Name_____ Date _____

8.5 Proving Triangle Congruence by SSS

For use with Exploration 8.5

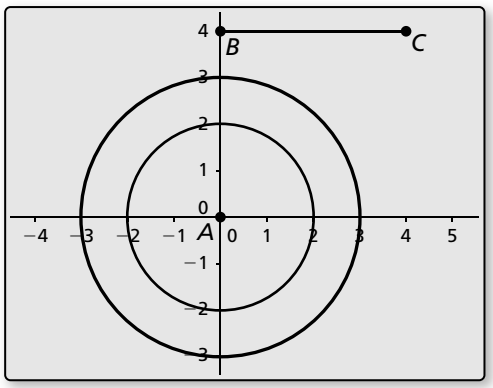
Essential Question What can you conclude about two triangles when you know the corresponding sides are congruent?

1 EXPLORATION: Drawing Triangles

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

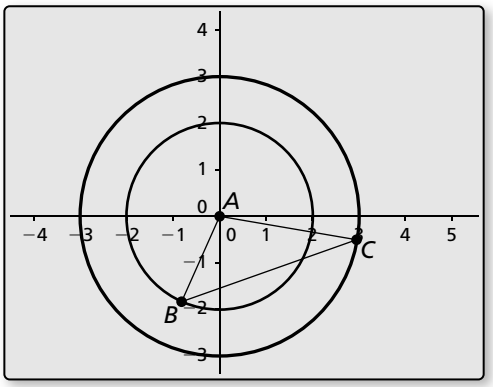
Work with a partner. Use dynamic geometry software.

a. Construct circles with radii of 2 units and 3 units centered at the origin. Label the origin A. Then draw $\overline{BC}$ of length 4 units.



b. Move $\overline{BC}$ so that B is on the smaller circle and C is on the larger circle. Then draw $\triangle ABC$.

c. Explain why the side lengths of $\triangle ABC$ are 2, 3, and 4 units.



d. Find $m\angle A, m\angle B,$ and $m\angle C$.

e. Repeat parts (b) and (d) several times, moving $\overline{BC}$ to different locations. Keep track of your results by completing the table on the next page. What can you conclude?

Name _____ Date _____

8.5 Proving Triangle Congruence by SSS (continued)

1 EXPLORATION: Drawing Triangles (continued)

	A	*B*	*C*	*AB*	*AC*	*BC*	$m\angle A$	$m\angle B$	$m\angle C$
1.	(0, 0)			2	3	4			
2.	(0, 0)			2	3	4			
3.	(0, 0)			2	3	4			
4.	(0, 0)			2	3	4			
5.	(0, 0)			2	3	4			

Communicate Your Answer

2. What can you conclude about two triangles when you know the corresponding sides are congruent?

3. How would you prove your conclusion in Exploration 1(e)?

Name_____ Date _____

8.5 Practice
For use after Lesson 8.5

Theorems

Side-Side-Side (SSS) Congruence Theorem

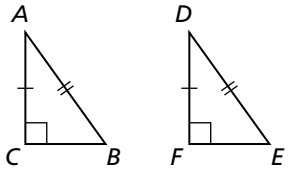
If three sides of one triangle are congruent to three sides of a second triangle, then the two triangles are congruent.

If $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, and $\overline{AC} \cong \overline{DF}$, then $\triangle ABC \cong \triangle DEF$.

Notes:

Hypotenuse-Leg (HL) Congruence Theorem

If the hypotenuse and a leg of a right triangle are congruent to the hypotenuse and a leg of a second right triangle, then the two triangles are congruent.



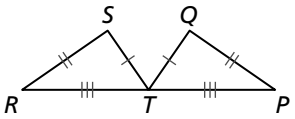
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $m\angle C = m\angle F = 90°$, then $\triangle ABC \cong \triangle DEF$.

Notes:

Worked-Out Examples

Example #1

$\triangle RST \cong \triangle TQP$



Decide whether the congruence statement is true. Explain your reasoning.

