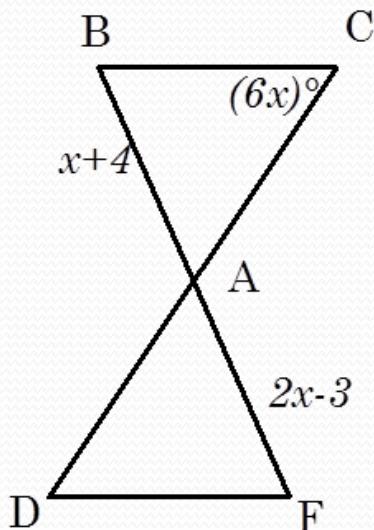


Formal Geometry Chapter

Proving Triangles Congruent

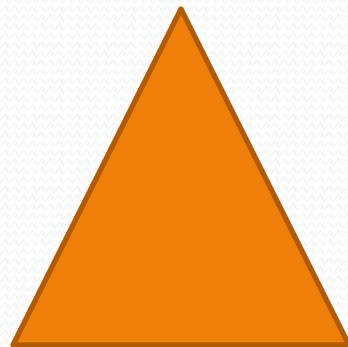
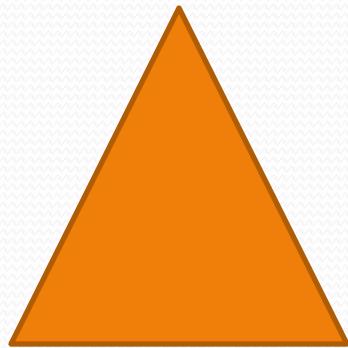
Warm Up

- 1) If $\Delta ABC \cong \Delta DEF$, write the corresponding congruent parts.
- 2) In the figure, $\Delta ABC \cong \Delta AFD$. What is the $m\angle D$?



Objectives

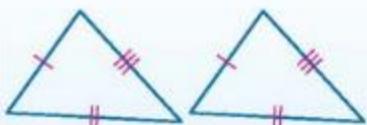
- Can you prove triangles congruent using SSS, SAS, ASA, AAS, and HL?



To Prove Triangles are Congruent you need one of the following...

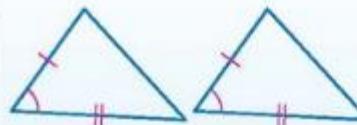
- Side Side Side (SSS)
- Side Angle Side (SAS)
- Angle Side Angle (ASA)
- Angle Angle Side (AAS)
- Hypotenuse Leg (HL)

SSS



Three pairs of corresponding sides are congruent.

SAS



Two pairs of corresponding sides and their included angles are congruent.

ASA



Two pairs of corresponding angles and their included side are congruent.

AAS

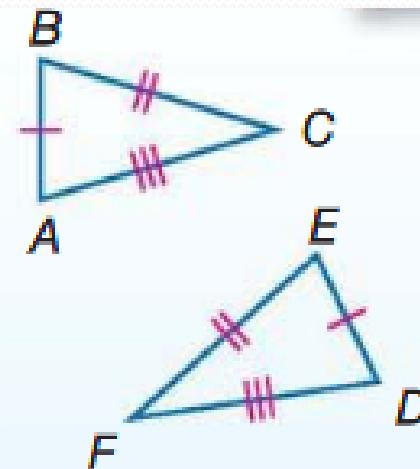


Two pairs of corresponding angles and their non-included side are congruent.

Side-Side-Side (SSS)

- If three sides of one triangle are congruent to three sides of a second triangle, then the triangles are congruent. (If SSS then \cong)

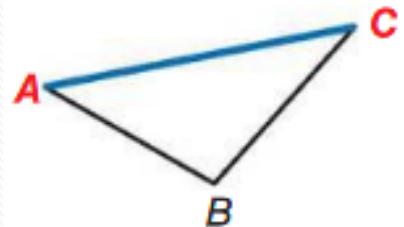
If Side $\overline{AB} \cong \overline{DE}$,
Side $\overline{BC} \cong \overline{EF}$, and
Side $\overline{AC} \cong \overline{DF}$,
then $\triangle ABC \cong \triangle DEF$.



