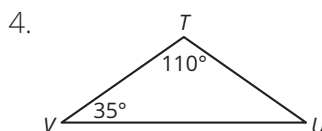# 3

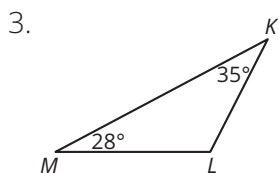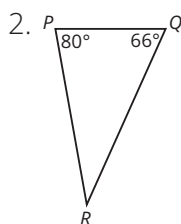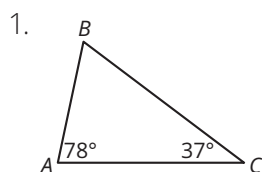# I Never Forget a Face

## Using Triangle Congruence to Solve Problems

## Warm Up

Determine the measure of the unknown angle in each triangle.

1.



2.



3.



4.



## Learning Goals

- Use triangle congruence theorems to identify congruent triangles.
- Identify the information needed to conclude that two triangles are congruent by SSS, SAS, or ASA.

You have proven that Side-Side-Side, Side-Angle-Side, and Angle-Side-Angle Congruence Theorems are valid criteria to determine triangle congruence. How can you apply these theorems to problems?

## A Bridge Too Far

Suppose you are planning to build a new bridge across a river to replace the old bridge, which has grown unusable. You need to know exactly how long to make the bridge, but you can't measure the width of the river. The only thing you know is the length of the old bridge.

**Think about:**

You can't assume that an angle is a right angle or that two figures are congruent, even if it seems like it.

new bridge ⟶          ⟵ old bridge
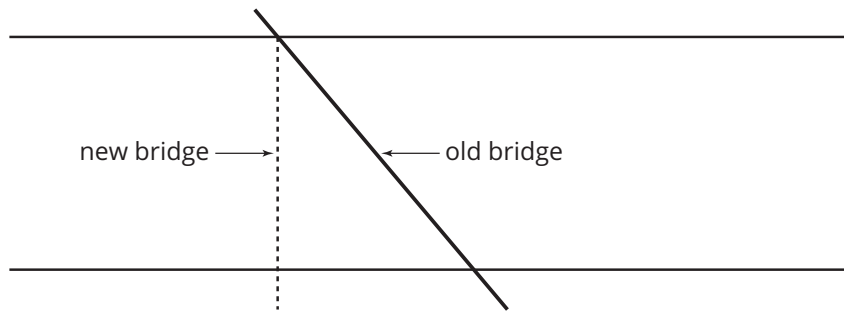
1. **Explain how you could use congruent triangles to determine the exact length of the new bridge needed to cross the river. Explain your thinking.**

# Using SSS, SAS, and ASA

You know that the Side-Side-Side, Side-Angle-Side, and Angle-Side-Angle Congruence Theorems can be used as valid reasons to demonstrate triangles are congruent. Consider each theorem as you analyze the given statements and diagrams.
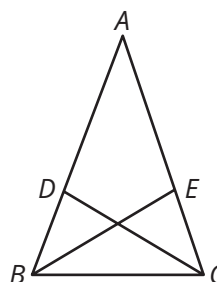
1. **Suppose $\overline{AD}$ bisects $\angle A$, and $\overline{AD} \perp \overline{BC}$.**

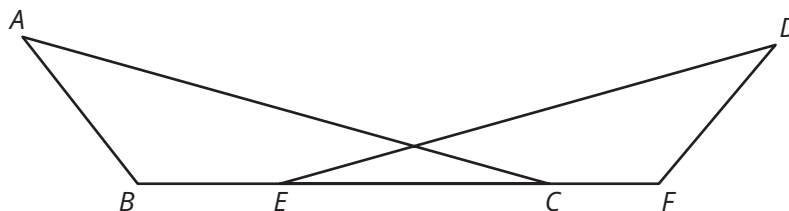   **Are there congruent triangles in this diagram? Explain your reasoning.**
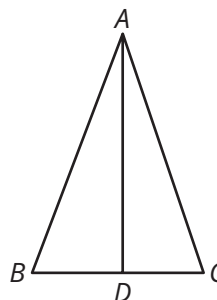


