# Geometry Unit 5

Ways to Prove Triangles Are Congruent

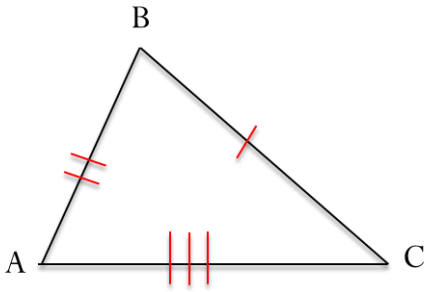
# Other Ways to Prove Triangles Congruent

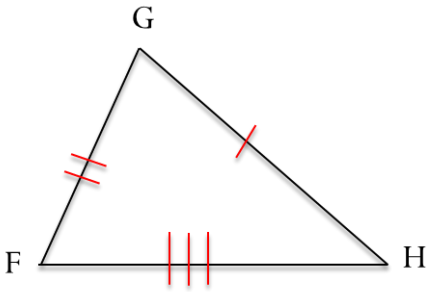
- **Content Objective**: Students will be able to use postulates and theorems to prove that triangles are congruent.

- **Language Objective**: Students will be able to write congruence statements using the AAS and HL Theorems.

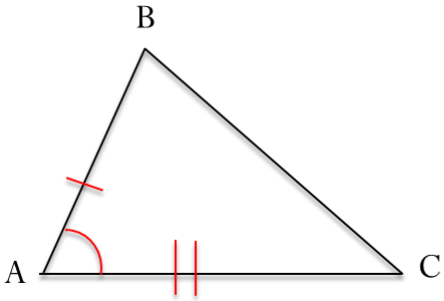
# We started with 3 Ways to prove Triangles Congruent

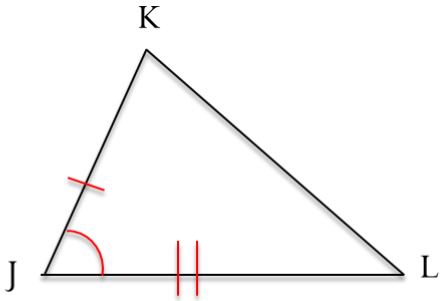
- SSS



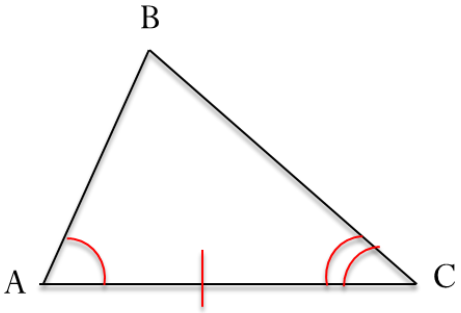



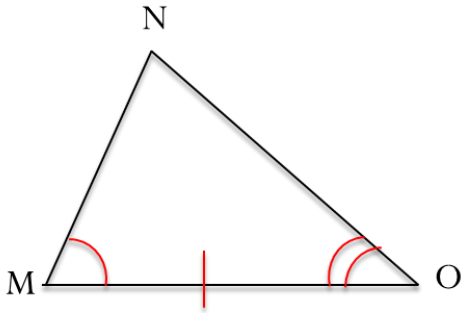

- SAS




- ASA




Today, we learn 2 more…

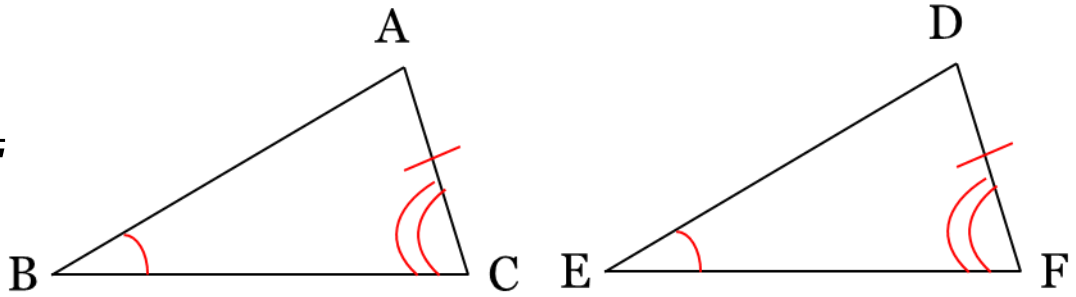
# AAS Theorem

- **Theorem 4-3: AAS Theorem**

If two angles and a non-included side of one triangle are congruent to the corresponding parts of another triangle, then the triangles are congruent.

