Introduction

If a rigid motion or a series of rigid motions, including translations, rotations, or reflections, is performed on a triangle, then the transformed triangle is congruent to the original. When two triangles are congruent, the corresponding angles have the same measures and the corresponding sides have the same lengths. It is possible to determine whether triangles are congruent based on the angle measures and lengths of the sides of the triangles.

Key Concepts

- To determine whether two triangles are congruent, you must observe the angle measures and side lengths of the triangles.
- When a triangle is transformed by a series of rigid motions, the angles are images of each other and are called corresponding angles.
- Corresponding angles are a pair of angles in a similar position.

Key Concepts, *continued*

- If two triangles are congruent, then any pair of corresponding angles is also congruent.
- When a triangle is transformed by a series of rigid motions, the sides are also images of each other and are called corresponding sides.
- Corresponding sides are the sides of two figures that lie in the same position relative to the figure.
- If two triangles are congruent, then any pair of corresponding sides is also congruent.

Key Concepts, *continued*

- Congruent triangles have three pairs of corresponding angles and three pairs of corresponding sides, for a total of six pairs of corresponding parts.
- If two or more triangles are proven congruent, then all of their corresponding parts are congruent as well. This postulate is known as **Corresponding Parts of Congruent Triangles are Congruent (CPCTC)**. A **postulate** is a true statement that does not require a proof.

Key Concepts, *continued*

- The corresponding angles and sides can be determined by the order of the letters.
- If $\triangle ABC$ is congruent to $\triangle DEF$, the angles of the two triangles correspond in the same order as they are named.
- Use the symbol $\rightarrow$ to show that two parts are corresponding.

Angle $A \rightarrow$ Angle D; they are equivalent.

Angle $B \rightarrow$ Angle E; they are equivalent.

Angle $C \rightarrow$ Angle F; they are equivalent.

Key Concepts, *continued*

- The corresponding angles are used to name the corresponding sides.

$\overline{AB} \rightarrow \overline{DE}$; they are equivalent.

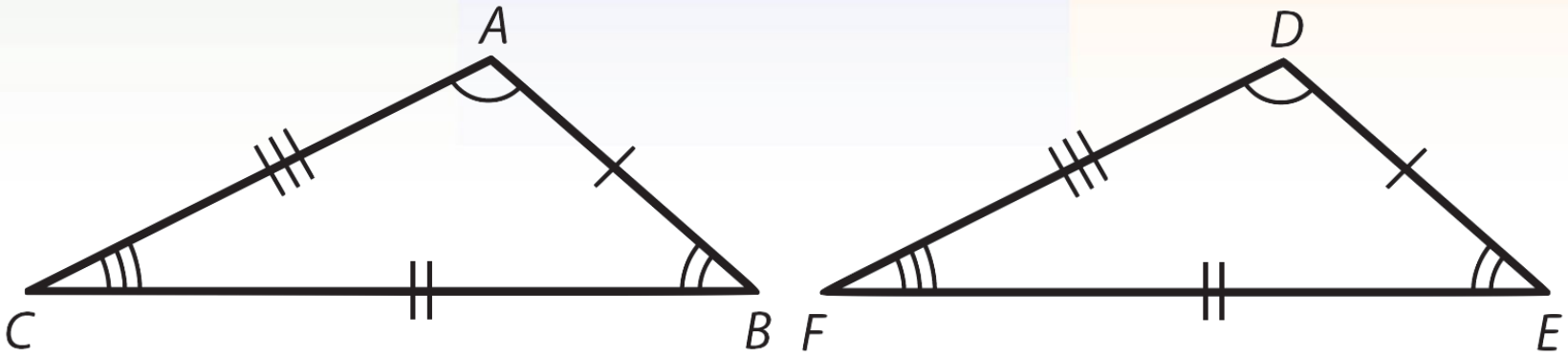
$\overline{BC} \rightarrow \overline{EF}$; they are equivalent.

$\overline{AC} \rightarrow \overline{DF}$; they are equivalent.

