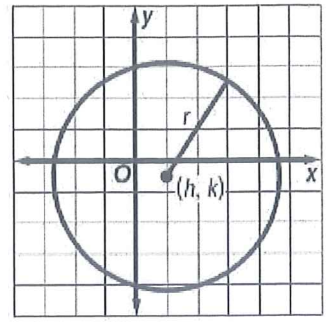
Name: Key

10-8 Equations of Circles: Notes

Equation of a Circle A **circle** is the locus of points in a plane equidistant from a given point. You can use this definition to write an equation of a circle.



Standard Equation of a Circle An equation for a circle with center at (h, k) and a radius of r units is $(x - h)^2 + (y - k)^2 = r^2$.

Write the equation for each circle, then graph each.

ex1. Center at (0,0), r=1

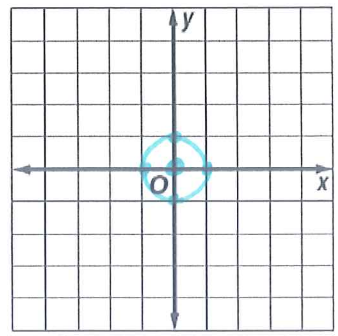
h k

Plug in!

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

$(x-0)^2+(y-0)^2=1^2$

$\boxed{x^2+y^2=1}$



ex2. Center at (2,-4), r = 1

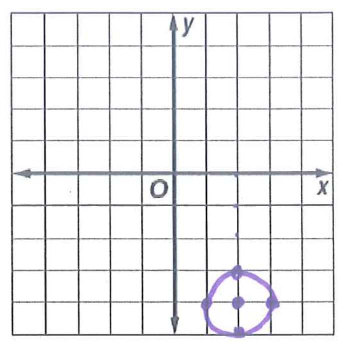
h k r

Watch negative!

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

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

$\boxed{(x-2)^2+(y+4)^2=1}$

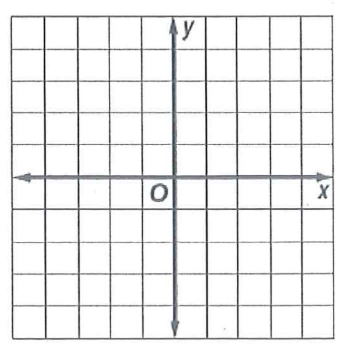


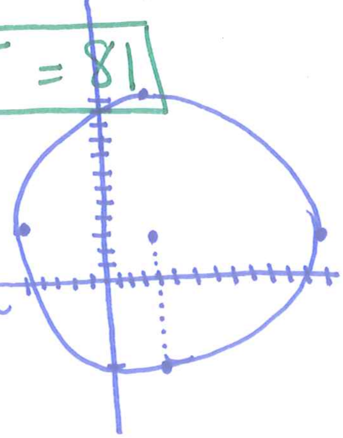
ex3. Center at (4,3), r = 9

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

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

$\boxed{(x-4)^2+(y-3)^2=81}$



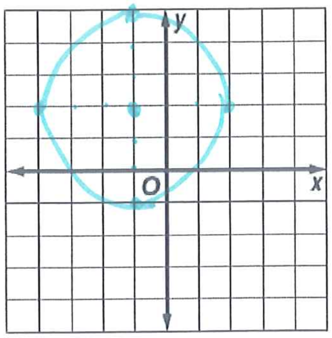


on SAT and Exams also Alg 2 you need to be able to make own grid.

Find the center and the radius and graph each equation.

$h \quad k \quad r^2$

Ex 4. $(x+1)^2 + (y-2)^2 = 9$

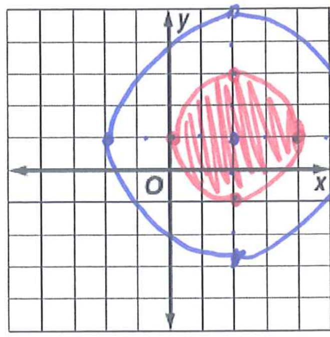


Center: $(-1, 2)$

r= $\sqrt{9}$

$\boxed{r=3}$

Ex 5. $(x-2)^2 + (y-1)^2 = 4$



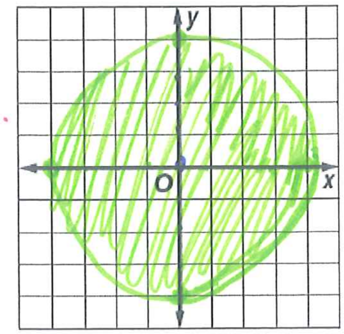
Duh
Red circle is correct.