Given: $< B \cong < E$;
$< C \cong < F$; $\overline{AC} \cong \overline{DF}$

Prove: $\Delta ABC \cong \Delta DEF$



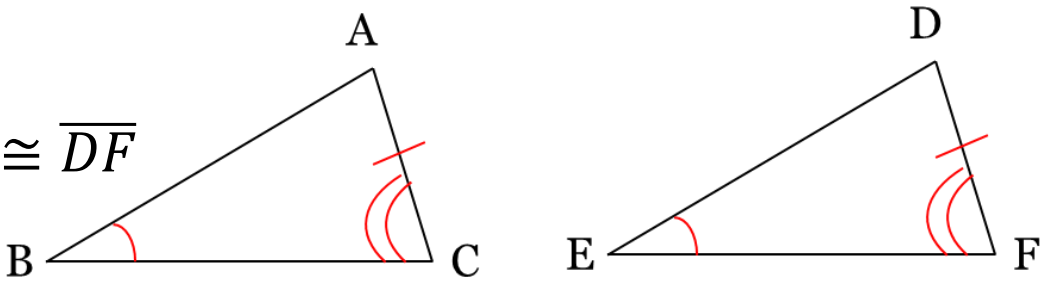

Plan for Proof:

- You can use the **ASA** Postulate by showing that $<$ **A** $\cong <$ **D**
- You can do that by using the following fact: two **Angles** of $\Delta ABC$ are congruent to two **Angles** of $\Delta DEF$.

# AAS Theorem – The Proof

Given: $< B \cong < E$;
$< C \cong < F$; $\overline{AC} \cong \overline{DF}$

Prove: $\Delta ABC \cong \Delta DEF$




| **Statements** | **Reasons** |
|---|---|
| 1.) $< B \cong < E; < C \cong < F;\ \overline{AC} \cong \overline{DF}$ | 1.) Given |
| 2.) $< A \cong < D$ | 2.) If 2 <'s of 1 Δ are ≅ to 2 <'s of another Δ, then the 3rd <'s are ≅. |
| 3.) $\Delta ABC \cong \Delta DEF$ | 3.) ASA Postulate |

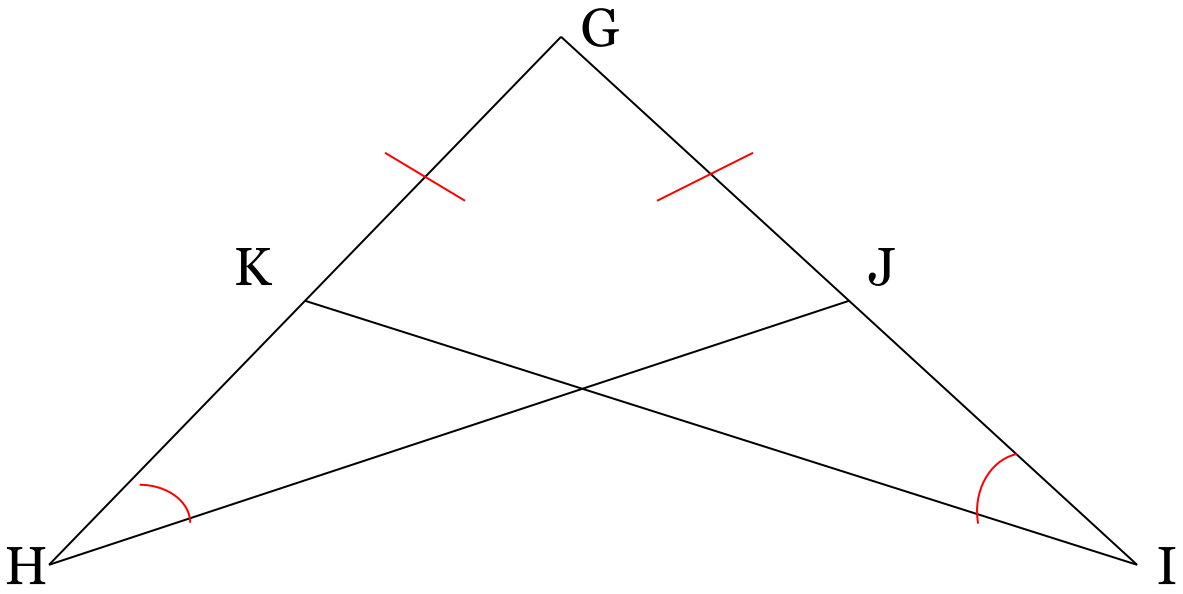
# Overlapping Triangles

- Suppose you have the following problem:

