SWBAT graph circles on the coordinate plane and write the equations of circles in standard form.

Standard Form of Circles

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

Center:	Radius:	Point on the circle:
(h, k)	r	(x, y)
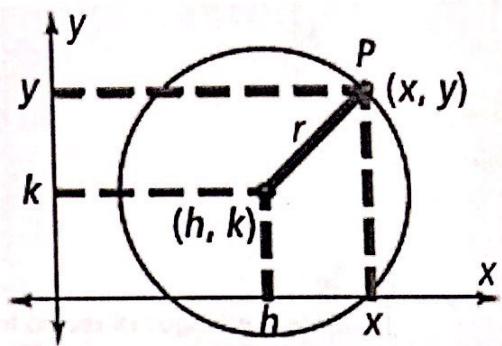
Example 1: Write the equation of a circle with the given information.

a) Center (0,0), Radius=10

$$(x-0)^2 + (y-0)^2 = 10^2 \rightarrow \boxed{x^2 + y^2 = 100}$$

b) Center (2, 3), Diameter=12 $\frac{12}{2} = 6$

$$\boxed{(x-2)^2 + (y-3)^2 = 6^2}$$

Example 2: Determine the center and radius of a circle the given equation.

a) $x^2 + y^2 = \dfrac{9}{4}$

center: $(0,0)$

$\sqrt{\dfrac{9}{4}} = \sqrt{r^2}$ $r = \dfrac{3}{2}$

b) $(x+3)^2 + (y-5)^2 = 81$

center: $(-3, 5)$

$\sqrt{r^2} = \sqrt{81}$ $r = 9$

c) $(x+4)^2 + (y+6)^2 = 1$

center: $(-4, -6)$

radius: 1

Example 3: Use the center and the radius to graph each circle.

a) $(x+2)^2 + y^2 = 64$

Center: $(-2, 0)$

Radius:

$r^2 = 64$

$r = 8$
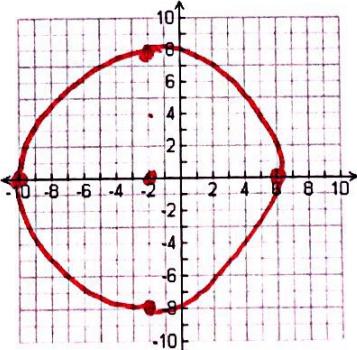
b) $x^2 + (y+4)^2 = 36$

Center: $(0, -4)$

Radius: $r = 6$
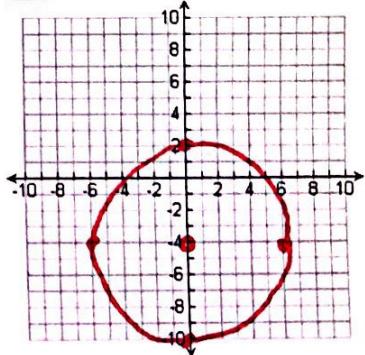
Writing an Equation with a Pass-Thru Point

Step 1: Substitute the center (h, k) into the equation

Step 2: Substitute the "pass through point (x, y)" into the equation for x and y.

Step 3: Simplify and solve for r^2.

Step 4: Substitute r^2 back into the equation from Step 1.

Example 4: Write the equation of a circle with a given center (2, 5) that passes through the point (5 ,-1).

$$(x-2)^2+(y-5)^2=r^2 \longrightarrow r^2=45$$
$$(5-2)^2+(-1-5)^2=r^2$$
$$\boxed{(x-2)^2+(y-5)^2=45}$$

Writing an Equation with Two Points on the Circle	Midpoint Formula
Find the midpoint (radius) between the two endpoints, and then follow steps 1-4.	$m=(x,y)=\left(\dfrac{x_1+x_2}{2},\dfrac{y_1+y_2}{2}\right)$

Example 5: Write the equation of a circle with endpoints of diameter at (-6, 5) and (4, -3).

$$\left(\frac{-6+4}{2},\frac{5-3}{2}\right)=(-1,1)$$

$$(x+1)^2+(y-1)^2=r^2$$
$$(-6+1)^2+(5-1)^2=r^2$$
$$r^2=41$$
$$\boxed{(x+1)^2+(y-1)^2=41}$$

Writing the Equation of a Circle in Standard Form

Step 1:	Group x's and group y's together.
Step 2:	Move any constants to the right side of the equation.
Step 3:	Use complete the square to make a perfect square trinomial for the x's and then again for the y's. *Remember, whatever you do to one side of the equation, you must do to the other!* $\left(\frac{b}{2}\right)^2$
Step 4:	Simplify factors into standard form of a circle!

Example 5: Write the equation of a circle in standard form. Then, state the center and the radius.

a) $x^2 + y^2 + 4x - 8y + 16 = 0$

$$x^2+4x+\square + y^2-8y+\triangle +16=0+\square+\triangle$$
$$x^2+4x+\boxed{4} + y^2-8y+\boxed{16}=-16+\boxed{4}+\triangle\!16$$

c) $x^2 + y^2 - 6x - 2y + 4 = 0$

b) $x^2 + y^2 + 6x - 4y = 0$

$$\frac{4}{2}=(2)^2=4$$

$$\frac{-8}{2}=(-4)^2=16$$

d) $x^2 + y^2 + 8x - 10y - 4 = 0$

$$\boxed{(x+2)^2 + (y-4)^2 = 4}$$

b) $x^2 + y^2 + 6x - 4y \cancel{-\#\#} = 0$

$x^2 + 6x + \boxed{9} + y^2 - 4y + \triangle = \cancel{\#\#\#} + \boxed{9} + \cancel{\triangle}$

$\dfrac{6}{2} = (3)^2 = 9 \qquad \dfrac{-4}{2} = (-2)^2 = 4$

$\boxed{(x+3)^2 + (y-2)^2 = 13}$

c) $(x-3)^2 + (y-1)^2 = 6$