

**SWBAT write the equation of a circle in standard form.**

**Standard: NC.M3.G.GPE.1**

**Agenda:**

**Warmup #39**

**Notes**

**Practice**

## General form equation for circle

$$ax^2 + by^2 + cx + dy + e = 0, \text{ where } a=b$$

## Standard form equation for circle

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

center - (h, k)

radius - r

\* Most of our work will be in Standard Form \*

note: Radius is squared here

**Write the equation of the circle with center at (4, 3) and the radius is 5.**

$$\text{Center: } (h, k) \Rightarrow (4, 3)$$

$$h = 4$$

$$k = 3$$

$$r = 5$$

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

$$(x-4)^2 + (y-3)^2 = 5^2 \quad \leftarrow \text{Now Simplify}$$

$$(x-4)^2 + (y-3)^2 = 25$$

\* Notice \*  
 how the center's  
 coordinates are  
 the opposite  
 in the equations  
 \* \* \*

# Write the equation of the circle with the given center and radius.

1. center  $(-1, 7)$   $r = 1$

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

2. center  $(-4, -2)$   $r = \sqrt{7}$

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



1. Write the standard form of the circle.
2. State the center and radius.
3. Graph the circle.

$$\underline{x^2} + \underline{y^2} + \underline{4x} + \underline{8y} + \underline{16} = 0$$

*move to other side* →

$$x^2 + 4x + 4 + y^2 + 8y + 16 = -16 + 4 + 16$$

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

$$\frac{4}{2} = [2]^2 = 4$$

$$\frac{8}{2} = [4]^2 = 16$$

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

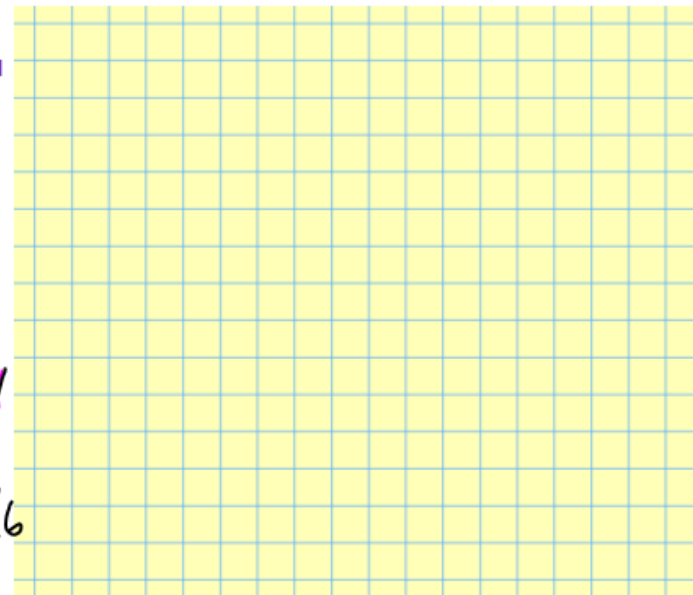
$$\text{center} = (-2, -4)$$

$$\text{radius} = 2$$

$$r^2 = 4$$

$$\sqrt{r^2} = \sqrt{4}$$

$$r = 2$$



1. Write the standard form of the circle.
2. State the center and radius.
3. Graph the circle.

$$x^2 + y^2 + 4x + 8y + 16 = 0$$

Now  
that  
we know

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

$$C = (-2, -4)$$

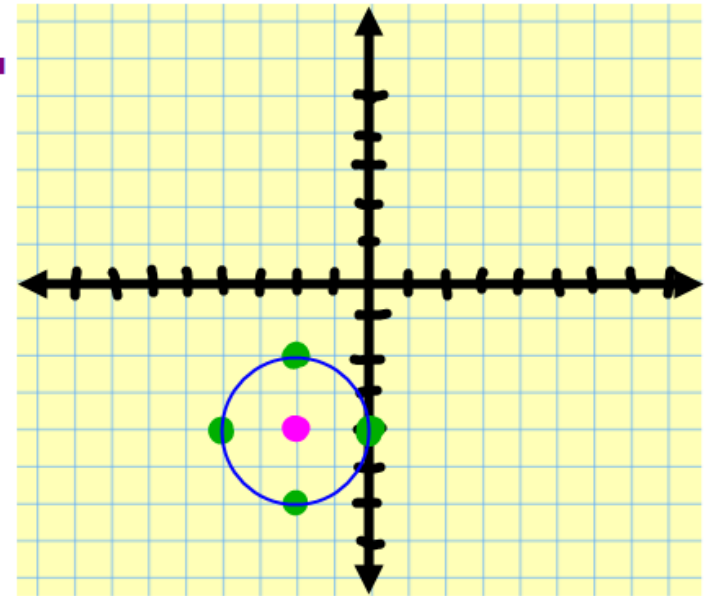
$$r = 2$$

① plot the center

② move the length of the radius (2)