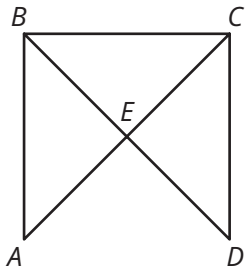2. **Suppose $\angle DBC \cong \angle ECB$, and $\angle DCB \cong \angle EBC$.**

   **Are there congruent triangles in this diagram? Explain your reasoning.**



3. **Suppose $\overline{AB} \cong \overline{DF}$, $\angle A \cong \angle D$, and $\overline{BE} \cong \overline{FC}$.**
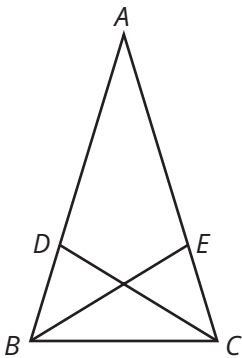


   **Are there congruent triangles in this diagram? Explain your reasoning.**

**4. Suppose $\overline{AC} \cong \overline{DB}$, $\overline{AB} \perp \overline{BC}$, and $\overline{DC} \perp \overline{CB}$.**

    **a. What information would you need to conclude △CAB is congruent to △BDC using the ASA Congruence Theorem?**

    **b. What information would you need to conclude △ABE is congruent to △DCE using the SAS Congruence Theorem?**



**5. Suppose $\overline{AB} \cong \overline{AC}$.**

    **a. What additional information would be needed to conclude △ABE is congruent to △ACD using the ASA Congruence Theorem?**

b. **What additional information would be needed to conclude △*ABE* is congruent to △*ACD* using the SSS Congruence Theorem?**

c. **What additional information would be needed to conclude △*ABE* is congruent to △*ACD* using the SAS Congruence Theorem?**

6. **Simone says that since △*ABC* and △*DCB* have two pairs of congruent corresponding sides and congruent corresponding angles, then the triangles are congruent by SAS. Is Simone correct? Explain your reasoning.**
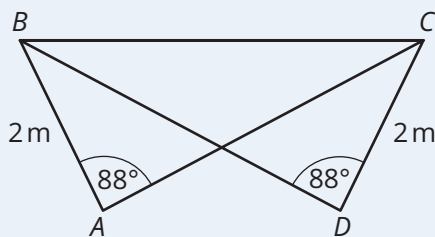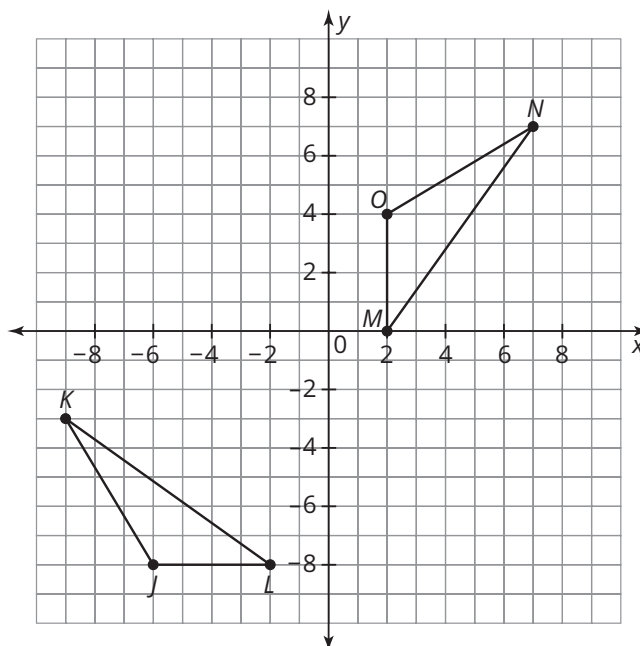
# SSS, SAS, and ASA on the Coordinate Plane

