5.7 Using Congruent Triangles

Example 1: Using Congruent Triangles

Explain how you can use the given information to prove that the hang glider parts are congruent.

(Write a 2-column proof or a paragraph proof)

Given $\angle 1 \cong \angle 2$, $\angle RTQ \cong \angle RTS$

Prove $\overline{QT} \cong \overline{ST}$

Key Concepts: Corresponding Parts of Congruent Triangles are Congruent!

CPCTC!!!

STOP! DO NOT KEEP SCROLLING!

Mental Readiness: Think back to a time when humans wanted to know how wide a river was without GPS and they did not want to estimate. How do you think they were able to determine this? Did they always have to cross the river? What obstacles did they have to overcome? **Lets draw a picture.**

I KNEW YOU WOULD KEEP SCROLLING!
YOU JUST COULDN'T RESIST! 😢

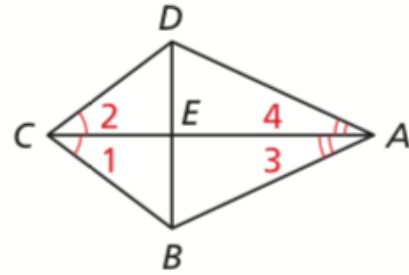**Example 2:** Using congruent triangles for measurement.

Example 3: Planning a proof involving pairs of triangles

Use the given information to write a plan for proof.

Given $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$

Prove $\triangle BCE \cong \triangle DCE$

SOLUTION

Vocabulary and Core Concept Check

1. **COMPLETE THE SENTENCE** _____ parts of congruent triangles are congruent.

2. **WRITING** Describe a situation in which you might choose to use indirect measurement with congruent triangles to find a measure rather than measuring directly.
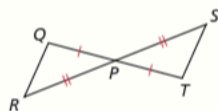
Monitoring Progress and Modeling with Mathematics

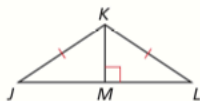**In Exercises 3–8, explain how to prove that the statement is true.** *(See Example 1.)*
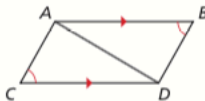
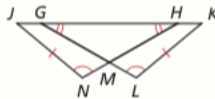3. $\angle A \cong \angle D$

4. $\angle Q \cong \angle T$

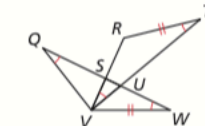5. $\overline{JM} \cong \overline{LM}$

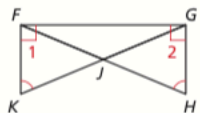6. $\overline{AC} \cong \overline{DB}$

7. $\overline{GK} \cong \overline{HJ}$
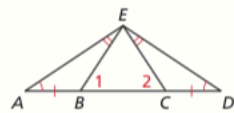
8. $\overline{QW} \cong \overline{VT}$

In Exercises 9–12, write a plan to prove that $\angle 1 \cong \angle 2$.
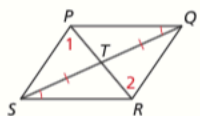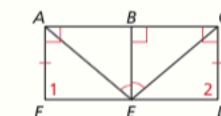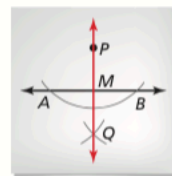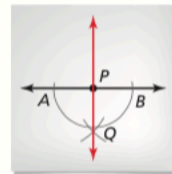*(See Example 3.)*

9.

10.

11.

12.

In Exercises 13 and 14, write a proof to verify that the construction is valid. *(See Example 4.)*

13. Line perpendicular to a line through a point not on the line

Plan for Proof Show that $\triangle APQ \cong \triangle BPQ$ by the SSS Congruence Theorem (Theorem 5.8). Then show that $\triangle APM \cong \triangle BPM$ using the SAS Congruence Theorem (Theorem 5.5). Use corresponding parts of congruent triangles to show that $\angle AMP$ and $\angle BMP$ are right angles.

14. Line perpendicular to a line through a point on the line

Plan for Proof Show that $\triangle APQ \cong \triangle BPQ$ by the SSS Congruence Theorem (Theorem 5.8). Use corresponding parts of congruent triangles to show that $\angle QPA$ and $\angle QPB$ are right angles.
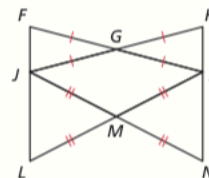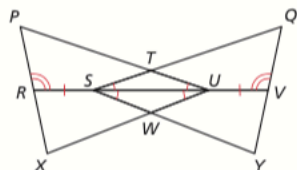
In Exercises 15 and 16, use the information given in the diagram to write a proof.

15. Prove $\overline{FL} \cong \overline{HN}$

16. Prove $\triangle PUX \cong \triangle QSY$

17. MODELING WITH MATHEMATICS Explain how to find the distance across the canyon. *(See Example 2.)*

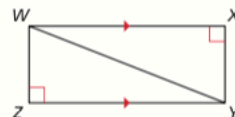**18. HOW DO YOU SEE IT?**
Use the tangram puzzle.

  a. Which triangle(s) have an area that is twice the area of the purple triangle?

  b. How many times greater is the area of the orange triangle than the area of the purple triangle?

19. PROOF Prove that the green triangles in the Jamaican flag are congruent if $\overline{AD} \parallel \overline{BC}$ and E is the midpoint of $\overline{AC}$.
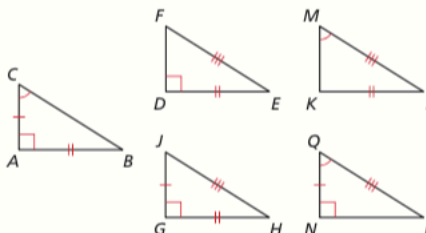

20. THOUGHT PROVOKING The Bermuda Triangle is a region in the Atlantic Ocean in which many ships and planes have mysteriously disappeared. The vertices are Miami, San Juan, and Bermuda. Use the Internet or some other resource to find the side lengths, the perimeter, and the area of this triangle (in miles). Then create a congruent triangle on land using cities as vertices.

21. MAKING AN ARGUMENT Your friend claims that $\triangle WZY$ can be proven congruent to $\triangle YXW$ using the HL Congruence Theorem (Thm. 5.9). Is your friend correct? Explain your reasoning.

22. CRITICAL THINKING Determine whether each conditional statement is true or false. If the statement is false, rewrite it as a true statement using the converse, inverse, or contrapositive.

  a. If two triangles have the same perimeter, then they are congruent.

  b. If two triangles are congruent, then they have the same area.

23. ATTENDING TO PRECISION Which triangles are congruent to $\triangle ABC$? Select all that apply.

Maintaining Mathematical Proficiency Reviewing what you learned in previous grades and lessons

Find the perimeter of the polygon with the given vertices. *(Section 1.4)*

24. $A(-1, 1), B(4, 1), C(4, -2), D(-1, -2)$ **25.** $J(-5, 3), K(-2, 1), L(3, 4)$