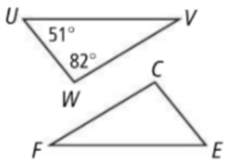
# Bell Ringer

**Section 10.1 – Congruent Triangles**

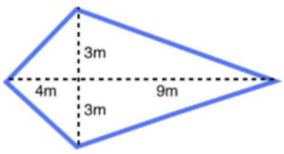
1. $\Delta FAR \cong \Delta HIT$ List all corresponding angles and corresponding sides.

2. Complete the statements, **Given:** $MATH \cong BEST$ $MH \cong$ _____ $ATHM \cong$ _____ ∠A≅ ∠_____
Given: $MATH \cong BEST$

3. If $\triangle UVW \cong \triangle EFC$, what is the measure of $\angle FEC$?




4. Find the area of the kite.



# Solutions

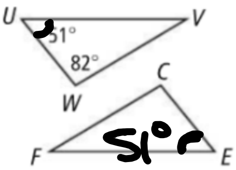
**Section 10.1 – Congruent Triangles**

1. $\Delta FAR \cong \Delta HIT$ List all corresponding angles and corresponding sides.

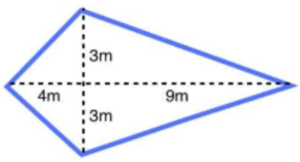
$\overline{FA} \cong \overline{HI}$, $\overline{AR} \cong \overline{IT}$, $\overline{RF} \cong \overline{TH}$ $\angle F \cong \angle H$, $\angle A \cong \angle I$, $\angle R \cong \angle T$

2. Complete the statements, **Given:** $MATH \cong BEST$ $MH \cong BT$ $ATHM \cong ESTB$ $\angle A \cong \angle E$
Given: $MATH \cong BEST$

3. If $\triangle UVW \cong \triangle EFC$, what is the measure of $\angle FEC$? $m\angle FEC = 51°$




4. Find the area of the kite.




A = ~~3[illegible]~~m$^2$

39m$^2$

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# 10-2 Triangle Congruence by SSS and SAS

G.SRT.5 Use congruence . . . criteria for triangles to solve problems and to prove relationships in geometric figures. Also prepares for G.CO.8

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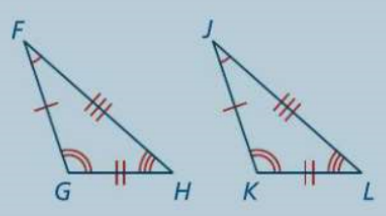
In the Solve It, you looked for relationships between corresponding sides and angles. In Lesson 10-1, you learned that if two triangles have three pairs of congruent corresponding angles and three pairs of congruent corresponding sides, then the triangles are congruent.

If you know . . .

$\angle F \cong \angle J \quad \overline{FG} \cong \overline{JK}$

$\angle G \cong \angle K \quad \overline{GH} \cong \overline{KL}$

$\angle H \cong \angle L \quad \overline{FH} \cong \overline{JL}$




. . . then you know $\triangle FGH \cong \triangle JKL$.

However, this is more information about the corresponding parts than you need to prove triangles congruent.

**Essential Understanding** You can prove that two triangles are congruent without having to show that *all* corresponding parts are congruent. In this lesson, you will prove triangles congruent by using (1) three pairs of corresponding sides and (2) two pairs of corresponding sides and one pair of corresponding angles.

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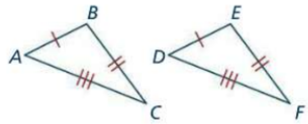
take note

**Postulate 3 Side-Side-Side (SSS) Postulate**

| Postulate | If . . . | Then . . . |
| --- | --- | --- |
| If the three sides of one triangle are congruent to the three sides of another triangle, then the two triangles are congruent. | $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$ | $\triangle ABC \cong \triangle DEF$ |




A postulate is an accepted statement of fact. The Side-Side-Side Postulate is perhaps the most logical fact about triangles. It agrees with the notion that triangles are rigid figures; their shape does not change until pressure on their sides forces them to break. This rigidity property is important to architects and engineers when they build things such as bicycle frames and steel bridges.