Given: $\overline{GJ} \cong \overline{GK}$;

$< H \cong <$ I

Prove: $\Delta GHJ \cong \Delta GIK$

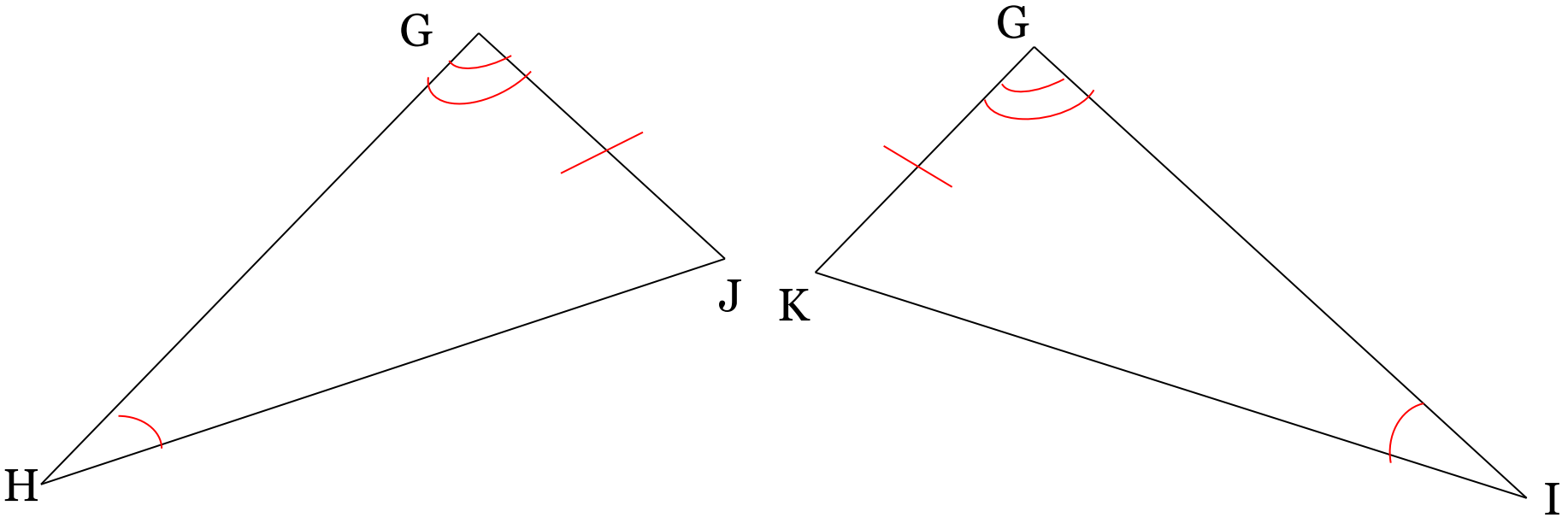



How would you solve this?

…Separate the Triangles!

# Overlapping Triangles

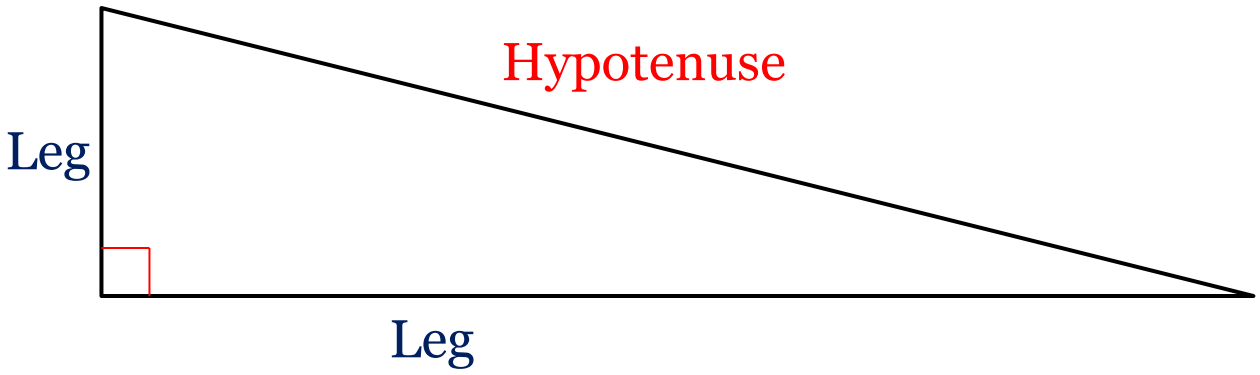
- Separating the two different triangles, we now have $\Delta GHJ$ and $\Delta GIK$ as such:




- You can also label $< G \cong < G$ because it is the exact the same angle from the combined diagram.
- Therefore, $\Delta GHJ \cong \Delta GIK$ by the **AAS** **Theorem**.

# Right Triangles

- The sides of a right triangle named as such:
  - The side opposite the right angle is known as the **Hypotenuse**
  - The other two sides are known as the **Legs**



# HL Theorem

- **Theorem 4-4: HL Theorem**

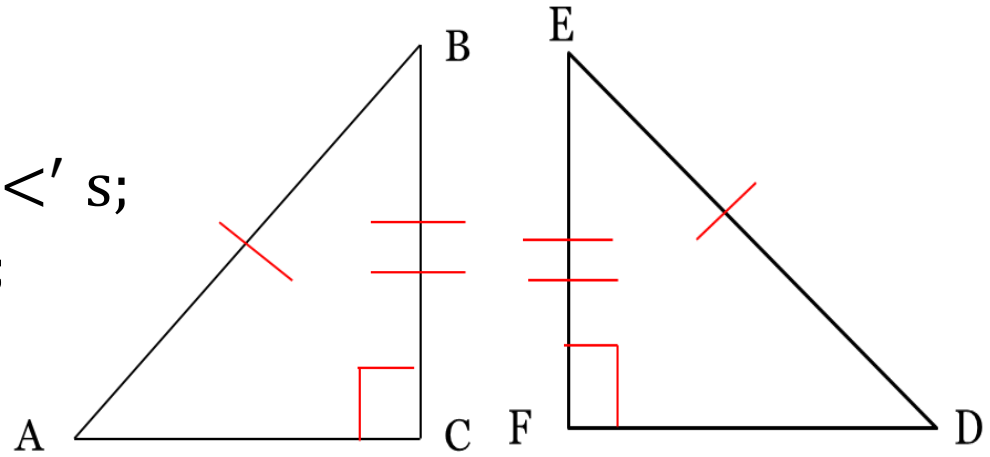
If the hypotenuse and a leg of one right triangle are congruent to the corresponding parts of another right triangle, then the triangles are congruent.

Given: $< C$ and $< F$ are right $<'$ s;

$\overline{AB} \cong \overline{DE}$ (Hypotenuse);

$\overline{BC} \cong \overline{EF}$ (Leg)

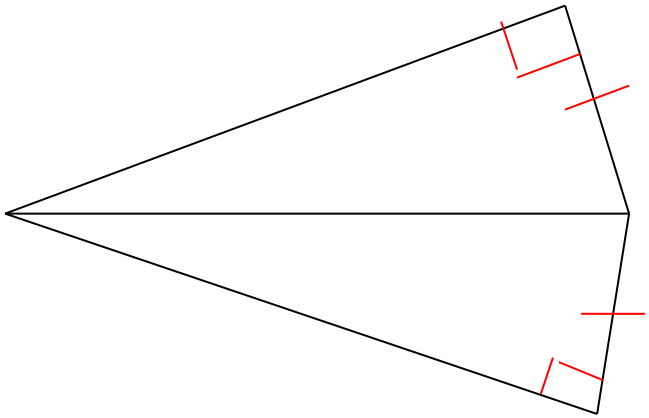
Prove: $\Delta ABC \cong \Delta DEF$




We will not be proving this one

# Proving Triangles Congruent

- State which postulate, or theorem, you can use to prove that these triangles are congruent. Explain using the sentence provided.