↑, ↓, ←, → from the center

③ Draw the greatest circle of your life!! 😊



1. Write the standard form of the circle.
2. State the center and radius.
3. Graph the circle.

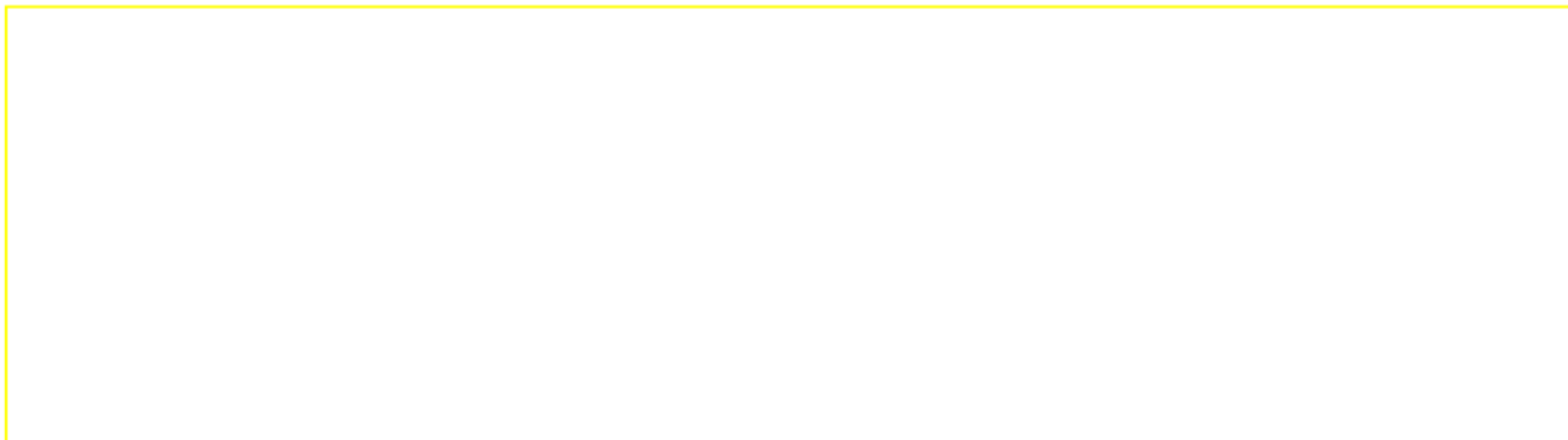
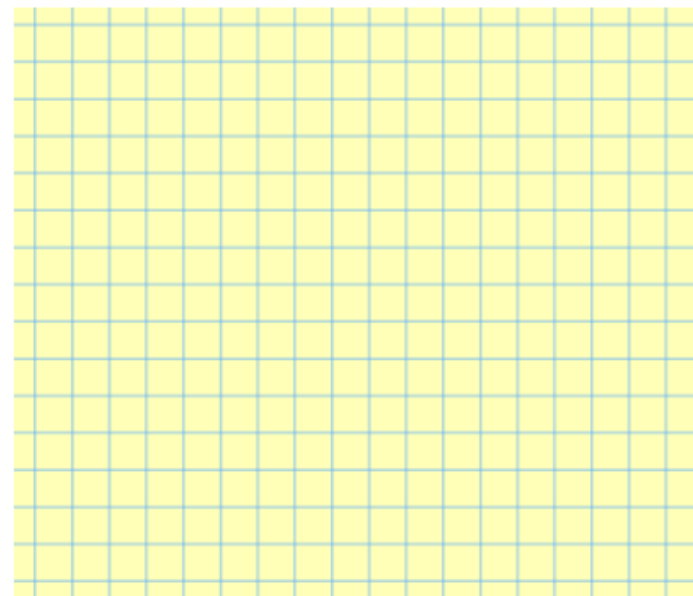
$$x^2 + y^2 - 11x + 6y - 18 = 7$$

