  and  $(4, 4)$ . The point  $(0, 7)$  is 5 units from each given point.**

Accept equivalent standard forms with terms in either order. For the challenge, accept any valid equal-distance explanation that identifies center  $(0, 7)$  and radius 5.