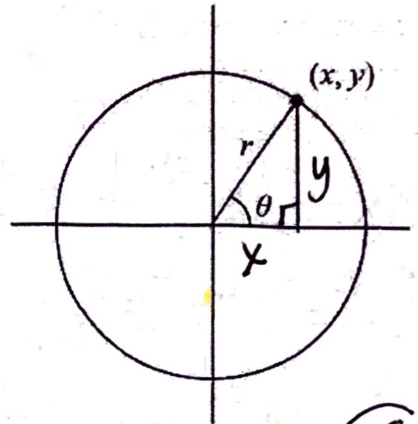
Equations of Circles Guided Notes Name:________________________

Equation of a Circle Centered at the Origin:

$$\boxed{x^2 + y^2 = r^2}$$



What if the center is not at the origin?
How do we transform graphs?

Equation of a Circle Centered at (h, k)

$$\boxed{(x-h)^2 + (y-k)^2 = r^2}$$

$(2\sqrt{3})^2 = 4 \cdot 3 = 12$

This is what we call standard form for an equation of a circle.

$r = 2\sqrt{3}$ $(-3, 2)$ C

$$\boxed{(x+3)^2 + (y-2)^2 = 12}$$

Write an equation of a circle with:

1. radius = 8, center = (4, 3).

   r h k

   $$\boxed{(x-4)^2 + (y-3)^2 = 64}$$

2. radius = 7, center = (−3, −8).

   r h k

   $$\boxed{(x+3)^2 + (y+8)^2 = 49}$$

Find the center and radius a circle with the equation of:

3. $(x-1)^2 + (y+4)^2 = 81$.

   $C(1, -4)$ $r = \sqrt{81} = 9$

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

   $C(2, -3)$ $r = 3$

5. Expand the binomial expressions in problem #4, simplify, and set the equation equal to 0.

This is called the general (or expanded) form of the equation of a circle.

From General Form to Standard Form $(x-h)^2+(y-k)^2=r^2$

To get an equation of a circle from general form to standard form, you must complete the square.

1. Given $x^2-8x+y^2+11=0$, put in standard form.

$-11 \quad -11$

$(x-4)(x-4) \swarrow (x^2-8x+\underline{16})+y^2=-11+\underline{16}$

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

$\boxed{(x-4)^2+y^2=5}$ STANDARD FORM $C(4,0)$ $r=\sqrt{5}$

2. Given $x^2+y^2+4x-6y=-4$, put in standard form.

$(x^2+4x+\underline{4})+(y^2-6y+\underline{9})=-4+\underline{4}+\underline{9}$

$\left(\frac{4}{2}\right)^2=(2)^2=4 \qquad \left(\frac{-6}{2}\right)^2=(-3)^2=9$

$\boxed{(x+2)^2+(y-3)^2=9}$ $C(-2,3)$ $r=3$

$x^2+y^2+10x+4y-92=0$

3. Given ~~$3x^2=9-3y^2-6y$~~, put in standard form.

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$(x^2+10x+\underline{25})+(y^2+4y+\underline{4})=92+\underline{25}+\underline{4}$

$\boxed{(x+5)^2+(y+2)^2=121}$

$C(-5,-2)$

$r=11$

4) $x^2+y^2-18x+16y+109=0$

$(x^2-18x+\underline{81})+(y^2+16y+\underline{64})=-109+\underline{81}+\underline{64}$

$\left(\frac{-18}{2}\right)^2=(-9)^2=81 \qquad \left(\frac{16}{2}\right)^2=(8)^2=64$

$\boxed{(x-9)^2+(y+8)^2=36}$

$C(9,-8)$ $r=6$