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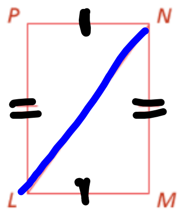
**Problem 1** Using SSS

**Proof** **Given:** $\overline{LM} \cong \overline{NP}$, $\overline{LP} \cong \overline{NM}$

**Prove:** $\triangle LMN \cong \triangle NPL$

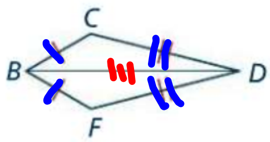



| S | R |
|---|---|
| $\overline{LM} \cong \overline{NP}$ | Given (S) |
| $\overline{LP} \cong \overline{NM}$ | Given (S) |
| $\overline{LN} \cong \overline{LN}$ | Reflexive Property (S) |
| $\triangle LMN \cong \triangle NPL$ | SSS |

# Got it pg 532

**Got It?** **Given:** $\overline{BC} \cong \overline{BF}, \overline{CD} \cong \overline{FD}$

**Prove:** $\triangle BCD \cong \triangle BFD$




| S | R |
|---|---|
| $\overline{BC} \cong \overline{BF}$ | Given |
| $\overline{CD} \cong \overline{FD}$ | Given |
| $\overline{BD} \cong \overline{BD}$ | Reflexive |
| $\triangle BCD \cong \triangle BFD$ | SSS |

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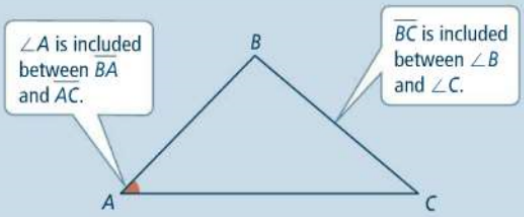
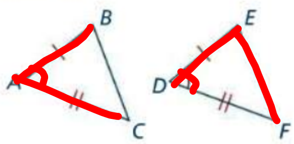
You can also show relationships between a pair of corresponding sides and an *included* angle.

The word *included* refers to the angles and the sides of a triangle, as shown at the right.




take note

**Postulate 4 Side-Angle-Side (SAS) Postulate**

| Postulate | If . . . | Then . . . |
|---|---|---|
| If two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle, then the two triangles are congruent. | $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, $\overline{AC} \cong \overline{DF}$  | $\triangle ABC \cong \triangle DEF$ |



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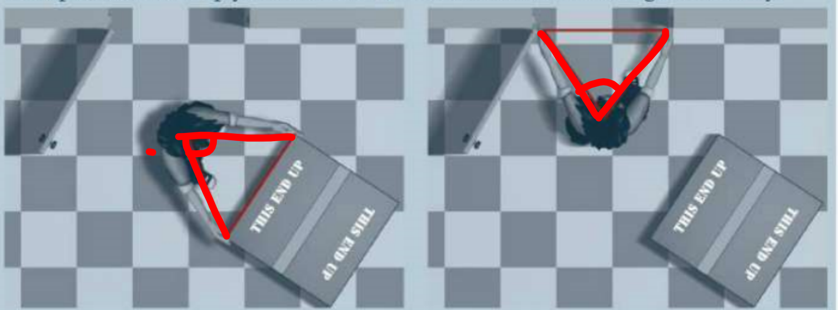
You likely have used the properties of the Side-Angle-Side Postulate before. For example, SAS can help you determine whether a box will fit through a doorway.




Suppose you keep your arms at a fixed angle as you move from the box to the doorway. The triangle you form with the box is congruent to the triangle you form with the doorway. The two triangles are congruent because two sides and the included angle of one triangle are congruent to the two sides and the included angle of the other triangle.

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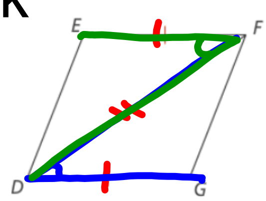
## Problem 2 Using SAS



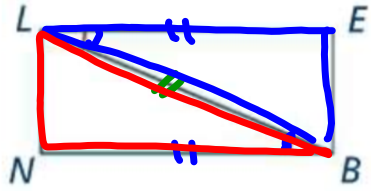

What other information do you need to prove $\triangle DEF \cong \triangle FGD$ by SAS? Explain.

