

Module 6: Congruent and Similar Triangles

Topic 2 Content: Proving Triangles Congruent by Angle-Side-Angle Postulate Transcript

Hi, guys. Welcome to Geometry. This topic is going to focus on how to prove triangles congruent by Angle-Side-Angle. Your knowledge of congruent figures is going to come in handy during this topic. Ready to get started? Let's go.

Before we dive into angle side angle, I want to take a minute to review congruent figures in general. Given ... In this case we have two triangles. If every pair of all your corresponding angles are congruent, and your corresponding sides are congruent, then you know that you have a pair of congruent figures. In the case of these two triangles, I see that angle F is congruent to angle S . Angle C is congruent to angle N . Angle D is congruent to angle M . I have all of my corresponding angles congruent. Then I also see from these congruent marks that FC is congruent to SN . CD is congruent to NM . FD is congruent to SM . I have three pairs of corresponding sides that are congruent.

What I can do now is write a congruent statement to describe the relationship between these triangles ... Let me make sure I have my pen ... I could say, for example, triangle FCD is congruent to triangle SNM . I did have to make sure when I wrote that congruent statement that I matched up my congruent parts. From looking at this statement, for example, I could tell that angle F is congruent to angle S . I could tell that FC is congruent to SN . I could also tell that FD is congruent to SM . You just have to make sure, when writing that statement, that you match up congruent parts. There are several other statements you could have written that would have also been true. There are different ways that you could have aligned those parts. Depending on where you started when you named the triangle. For example, if I refer to this triangle as triangle DFC then I would have to say that triangle DFC is congruent to triangle MSN . Okay? Again, there are several other statements or several other ways that I could have written that congruent statement.

Now that you're a little familiar with congruent figures I want to talk to you a little bit about Angle-Side-Angle. What Angle-Side-Angle is, is it's like a short cut that you can use in order to determine if you have a pair of congruent triangles. It saves you from having to do the work of proving that you have three pairs of corresponding angles that are congruent and three pairs of corresponding sides that are congruent. With Angle-Side-Angle, if you can show that you have two pair of corresponding angles that are congruent and one pair of included sides that are congruent, then you can conclude that you have a pair of congruent triangles by Angle-Side-Angle.

I'm sure you heard me say, "included side." Let me make sure you understand what I mean by that. You can think of an included side as the side that lies in between two angles. The two given angles in your triangle. For example, in this triangle I'm given that angle A is

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congruent to angle D in the other triangle and angle B is congruent to angle E . I'm going to refer to angle A and angle B as my given angles because I'm given some information about those angles.

In this triangle, the side that lies between these given angles is side AB . In this triangle, the side that lies between these given angles is side DE . We refer to those sides as included sides because they're included between our given angles. Okay? In the case of Angle-Side-Angle, all you need to show is that you have two pair of corresponding angles that are congruent and one pair of included sides that are congruent. Okay?

Now that you're a little familiar with Angle-Side-Angle, let's go ahead and start applying it in these next few examples. Okay. What I'm going to show you ... I'm going to give you a few different pairs of triangles, and you're going to be given some information about those triangles. What we're going to figure out is: What's the additional information that we need in order to prove that those triangles are congruent by Angle-Side-Angle? Okay?

Let's look at that first example. Here I see I'm given two triangles and they meet. They intersect right at C . I'm given some information about the angles here. I can tell that angle A is congruent to angle E and I can tell that angle B is congruent to angle D . Let me shift a few things around here so we can get a little room to the right to write a few things. Okay? Okay. In regards to Angle-Side-Angle, I was given a relationship between one pair of angles. I can tell these angles are congruent. I can also tell that these angles are congruent. What I need to figure out ... I need to determine where's that side relationship need to be? Where's that included side in each of these triangles, that if I knew that they were congruent, I could show that these triangles were congruent by Angle-Side-Angle.

Looking at my triangle on the left I can see, okay, these are my given angles in this triangle. AB is the side that I need. That's going to be the included side in that triangle. In my triangle on the right angle D and angle E are the given angles so DE is the side that I need. That's the included side in the other triangle. Another way you can think about it, when you're trying to figure out where the included side is, is the marks in each triangle. They're all going to lie along the same side of the triangle when you're using Angle-Side-Angle to prove your triangles are congruent. Here all my marks are on the same side, right? I can use that to help me figure out that AB 's the included side that I need. Here, all the marks are the same side. I can use that to help me figure out that DE 's the included side that I need.

If in this triangle, I knew that AB was congruent to DE , I'd be able to prove that those triangles were congruent by Angle-Side-Angle. Okay? Good job on that.

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Let's look at the next one. Here we have another pair of triangles here. I notice I have the triangle on the top and that it shares a side with the triangle on the bottom. Okay? Let me again move some things around here. Let's shift this a little bit to the left. Okay. What I'm going to do first in this case, because I think it may help you see what's going on here, is I'm going to separate these triangles. Okay?