- To prove this in a graph might need distance formula

Included Side and Included Angle

- Included Side: the side located between two consecutive angles

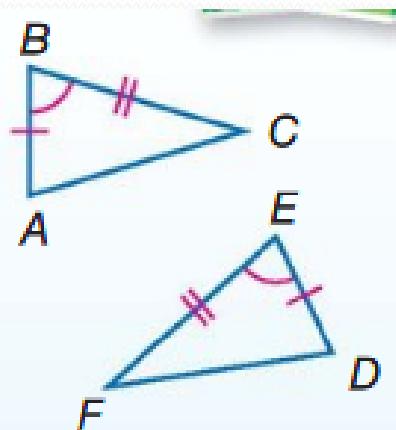


- Included Angle: the angle located between two consecutive sides

Side-Angle-Side (SAS)

- 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 triangles are congruent. (If SAS then \cong)

If Side $\overline{AB} \cong \overline{DE}$,
Angle $\angle B \cong \angle E$, and
Side $\overline{BC} \cong \overline{EF}$,
then $\triangle ABC \cong \triangle DEF$.

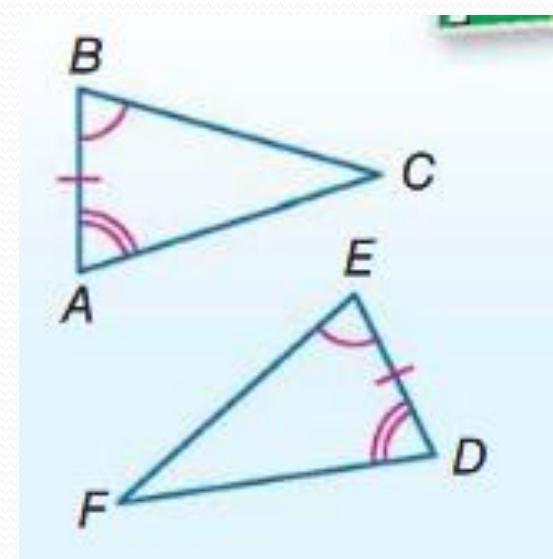


- To prove congruent in a grid---distance formula and angle measure

Angle-Side-Angle (ASA)

- If two angles and the included side of one triangle are congruent to two angles and the included side of a second triangle, then the triangles are congruent. (If ASA then \cong)

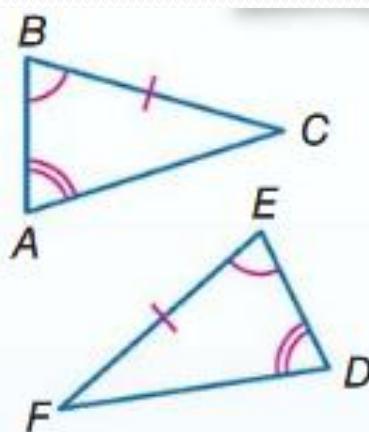
If Angle $\angle A \cong \angle D$,
Side $\overline{AB} \cong \overline{DE}$, and
Angle $\angle B \cong \angle E$,
then $\triangle ABC \cong \triangle DEF$.



Angle-Angle-Side (AAS)

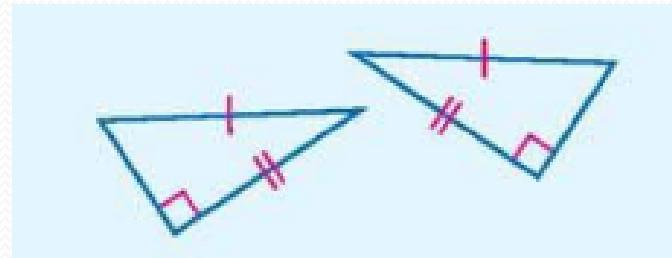
- If two angles and the nonincluded side of one triangle are congruent to the corresponding two angles and side of a second triangle, then the triangles are congruent.
(If AAS then \cong)

If Angle $\angle A \cong \angle D$,
Angle $\angle B \cong \angle E$, and
Side $\overline{BC} \cong \overline{EF}$,
then $\triangle ABC \cong \triangle DEF$.



