Unit 1 Family Support Materials

Convincing Arguments

In this unit, your student will continue learning about triangles and proof. Triangles are the building blocks of geometric figures. Once students understand triangles, they can apply their understanding to quadrilaterals and other shapes. Students start out with some experiments. You can recreate these experiments at home with different-sized pieces of linguine.

- If I know two side lengths in a triangle, what are some possible lengths for the third side?
- If I change the length of one side of a triangle, what happens to the angle opposite that side?

Students use these experiments to collect information. If that information leads to a general conclusion, students make a *conjecture*. Here is one conjecture: The length of any side of a triangle must be less than the sum of the other two sides' lengths. We can try dozens of possible triangles, and one side will always be smaller than the sum of the other two. But how can we be certain that this conjecture works for every possible triangle anyone could ever make? For that, we need a proof that relies on precise definitions.

Proof is how mathematicians take a conjecture, a claim that seems to be true, and turn it into a theorem, a claim we are certain is true. To prove that something is true, every statement must be backed up with a reason. In a previous grade, students started building a list of reasons they can use for proofs. Students will continue to use those reasons and add to their list of reasons this year. This list includes definitions, assumptions, and theorems students have already proven. Proofs in geometry work like court cases in which lawyers use evidence and case law to make an argument. Proofs also work like arguments at home. Next time your student says you need to buy them something, ask them to prove it. They could use the definition of "need" and provide convincing evidence of that need, or they might have to adjust their conjecture and provide convincing evidence they deserve something they want instead.

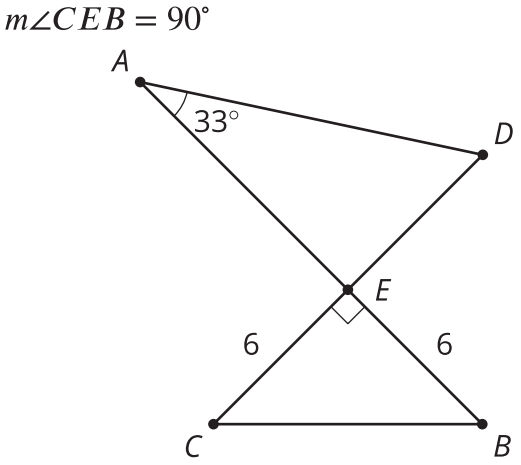
Here is a task to try with your student:

1. Andre is trying to build a triangle with side lengths 2 centimeters, 8 centimeters, and 10 centimeters. Kiran says that those side lengths will not form a triangle. Do you agree or disagree with Kiran? Explain your reasoning.

2. Here is a figure with two triangles formed with intersecting lines.

   a. What is the longest side in triangle AED? Explain your reasoning.

   b. What is the smallest angle in triangle CEB? Explain your reasoning.



Solution:

1. Agree. Sample reasoning: The 2-centimeter and 8-centimeter sides would have to lie flat to reach the endpoints of the 10-centimeter side. If all three segments lie flat, they create a straight line, not a triangle.
2. a. AD. Sample reasoning: Using vertical angles, angle AED is a right angle and the largest in the triangle, so side AD must be the longest.

   b. Angles C and B are both the smallest. Sample reasoning: Since CE and EB are the same length, the angles across from them in the same triangle must be the same size. If the angles weren't the same size, then one angle would have to be bigger. If one angle were bigger, then the side opposite that angle would have to be longer than the other.