Name____ Date __________

10.5 Proving Triangle Similarity by SSS and SAS

For use with Exploration 10.5

Essential Question What are two ways to use corresponding sides of two triangles to determine that the triangles are similar?

1 EXPLORATION: Deciding Whether Triangles Are Similar

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software.

a. Construct $\triangle ABC$ and $\triangle DEF$ with the side lengths given in column 1 of the table below.

	1.	2.	3.	4.	5.	6.	7.
AB	5	5	6	15	9	24	
BC	8	8	8	20	12	18	
AC	10	10	10	10	8	16	
DE	10	15	9	12	12	8	
EF	16	24	12	16	15	6	
DF	20	30	15	8	10	8	
$m\angle A$							
$m\angle B$							
$m\angle C$							
$m\angle D$							
$m\angle E$							
$m\angle F$							

b. Complete column 1 in the table above.

c. Are the triangles similar? Explain your reasoning.

d. Repeat parts (a)–(c) for columns 2–6 in the table.

e. How are the corresponding side lengths related in each pair of triangles that are similar? Is this true for each pair of triangles that are not similar?

1 EXPLORATION: Deciding Whether Triangles Are Similar (continued)

f. Make a conjecture about the similarity of two triangles based on their corresponding side lengths.

g. Use your conjecture to write another set of side lengths of two similar triangles. Use the side lengths to complete column 7 of the table.

2 EXPLORATION: Deciding Whether Triangles Are Similar

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software. Construct any $\triangle ABC$.

a. Find AB, AC, and $m\angle A$. Choose any positive rational number k and construct $\triangle DEF$ so that $DE = k \bullet AB$, $DF = k \bullet AC$, and $m\angle D = m\angle A$.

b. Is $\triangle DEF$ similar to $\triangle ABC$? Explain your reasoning.

c. Repeat parts (a) and (b) several times by changing $\triangle ABC$ and k. Describe your results.

Communicate Your Answer

3. What are two ways to use corresponding sides of two triangles to determine that the triangles are similar?

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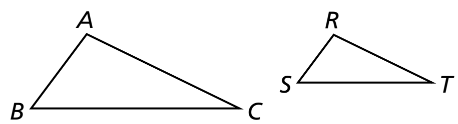
10.5 Practice
For use after Lesson 10.5

Theorems

Side-Side-Side (SSS) Similarity Theorem

If the corresponding side lengths of two triangles are proportional, then the triangles are similar.

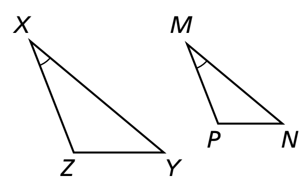


If $\dfrac{AB}{RS} = \dfrac{BC}{ST} = \dfrac{CA}{TR}$, then $\triangle ABC \sim \triangle RST$.

Notes:

Side-Angle-Side (SAS) Similarity Theorem

If an angle of one triangle is congruent to an angle of a second triangle and the lengths of the sides including these angles are proportional, then the triangles are similar.



If $\angle X \cong \angle M$ and $\dfrac{ZX}{PM} = \dfrac{XY}{MN}$, then $\triangle XYZ \sim \triangle MNP$.

Notes:

Worked-Out Examples

Example #1

Find the value of x that makes ΔDEF~ΔXYZ

$$\frac{DE}{XY} = \frac{EF}{YZ}$$

$$\frac{5}{10} = \frac{2x-1}{14}$$

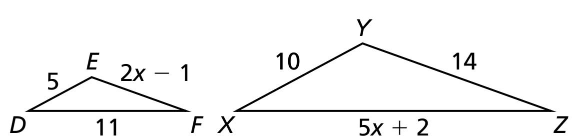
$$\frac{5}{10} = \frac{2x-1}{14}$$

$$5 \bullet 14 = 10 \bullet (2x-1)$$

$$70 = 20x - 10$$

$$80 = 20x$$

$$4 = x$$



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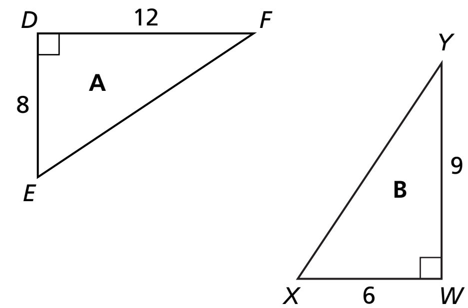
Example #2

Determine whether the two triangles are similar. If they are similar, write a similarity statement and find the scale factor of triangle B to triangle A.