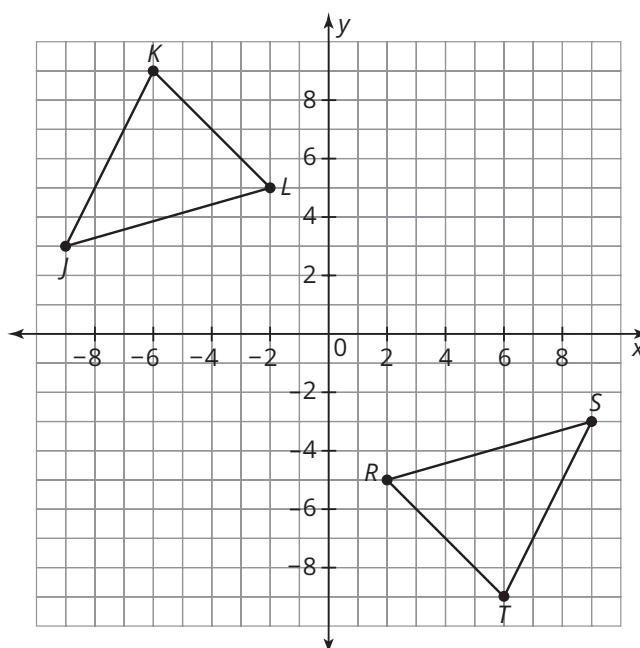1. **Use the Distance Formula and patty paper to show that the two triangles on the coordinate plane are congruent by SAS. Show your work.**

> **Think**
>
> How does your reasoning change when figures are represented on a coordinate plane?



2. **Use the Distance Formula and patty paper to show that the two triangles on the coordinate plane are congruent by SSS. Show your work.**

3. Emerson wants to translate △*ABC* and then reflect it across the *y*-axis to form a new triangle in Quadrant II. She uses what she knows about transformations to determine the vertices of △*A'B'C'* before performing the transformations.
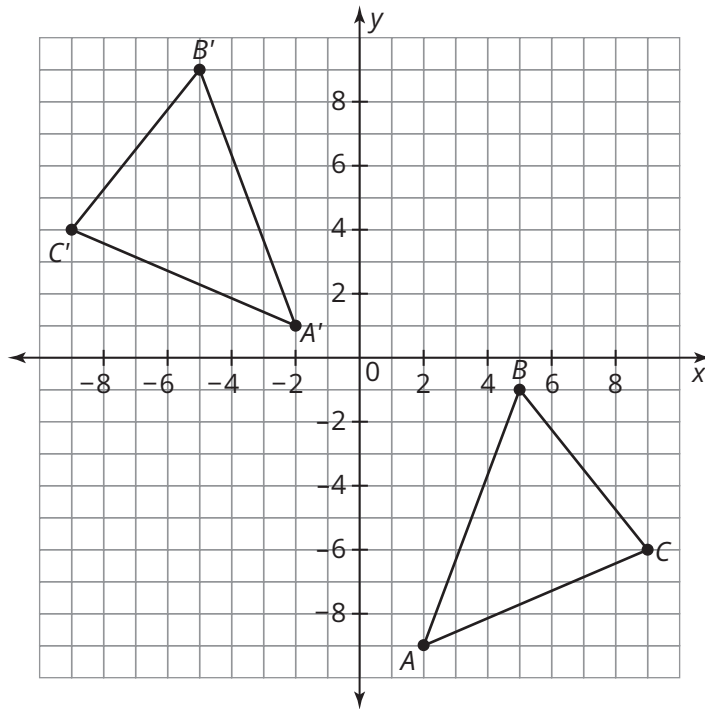


a. Describe how Emerson can use the ASA Congruence Theorem to determine whether or not she transformed △*ABC*, such that the image is congruent to the pre-image.

b. Did Emerson perform the transformations on △*ABC* so that the image is congruent to the pre-image? Explain your reasoning.