S S

$\angle FDG \cong \angle DFE$

# Got it pg 534

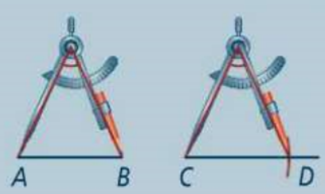
**Got It?** What other information do you need to prove $\triangle LEB \cong \triangle BNL$ by SAS?




$\angle ELB \cong \angle NBL$
$\overline{LB} \cong \overline{LB}$

$BN \cong LE$

Recall that, in Lesson 7-1, you learned to construct segments using a compass open to a fixed angle. Now you can show that it works. Similar to the situation with the box and the doorway, the Side-Angle-Side Postulate tells you that the triangles outlined at the right are congruent. So, $\overline{AB} \cong \overline{CD}$.

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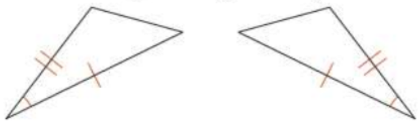
## Problem 3 Identifying Congruent Triangles

Would you use SSS or SAS to prove the triangles congruent? If there is not enough information to prove the triangles congruent by SSS or SAS, write *not enough information.* Explain your answer.

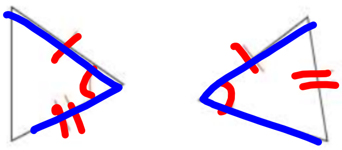
**A**



SAS

Would you use SSS or SAS to prove the triangles congruent? If there is not enough information to prove the triangles congruent by SSS or SAS, write *not enough information.* Explain your answer.

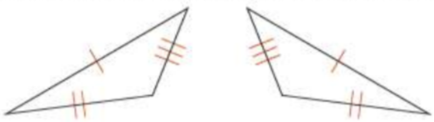
**B**



n.e.i.

Would you use SSS or SAS to prove the triangles congruent? If there is not enough information to prove the triangles congruent by SSS or SAS, write *not enough information.* Explain your answer.

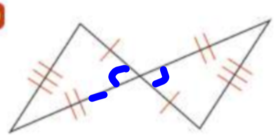
**C**



SSS

Would you use SSS or SAS to prove the triangles congruent? If there is not enough information to prove the triangles congruent by SSS or SAS, write *not enough information.* Explain your answer.

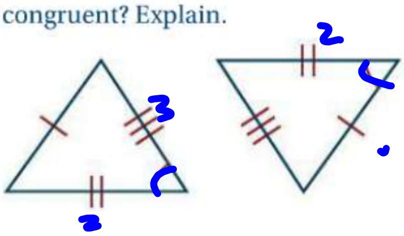
**D**



SSS or SAS

# Got it pg 535

**Got It?** Would you use SSS or SAS to prove the triangles below congruent? Explain.



SSS

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# 10-3 Triangle Congruence by ASA and AAS

G.SRT.5 Use congruence . . . criteria for triangles to solve problems and to prove relationships in geometric figures. Also prepares for G.CO.8

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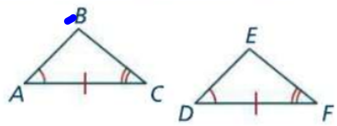
pg 540

You already know that triangles are congruent if two pairs of sides and the included angles are congruent (SAS). You can also prove triangles congruent using other groupings of angles and sides.

**Essential Understanding** You can prove that two triangles are congruent without having to show that *all* corresponding parts are congruent. In this lesson, you will prove triangles congruent by using one pair of corresponding sides and two pairs of corresponding angles.

take note

**Postulate 5 Angle-Side-Angle (ASA) Postulate**

| Postulate | If . . . | Then . . . |
|---|---|---|
| If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then the two triangles are congruent. | $\angle A \cong \angle D$, $\overline{AC} \cong \overline{DF}$, $\angle C \cong \angle F$  | $\triangle ABC \cong \triangle DEF$ |

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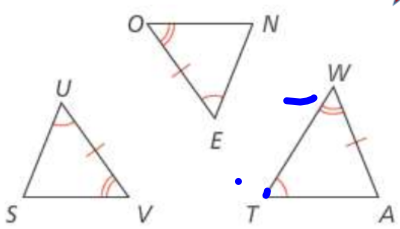
## Problem 1 Using ASA

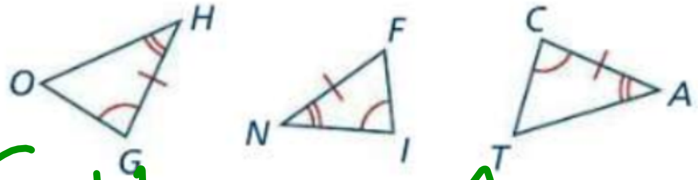
Which two triangles are congruent by ASA? Explain.




