

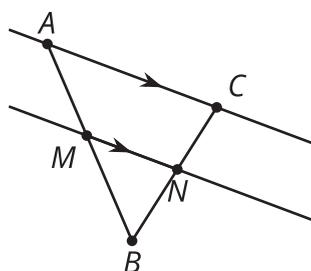
Lesson 11: Splitting Triangle Sides with Dilation, Part 2

- Let's investigate parallel segments in triangles.

11.1: Notice and Wonder: Parallel Segments

What do you notice? What do you wonder?

$$\overleftrightarrow{AC} \parallel \overleftrightarrow{MN}$$



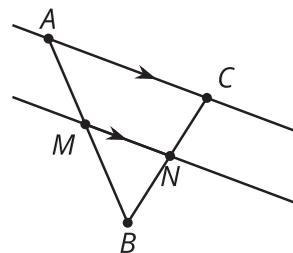
11.2: Prove It: Parallel Segments

Does a line parallel to one side of a triangle always create similar triangles?

1. Create several examples. Decide if the conjecture is true or false. If it's false, make a more specific true conjecture.

2. Find any additional information you can be sure is true. Label it on the diagram.

$$\overleftrightarrow{AC} \parallel \overleftrightarrow{MN}$$



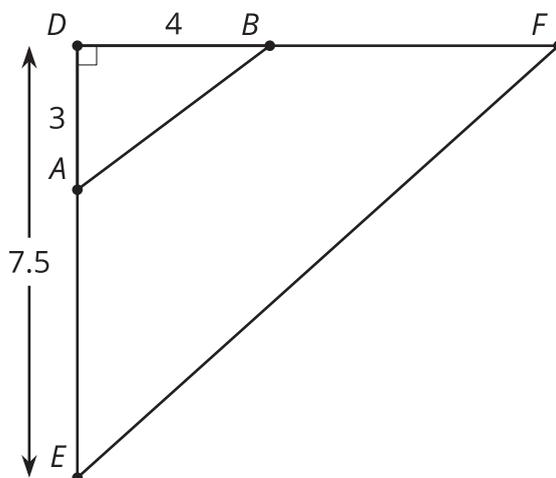
3. Write an argument that would convince a skeptic that your conjecture is true.

11.3: Preponderance of Proportional Relationships

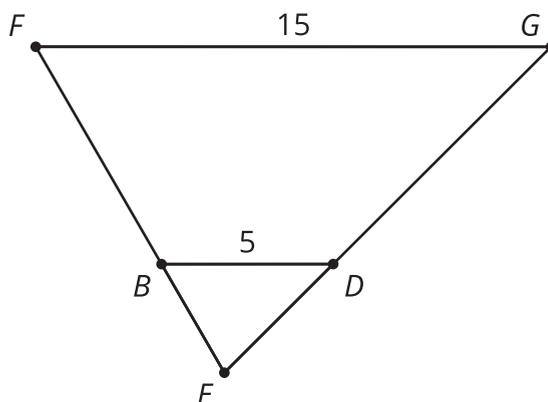
Find the length of each unlabelled side.

1. Segments AB and EF are parallel.

$$\overline{AB} \parallel \overline{EF}, \overline{AD} \perp \overline{DB}$$

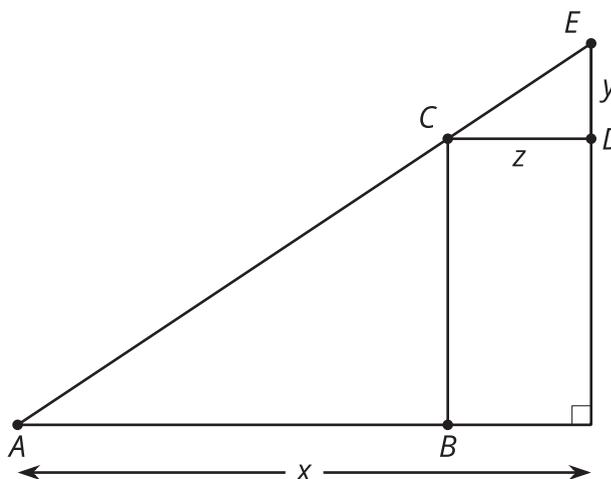


2. Segments BD and FG are parallel. Segment EG is 12 units long. Segment EB is 2.5 units long.
 $\overline{BD} \parallel \overline{FG}$



Are you ready for more?

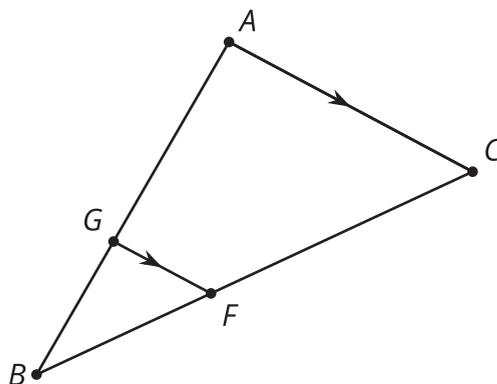
Find the lengths of sides CE , CB , and CA in terms of x , y , and z . Explain or show your reasoning.



Lesson 11 Summary

In triangle ABC , segment FG is parallel to segment AC . We can show that corresponding angles in triangle ACB and triangle GFB are congruent, so the triangles are similar by the Angle-Angle Triangle Similarity Theorem. There must be a dilation that sends triangle GFB to triangle ACB , and so pairs of corresponding side lengths are in the same proportion. Then we can show that segment GF divides segments AB and CB proportionally. In other words, $\frac{BG}{GA} = \frac{BF}{FC}$.

$$\overleftrightarrow{FG} \parallel \overleftrightarrow{AC}$$



For example, suppose G is $\frac{2}{3}$ of the way from A to B and F is $\frac{2}{3}$ of the way from C to B . Then if $BA = 9$ and $BC = 12$, we know that $GA = 6$ and $FC = 8$. What will BG and BF equal? Since $BG = 3$ and $BF = 4$, we know that $\frac{3}{6} = \frac{4}{8}$ and can show that $\frac{BG}{GA} = \frac{BF}{FC}$.

This argument holds in general. A segment in a triangle that is parallel to one side of the triangle divides the other 2 sides of the triangle proportionally.