Key Concepts, *continued*

- Observe the diagrams of $\triangle ABC$ and $\triangle DEF$.

$\triangle ABC \cong \triangle DEF$



$\angle A \cong \angle D$

$\angle B \cong \angle E$

$\angle C \cong \angle F$

$\overline{AB} \cong \overline{DE}$

$\overline{BC} \cong \overline{EF}$

$\overline{AC} \cong \overline{DF}$

Key Concepts, *continued*

- By observing the angles and sides of two triangles, it is possible to determine if the triangles are congruent.
- Two triangles are congruent if the corresponding angles are congruent and corresponding sides are congruent.
- Notice the number of tick marks on each side of the triangles in the diagram.
- The tick marks show the sides that are congruent.

Key Concepts, *continued*

- Compare the number of tick marks on the sides of $\triangle ABC$ to the tick marks on the sides of $\triangle DEF$.
- Match the number of tick marks on one side of one triangle to the side with the same number of tick marks on the second triangle.
  - $\overline{AB}$ and $\overline{DE}$ each have one tick mark, so the two sides are congruent.
  - $\overline{BC}$ and $\overline{EF}$ each have two tick marks, so the two sides are congruent.
  - $\overline{AC}$ and $\overline{DF}$ each have three tick marks, so the two sides are congruent.

Key Concepts, *continued*

- The arcs on the angles show the angles that are congruent.
- Compare the number of arcs on the angles of $\triangle ABC$ to the number of arcs on the angles of $\triangle DEF$.
- Match the arcs on one angle of one triangle to the angle with the same number of arcs on the second triangle.
  - $\angle A$ and $\angle D$ each have one arc, so the two angles are congruent.
  - $\angle B$ and $\angle E$ each have two arcs, so the two angles are congruent.
  - $\angle C$ and $\angle F$ each have three arcs, so the two angles are congruent.

Key Concepts, *continued*

- If the sides and angles are not labeled as congruent, you can use a ruler and protractor or construction methods to measure each of the angles and sides.
- You can also measure the side lengths using the distance formula if the triangle is plotted on the coordinate plane.

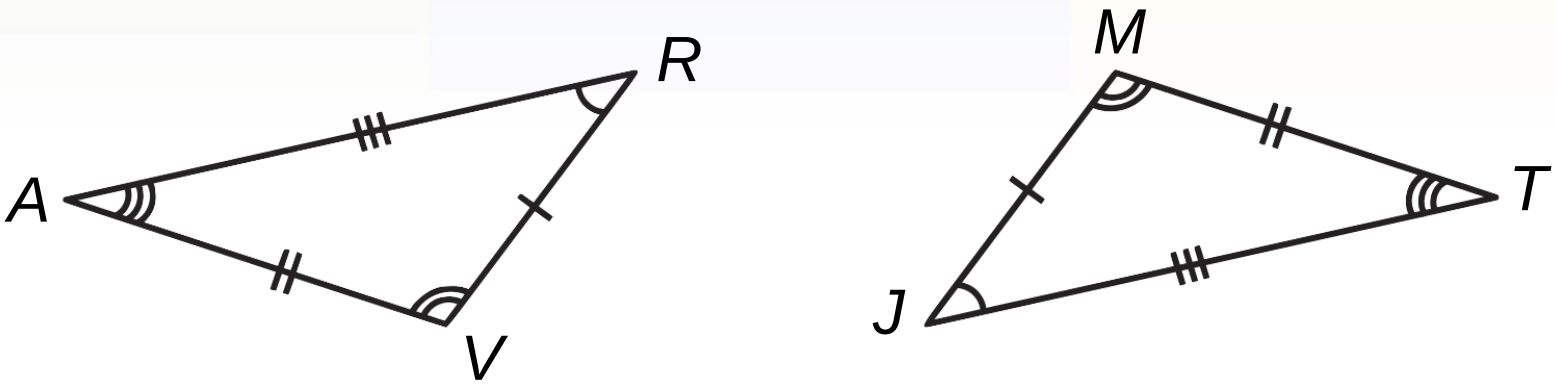
Common Errors/Misconceptions

- incorrectly identifying corresponding parts of triangles
- assuming corresponding parts indicate congruent parts
- assuming alphabetical order indicates congruence

Guided Practice

Example 1

Use corresponding parts to identify the congruent triangles.



