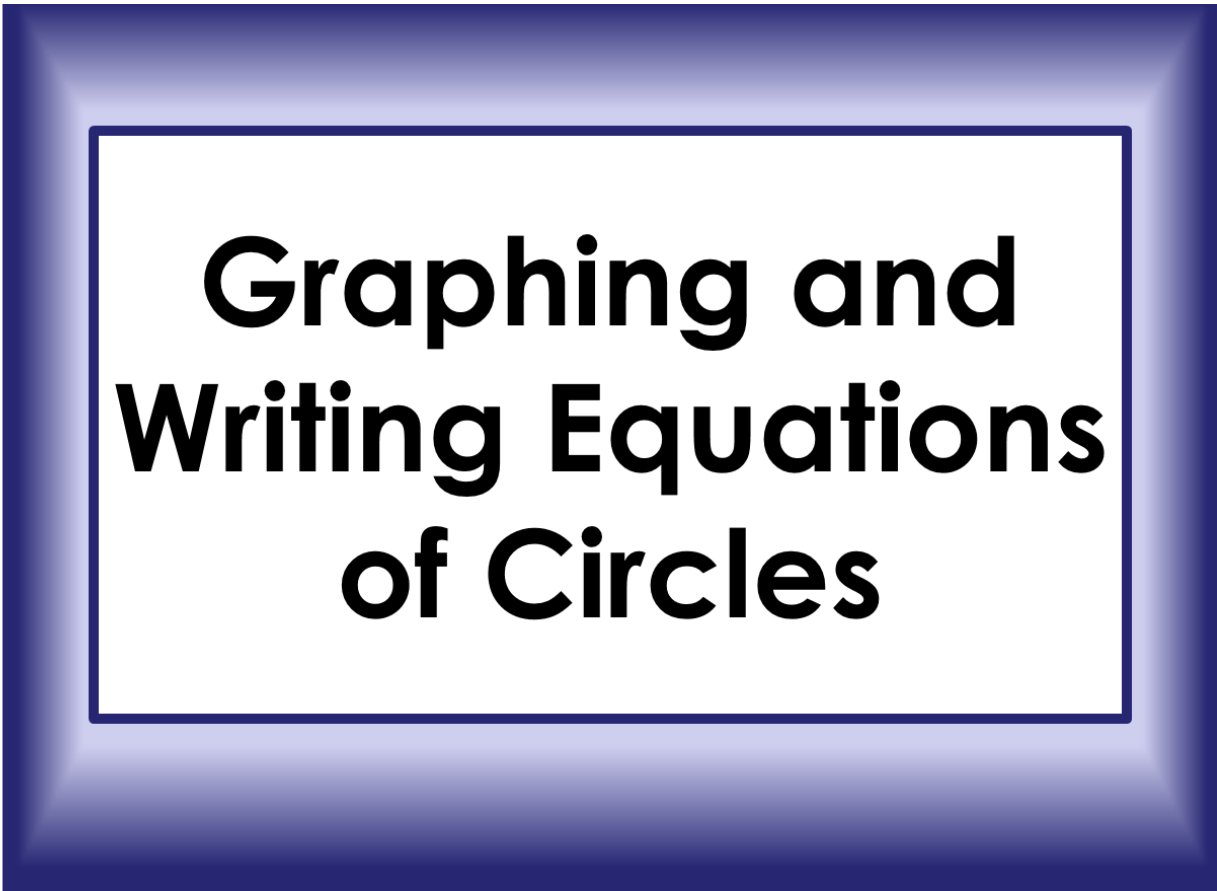
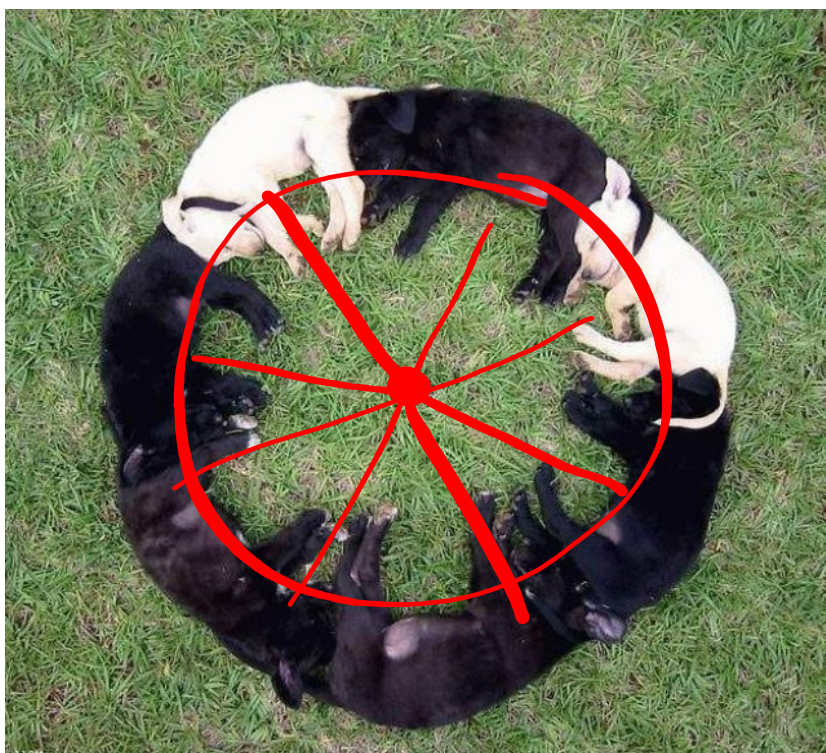


