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Unit 2, Lesson 9: Side Length Quotients in Similar Triangles

Let's find missing side lengths in triangles.

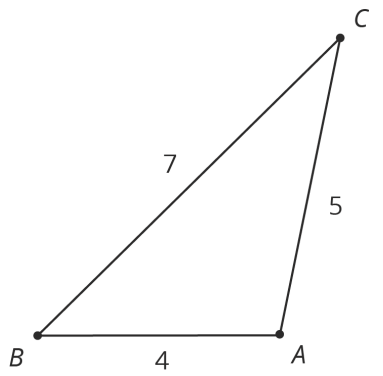
9.1: Two-three-four and Four-five-six

Triangle A has side lengths 2, 3, and 4. Triangle B has side lengths 4, 5, and 6. Is Triangle A similar to Triangle B?

9.2: Quotients of Sides Within Similar Triangles

Your teacher will assign you one of the three columns in the second table.

Triangle ABC is similar to triangles DEF, GHI, and JKL. The scale factors for the dilations that show triangle ABC is similar to each triangle are in the table.



triangle	scale factor	length of short side	length of medium side	length of long side
ABC	1	4	5	7
DEF	2			
GHI	3			
JKL	$\frac{1}{2}$			

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triangle	(long side) ÷ (short side)	(long side) ÷ (medium side)	(medium side) ÷ (short side)
ABC	$\frac{7}{4}$ or 1.75		
DEF			
GHI			
JKL			

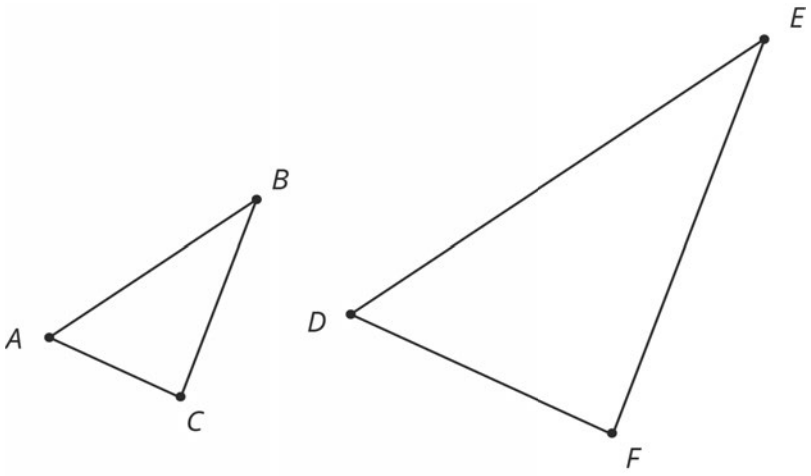
1. Find the side lengths of triangles DEF, GHI, and JKL. Record them in the first table.

2. For all four triangles, find the quotient of the triangle side lengths assigned to you and record them in the second table. What do you notice about the quotients?

3. Compare your results with your partner's and complete your table.

Are you ready for more?

Triangles ABC and DEF are similar. Explain why $\frac{AB}{BC} = \frac{DE}{EF}$.