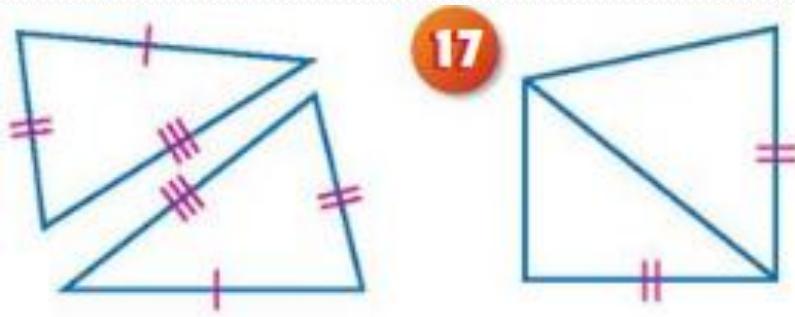
Hypotenuse Leg (HL)

- If the hypotenuse and a leg of one right triangle are congruent to the hypotenuse and corresponding leg of a second right triangle, then the triangles are congruent. (If HL then \cong)



Examples

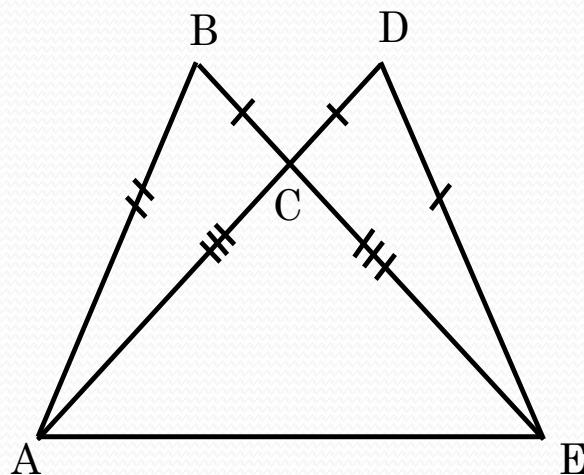
- Can you determine if these triangles are congruent?



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Examples

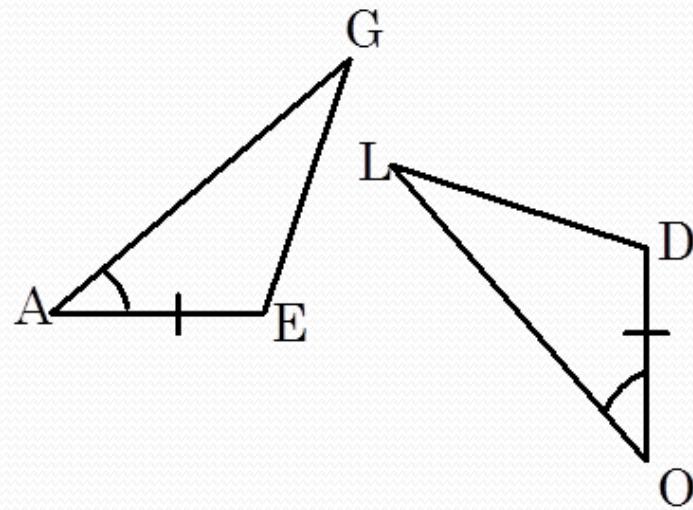
- Refer to the figure to complete the congruence statement, $\Delta ABC \cong \underline{\hspace{2cm}}$.



Examples

In the figure $\angle GAE \cong \angle LOD$ and $\overline{AE} \cong \overline{DO}$.

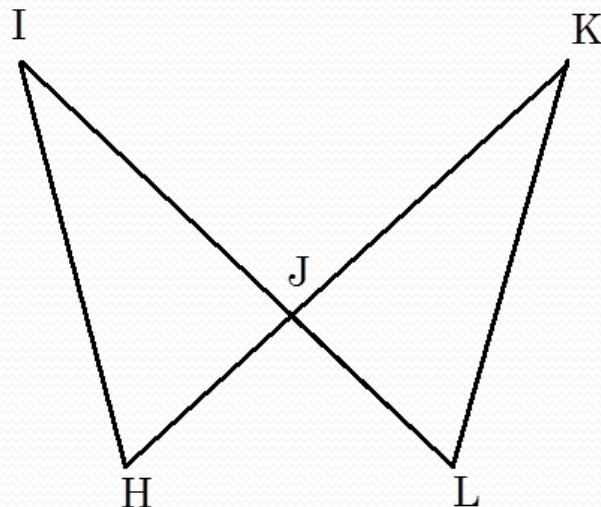
What information is needed to prove that $\Delta AGE \cong \Delta OLD$ by SAS.