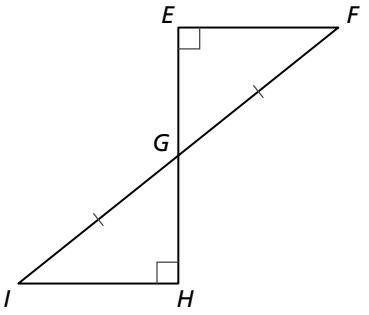
no; You are given that $\overline{RS} \cong \overline{PQ}$, $\overline{ST} \cong \overline{QT}$, and $\overline{RT} \cong \overline{PT}$. So, it should say $\triangle RST \cong \triangle PQT$ by the SSS Congruence Theorem.

Example #2

Redraw the triangles so they are side by side with corresponding parts in the same position. Then write a proof

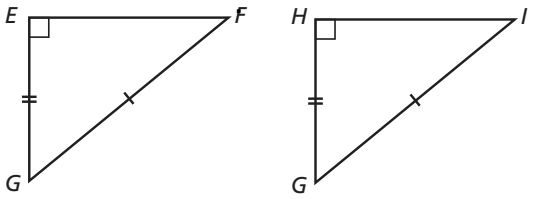
Given G is the midpoint of $\overline{EH}$, $\overline{FG} \cong \overline{GI}$, $\angle E$ and $\angle H$ are right angles.

Prove $\triangle EFG \cong \triangle HIG$



Name _____ Date _____

8.5 Practice (continued)



Given G is the midpoint of $\overline{EH}$, $\overline{FG} \cong \overline{GI}$, $\angle E$ and $\angle H$ are right angles.

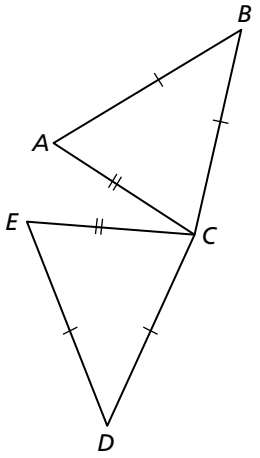
Prove $\triangle EFG \cong \triangle HIG$

STATEMENTS	REASONS
1. G is the midpoint of $\overline{EH}$, $\overline{FG} \cong \overline{GI}$, $\angle E$ and $\angle H$ are right angles.	**1.** Given
2. $\overline{EG} \cong \overline{HG}$	**2.** Definition of midpoint
3. $\triangle EFG$ and $\triangle HIG$ are right triangles.	**3.** Definition of a right triangle
4. $\triangle EFG \cong \triangle HIG$	**4.** HL Congruence Theorem

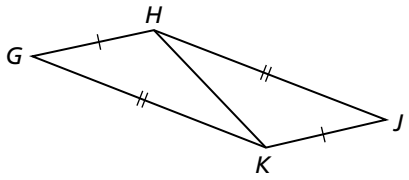
Practice A

In Exercises 1–4, decide whether the congruence statement is true. Explain your reasoning.

