Warm Up

If the $\sin(A) = \frac{5}{13}$ opp/Hyp, find the following for triangle ABC.

Missing side 12

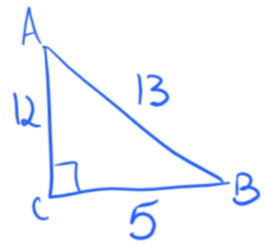
$\cos(A) = \frac{12}{13}$

$\tan(A) = \frac{5}{12}$

$\sin(B) = \frac{12}{13}$

$\cos(B) = \frac{5}{13}$

$\tan(B) = \frac{12}{5}$



Missing side

$5^2 + b^2 = 13^2$

$25 + b^2 = 169$

$b^2 = 144$

$b = 12$

Today, we are going to discuss:

Circles

- The equation for a circle on the coordinate plane

- Identifying radius, center and points on a circle.

Geometry in Coordinate Plane

Up until now we have been learning about lines.
Match each blue with its corresponding orange.

1. $y=mx+b$:
2. parallel :
3. perpendicular :
4. distance :
5. section formula :

$\left(\frac{ax_2 + bx_1}{a+b}, \frac{ay_2 + by_1}{a+b} \right)$

$\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

m = slope, b = y-intercept

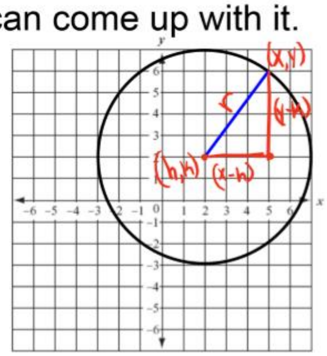
same slope

opposite reciprocal slope

Now we are going to learn about circles.

Don't forget $y - y_1 = m(x - x_1) \rightarrow$ point slope formula.
Used to find the equation of a line through a given point.

Circles have their own equation. Lets see if we can come up with it.



Use Pythagorean Theorem

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

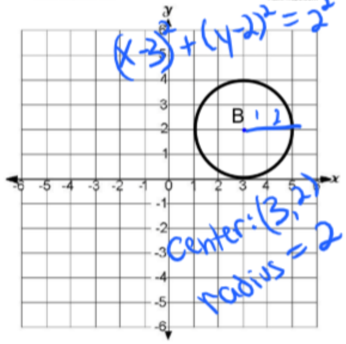
Standard Form Equation

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

(h,k) is the center

r is the radius

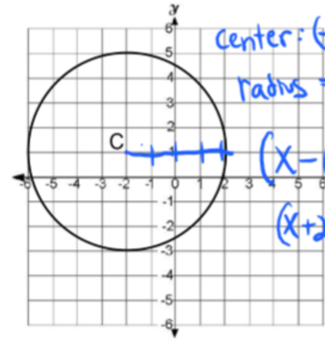
Identify the center and radius, then write an equation for the circle.



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

center: $(3,2)$

radius $= 2$



center: $(-2,1)$

radius $=4$

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

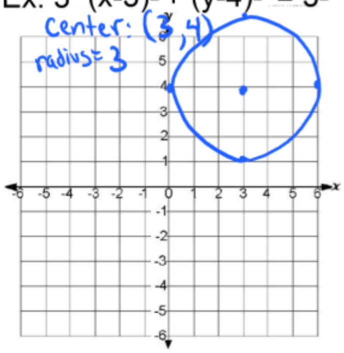
$(x+2)^2+(y-1)^2=16$

Identify the center and radius of a circle given its equation. Then graph it.

Ex. 3 $(x-\overset{h}{3})^2+(y-\overset{k}{4})^2 = \overset{r}{3}^2$

center: $(3,4)$

radius $= 3$

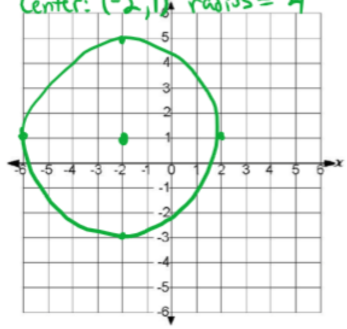


Ex. 4 $(x+\overset{h}{2})^2+(y-\overset{k}{1})^2 = \overset{r^2}{16}$

$r^2=16$

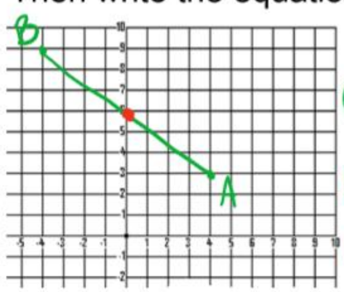
$r=4$

Center: $(-2,1)$ radius $= 4$



Another way to look at it.

Given that the diameter of a circle lies on points A(4,3) and B(-4,9); Identify the center and length of the radius. Then write the equation of the circle.



Find center

use midpoint formula.

$(x,y)=\left(\frac{4+-4}{2},\frac{9+3}{2}\right)$

$(x,y)=\left(\frac{0}{2},\frac{12}{2}\right)$

$(x,y)=(0,6)$

Find length of radius

Find distance of diameter divide in half for radius.

$\overline{AB}=\sqrt{(4-(-4))^2+(3-9)^2}$

$\overline{AB}=\sqrt{(8)^2+(-6)^2}$

$\overline{AB}=\sqrt{64+36}$

$\overline{AB}=\sqrt{100}=10$

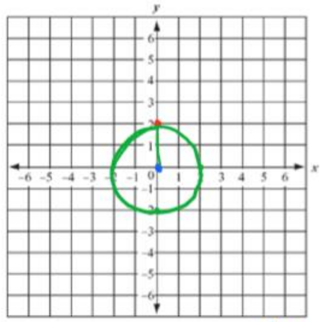
so $r=5$

Equation: $(x-0)^2+(y-6)^2=5^2$

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

One more type of problem

Prove or disprove that the point (1, √3) lies on a circle centered at the origin and containing the point (0,2).



Does point $(1,\sqrt{3})$ lie on the circle? If so, it will make the circle equation true.

Equation of circle.

center: (0,0)

radius: 2

$(x-0)^2+(y-0)^2=2^2$

$x^2+y^2=4$

Check point

$(1,\sqrt{3})$

$(x\ ,y)$

$x^2+y^2=4$

$(1)^2+(\sqrt{3})^2=4$

$1+3=4$

$4=4$ ✓

Algebraically, it is shown that point $(1,\sqrt{3})$ lies on the given circle with equation $x^2+y^2=4$.

You do one

Prove or disprove that point (8,4) lies on a circle that is centered at (2,-4) and a contains the point (10,-10).

Equation of Circle

Center: $(2,-4)$

radius: Distance from center to point on circle

$r=\sqrt{(10-2)^2+(-10-(-4))^2}$

$r=\sqrt{(8)^2+(-6)^2}$

$r=\sqrt{64+36}$

$r=\sqrt{100}=10$

Equation $(x-2)^2+(y-(-4))^2=10^2$

$(x-2)^2+(y+4)^2=100$

Check given point

$(x-2)^2+(y+4)^2=100$

$(x,y)=(8,4)$

$(8-2)^2+(4+4)^2=100$

$6^2+8^2=100$

$36+64=100$

$100=100$ ✓

The above work shows point 8,4 lies on the given circle.

Recap:

What is the standard form equation of a circle?

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

Given the two points that make a diameter of a circle, how would you find the coordinates for the center? Use mid point formula