Center: $(2,1)$

r= $\sqrt{4}$

$\boxed{r=2}$

Ex6. $x^2 + y^2 = 16$



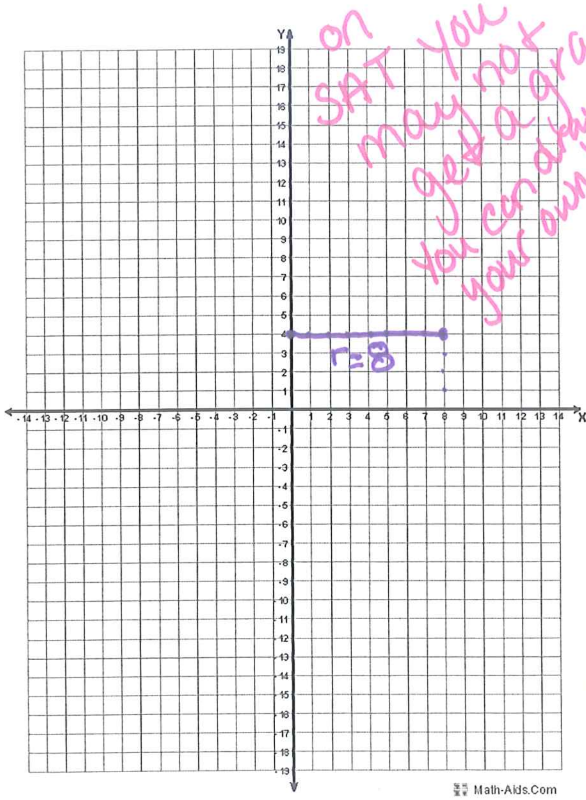
Center: $(0,0)$

r= $\sqrt{16}$

$\boxed{r=4}$

Ex 7. Write the equation of a circle with the center at (8,4) and a radius with the endpoint (0,4).

(h,k)



on SAT you may not get a graph
you can draw your own!

Find radius (AKA distance)

distance is easy for this question because we just count...

$r = 8$

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

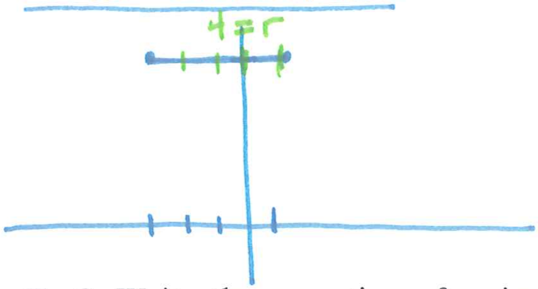
$(x-8)^2 + (y-4)^2 = 8^2$

$(x-8)^2 + (y-4)^2 = 64$

h, k

Ex 8. Write the equation of a circle with the center at (-3,9) and a radius with the endpoint (1,9). (In Alg. 2, SAT, and exams you may not be given graph paper)

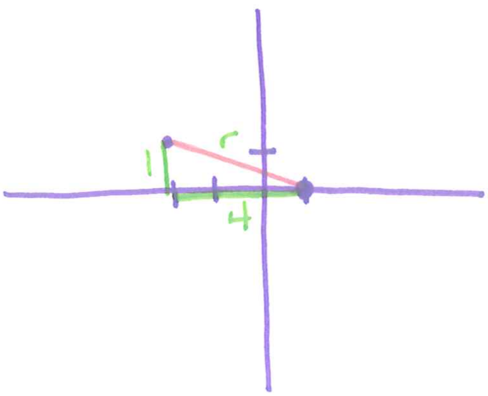
Find distance



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

$\boxed{(x+3)^2 + (y-9)^2 = 16}$

Ex 9. Write the equation of a circle with the center at (-2,1) and a radius with the endpoint (1,0). (In Alg. 2, SAT, and exams you may not be given graph paper)



$1^2 + 4^2 = r^2$

$1 + 16 = r^2$

$\boxed{\sqrt{17} = r}$

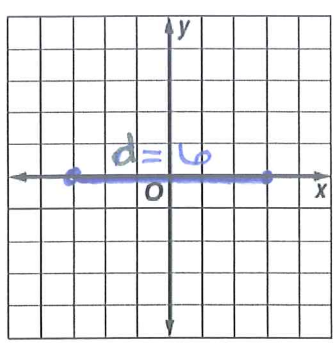
$(x - -2)^2 + (y-1)^2 = \sqrt{17}^2$

$(x+2)^2 + (y-1)^2 = 17$

Ex 10. Write the equation of a circle whose diameter has endpoints (-3,0) and (3,0).