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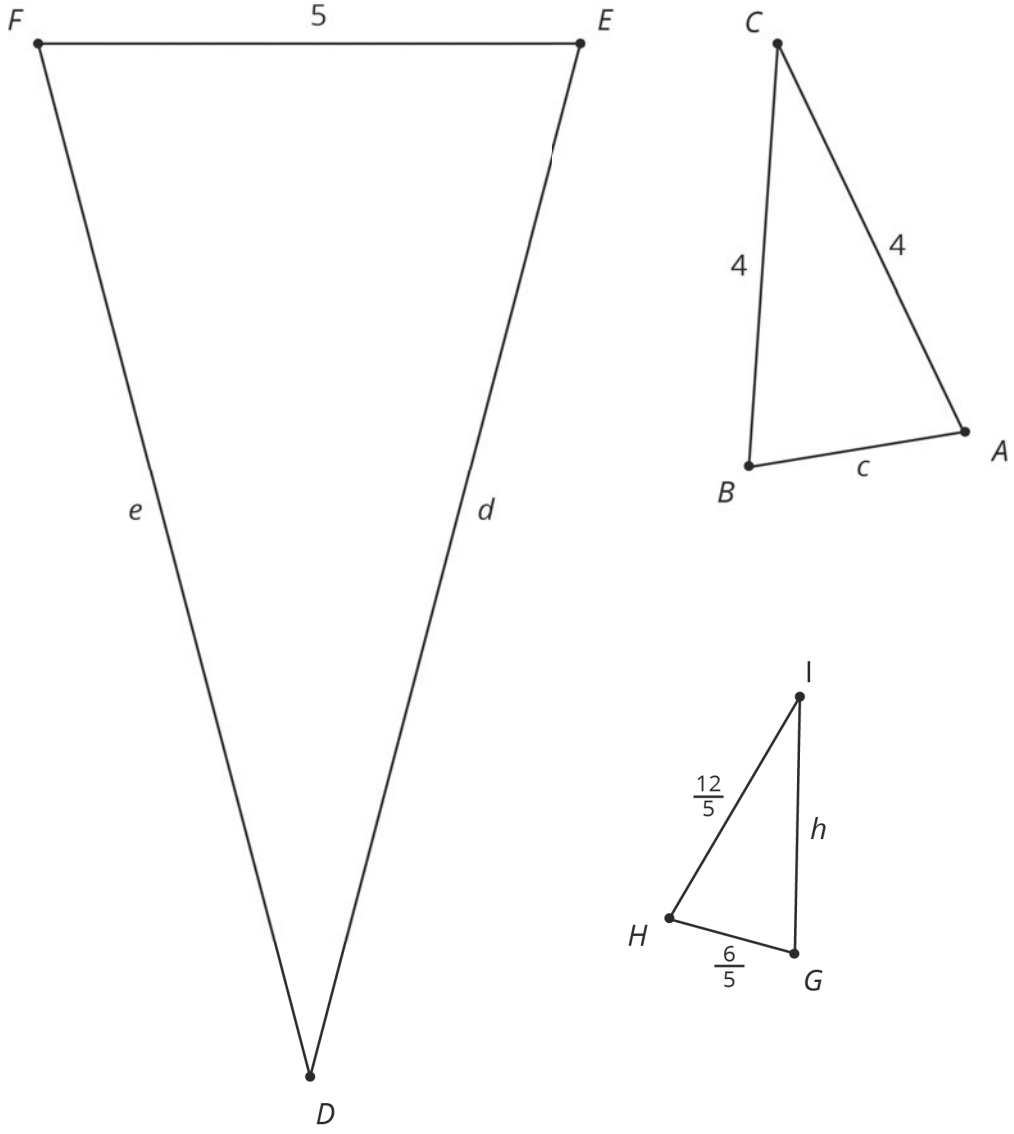
9.3: Using Side Quotients to Find Side Lengths of Similar Triangles

Triangles ABC, EFD, and GHI are all similar. The side lengths of the triangles all have the same units. Find the unknown side lengths.



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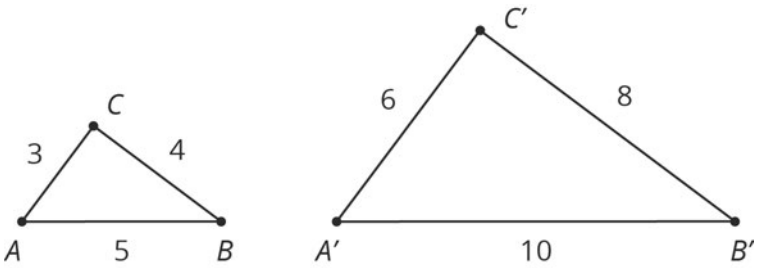
Lesson 9 Summary

If two polygons are similar, then the side lengths in one polygon are multiplied by the same scale factor to give the corresponding side lengths in the other polygon. For these triangles the scale factor is 2:



Here is a table that shows relationships between the short and medium length sides of the small and large triangle.

	small triangle	large triangle
medium side	4	8
short side	3	6
(medium side) ÷ (short side)	$\frac{4}{3}$	$\frac{8}{6} = \frac{4}{3}$

The lengths of the medium side and the short side are in a ratio of $4 : 3$. This means that the medium side in each triangle is $\frac{4}{3}$ as long as the short side.