- These triangles are congruent by the **HL** **Theorem** because

  Between the two right triangles, we have the corresponding hypotenuse and legs congruent to one another.

# Proving Triangles Congruent

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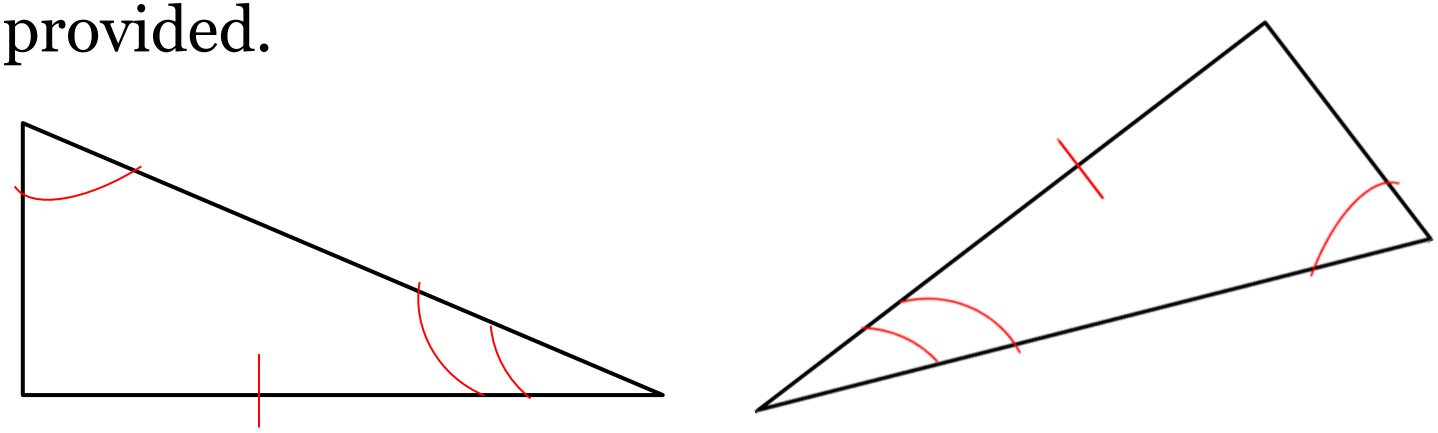
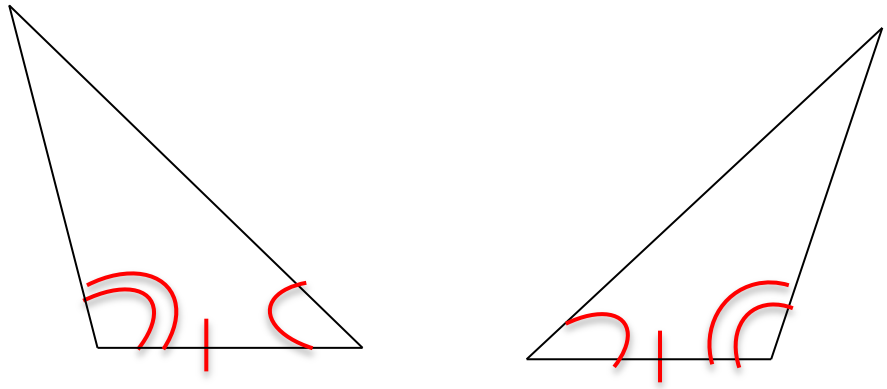


- These triangles are congruent by the **AAS** **Theorem** because

  Between the two triangles, we have two angles and their included sides congruent to one another.

# Proving Triangles Congruent

- State which postulate, or theorem, you can use to prove that these triangles are congruent. Explain using the sentence provided.

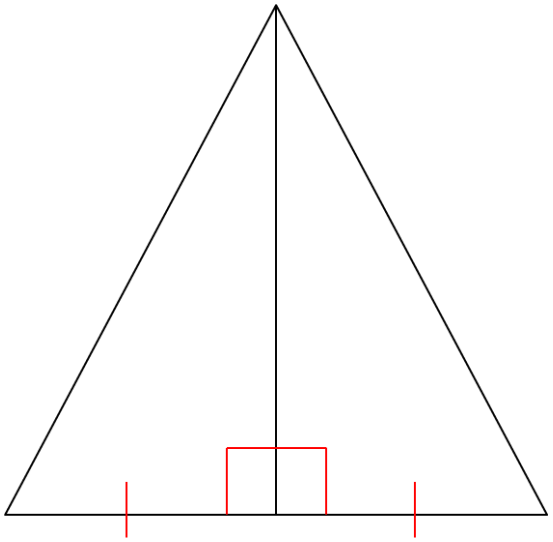


- These triangles are congruent by the **ASA** **Postulate** because

  Between the two triangles, we have two angles and their included sides congruent to one another.