Guided Practice: Example 1, *continued*

1. **Match the number of tick marks to identify the corresponding congruent sides.**

$\overline{RV}$ and $\overline{JM}$ each have one tick mark; therefore, they are corresponding and congruent.

$\overline{VA}$ and $\overline{MT}$ each have two tick marks; therefore, they are corresponding and congruent.

$\overline{RA}$ and $\overline{JT}$ each have three tick marks; therefore, they are corresponding and congruent.

Guided Practice: Example 1, *continued*

2. Match the number of arcs to identify the corresponding congruent angles.

$\angle R$ and $\angle J$ each have one arc; therefore, the two angles are corresponding and congruent.

$\angle V$ and $\angle M$ each have two arcs; therefore, the two angles are corresponding and congruent.

$\angle A$ and $\angle T$ each have three arcs; therefore, the two angles are corresponding and congruent.

Guided Practice: Example 1, *continued*

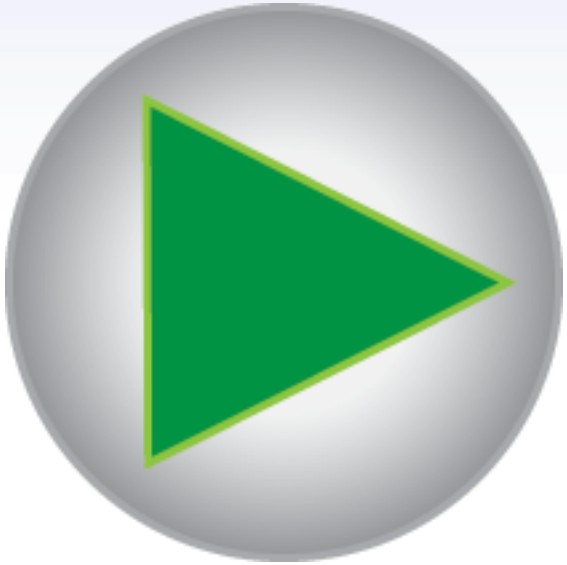
3. Order the congruent angles to name the congruent triangles.

$\triangle RVA$ is congruent to $\triangle JMT$, or $\triangle RVA \cong \triangle JMT$.

It is also possible to identify the congruent triangles as $\triangle VAR \cong \triangle MTJ$, or even $\triangle ARV \cong \triangle TJM$; whatever order chosen, it is important that the order in which the vertices are listed in the first triangle matches the congruency of the vertices in the second triangle.

For instance, it is not appropriate to say that $\triangle RVA$ is congruent to $\triangle MJT$ because $\angle R$ is not congruent to $\angle M$.

Guided Practice: Example 1, *continued*



Guided Practice

Example 2

$\triangle BDF \cong \triangle HJL$

Name the corresponding angles and sides of the congruent triangles.

Guided Practice: Example 2, *continued*

1. Identify the congruent angles.

The names of the triangles indicate the angles that are corresponding and congruent. Begin with the first letter of each name.

Identify the first set of congruent angles.

$\angle B$ is congruent to $\angle H$.

Identify the second set of congruent angles.

$\angle D$ is congruent to $\angle J$.

Identify the third set of congruent angles.

$\angle F$ is congruent to $\angle L$.

Guided Practice: Example 2, *continued*

2. Identify the congruent sides.

The names of the triangles indicate the sides that are corresponding and congruent. Begin with the first two letters of each name.

Identify the first set of congruent sides.

$\overline{BD}$ is congruent to $\overline{HJ}$.

Identify the second set of congruent sides.

$\overline{DF}$ is congruent to $\overline{JL}$.

Identify the third set of congruent sides.

$\overline{BF}$ is congruent to $\overline{HL}$.

Guided Practice: Example 2, *continued*