$x_1\ y_1$ $\qquad$ $x_2\ y_2$

$d = 6 \xrightarrow{\div 2} \boxed{r=3}$



Now find center: midpoint $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-3+3}{2}, \frac{0+0}{2}\right) = \left(\frac{0}{2}, \frac{0}{2}\right) = (0,0)$

Center: (0,0)

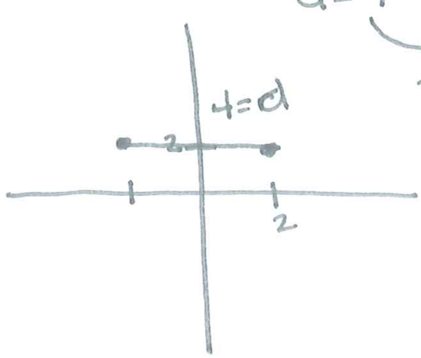
$(x-0)^2 + (y-0)^2 = 3^2$

$x^2 + y^2 = 9$

Ex 11. Write the equation of a circle whose diameter has endpoints (2,2) and (-2,2).

$x_1\ y_1$ $\qquad$ $x_2\ y_2$

$d=4 \xrightarrow{\div 2} r=2$



Find midpoint

$\left(\frac{2+(-2)}{2}, \frac{2+2}{2}\right) = \left(\frac{0}{2}, \frac{4}{2}\right)$

Center: (0, 2) $\boxed{r=2}$

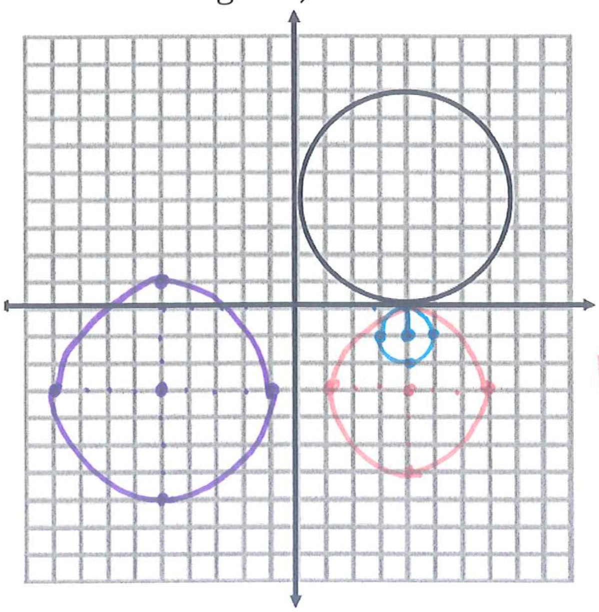
$(x-0)^2 + (y-2)^2 = 2^2$

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

Ex 12. The circle below is graphed from the equation $(x-4)^2 + (y-4)^2 = 16$.

a. Graph and write an equation of another circle which is tangent to the one given. W/ Shoulder partners define tangent.

b. Graph and write an equation of a third circle which is NOT tangent to the circle given, nor the circle from part a, and has a center at the origin.



a.) Center $(4,-1)$ $r=1$

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

$\boxed{(x-4)^2 + (y+1)^2 = 1}$

another example

Center: $(4,-3)$ $r=3$

$\boxed{(x-4)^2 + (y+3)^2 = 9}$

b.) Center $(-5,-3)$ $r=4$

$(x--5)^2 + (y--3)^2 = 4^2$

$(x+5)^2 + (y+3)^2 = 16$

Ex 13. The 2 circles $(x+5)^2 + (y+5)^2 = 25$ and $(x-5)^2 + (y-5)^2 = 25$ are graphed in the standard (x, y) coordinate plane below. Which of the following circles, when graphed, will be tangent to both circles.

I. $x^2 + y^2 = 1$ ← Nope

II. $x^2 + y^2 = 100$ ← Nope

III. $(x-5)^2 + (y+5)^2 = 25$ ← tangent to both!

A. I only

B. III only

C. I and III only

D. I, II, and III