Module 10: Circles
Topic 3 Content: Finding the Lengths of Intersecting Secants and Tangents Transcript

Hi guys, welcome to Geometry. In this topic you're going to focus on how to find the lengths of intersecting secants and tangents. Your knowledge of circles and your algebra skills are going to come in handy during this topic. You ready to get started? Let's go.

Okay, now we've covered before in some of our earlier lessons that a tangent is a line that intersects a circle at exactly one point and a secant is a line that intersects a circle at two points. What we're going to figure out is how to determine the links of the segments of those lines. Here, given a situation like this, if you have a secant and a tangent that intersect in the exterior of a circle and you're given lengths a, b, and c as we have here. This is the rule that you can use to determine those lengths.

A squared or that tangent segment squared, the length of that equals c times b plus c. Now, I'm going to say that in a different way this time that may help that rule make a little more sense. The tangent squared equals the part of the secant that's in the outside of the circle times the whole secant. So tangent squared equals the outside times the whole. All right, so keep that rule in mind as we work through the next few examples.

Here, example one we're asked to find x. Let's go ahead and apply that rule and use it to help us set up an equation to solve for x. The length of that tangent segment squared so six squared, switch to my pen. My pen doesn't want to catch up to me here, there we go. So six squared equals the outside, so four times the whole, so x plus four. Okay, so let's simplify this and go ahead and solve this equation. Six squared, that's 36 equals, let's apply the distributive property on the right side. Four times x, that's 4x, four times four, that's 16. Let's keep going here. Let's subtract 16 from each side so we have 20 equals 4x and divide each side by four. So 5 equals x and you're all done with this one.

Okay, let me just review what we did, just help pull that all together. The length of our tangent squared so 6 squared equals four, so the part of that secant that's on the exterior of the circle, that length times the length of the whole secant so x plus four. We use that equation, we solve for x using our algebra skills and we found out that x equaled five. All right? Good gob with working on that. Let's go ahead and move onto this one.

We also have on this one a tangent and a secant intersecting in the exterior. We're just given the lengths in a different way this time. We're going to still use that same rule to help us solve for x. Our tangent squared, so five squared equals the outside part of that secant, so x times the whole secant which they actually gave us this time, it's 20 units. So the tangent squared, five squared equals the outside which is x times 20, the length of that whole segment. Let's go ahead and solve this equation. Five squared is 25 equals, x times 20, that's 20x. Let's divide each side by 20. Going to use the calculator on this one. We have 25 divided by 20, so 25 divided by 20, that is 1.25. Back to our work, 1.25 equals x and you're all done on that one.

Like I said earlier, they did give us the lengths in a different way this time but we still used our rule, the tangent squared equals the outside times the whole to set up our equation and solve for x. All right, good job on that one. Go ahead and try this one. Press pause, take a few minutes. Work through this one. Press play when you're ready to check your work. All right, let's see how you did on this one. Here you were asked to find ST, which I'm looking here,

that's the length of this whole secant down here. The first thing I'm going to do is use the rule to set up an equation, solve for x, then I'll be able to figure out what the length of ST is.

Our tangent squared, I think I'll just slide this over just a little bit and slide it up just to make sure I have enough space to do my work over here. Our tangent squared, so that's 10 squared equals the outside so that's five times the whole so x plus five. So 10 squared, that's 100 equals, let's use the distributive property over here. Five times x, that's 5x, five times five, that's 25. Let's go ahead and subtract 25 from each side. Little more room to work here. All right, that cancels out. 75, 100 minus 25 is 75 equals 5x.

Divide each side by five and just want to make sure my mental math is right here. 75 divided by five, let's go ahead to the calculator. 75 divided by five is 15, yes.

Let's go back to our work. So here 15 equals x. Now, don't be tempted to stop there. That just tells us what x is, but if you recall, I'm going to scroll back up to the top. We were asked to find ST. Now, ST equals SB plus BT, right? We have to add the pieces together, figure out the whole and do that right underneath here. So ST equals SB plus BT. SB, that's x which we just solved for and we found that x was 15, right? So 15 plus BT which is five, 15 plus five, that's 20. So ST equals 20 and you're all done on that one.

Now, just to pull that all together let's go ahead and review really quickly. We used our rule to set up our equation. The tangent squared equals the outside times the whole. We set up our equation, we solve for x, we figured out that x equaled 15. Once we knew that we were able to substitute that value in for x and figure out that ST equaled 20. All right, good job on that one. All right guys, we've reached the conclusion of this topic of how to find the lengths of intersecting secants and tangents. I hope you saw how your knowledge of circles and your algebra skills came in handy during this topic. Bye.