$\triangle UVS \cong \triangle EON$ by ASA

Got it pg 541

**Got It?** Which two triangles are congruent by ASA? Explain.

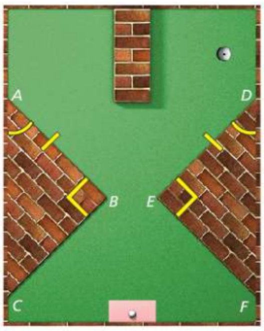



$\triangle GHO \cong \triangle CAT$

not in book

**Problem 2** Writing a Proof Using ASA

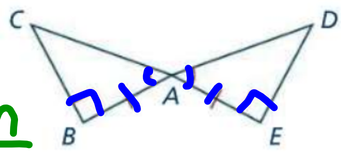
**Proof Recreation** Members of a teen organization are building a miniature golf course at your town's youth center. The design plan calls for the first hole to have two congruent triangular bumpers. Prove that the bumpers on the first hole, shown at the right, meet the conditions of the plan.



# Got it pg 542

**Got It?** **Given:** $\angle CAB \cong \angle DAE$, $\overline{BA} \cong \overline{EA}$, $\angle B$ and $\angle E$ are right angles

**Prove:** $\triangle ABC \cong \triangle AED$




| Statement | Reason |
|---|---|
| $\angle CAB \cong \angle DAE$ | Given (A) |
| $\overline{BA} \cong \overline{EA}$ | Given (S) |
| $\angle B$ & $\angle E$ are right $\angle$s | Given |
| $\angle B \cong \angle E$ | All right $\angle$s are $\cong$ (A) |
| $\triangle ABC \cong \triangle AED$ | ASA |

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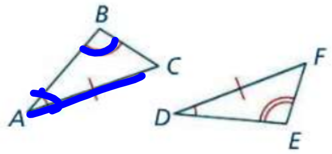
You can also prove triangles congruent by using two angles and a nonincluded side, as stated in the theorem below.

take note

**Theorem 2 Angle-Angle-Side (AAS) Theorem**

| Theorem | If . . . | Then . . . |
|---|---|---|
| If two angles and a nonincluded side of one triangle are congruent to two angles and the corresponding nonincluded side of another triangle, then the triangles are congruent. | $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\overline{AC} \cong \overline{DF}$   | $\triangle ABC \cong \triangle DEF$ |

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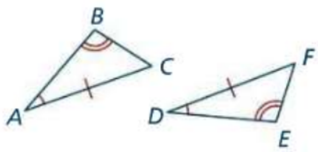
### Proof Proof of Theorem 2: Angle-Angle-Side Theorem

**Given:** $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\overline{AC} \cong \overline{DF}$

**Prove:** $\triangle ABC \cong \triangle DEF$




$\angle A \cong \angle D$
Given

$\angle B \cong \angle E$
Given

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

$\angle C \cong \angle F$
Third Angles Theorem

$\triangle ABC \cong \triangle DEF$
ASA

You have seen and used three methods of proof in this book—two-column, paragraph, and flow proof. Each method is equally as valid as the others. Unless told otherwise, you can choose any of the three methods to write a proof. Just be sure your proof always presents logical reasoning with justification.