Examples

In the figure $\angle H \cong \angle L$ and $HJ = JL$.

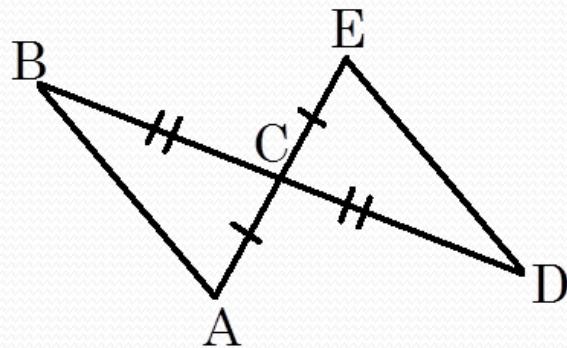
Write a congruence statement for the triangles and justify your answer.



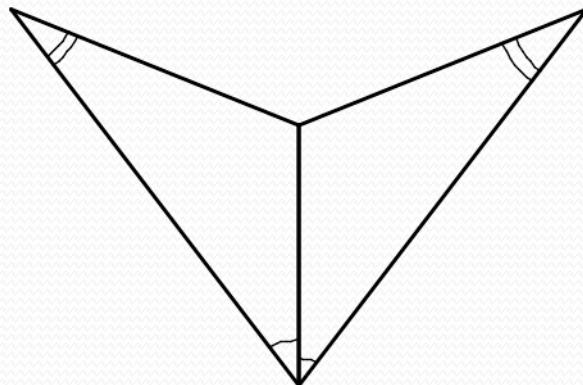
Example

Determine which postulate or theorem can be used to prove each pair of triangles congruent.

a.



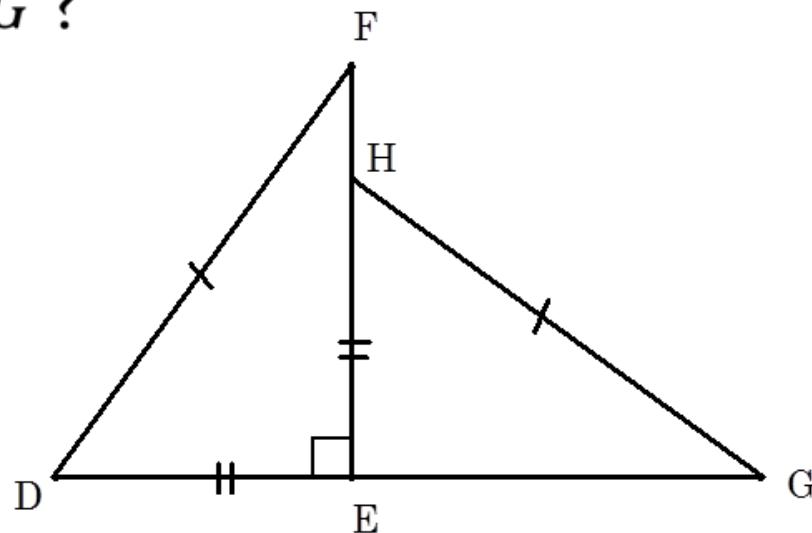
b.



Examples

In the figure $DE = EH$ and $\overline{GH} \cong \overline{DF}$.

Which theorem can be used to conclude that $\Delta DEF \cong \Delta HEG$?



Complete the “are we congruent activity” now!

- Determine whether triangle PQR and triangle STU are congruent. P(3,-2) Q(1,2) R(-1,4) and S(-4,-3) T(-2,1) U(0,3)

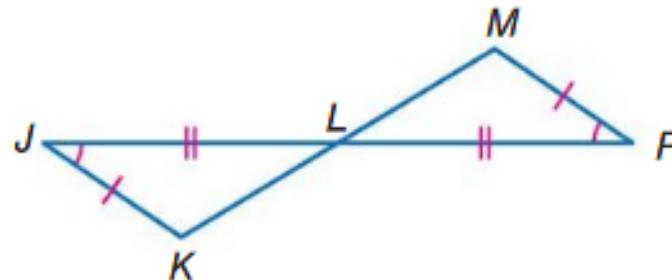
Example Proofs

Check Your Progress

4. Write a two column proof.

Given: $\angle J \cong \angle P$, $\overline{JK} \cong \overline{PM}$,
 $\overline{JL} \cong \overline{PL}$, and L bisects \overline{KM} .

