Module 2: Angles Formed by a Transversal Intersecting Parallel Lines

Topic 2 Content: Practical Problems Involving Angles Formed by a Transversal Intersecting Parallel Lines Transcript

Hi, guys. Welcome to Geometry. This topic's going to focus on practical problems. You may have heard of practical problems before. A lot of times they've been called *word problems*, or *real-world problems*. You're going to apply your knowledge of angles formed by a transversal intersecting parallel lines to answer these next few practical problems. You ready to get started? Let's go.

Okay, so let's dive right in and take a look at this first example. What value of *x* will ensure that the guardrails are parallel? I see here we have a hill of some sort, and we have some guardrails running up the hill or down the hill, depending on how you looked at it. You have some vertical posts in that hill also. We need to determine what value should *x* have in order to guarantee that these guardrails are parallel.

Now, to answer that question, you're actually going to use your knowledge of angles formed by a transversal intersecting parallel lines. If you look closely, you can find this diagram in the picture. Now, the guardrails you might not be too familiar with, but you've seen that diagram a time or two, right? We've seen it like this. If you remember where angle 4 ... Let's actually just bounce back to it ... that angle that's 84 degrees, and where *x* was, these are actually consecutive interior angles. Now, bouncing back forward, think about what you remember about consecutive interior angles. Recall that if you have two parallel lines intersected by a transversal, then your consecutive interior angles are supplementary.

Well, guess what. The converse of that is also true. If you have consecutive interior angles that are supplementary, that means that you have a transversal that intersected a pair or parallel lines. In other words, if I can ensure that angle 4 and angle 6, or that angle 3 and angle 5, are supplementary, then I can guarantee you that lines *c* and *d* are parallel to each other. Similar logic exists when dealing with a few other angle pairs. For example, alternate interior angles. If you have alternate interior angles that are congruent, that means you have a pair of parallel lines that were intersected by a transversal. Again, for alternate exterior angles. If you can prove that your alternate exterior angles are congruent, then you can show that you have two parallel lines that were intersected by a transversal. Again, for corresponding angles. If you can prove that your corresponding angles are congruent, then you can prove that you have two parallel lines that were intersected by a transversal.

Now, keep all that in mind, all those relationships in mind as we look back to our problem with the guardrails. Remember we said ... going to switch ink here. Go back to black. If I can guarantee that these angles are supplementary, because we've said that we know they're consecutive interior angles, if I can guarantee they're supplementary, or if I can ensure that they are, then I can also guarantee you that those guardrails are going to be parallel. Let's just do a little math here. Let's do it over on this side. 180 minus 84. Old school, going to borrow from the 8, carry over. 96 degrees. If *x* is 96, then these guardrails are absolutely going to be parallel.

You saw how you used your knowledge of those angle pairs and parallel lines in order to answer this practical problem? Alright. Let's stay on the ball with that and take a look at this next example. What value of *x* will ensure that the traffic lanes are parallel? Look at my diagram here. Have a lane of traffic driving north, one driving south, and I have the train track crossing through diagonally. Let's think about this. Now, it appears to be just lanes of traffic and a railroad track, right? Knowing what we do, we can see the geometry in this. We see that we actually are trying to force parallel lines and a transversal, right? We know a few angle relationships that exist when we have this particular situation.

Now, it may be a little difficult for you to see that red over here so I'm actually going to copy that diagram right here. Do a little scratch work over here in the grassy area. Get my pen back. All right. What I have looks something like this. I have my 162 right here, and then I have *y* right here. Looking at our scratch work over here, do you notice how we're in the interior of these lines that we're trying to force to be parallel, and we're on opposite sides of our transversal? Interior of the parallel lines, opposite sides of the transversal, we're trying to force a pair of alternate interior angles to be congruent, because you know that if alternate interior angles are congruent, that means you have 2 parallel lines intersected by a transversal. If this angle here is 162 degrees, I'm going to also need *y* to equal 162, because if it is, then those alternate interior angles are congruent and these lanes of traffic are parallel.

Now, keep all that knowledge in mind, and I want you to try this next problem. Take a look at this mirror, and I want you to figure out: What does *x* need to be in order to guarantee that the top of this frame is parallel to the bottom of this frame? Pause, take a few minutes, answer that, and when you're ready to check your answer, press play.

Alright. Let's see what you got. Going to move on to this so I have a little workspace here. I'm going to switch to red ink. What I'm going to try to do first is find that diagram. Find those parallel lines intersected by a transversal. I see I've got the top of this frame, the bottom of this frame, and I can treat the side of it like my transversal. If I look here, I'm in the interior of the top and the bottom on the frame, and I'm on the same side of the transversal. Here I have a pair of consecutive interior angles. Want to abbreviate that. If I could ensure that those angles are supplementary, then I can guarantee you that the top of that frame will be parallel to the bottom of the frame. Let's see what *x* would need to be to make sure those angles are supplementary. 180 minus 91, do a little more borrowing here, old school math. 10 minus 1 is 9, 17 minus 9 is 8. If I can force *x* to equal 89, then I can guarantee you the top and the bottom of that frame are going to be parallel. Alright. Good job on that.

Alright. You've reached the conclusion of your topic on practical problems involving angles formed by a transversal intersecting parallel lines. I hope you saw how you can apply geometry to some real world situations. Bye.