Module 10: Circles
Topic 5 Content: Verifying the Properties of a Circle Transcript

Hi, guys. Welcome to Geometry. In this topic, we're going to focus on verifying the properties of a circle. Now your knowledge of the properties of the circle and your reasoning skills are going to come in handy for you during this topic. Are you ready to get started? Let's go.

Before we dive into the first example, let's just think a bit about what we've covered so far in regards to circles. Now we've studied some properties related to the angles and the arcs and the segments of a circle and what we're going to do here is use our reasoning skills to prove some of those properties. Let's take a look at this first example.

What value of X will prove the relationship between the lengths of intersecting secants? Let's think back to that property related to those lengths. I'm going to do a little rough sketch here just to jog our memory about exactly what that property is. Given intersecting secants and given the lengths, like we have here, we can determine what those lengths are by using this rule: B times the sum of A and B equals D times the sum of C and D [b(a+b)=d(c+d) 00:01:18]. A shorthand way that we will remember that property, if you remember, is the outside times the whole equals the outside times the whole

What we want to do in this example is determine the value of X that will prove that that relationship is true.

Let's set up that equation using this property and figure out what that value of X has to be. Let's get a little workspace here and make sure I've got my pen. So this figure right here we need the outside, which is 3 times the length of this whole segment, which is 7 plus 3, which is 10 equals the outside, which is 4, times the sum of this whole segment, which is X plus 4 [3(10)=4(X+4) 00:02:12]. Let's just clean this equation up and go ahead and solve for X. Three times 10, that's 30 equals, we're going to have to apply the distributive property here on the right, 4 times X, that's 4X and 4 times 4 that's 16. Get a little more room here. All right, let's subtract 16 from each side and 30 minus 16, that's 14 equals 4X. Now let's divide each side by 4 and we're going to switch to the calculator to get this answer because I believe it's going to be a decimal. We need 14 divided by 4. That is 3.5. Let's go back to our work, go full screen here. X equals 3.5. Going back to what we were asked to do in this example, if I scroll back up to the top, is we were asked to determine the value of X that would prove that this relationship is true.

Now we see that if X equals 3.5, the relationship is true for this example.

Let's move on to the next one. This one's going to be your turn, but I want to get you started a little bit to make sure you understand exactly what I mean on this one. Let's read through what we're being asked to do here. A line is tangent to a circle if and only if the line is perpendicular to a radius at the point of tangency. Prove that Line AB is tangent to Circle T at A.

Let's break this down a little bit. I'm going to get you started and then I'm going to let you finish up. What you're given here is actually another property of the circle, which says that a line is tangent to the circle if and only if at the point of tangency that line is perpendicular to a radius. What you're going to have to do here is you're going to have to use your reasoning skills and your knowledge of coordinate methods to figure out is this Radius TA

perpendicular to Line AB at point A? If you can use your reasoning skills and your skills on a coordinate plane to prove that this radius is perpendicular to this line at point A then you will have proven that this property is true, this property of the circles.

How I want you to give me the answer here is that I actually want you to write a paragraph proof. Basically what that is just explaining your thought process, explaining your reasoning in the form of a paragraph and once you've got that done you've proven or you've answered the question here. Go ahead and press pause, take a few minutes. Go ahead and get that paragraph written out, a paragraph that just explains the reasoning that you used to prove this property is true and then go ahead and press play when you're ready to check your work.

Let's see how you did here. What I'm going to do is I'm going to explain my reasoning, the reasoning that I used to prove this statement is true and I'm going to write down a few key points and if your paragraph includes my key points and kind of follows my line of thinking, then you know you're good to go on this example.

Let's dive in here. The first thing I notice here is that this radius, TA, intersects Line AB at A. That's one of those key facts I'm going to go ahead and write down. You just want to make sure that your paragraph also included that statement somewhere in there. Oops, let's get off of the highlighter here and get our pen. Radius TA intersects Line AB at A. I'll just number that number one. That's the first kind of key point you want to make sure your paragraph includes.

The next couple of things I'm noticing here is that Radius TA is vertical and Line AB is horizontal. That's another key point you want to make sure is included in your paragraph. Just write that right here. Radius TA is vertical, I'm going to abbreviate that and Line AB is horizontal. I'm going to abbreviate that also.

Because of what we know about vertical lines or vertical segments and their relationship to horizontal line or horizontal segments, we know that all vertical lines are perpendicular to all horizontal lines, right? Great, so let's go ahead and get that down. We'll say that radius, we'll just say TA this time, Segment TA is perpendicular to Line AB. Like I said, we know that because all vertical lines are perpendicular to all horizontal lines. Just make sure somewhere in your paragraph you included that key fact.

Also, what I'm going to actually add to this fact here is because we've already stated that Segment TA or Radius TA and Line AB intersect at A, we know that Radius TA is perpendicular to Line AB at A, at their point of intersection. What that tells us, if I go to my figure here and go ahead and write that in there, this radius is perpendicular to this line at Point A. At its point of tangency, basically at that point where that line intersects that circle. If you look here, you've basically got all the key facts that you need in order to prove that that property is true. As long as your paragraph included these three facts and also kind of followed my line of reasoning, followed the way I kind of thought through this problem, you're good to go on this problem. Good job on that one.

All right, guys, you've reached the conclusion of this topic on verifying the properties of a

circle. I hope you saw how your knowledge of some of those properties and your skills on the coordinate plane helped you get through this topic. Bye.