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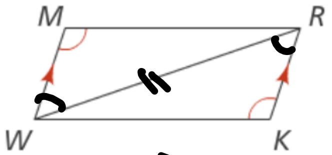
not in book

**Problem 3** Writing a Proof Using AAS

**Proof** **Given:** $\angle M \cong \angle K$, $\overline{WM} \parallel \overline{RK}$

**Prove:** $\triangle WMR \cong \triangle RKW$

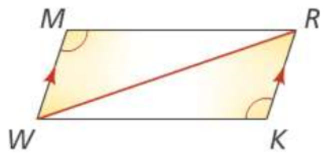



| Statements | Reasons |
|---|---|
| $\angle M \cong \angle K$ | Given (A) |
| $\overline{WM} \parallel \overline{RK}$ | Given |
| $\angle MWR \cong \angle KRW$ | Alt. Int $\angle$s are $\cong$ (A) |
| $\overline{WR} \cong \overline{WR}$ | Reflexive Prop. (S) |
| $\triangle WMR \cong \triangle RKW$ | AAS |

## Problem 3 Writing a Proof Using AAS

**Proof** **Given:** $\angle M \cong \angle K$, $\overline{WM} \parallel \overline{RK}$

**Prove:** $\triangle WMR \cong \triangle RKW$

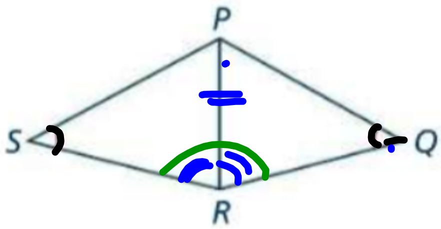



| Statements | Reasons |
|---|---|
| 1) $\angle M \cong \angle K$ | 1) Given |
| 2) $\overline{WM} \parallel \overline{RK}$ | 2) Given |
| 3) $\angle MWR \cong \angle KRW$ | 3) If lines are $\parallel$, then alternate interior $\angle$s are $\cong$. |
| 4) $\overline{WR} \cong \overline{WR}$ | 4) Reflexive Property of Congruence |
| ✔5) $\triangle WMR \cong \triangle RKW$ | 5) AAS |

Got it pg 544

**Got It?** **a. Given:** $\angle S \cong \angle Q$, $\overline{RP}$ bisects $\angle SRQ$

**Prove:** $\triangle SRP \cong \triangle QRP$



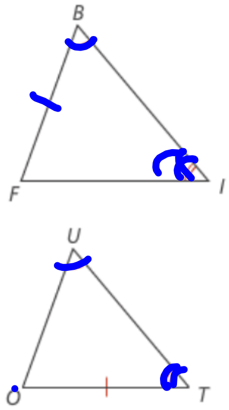

| Statement | Reason |
|---|---|
| $\angle S \cong \angle Q$ | Given (A) |
| $\overline{RP}$ bisects $\angle SRQ$ | Given |
| $\angle PRS \cong \angle PRQ$ | By def. of $\angle$ bisector (A) |
| $\overline{PR} \cong \overline{PR}$ | Reflexive Prop. (S) |
| $\triangle SRP \cong \triangle QRP$ | AAS |

not in book

**Problem 4** Determining Whether Triangles Are Congruent

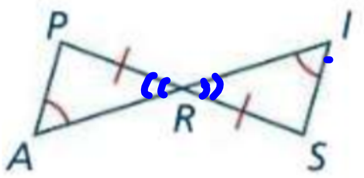
**Multiple Choice** Use the diagram at the right. Which of the following statements best represents the answer and justification to the question "Is $\triangle BIF \cong \triangle UTO$?"

(A) Yes, the triangles are congruent by ASA.
(B) No, $\overline{FB}$ and $\overline{OT}$ are not corresponding sides.
(C) Yes, the triangles are congruent by AAS.
(D) No, $\angle B$ and $\angle U$ are not corresponding angles.