This is true for all similar polygons; the ratio between two sides in one polygon is the same as the ratio of the corresponding sides in a similar polygon.

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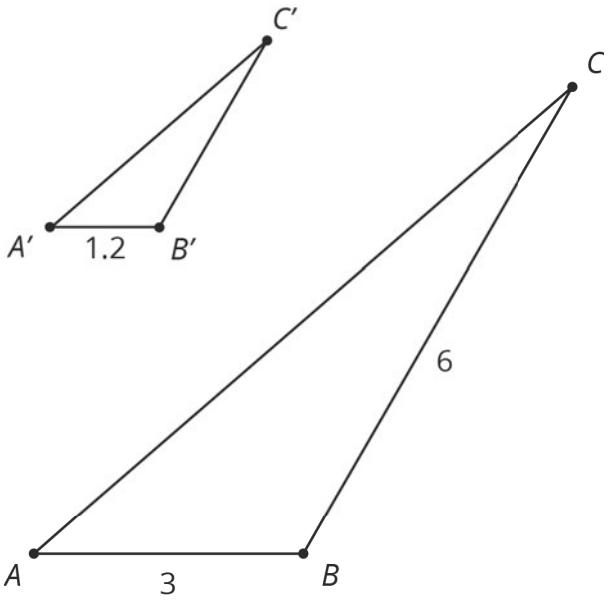
We can use these facts to calculate missing lengths in similar polygons. For example, triangles $A'B'C'$ and ABC shown here are similar. Let's find the length of segment $B'C'$.



In triangle ABC, side BC is twice as long as side AB, so this must be true for any triangle that is similar to triangle ABC. Since $A'B'$ is 1.2 units long and $2 \cdot 1.2 = 2.4$, the length of side $B'C'$ is 2.4 units.

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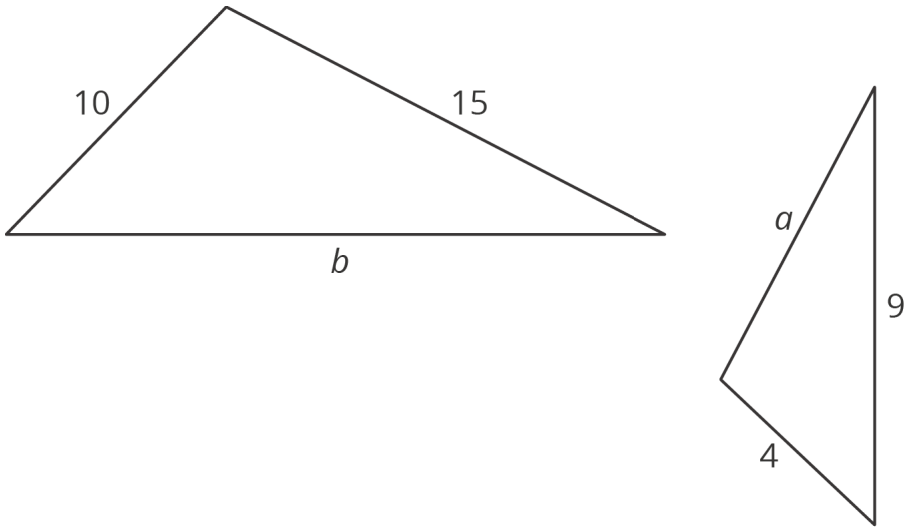
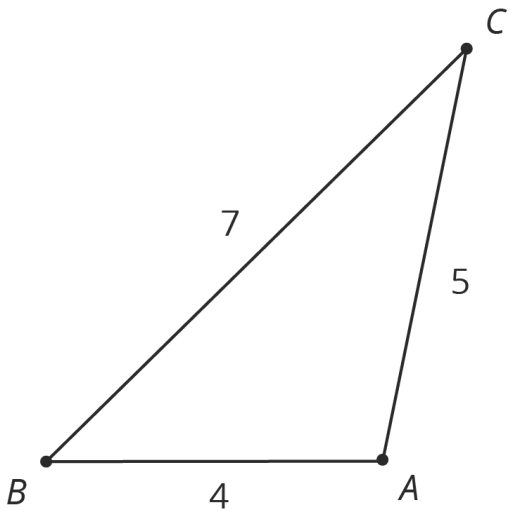
Unit 2, Lesson 9: Side Length Quotients in Similar Triangles

