

**MODEL & DISCUSS**

Damian uses an app to find all pizza restaurants within a certain distance of his current location.

**9-3**  
Circles in the  
Coordinate Plane  
PearsonRealize.com

A. What is the shape of the region that the app uses to search for pizza restaurants? Explain how you know.

The app uses a circle. The points that are the same distance from a given central location form a circle.  
 where the person with the app is standing

B. What information do you think the app needs to determine the area to search?

You would need to know the location of the person and the radius length of the search area.

C. **Construct Arguments** If Damian's friend is using the same app from a different location, could the app find the same pizza restaurant for both boys? Explain. **MP3**

Yes - if Damian and his friend use a search radius that is long enough, the app could find the same restaurant from each person's location.

**HABITS OF MIND**

**Use Appropriate Tools** What geometric figure could you use with a paper map to locate points within a given distance from a given location? What tool would you use? **MP5**

- the geometric figure would be a circle
- the proper tool to use is a compass.

**EXAMPLE 1** Try It! Derive the Equation of a Circle

1. What are the radius and center of the circle with the equation  $(x-2)^2 + (y-3)^2 = 25$ ?

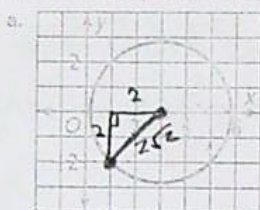
$$(x-h)^2 + (y-k)^2 = r^2 \quad \text{center: } (2, 3)$$

$$\text{Center: } (h, k) \quad \text{radius: } \sqrt{25} = 5$$

$$\text{radius: } \sqrt{r^2}$$

**EXAMPLE 2** Try It! Write the Equation of a Circle

2. What is the equation for each circle?

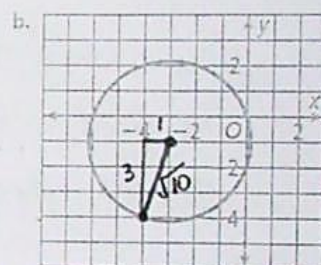


$$\text{center } (3, 0)$$

$$\text{radius} = 2\sqrt{2}$$

$$(x-3)^2 + (y-0)^2 = (2\sqrt{2})^2$$

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



$$\text{center } (-3, -1)$$

$$\text{radius} = \sqrt{1^2 + 3^2}$$

$$= \sqrt{1+9}$$

$$= \sqrt{10}$$

$$[x - (-3)]^2 + [y - (-1)]^2 = (\sqrt{10})^2$$

$$(x+3)^2 + (y+1)^2 = 10$$

**HABITS OF MIND**

**Use Structure** Given the endpoints of the diameter of a circle, how would you find the equation of the circle? © M8.7



- 1) Find the midpoint of the diameter  

$$\left( \frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right) = (h, k) \text{ center of } \odot$$
- 2) Use the distance formula to find the radius length between center and one endpoint.
- 3) Center =  $(h, k)$  →  $(x-h)^2 + (y-k)^2 = r^2$   
 radius =  $r$   
 Write equation

**EXAMPLE 3 Try It! Determine Whether a Point Lies on a Circle**

3. Determine whether each point lies on the given circle.

a.  $(-3, \sqrt{11})$ ; circle with center at the origin and radius  $2\sqrt{5}$

Circle Equation:  $(x-0)^2 + (y-0)^2 = (2\sqrt{5})^2$   
 $x^2 + y^2 = 20$   
 Substitute Given point  $(-3, \sqrt{11})$   
 $(-3)^2 + (\sqrt{11})^2 \stackrel{?}{=} 20$   
 $9 + 11 = 20$   
 $20 = 20$  TRUE

Yes,  $(-3, \sqrt{11})$  is on this  $\odot$

b.  $(6, 3)$ ; circle with center at  $(2, 4)$  and radius  $3\sqrt{3}$

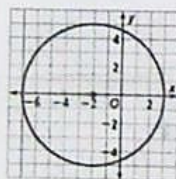
Equation:  $(x-2)^2 + (y-4)^2 = (3\sqrt{3})^2$   
 Simplify:  $(x-2)^2 + (y-4)^2 = 27$   
 Substitute:  $(6-2)^2 + (3-4)^2 \stackrel{?}{=} 27$   
 $(4)^2 + (-1)^2 = 27$   
 $16 + 1 \neq 27$

No  $(6, 3)$  did not satisfy the equation. This point is NOT on the  $\odot$

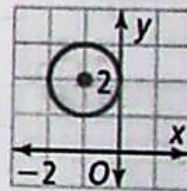
**EXAMPLE 4 Try It! Graph a Circle from Its Equation**

4. What is the graph of each circle?

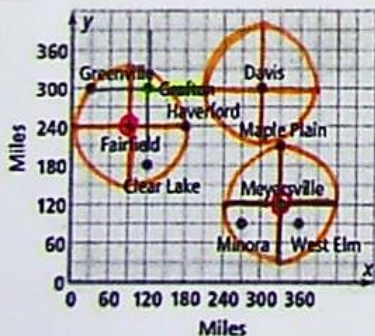
a.  $(x+2)^2 + y^2 = 25$   
 center  $(-2, 0)$  radius  $= 5$



b.  $(x+1)^2 + (y-2)^2 = 1$   
 center  $(-1, 2)$   $r = 1$



**EXAMPLE 5 Try It! Use the Graph and Equation of a Circle to Solve Problems**



5. If one or both of the existing radar stations could be moved, would three radar stations be sufficient to cover all the towns? Explain.

Doppler radar stations are currently located at Grafton and Meyersville. If the radar station at Grafton was moved to Fairfield, then a third radar station could be placed at Davis and then all towns would be covered by each Doppler radar's maximum reach which is a radius length of 90 miles.

**HABITS OF MIND**

Use Structure How can you verify that an equation of a circle agrees with the graph of the circle?  $\odot$  MP.7

Select and test points on the circle by substituting them into the equation for the circle.