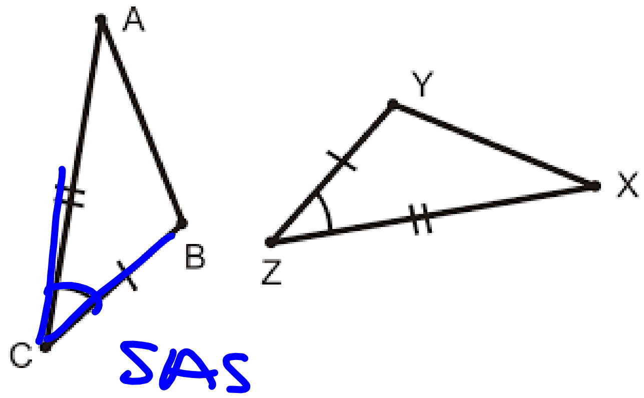
# Got it pg 545

**Got It?** Are $\triangle PAR$ and $\triangle SIR$ congruent? Explain.

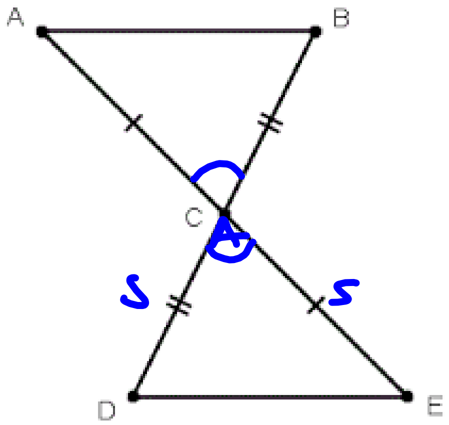



Yes! by AAS

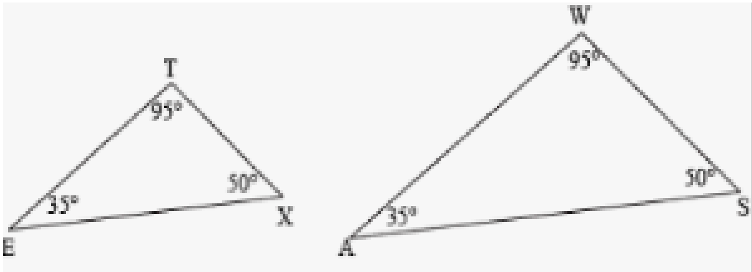
Are the triangles congruent? How do you know?



Are the triangles congruent? How do you know?

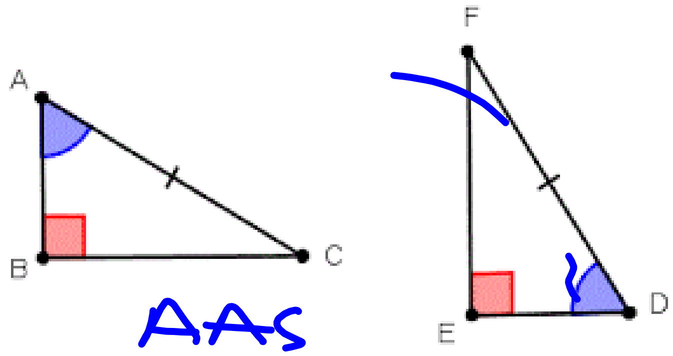


Are the triangles congruent? How do you know?



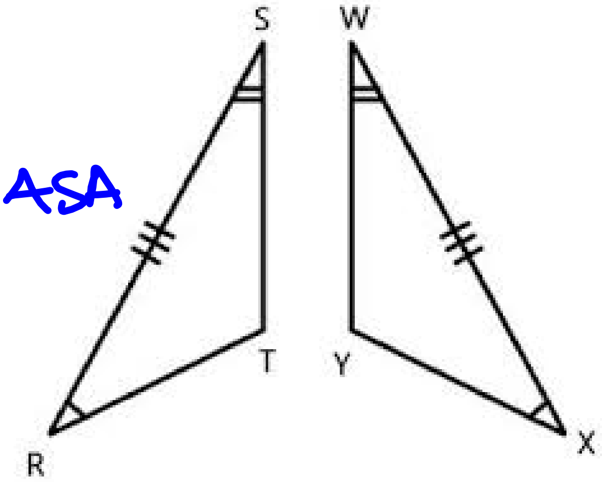

n.e.i

Are the triangles congruent? How do you know?



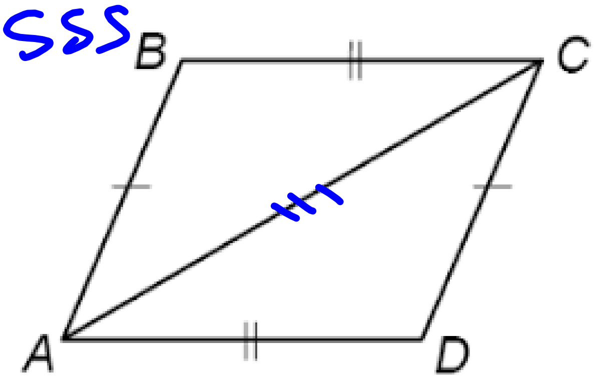
Are the triangles congruent? How do you know?