# Proving Triangles Congruent

- State which postulate, or theorem, you can use to prove that these triangles are congruent. Explain using the sentence provided.

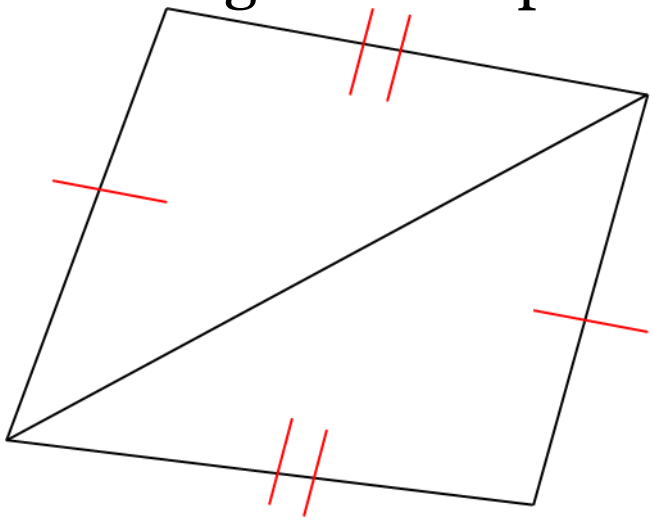


- These triangles are congruent by the **SAS** **Postulate** because

  Between the two triangles, we have two angles and their included sides congruent to one another.

# Proving Triangles Congruent

- State which postulate, or theorem, you can use to prove that these triangles are congruent. Explain using the sentence provided.



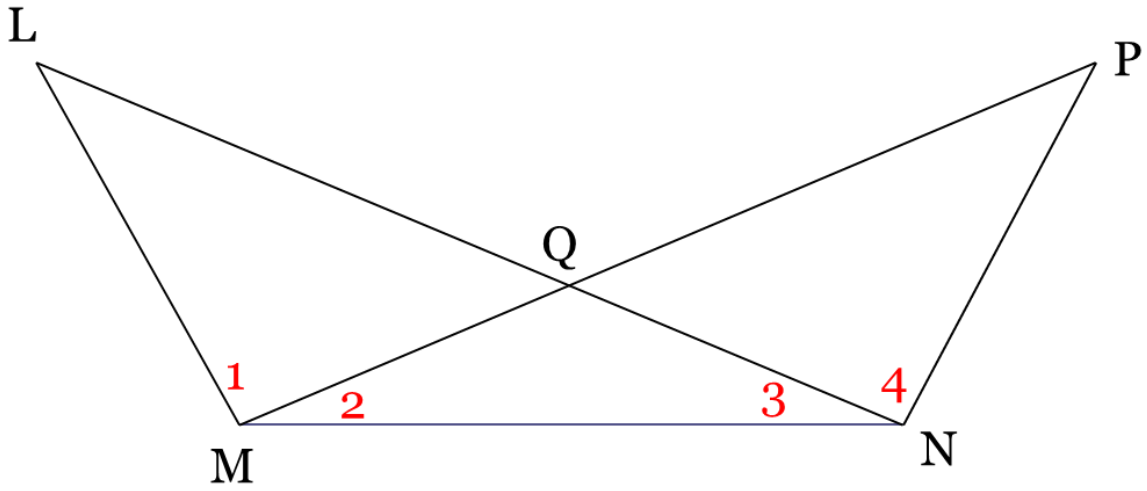
- These triangles are congruent by the **SSS** **Postulate** because

  Between the two triangles, we have two angles and their included sides congruent to one another.

# Proving Triangles Congruent

- State which postulate, or theorem, you can use to prove that these triangles are congruent. Explain using the sentence provided.

Given: $< 2 \cong < 3$;
$< 1 \cong < 4$




- These triangles are congruent by the **AAS** **Theorem**