Module 10: Circles
Topic 6 Content: Identifying Points the Lie on a Circle Transcript

Hey guys. Welcome to Geometry. This topic we're going to focus on how to identify points that lie on a circle. Your knowledge of the standard equation of the circle and your knowledge of coordinate methods is going to help you get through this topic. You ready to get started? Let's go.

Okay. Before we dive in to our lesson, I just want to review really quickly that standard equation of a circle. Given a circle with center at (h, k) and a radius of length r, we know that the standard equation of a circle is given by this equation. x minus h, that quantity squared plus y minus k, that quantity squared equals r squared.

Now we're going to use this equation to get through the next few examples. Take a look at this one. Given Circle D with center (7, 3) and a radius of the square root of 5, determine if the point lies on the circle. Okay. So how we want to get through this one is we first want to write out the equation for this circle. Then we'll easily be able to determine if (6, 0) is a point that lies on the circle.

Okay. So what I'm going to do here is I'm going to first write out that general form. X minus h that quantity squared, plus y minus k, that quantity squared, equals r squared. Our center is (7, 3), so that's h and k, and our radius is the square root of 5, so that's r. I'm going to first substitute those in here and get my equation. I would have x minus 7 squared, plus y minus 3, that quantity squared equals r squared

Now because r is the square root of 5, like we learned back in Algebra I, I'm just going to do a little scratch work off to the side. The square root of 5 squared equals the square root of 5 times the square root of 5 which is just 5.

Okay, so our r squared is just 5. We have the equation for this circle. I'm going to get rid of our scratch work here just so it doesn't get too crowded. Okay. Now that we know the equation of the circle is given by this, what we need to figure out is does (6, 0) lie on this circle? Now, if (6, 0) lies on the circle, this is what we'll happen. We are going to use (6, 0) as x and y. We're going to take the x and y coordinates of that point, and we're going to substitute them into this equation. Now when we substitute those coordinates, 6 and 0 into this equation, if the equation still remains true, then we know that (6, 0) is a point that lies on this circle.

Let me show you that substitution; show you how this works out. I'm actually going to get rid of this line, just so we can continue on referring to that equation. Remember (6, 0), that's our x and our y. So 6 minus 7 squared plus 0 minus 3 squared, we want to determine does this quantity, does this value equal 5. Okay. Let's see here. So 6 minus 7, that's negative 1, squaring that. Plus 0 minus 3, that's negative 3, and we're squaring that. So negative 1 squared. That's 1. Plus negative 3 squared, that's 9. 1 plus 9, that's 10, and 10 does not equal 5.

So because, when we substituted (6, 0) into the equation, the equation was no longer valid, it didn't remain true. We know that (6, 0) is not a point on the circle. The answer to this question is no. (6, 0) is not on our circle. Just to recap the work that we did here.

We used the center and the radius that we were given, and we wrote our standard equation for the circle. Then we used the point that we were given, (6, 0), we substituted that for x and y, those coordinates, and we used our algebra skills, we simplified, and determined did the equation remain true. We found that it did not, so that told us no, (6, 0) was not a point that was on our circle. Okay.

All right, now, keep that in mind, and go ahead and try this example. Press pause, take a few minutes, work your way through this one. Press play when you're ready to check your work. All right, let's see how you did here.

So here given Circle E with center (-2, 5) and a radius of 10, determine if the point below lies on the circle. So here our center's (-2, 5), so that's h and k, and r is 10. Let's get that general form written out first for our standard equation. Then we'll write the equation for this circle. So h and k are negative 2 and 5. So x minus negative 2, we're squaring that quantity. That's going to become an addition right there because we have a double negative. Y minus 5, and we're squaring that quantity. Equals r squared, which is 10 squared, so that's 100.

So here's our equation for this circle. Now we want to determine if (4, 13) is a point that lies on the circle. 4 is going to be x. 13 is going to be y. We're going to substitute into our equation here. We'll have 4 plus 2, we're squaring that quantity, and 13 minus 5, and we're going to square that quantity. We want to see does it equal 100. So 4 plus 2, that's 6, so 6 squared. 13 minus 5, that's 8, so 8 squared. 6 squared is 36. 8 squared is 64. 36 plus 64 is 100.

So it looks like, let's scroll back, our equation did remain true. When we substituted in (4, 13) in for x and y, that value or the value of the left side of our equation did equal 100. That tells us yes, that (4, 13) is a point that lies on the circle.

Okay. All right, good job on that one. Now take a look at this one. Given a circle with center (2, 1) and radius of 3, determine four points that lie on the circle. Okay, so here we're going to do our work actually on the coordinate plane in order to determine four points that lie on the circle.

The first thing we want to do is we want to plot the center. We want to plot that point. We know the center's at (2, 1), so (2, 1). Here's the center of our circle. We were also told that the radius is three units long. What I'm actually going to do is I'm going to determine two points, and then I'm going to leave you to determine the other two points.

Now the easiest way for me to determine some points that lie on my circle is just to count out the length of that radius and figure out a few points. Now remember on the coordinate plane when you're dealing with length, you can only count horizontally or vertically. Outside of that, you've got to involve some formulas in order to figure out exactly where your points are.

Here, I'm going to count out three units to the right. One, two, three. This is the point, one, two, three, four, five, one, so (5, 1). That's a point on my circle. And I'm going to count three

units up, one, two three. So this is two, one, two, three, four. So (2, 4) that's another point on my circle. (5,1), I've actually wrote it on the graph here, and then (2, 4). You can actually start to visualize what the circle's going to look like if you really follow how that curve's going to be.

What I want you to do is to get two more points on the circle. Go ahead and count out another horizontal length. Count out to the left this time. Then count down, starting from the center. Give me two more points that lie on this circle. Press pause while you do that. Press play when you're ready to check your work.

All right. Let's see how you did here. If I start on the center, and I count three units left, one, two, three, I am at the point (-1, 1). I'll just add that to the list over here. If I count three units down from the center, one, two, three, I am at (2, -2). I'll add that to the list over here.

You can actually get a visual of what your circle could start to look like here. But you see how we used the fact that we knew the center, and we counted out three units right, three units up, three units left, three units down, and figured out four points that lie on our circle. Okay, good job on that one.

All right, guys, you've reached the conclusion of this topic of how to identify points that lie on a circle. Hope you saw how your knowledge of the standard equation of the circle and your knowledge of coordinate methods helped you get through this topic. Bye.