Finding the Key Components of Circles

Given an equation of a circle, identify the key components: center and radius

Circle formula*:*

r(radius), center(h,k)

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

Example 1. Given an equation of a circle with no visible (h,k) values.

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

Knowing the basic formula of a circle allows us to compare each area and solve for what we need to know. We can start by solving for the radius. We can see that:

$$r^2=25.$$

$$\sqrt{r^2}=\sqrt{25}$$

$$r = 5.$$

Now we need to find the center point (h,k). We compare the equation we were given to the basic circle formula to find this. We have:

$$x^2 \Leftrightarrow (x-0)^2,$$

Thus, our h value must be 0.

Let's do the same with the y component.

$$y^2 \Leftrightarrow (y-0)^2,$$

Thus, our k value must be 0 also.

Now we know that our center (h,k) is at (0,0) and our radius is 5.

Example 2. Given an equation where both groups have a negative sign.

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

So, lets follow the same process as in Example 5. We can start by finding our radius.

$$r^2=17.$$

$$\sqrt{r^2}=\sqrt{17}$$

$$r=\sqrt{17}$$

Next, we can compare each of our groups to the patterns set by the basic circle formula. We have:

$$(x-1)^2 \Leftrightarrow (x-h)^2,$$

we can see that h = 1.

$$(y-2)^2 \Leftrightarrow (y-k)^2,$$

we can see that k = 2.

Now we know that our center (h,k) is at (1,2) and our radius is $\sqrt{17}$.

Example 3. Given an equation where groups may have a negative or positive sign.

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

We are going to follow the same step by step process.

$$r^2=4.$$

$$\sqrt{r^2}=\sqrt{4}$$

$$r=2$$

Next, we can compare each of our groups to the patterns set by the basic circle formula. We have:

$$(x-2)^2 \Leftrightarrow (x-h)^2,$$

we can see that h = 2.

$$(y+3)^2 \Leftrightarrow (y-(-3))^2 \Leftrightarrow (y-k)^2,$$

we can see that k = -3.

Now we know that our center (h,k) is at (2,-3) and our radius is 2.

You Try:

Examples:

1. $x^2+(y-2)^2=25$
2. $(x-2)^2+(y-3)^2=17$
3. $(x+2)^2+(y+3)^2=9$

Answers:

1. Center at (0, 2) and radius = 5
2. Center at (2,3) and radius = $\sqrt{17}$
3. Center at (-2, -3) and radius is 3.