



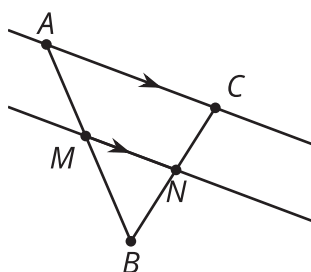
# Splitting Triangle Sides with Dilation (Part 2)

Let's investigate parallel segments in triangles.

## 11.1 Notice and Wonder: Parallel Segments

What do you notice? What do you wonder?

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



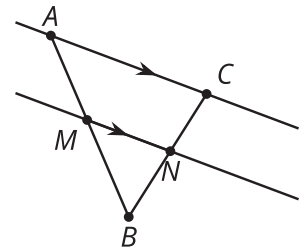
## 11.2 Prove It: Parallel Segments

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 that you can be sure is true.  
Label it on the diagram.

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

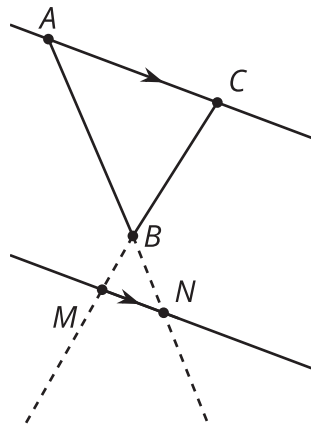


3. Write an argument that would convince a skeptic that your conjecture is true.

### Are you ready for more?

If the line parallel to one side of the triangle does not intersect the other sides of the triangle, does it still create a similar triangle if the sides of the original triangle are extended? Modify your reasoning from this activity to show that triangle  $ABC$  is similar to triangle  $NBM$ .

$$\overleftrightarrow{AC} \parallel \overleftrightarrow{NM}$$



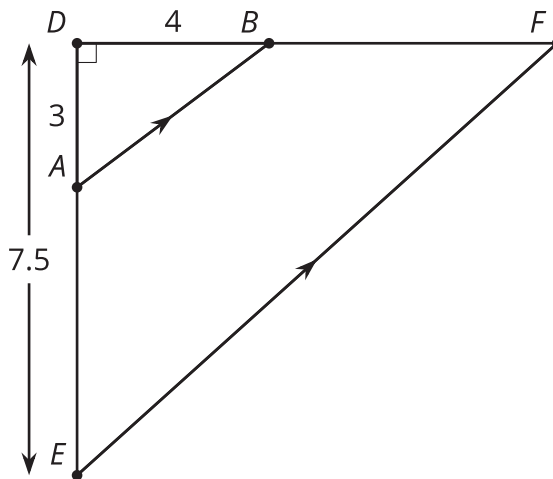
## 11.3

## Preponderance of Proportional Relationships

Find the length of each unlabelled side.

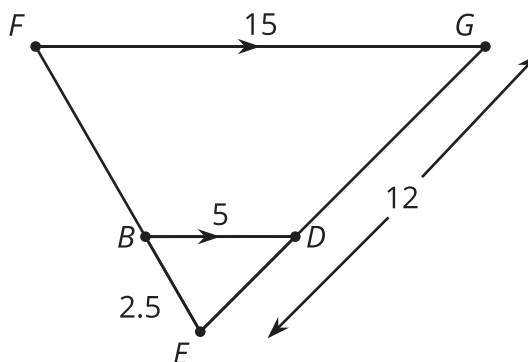
1. Segments  $AB$  and  $EF$  are parallel.

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



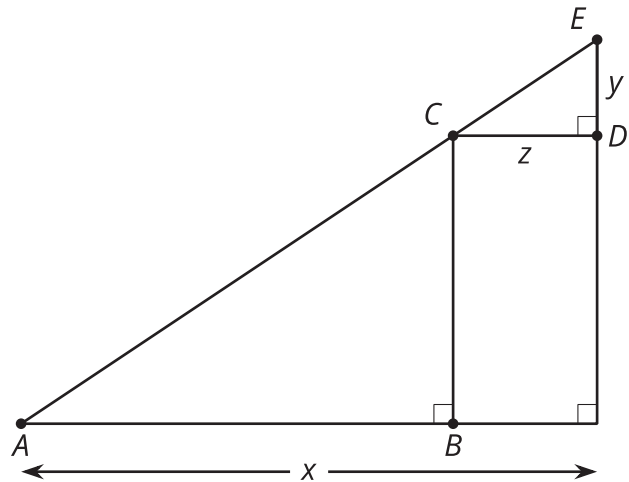
2. Segments  $BD$  and  $FG$  are parallel. Segment  $EG$  is 12 units long. Segment  $EB$  is 2.5 units long.

- $EF =$   $\overline{BD} \parallel \overline{FG}$
- $ED =$



## Are you ready for more?

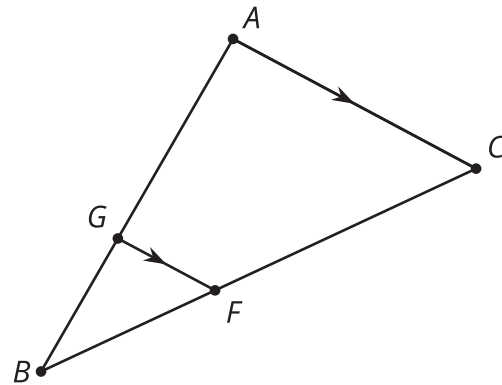
Find the lengths of sides  $CE$ ,  $CB$ , and  $CA$  in terms of  $x$ ,  $y$ , and  $z$ . Explain or show your reasoning.



## Lesson 11 Summary

In triangle  $ABC$ , segment  $GF$  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,  $\frac{BG}{GA} = \frac{BF}{FC}$ .

$$\overline{FG} \parallel \overline{AC}$$



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 two sides of the triangle proportionally.