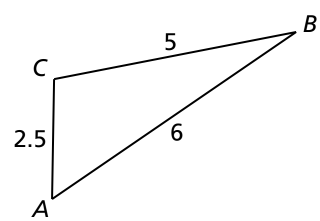
The ratio of the shorter sides is $\frac{DE}{WX} = \frac{8}{6} = \frac{4}{3}$. The ratio of the longer sides is $\frac{DF}{WY} = \frac{12}{9} = \frac{4}{3}$. So, by the SAS Similarity Theorem, $\triangle DEF \sim \triangle WXY$.

The scale factor of triangle B to triangle A is $\frac{4}{3}$.

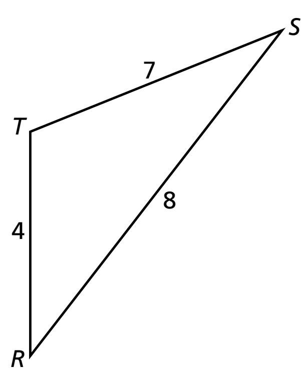


Practice A

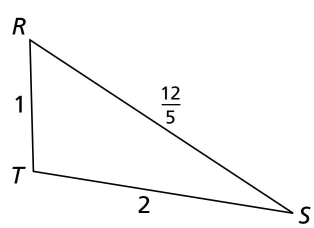
In Exercises 1 and 2, determine whether $\triangle RST$ is similar to $\triangle ABC$.



1.

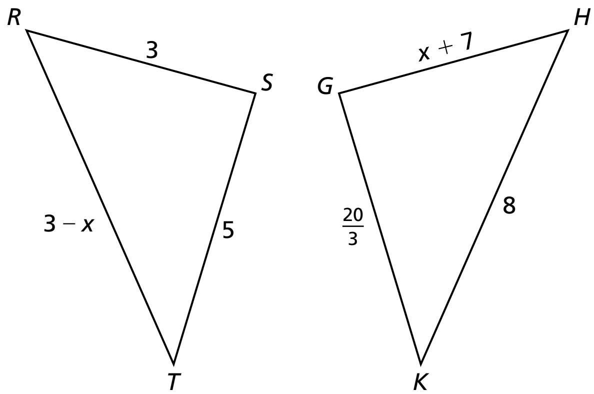


2.



10.5 Practice (continued)

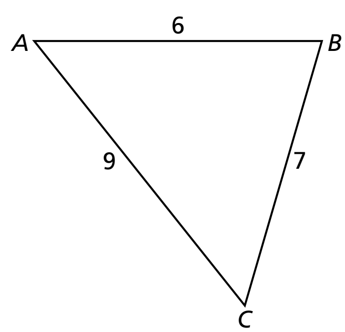
3. Find the value of x that makes $\triangle RST \sim \triangle HGK$.



4. Verify that $\triangle RST \sim \triangle XYZ$. Find the scale factor of $\triangle RST$ to $\triangle XYZ$.

$$\triangle RST : RS = 12, ST = 15, TR = 24$$
$$\triangle XYZ : XY = 28, YZ = 35, ZX = 56$$

In Exercises 5 and 6, use $\triangle ABC$.



5. The shortest side of a triangle similar to $\triangle ABC$ is 15 units long. Find the other side lengths of the triangle.

6. The longest side of a triangle similar to $\triangle ABC$ is 6 units long. Find the other side lengths of the triangle.