4. **Describe how to prove the given triangles are congruent. Use the key terms _included angle_ and _Side-Angle-Side Congruence Theorem_ in your answer.**
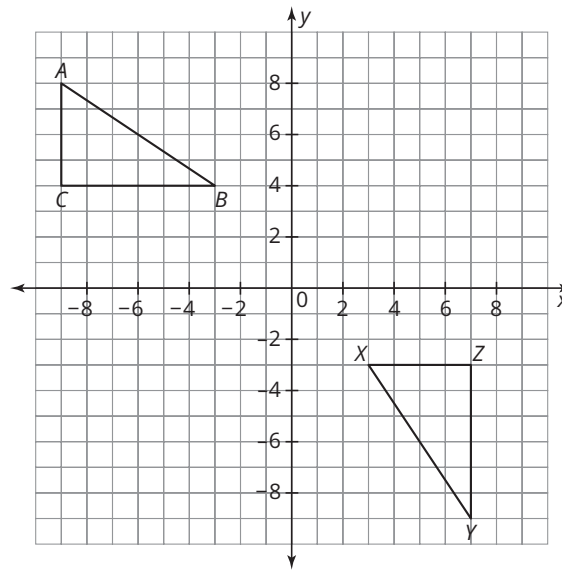


5. **Describe how to prove the given triangles are congruent. Use the key terms _included side_ and _Angle-Side-Angle Congruence Theorem_ in your answer.**
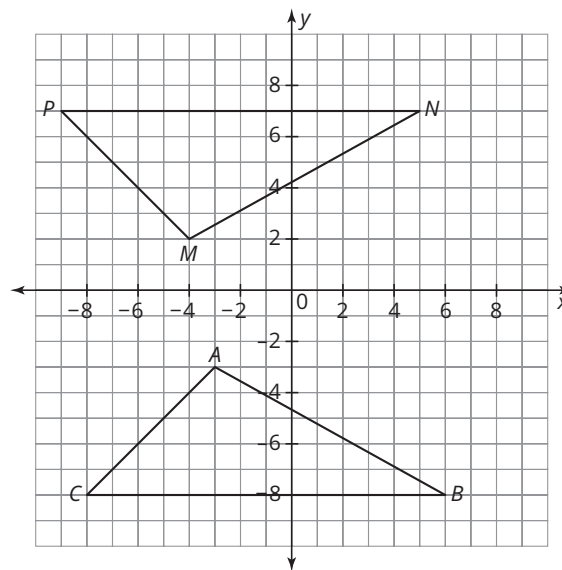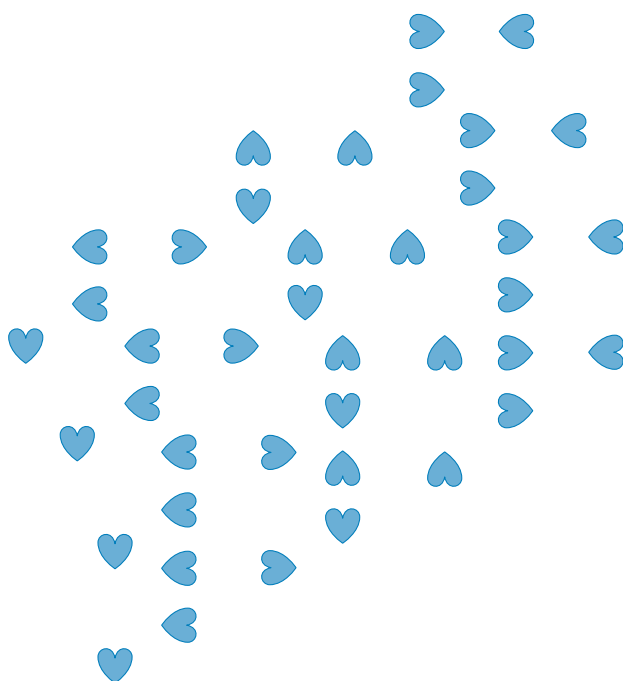
# TALK the TALK

## A Transformational Arteest

Congruence is an important concept, not only in technology but also in the world of art and design.

The image shown uses all three rigid motions—a rotation, a translation, and a reflection—and a single shape repeated to create a wallpaper design.



1. **Use the space on the next page to create your own wallpaper design using a single geometric figure and all three rigid motions.**

2. **Share your designs with your classmates. Determine the repeated pattern of transformations used to create each design.**