Good morning!

1. "Here"
2. Notes on Equations of Circles
3. Practice
4. Homework is on DeltaMath (due 11/9)



Graphing and Writing Equations of Circles



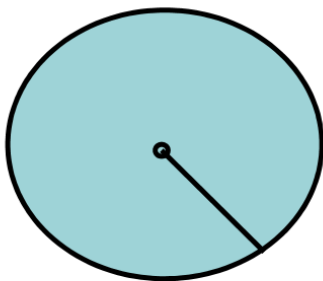
Radius
Center

Standard Form of a Circle

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

opposite *opposite*

Center is at (h, k)



*r is the radius
of the circle*

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

center(2, -3)

radius = 3

$$\begin{aligned} \sqrt{r^2} &= \sqrt{9} \\ r &= 3 \end{aligned}$$

General Form of a Circle

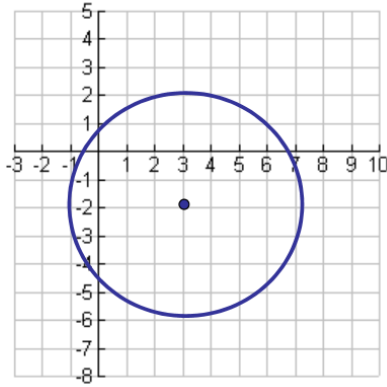
$$Ax^2 + By^2 + Cx + Dy + E = 0$$

Simplify the
Standard form.
"work it out"

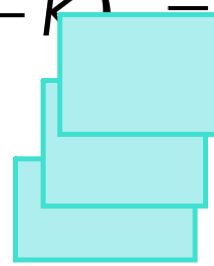
General Form of a Circle

- *Every binomial squared has been multiplied out.*
- *Every term is on the **left** side, equal to 0.*
- *Squared terms go first in alpha order.*

EX 1 Write an equation of a circle with center (3, -2) and a radius of 4.



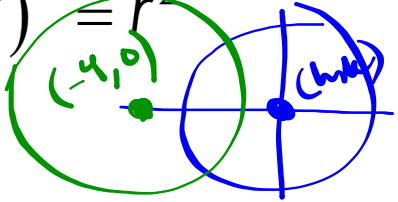
$$(x - h)^2 + (y - k)^2 = r^2$$



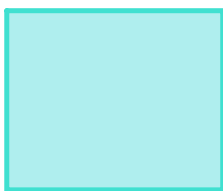
$$(x - 3)^2 + (y + 2)^2 = 16$$

Standard Form

EX 2 Write an equation of a circle with center $(-4, 0)$ and a diameter of 10. \rightarrow radius = 5

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


$$(x + 4)^2 + y^2 = 5^2 = 25$$



EX 3 Write an equation of a circle with center $(2, -9)$ and a *radius* of $\sqrt{11}$.

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

$$(x - 2)^2 + (y + 9)^2 = 11$$



EX 4 Find the coordinates of the center and the measure of the radius.

$$(x - 6)^2 + (y + 3)^2 = 25$$

center (6, -3)