$$x^2 - 11x + 30.25 \quad y^2 + 6y + 9 = 25 + 30.25 + 9$$

$$(x - 5.5)^2 + (y + 3)^2 = 64.25$$


center:  $(5.5, -3)$

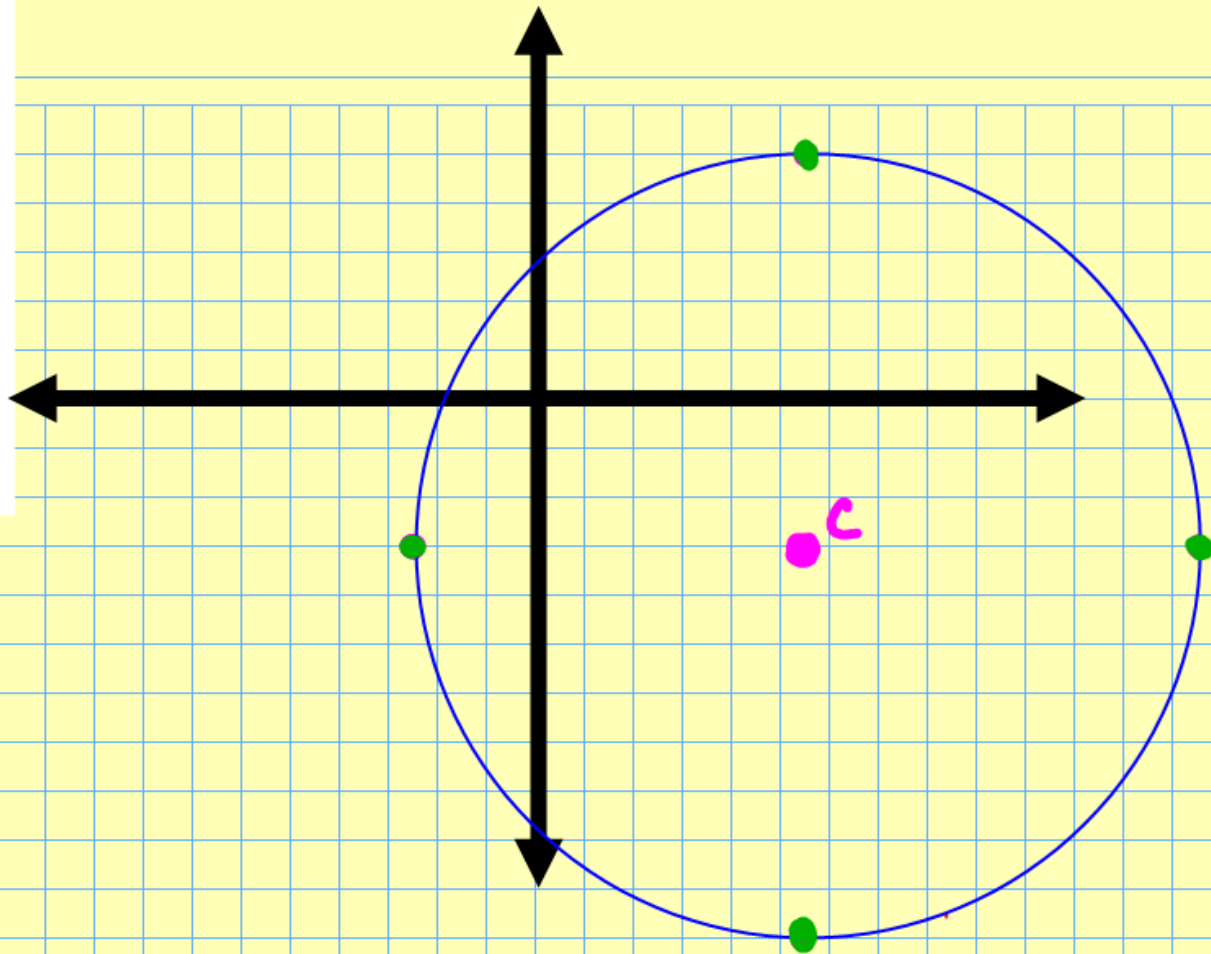
radius: 8.02



$$C(5.5, -3)$$

$$r = 8.02$$

- ① plot center
- ② move the radius 
- ③ Connect the circle





**Give the equation of the circle whose center is (5, -3) and goes through (2, 5).**

$$(x-5)^2 + (y+3)^2 = 73$$

\* remember its  $r^2$  so  $(\sqrt{73})^2 = 73$

to find  $r$ , we need to find distance from center to circle

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

AKA Pythagorean Theorem

$$d = \sqrt{(5-2)^2 + (-3-5)^2}$$

$$\sqrt{3^2 + (-8)^2}$$

$$\sqrt{9 + 64}$$

$$\sqrt{73}$$

$$\text{radius} = \sqrt{73}$$

## Problem-Based Task 7.1: Nurturing an Investment

Anna's landscaping company has a contract to improve and maintain a municipal park. Anna made a scale drawing of the park on a coordinate system, using meters as the unit of distance. She has already installed two permanent sprinkler outlets. Sprinkler 1 waters inside the region whose boundary has the equation  $x^2 + y^2 - 20x - 20y + 136 = 0$ . Sprinkler 2 waters inside the region whose boundary has the equation  $x^2 + y^2 - 50x - 24y + 669 = 0$ . Anna bought an expensive tree and she wants to plant it at the point  $(17, 8)$ , where she thinks it will be watered by both sprinklers. Will the tree be watered by both sprinklers at that point? Draw a sketch that illustrates your answer.

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Sprinkler 1

$$x^2 + y^2 - 20x - 20y + 136 = 0$$

$$x^2 - 20x + 100 + y^2 - 20y + 100 = -136 + 100 + 100$$

$$(x - 10)^2 + (y - 10)^2 = 64$$

$$C: (10, 10)$$

$$r: 8$$

Sprinkler 2

$$x^2 + y^2 - 50x - 24y + 669 = 0$$

$$x^2 - 50x + 625 + y^2 - 24y + 144 = -669 + 625 + 144$$

$$(x - 25)^2 + (y - 12)^2 = 100$$

$$C: (25, 12)$$

$$r: 10$$

