

Module 10: Circles

Topic 3 Content: Finding the Lengths of Intersecting Secants Transcript

Hi guys. Welcome to Geometry. In this topic we're going to focus how to find the lengths of intersecting secants. 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. So you learned earlier that a secant is a line that intersects a circle at two points. Now part of that line, of course, consists of segments and we're going to focus on finding the lengths of those segments of that secant. So here we have two secants intersecting in the exterior of a circle and given the situation and given lengths A and B and C and D. This is the rule that you're going to use to determine the lengths of those segments. So B times the sum of A and B equals D times the sum of C and D. I'm going to say that again. I'm going to say it a different way this time that may help it make a little more sense.

Notice that in this part right here, our top secant, we have a part of the secant that's in the interior of the circle and a part of the secant that's in the exterior of the circle. Or you could say we have a part of the secant that's on the inside of the circle and a part that's on the outside. So another way to think of this rule to help you remember it is you can think of it as the outside part times the whole secant equals the outside part times the whole secant. So outside time the whole equals the outside times the whole. All right? Now keep that rule in mind as we work through the next few examples.

Let's take a look at the first one here. Let me make sure I have my pen. All right. So here we're asked to find X and we're given the lengths of two secants that intersect in the exterior of the circle. So we're going to use that rule to help us set up an equation and solve for X. Remember, outside times the whole equals outside times the whole. So I'll say 5 times ... So this whole length here is 6 plus 5, which is 11. So 5 times 11 equals the outside. So that's 4 times X plus 4. Because that's my entire length right down here, this secant. All right? So let's go ahead and solve this equation and we'll figure out what X is. So 5 times 11, that's 55, equals ... I'm going to use the distributive property over here. So 4 times X, that's 4X. 4 times 4, that's 16. Keep solving here. Let's subtract 16 from each side. I think I'll go ahead and switch to the calculator to finish out the rest of this one because I think we're going to end up at a decimal value if it's going to turn out how I think it is.

So we have 55 minus 16. So let's get that. 55 minus 16, 39. Yep and it does look like it is going to end up being a decimal here. So 39 equals 4X. Then let's go ahead and divide each side by 4. I'm going to switch to the calculator to do that part. So we have 39 divided by 4. Get our calculator up. So 39 divided by 4, 9.75. So let's get that down on our work here. So let's see. 9.75 equals X. And we're all done with that one. So let's just recap just to review what we did. We used our rule to set up the equation. The outside times the whole, that gave us our left side, equals the outside times the whole, that gave us the right side. We solved our equation, we used our algebra skills to do that and we ended up at 9.75 equals X. And we wrapped that one up. All right?

Okay, now let's go ahead and try the next one. Okay, so here we're asked to find GT. So we actually want to find the length of this segment, this segment of this secant. So let's go ahead and start out by using our rule that'll let us set up an equation, we'll solve for X, and then we'll be able to figure out the length of segment GT. All right? So let's see here. The outside times the whole. So that is 2 times 2 plus X equals the outside. So that's 3 times the whole.

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So that's 3 plus 5 which is 8. Let's go ahead and use the distributive property on the left side. 2 times 2, that's 4. 2 times X, that's 2X, equals 3 times 8, that's 24. Let's subtract 4 from each side. So 2X equals 20. Divide each side by 2. X equals 10.

Now, remember, we're not done just yet because we were asked to find the length of segment GT. And GT equals GL plus LT. Go ahead and write that down We're adding the parts of that segment together to figure out the length of that whole segment, GT. So GT equals GL plus LT. So that means that GT will equal 2 plus X, which now we know is 10. So 2 plus 10, which is 12. So GT is 12. And you're all done with that one. Now just to recap, just to pull that all together. We used our rule that the outside times the whole, which gave us the left side, equals the outside times whole, that gave us the right side. We used our algebra skills, we solved this equation, and we ended up at X equals 10. Once we knew that, we were able to go back to our segment here. We found that GT equals GL plus LT. So we have 2 plus 10, adding those lengths together, and we figured out that GT equals 12. All right? Good job on that one.

Now I want you to go ahead and try this one. So press pause, take a few minutes, work your way through this, press play when you're ready to check your work.

All right. Let's see how you did here. So let's use our rule first to set up our equation, solve for X, and we're asked to actually determine EC. So the length of this segment here. So the outside, so that's 9, times the whole. So that's 5 plus 9, which is 14, equals the outside, so that's 7, times the whole, which is X plus 7. 9 plus 14. I'm going to go ahead and put that in the calculator. Let's see what that is. So 9 times 14, that is 126. Let's go back to our work here. So we have 126 equals ... And we're going to use the distributive property on the right side. So 7 times X, that's 7X. 7 times 7, that's 49. Now let's subtract 49 from each side. So 126 minus 49. I'm going to go back to the calculator for that. So 126 minus 49, that's 77. Let's go back to our work. So 77 equals 7X. Now we'll divide each side by 7 and we have that 11 equals X.

Now don't be tempted to stop there because, remember, you were asked to determine EC and EC equals ED plus DC. So let's go ahead and figure out what that is, then we'll know the length of EC. And I'll switch to blue ink here. So EC equal ED plus DC. So ED equals X, which now we know is 11. So that's 11 plus 7, because DC is 7. And 11 plus 7, that's 18. So EC equals 18. And you're all done with that one. Just to recap, just to pull that all together. We started out by using our rule to set up the equation that the outside times the whole equals the outside times the whole. We used our algebra skills, we solved for X, we figured out that X equaled 11. Once we knew that, we were able to substitute that value in there for ED and we landed at the fact that EC equals 18. All right, good job on that one.

All right guys. We've reached the conclusion of this topic on how to determine the lengths of intersecting secants. I hope we saw how your knowledge on circles and your algebra skills came in handy during this topic. Bye.