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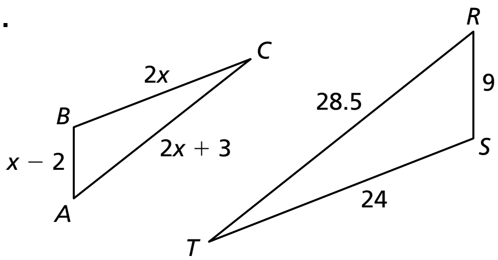
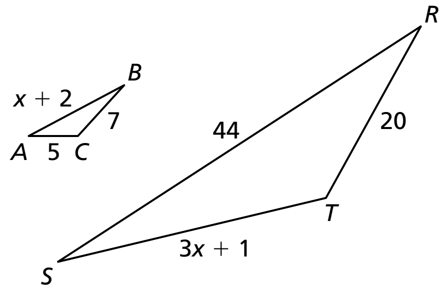
Practice B

In Exercises 1 and 2, find the value of *x* that makes $\triangle ABC \sim \triangle RST$.

1.



2.

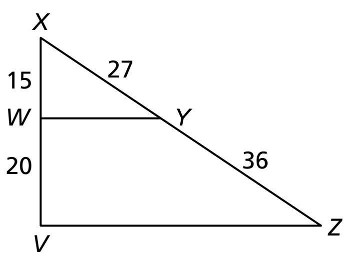


3 Verify that $\triangle JKL \sim \triangle PQR$. Find the scale factor of $\triangle JKL$ to $\triangle PQR$.

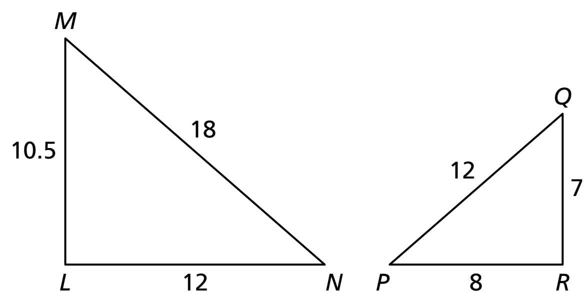
$\triangle JKL$: $JK = 15$, $KL = 30$, $JL = 25$ $\qquad$ $\triangle PQR$: $PQ = 12$, $QR = 24$, $PR = 20$

In Exercises 4 and 5, show that the triangles are similar and write a similarity statement. Explain your reasoning.

4.

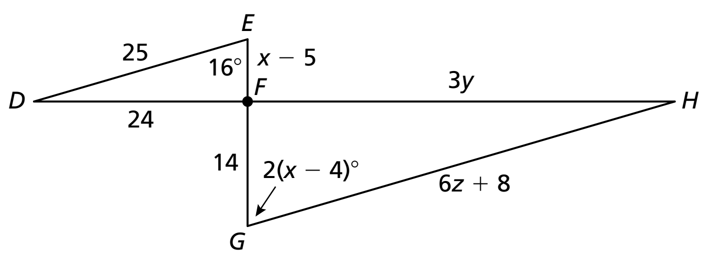


5.



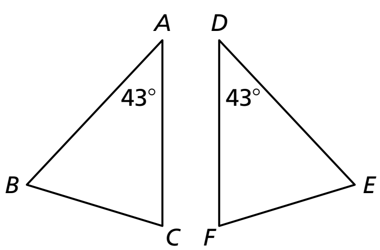
6. $\triangle ABC$ has side lengths 42, 21, and 35 units. The shortest side of a triangle similar to $\triangle ABC$ is 9 units long. Find the other lengths of the triangle.

7. Use the figure to find the values of *x*, *y*, and *z* that makes $\triangle DEF \sim \triangle GHF$.



Use the figure to write a two-column proof

8. Given $\dfrac{AC}{DF} = \dfrac{AB}{DE}$ $\qquad$ **Prove** $\angle B \cong \angle E$



9. Given $LN = 2x$

$MN = 2y$

$NP = x$

$NQ = y$

Prove $\triangle MLN \sim \triangle PQN$