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)

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

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.