I'm going to redraw them so you can look at them separately. That really may help you figure out what we need in this case. I'm going to copy triangle EFG . I'm going to grab the marks also. Then triangle EGH and I'm going to get those marks. Okay. Here ... Again, we're trying to figure out what we need in order to use Angle-Side-Angle to prove these triangles are congruent. Here, Angle-Side-Angle. I'm given that angle F is congruent to angle H , so I have an angle relationship. I'm told that FG is congruent to EH so I have a side relationship. What I need, is I need another angle relationship. I have to make sure that the angle relationship that I'm going to figure out, forces FG and EH to be an included side in each triangle.

You remember what we mentioned before about how you could use the fact that the congruent marks would all lie on the same side of your triangle when you're trying to determine what's that extra relationship that you need? I'm going to use that fact to help me figure out the answer to this one. I see angle F is marked, side FG is marked, so here's the additional angle relationship I need in this triangle. Here I see angle H is marked, EH is marked, so here's the extra angle relationship that I need in this triangle.

Now, I'm going to move over here and I'm going to put these marks on the figure that we were given before we actually write out that congruent statement that we need for those two angles. Now notice here. What I can't say when I write that statement ... I can't just write down that angle G is congruent to angle E because if you look there are two angles that share G as the vertex. I have this angle right up top here, angle FGE . Then I have this angle on the bottom here, angle HGE . I can't just say angle G is congruent to angle E because it won't specify exactly which angle G I'm referring to. When we write down that angle relationship that we need, we're just going to make sure that we write three letters to describe those angles. Okay? Just get a few things out of our way here because it's getting a little crowded. Let's get rid of our kind of scratch work right there. We'll write that angle relationship right in that space.

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What we need is we need angle FGE to be congruent to angle HEG . If we had this angle relationship we'd have enough to show that these triangles are congruent by Angle-Side-Angle.

It is your turn. I'm going to present you with another problem similar to what we did before but it's going to be multiple choice. You're going to be presented with two triangles: triangle MLK and triangle MJK . I want you to select the relationship that if you ... If that were true. If that relationship were true, that you could show those triangles were congruent by Angle-Side-Angle. Okay? Go ahead and take a look at this. Pull it apart, dissect it, take your time and work your way through this problem. When you're ready to check your answer go ahead and press play.

Let's see how you did with this one. I'm going to run through all the answer choices and see, what's the one that I need to show Angle-Side-Angle? If JM were congruent to ML ... Actually before I even jump and get that, I notice that these triangles share a side. They share MK . I'm going to go ahead and mark MK congruent to itself. Okay? Let's see here. JM congruent to ML . If JM were congruent to ML , I actually wouldn't have Angle-Side-Angle. I wouldn't have two pair of corresponding angles that were congruent and an included side that was congruent another included side in the other triangle. Just to roughly show you that, I'm going to just roughly sketch that. Take a look at the marks here. Notice, you have two pair of corresponding sides that are congruent and a pair of included angles that are congruent. This wouldn't show me Angle-Side-Angle, and that's what I'm going for with this.

"A" is not going to be the one I'm looking for. Let's erase this and let's try "B" out. Get that out of the way. Okay. If angle MJK were congruent to MLK . MJK , that's this angle. If it were congruent to angle MLK . MLK , that's this angle. We already said we know that that angle's congruent to itself, right? Let's break that apart and let's take a look at those marks. Okay so let's sketch that underneath. We have this angle, this angle, this side. This angle, this angle, this side. Okay. Notice here, you do have two pairs of corresponding angles that are congruent but I don't have an included side in this triangle, congruent to the included side in this triangle. Angle B , or answer choice "B", wouldn't show me that these triangle are congruent by Angle-Side-Angle, right? It's not "B."

Process of elimination, you know it's "C," but you know math teachers, we always want to see you prove it so let's actually show it. Has to be "C." Okay, get the pen back. Take a look at this one. Let's get those marks out of the way too so we can look at fresh marks on this triangle. We do know that MK congruent to itself. That mark's there to stay. Angle JKM .

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$\angle JKM$, so up here. Congruent to angle $\angle LKM$. $\angle LKM$, up here. Now I'm going to break that apart and let's take a look at the marks. You might already see it with them together, with those triangles together and sharing that side, but just in case let's take a look here. Okay. Notice here I have two pair of corresponding angles that are congruent and I have a pair of included sides that are congruent. Remember I mentioned, you can think about it as you are marks all lie on the same side of the triangle. It is answer choice "C" that will show you Angle-Side-Angle, okay?

All right. Good job on that. You've reached the conclusion of this lesson on how to prove triangles congruent by Angle-Side-Angle. I hope you saw how your knowledge of congruent figures really helped you get through this lesson. Bye.