Date: 12/15/20

# Lesson 5.3 - SAS Triangle Congruency

**Learning Intent (Target):** *Today I will* be able to determine whether or not triangles are congruent based on Side-Angle-Side Congruency.

**Success Criteria:** *I'll know I'll have it when* I can accuratley determine if triangles are congruent and write 2-column proofs using SAS Congruency for Triangles.

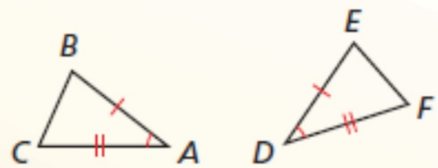
**Accountable Team Task:** *Therefore, I can* practice using interactive flip charts for notes and invstigations using gizmos & creating foldables.

## Theorem

### Theorem 5.5 Side-Angle-Side (SAS) Congruence Theorem

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

If $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\overline{AC} \cong \overline{DF}$, then $\triangle ABC \cong \triangle DEF$.

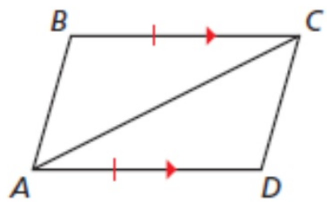



*Proof* p. 246

**Write a proof.**

**Given** $\overline{BC} \cong \overline{DA}, \quad \overline{BC} \parallel \overline{AD}$

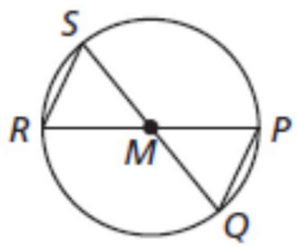
**Prove** $\triangle ABC \cong \triangle CDA$




**SOLUTION**

| | STATEMENTS | REASONS |
|---|---|---|
| S | **1.** $\overline{BC} \cong \overline{DA}$ | **1.** Given |
| | **2.** $\overline{BC} \parallel \overline{AD}$ | **2.** Given |
| A | **3.** $\angle BCA \cong \angle DAC$ | **3.** Alternate Interior Angles Theorem (Thm. 3.2) |
| S | **4.** $\overline{AC} \cong \overline{CA}$ | **4.** Reflexive Property of Congruence (Thm. 2.1) |
| | **5.** $\triangle ABC \cong \triangle CDA$ | **5.** SAS Congruence Theorem |

In the diagram, $\overline{QS}$ and $\overline{RP}$ pass through the center $M$ of the circle. What can you conclude about $\triangle MRS$ and $\triangle MPQ$ ?

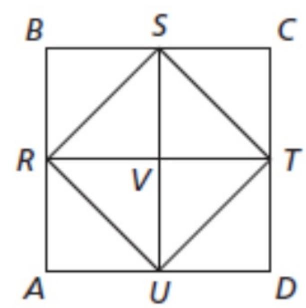



**SOLUTION**

Because they are vertical angles, $\angle PMQ \cong \angle RMS$. All points on a circle are the same distance from the center, so $\overline{MP}$, $\overline{MQ}$, $\overline{MR}$, and $\overline{MS}$ are all congruent.

▶ So, $\triangle MRS$ and $\triangle MPQ$ are congruent by the SAS Congruence Theorem.

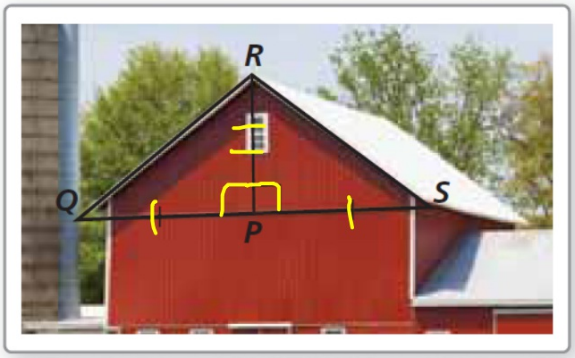
**In the diagram, *ABCD* is a square with four congruent sides and four right angles. *R*, *S*, *T*, and *U* are the midpoints of the sides of *ABCD*. Also,** $\overline{RT} \perp \overline{SU}$ **and** $\overline{SV} \cong \overline{VU}$.




**1.** Prove that $\triangle SVR \cong \triangle UVR$.

| STATEMENTS | REASONS |
|---|---|
| 1. $\overline{SV} \cong \overline{VU}$, $\overline{RT} \perp \overline{SU}$ | 1. Given |
| 2. $\overline{VR} \cong \overline{VR}$ | 2. Reflexive Property of Congruence (Thm. 2.1) |
| 3. $\angle SVR$ and $\angle UVR$ are right angles. | 3. Definition of perpendicular lines |
| 4. $\angle SVR \cong \angle UVR$ | 4. Right Angles Congruence Theorem (Thm. 2.3) |
| 5. $\triangle SVR \cong \triangle UVR$ | 5. SAS Congruence Theorem (Thm. 5.5) |

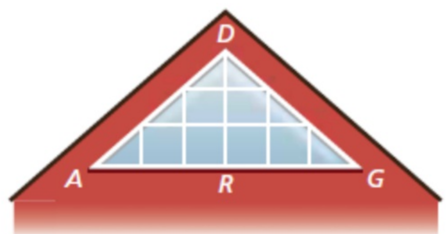
You are making a canvas sign to hang on the triangular portion of the barn wall shown in the picture. You think you can use two identical triangular sheets of canvas. You know that $\overline{RP} \perp \overline{QS}$ and $\overline{PQ} \cong \overline{PS}$. Use the SAS Congruence Theorem to show that $\triangle PQR \cong \triangle PSR$.




You are given that $\overline{PQ} \cong \overline{PS}$. By the Reflexive Property of Congruence (Theorem 2.1), $\overline{RP} \cong \overline{RP}$. By the definition of perpendicular lines, both $\angle RPQ$ and $\angle RPS$ are right angles, so they are congruent. So, two pairs of sides and their included angles are congruent.

▶ $\triangle PQR$ and $\triangle PSR$ are congruent by the SAS Congruence Theorem.

**3.** You are designing the window shown in the photo. You want to make $\triangle DRA$ congruent to $\triangle DRG$. You design the window so that $\overline{DA} \cong \overline{DG}$ and $\angle ADR \cong \angle GDR$. Use the SAS Congruence Theorem to prove $\triangle DRA \cong \triangle DRG$.




| STATEMENTS | REASONS |
|---|---|
| 1. $\overline{DA} \cong \overline{DG}$, $\angle ADR \cong \angle GDR$ | 1. Given |
| 2. $\overline{DR} \cong \overline{DR}$ | 2. Reflexive Property of Congruence (Thm. 2.1) |
| 3. $\triangle DRA \cong \triangle DRG$ | 3. SAS Congruence Theorem (Thm. 5.5) |