LESSON 10.6

NAME _____ DATE _____

Reteaching with Practice

For use with pages 636–640

GOAL **Write the equation of a circle and use it and its graph to solve problems**

VOCABULARY

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

EXAMPLE 1 *Writing a Standard Equation of a Circle*

a. Write the standard equation of the circle with center (2, 4) and radius 5.

b. The point $(-2, 4)$ is on a circle whose center is (0, 2). Write the standard equation of the circle.

SOLUTION

a. $(x - h)^2 + (y - k)^2 = r^2$ Standard equation of a circle

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

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

b. The radius is the distance from the point $(-2, 4)$ to the center (0, 2).

$r = \sqrt{(0 - (-2))^2 + (2 - 4)^2}$ Use the Distance Formula.

$r = \sqrt{2^2 + (-2)^2} = 2\sqrt{2}$ Simplify.

Substitute $(h, k) = (0, 2)$ and $r = 2\sqrt{2}$ into the standard equation of a circle.

$(x - h)^2 + (y - k)^2 = r^2$ Standard equation of a circle

$(x - 0)^2 + (y - 2)^2 = \left(2\sqrt{2}\right)^2$ Substitute.

$x^2 + (y - 2)^2 = 8$ Simplify.

Exercises for Example 1

Write the standard equation of the circle described.

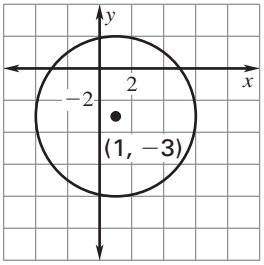
1. center $(4, -1)$, radius 6

2. center $(-1, -5)$, radius 3.2

3. The center is $(-2, 3)$, a point on the circle is (2, 3).

EXAMPLE 2 *Graphing a Circle*

The equation of a circle is $(x - 1)^2 + (y + 3)^2 = 25$. Graph the circle.



SOLUTION

Rewrite the equation to find the center and radius:

$(x - 1)^2 + (y + 3)^2 = 25$

$(x - 1)^2 + (y - (-3))^2 = 5^2$

The center is $(1, -3)$ and the radius is 5. To graph the circle, place the point of a compass at $(1, -3)$, set the radius at 5 units, and swing the compass to draw a full circle.

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Exercises for Example 2

Graph the circle that has the given equation.

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

5. $(x + 6)^2 + (y - 4)^2 = 9$

6. $(x + 3)^2 + y^2 = 16$

7. $x^2 + (y + 2)^2 = \frac{1}{2}$

EXAMPLE 3 Applying Graphs of Circles

A farmer's plot of land was struck by a meteorite which damaged a circular area of his farm. If the farmer's house is labeled as the origin of a coordinate plane, the area damaged by the meteorite can be expressed by the equation $(x - 6)^2 + (y - 7)^2 = 16$.

a. Graph the damaged area of the farm.

b. Items on the farm are located as follows: A silo is at (2, 4), a barn is at (4, 6), and a pigpen is at (8, 9). Which of these items were damaged by the meteorite?

SOLUTION

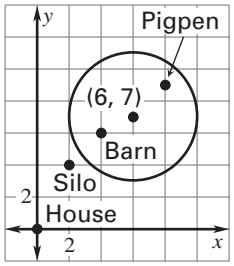
a. Rewrite the equation to find the center and radius:

$$(x - 6)^2 + (y - 7)^2 = 16$$

$$(x - 6)^2 + (y - 7)^2 = 4^2$$

The center is (6, 7) and the radius is 4.

b. The graph shows that the barn and the pigpen were damaged by the meteorite.



Exercises for Example 3

In Exercises 8–10, reconsider the situation from Example 3 above, assuming that the damage from the meteorite can be expressed by the equation $(x - 3)^2 + (y - 3)^2 = 9$. Did the meteorite damage the following items in this new situation?

8. The farmer's house

9. The silo

10. The pigpen