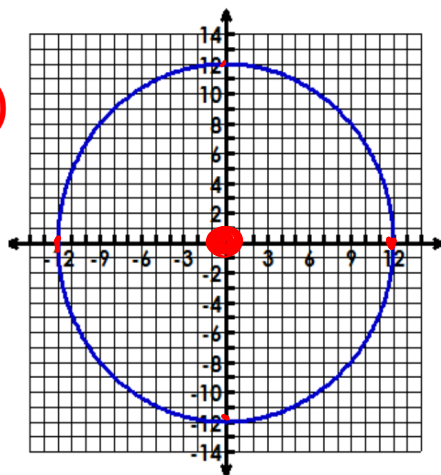
radius = 5

5. Find the center, radius, & equation of the circle.

The center is $(0, 0)$

The radius is 12

The equation is
 $x^2 + y^2 = 144$



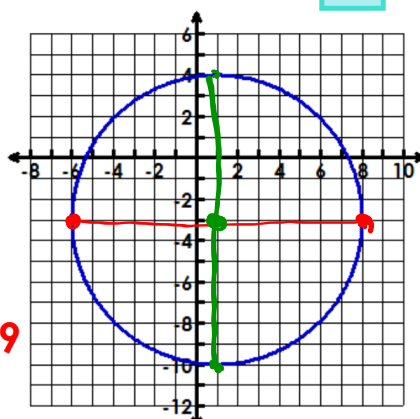
6. Find the center, radius, & equation of the circle.

The center is $(1, -3)$

The radius is 7

The equation is

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



$$(1, -3)$$
$$r = 7$$



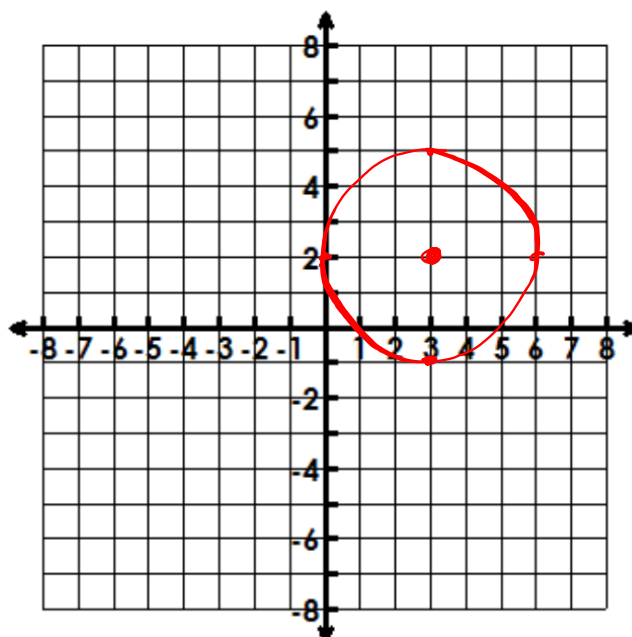
7. Graph the circle, identify the center & radius.



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

Center **(3, 2)**

Radius of **3**



Converting from General to Standard

1. A needs to be 1. Divide if needed.
2. Move the x terms together and the y terms together.
3. Move E to the other side of the equals sign.
4. Complete the square (as needed) for x.
5. Complete the square (as needed) for y.
6. Factor the left & simplify the right.

$$\begin{aligned}
 & \rightarrow Ax^2 + By^2 + Cx + Dy + E = 0 \\
 & Ax^2 + Cx + \square + By^2 + Dy + \square = -E + \square + \square
 \end{aligned}$$

8. Write the **standard** equation of the circle.
State the center & radius.

General

$$x^2 + y^2 - 8x + 7 = 0$$

$$x^2 - 8x + 16 + y^2 = -7 + 16$$

Standard

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

$$x^2 - 8x + 16 = (x-4)(x-4) = (x-4)^2$$

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

Center: (4, 0) radius: 3

9.  e.

State the center & radius.

$$\begin{aligned}
 & \underline{x^2} + \underline{y^2} + \underline{4x} - \underline{6y} - 3 = 0 \\
 & x^2 + 4x + 4 + y^2 - 6y + 9 = 3 + 4 + 9 \\
 & (x+2)^2 + (y-3)^2 = 16
 \end{aligned}$$

$$(x+2)^2 + (y-3)^2 = 16$$

Center: (-2, 3) radius: 4

10. Write the **standard** equation of the circle.

State the center & radius.