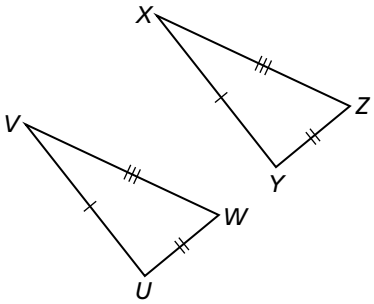
1. $\triangle ABC \cong \triangle EDC$



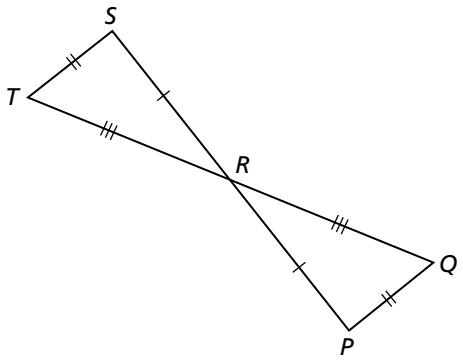
2. $\triangle KGH \cong \triangle HJK$



3. $\triangle UVW \cong \triangle XYZ$



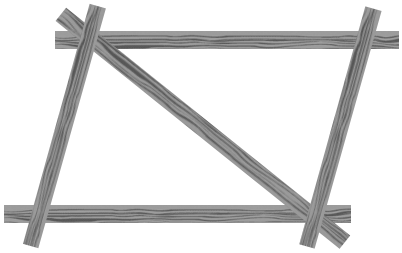
4. $\triangle RST \cong \triangle RPQ$



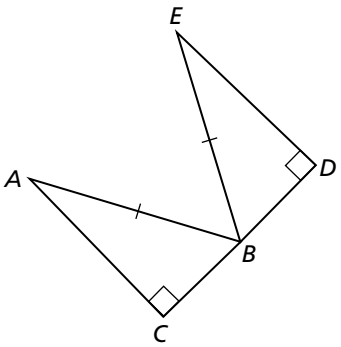
Name_____ Date _____

8.5 Practice (continued)

5. Determine whether the figure is stable. Explain your reasoning.



6. Redraw the triangles so they are side by side with corresponding parts in the same position. Then write a proof.



Given B is the midpoint of $\overline{CD}$,
$\overline{AB} \cong \overline{EB}, \angle C$ and $\angle D$ are right angles.

Prove $\triangle ABC \cong \triangle EBD$

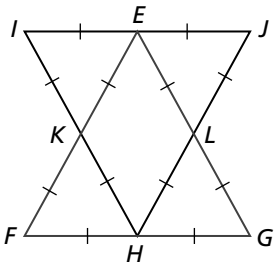
STATEMENTS	REASONS

Name _____ Date _____

7. Write a proof.

Given $\overline{IE} \cong \overline{EJ} \cong \overline{JL} \cong \overline{LH} \cong \overline{HK} \cong \overline{KI} \cong \overline{EK} \cong \overline{KF} \cong \overline{FH} \cong \overline{HG} \cong \overline{GL} \cong \overline{LE}$

Prove $\triangle EFG \cong \triangle HIJ$



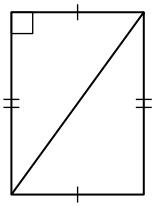
STATEMENTS	REASONS

Name _____ Date _____

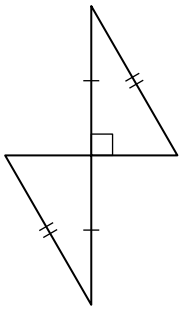
Practice B

In Exercises 1–3, decide whether enough information is given to prove that the triangles are congruent. If so, state the theorem you would use.

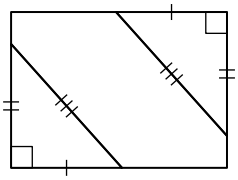
1.



2.



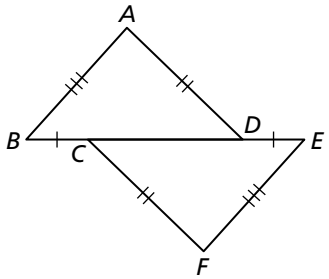
3.



In Exercises 4 and 5, write a proof.

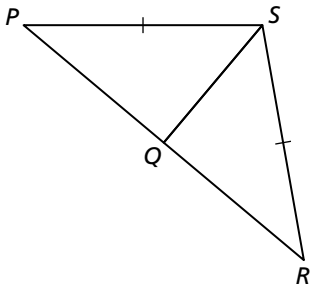
4. **Given** $\overline{BC} \cong \overline{ED}$, $\overline{AB} \cong \overline{FE}$, and $\overline{AD} \cong \overline{FC}$

Prove $\triangle ABD \cong \triangle FEC$



5. **Given** $\overline{PS} \cong \overline{RS}$, $\overline{SQ} \perp \overline{PR}$

Prove $\triangle PSQ \cong \triangle RSQ$



6. Two triangles are formed by the four lines described below. Both triangles share lines a and b. A side of one triangle is contained in line c, and a side of the other triangle is contained in line d. How can you use this information to determine whether the triangles are congruent?

Line a: $y = 3x + 2$

Line b: $y = -\frac{1}{3}x - 1$

Line c: passes through points $(1, 5)$ and $(3, -2)$

Line d: passes through points $(-6, 1)$ and $(-3, -7)$