ASA



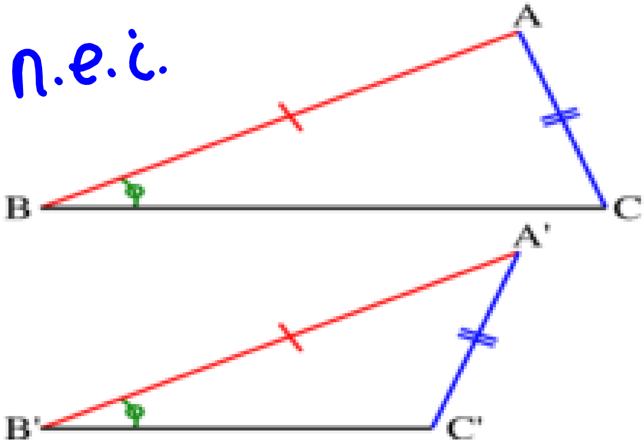
Are the triangles congruent? How do you know?

SSS

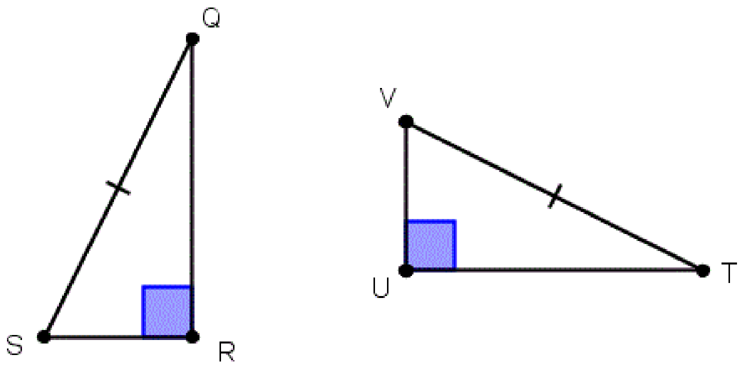


Are the triangles congruent? How do you know?

n.e.i.

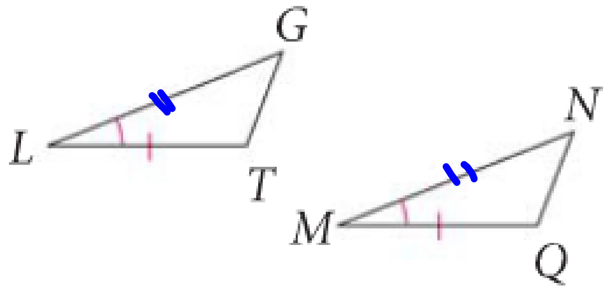


Are the triangles congruent? How do you know?

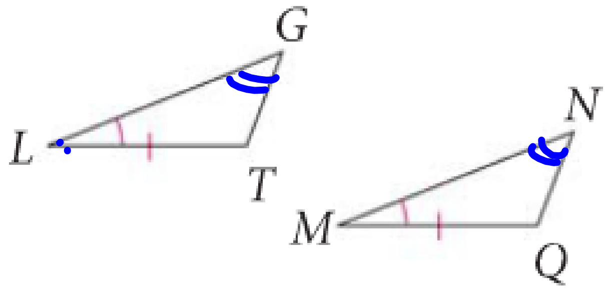



n.e.i

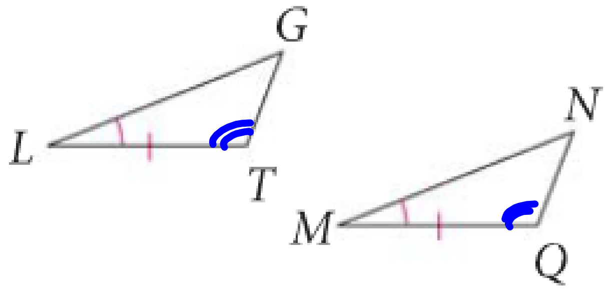
What information is missing that would prove the triangles are congruent by SAS?



What information is missing that would prove the triangles are congruent by AAS?



What information is missing that would prove the triangles are congruent by ASA?



hw 10.2 #s 1-14, 23-27, skip #26

hw 10.3 #s 1-3, 5, 7-15, 20