$$\underline{2x^2 + 2y^2 - 16x + 4y + 20 = 0}$$

$$\underline{x^2 + y^2 - 8x + 2y + 10 = 0}$$

$$x^2 - 8x + \boxed{16} + y^2 + 2y + \boxed{1} = -10 + \boxed{16} + \boxed{1}$$

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

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

Center: (4, -1) Radius: $\sqrt{7} \approx 2.6$

11. Write the **general** form of the equation of the circle.

$$(x - 4)^2 + (y + 3)^2 = 36$$

$$(x-4)(x-4)$$

x	x-4
-4	x-4
	x ² -4x
	-4x+16
	x ² -8x+16

$$(y+3)(y+3)$$

y	y+3
3	y+3
	y ² +3y
	3y+9
	y ² +6y+9

$$x^2 - 8x + 16 + y^2 + 2 \cdot 3y + 9 = 36$$

$$x^2 + y^2 - 8x + 6y - 11 = 0$$

$$x^2 + y^2 - 8x + 6y - 11 = 0$$

Name: _____ Date: _____

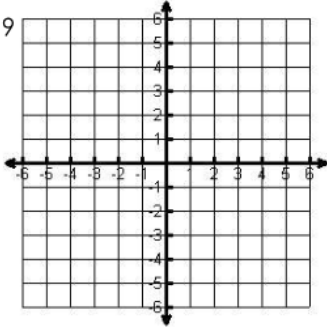
Graphing & Writing Equations of Circles

Graph the following circles. State the center and radius.

1. $x^2 + y^2 = 9$

Center: _____

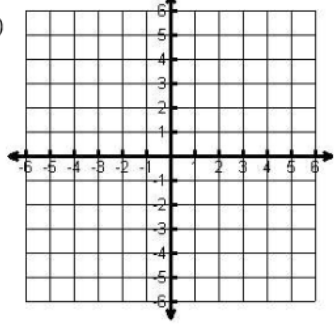
Radius: _____



2. $x^2 + y^2 = 20$

Center: _____

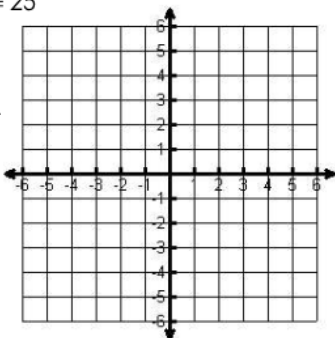
Radius: _____



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

Center: _____

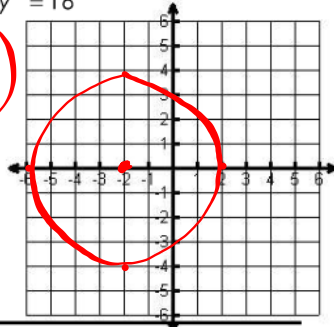
Radius: _____



4. $(x+2)^2 + y^2 = 16$

Center: $(-2, 0)$

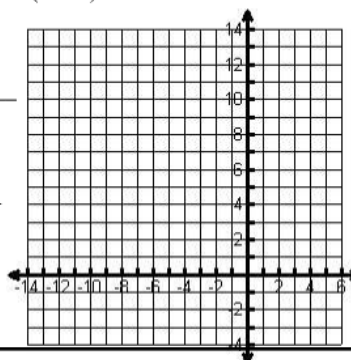
Radius: 4



5. $(x+4)^2 + (y-6)^2 = 64$

Center: _____

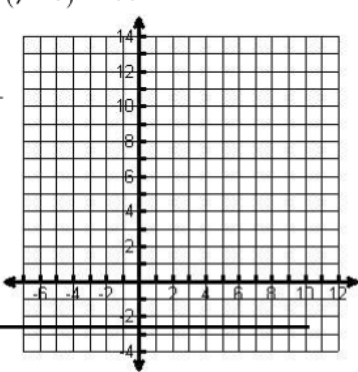
Radius: _____



6. $(x-3)^2 + (y-5)^2 = 50$

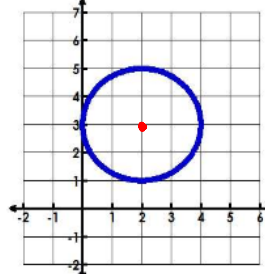
Center: _____

Radius: _____



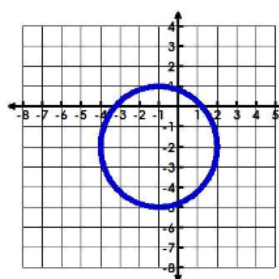
Write the equation of the circle in standard form. Then, convert to the general form.

7. Standard Form: $(x-2)^2 + (y-3)^2 = 4$
 $x^2 + y^2 - 4x - 6y + 9 = 0$



General Form: _____

8. Standard Form: _____



General Form: _____

Write the standard equation for the circle. State the center and radius.

9. $x^2 + 2x + y^2 - 10y + 10 = 0$

10. $x^2 + y^2 - 4x + 6y + 9 = 0$

11. $7x^2 + 7y^2 - 28x + 14 = 0$

12. $3x^2 + 3y^2 + 18x + 6y = 0$