1. These two triangles are similar.



What are a and b? Note: the two figures are not drawn to scale.

Here is triangle ABC. Triangle XYZ is similar to ABC with scale factor $\frac{1}{4}$.



2. a. Draw what triangle XYZ might look like.

b. How do the angle measures of triangle XYZ compare to triangle ABC? Explain how you know.

c. What are the side lengths of triangle XYZ?

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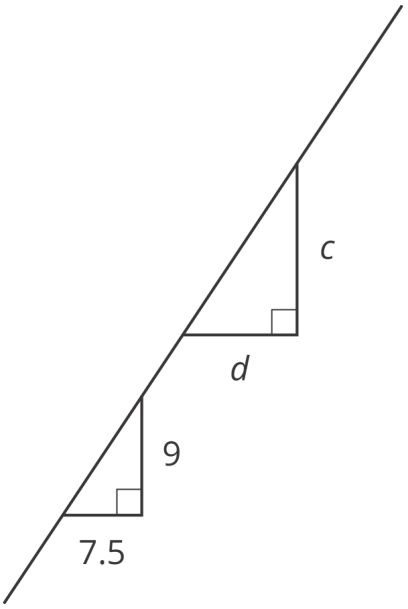
d. For triangle XYZ, calculate (long side) ÷ (medium side), and compare to triangle ABC.

3. The two triangles shown are similar. Find the value of $\frac{d}{c}$.



4. The diagram shows two nested triangles that share a vertex. Find a center and a scale factor for a dilation that would move the larger triangle to the smaller triangle.

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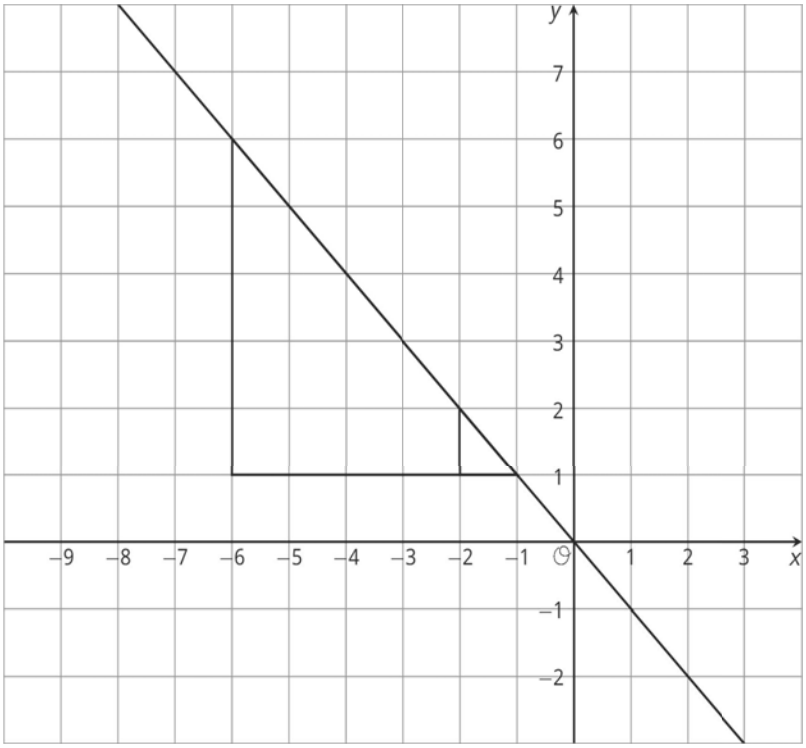

(from Unit 2, Lesson 5)