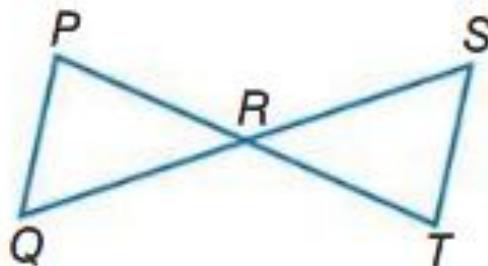
Prove: $\triangle JLK \cong \triangle PLM$



Write a 2-column proof

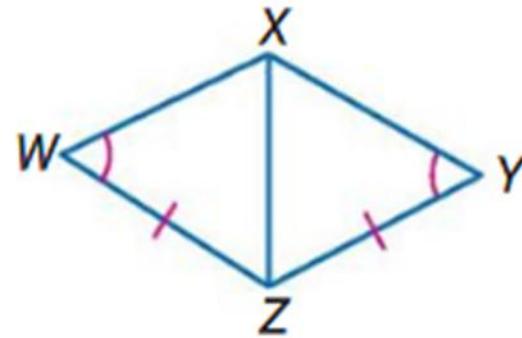
Given: R is the midpoint of \overline{QS} and \overline{PT} .

Prove: $\triangle PRQ \cong \triangle TRS$



Given: $\angle W \cong \angle Y$, $\overline{WZ} \cong \overline{YZ}$, \overline{XZ} bisects $\angle WZY$.

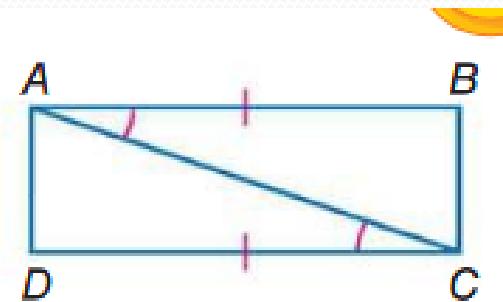
Prove: $\triangle XWZ \cong \triangle XYZ$



Write a two-column proof.

Given: $\overline{BA} \cong \overline{DC}$, $\angle BAC \cong \angle DCA$

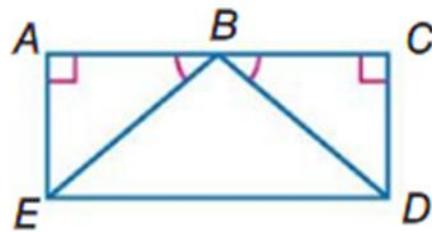
Prove: $\overline{BC} \cong \overline{DA}$



Given: $\angle A$ and $\angle C$ are right angles.

$$\angle ABE \cong \angle CBD, \overline{AE} \cong \overline{CD}$$

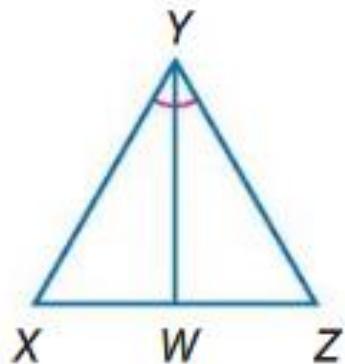
Prove: $\overline{BE} \cong \overline{BD}$



Warm Up

Given: $\triangle XYZ$ is equilateral.
 \overline{WY} bisects $\angle Y$.

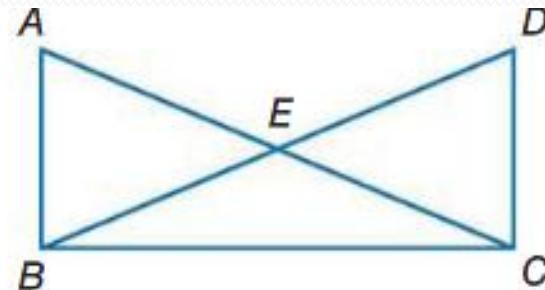
Prove: $\overline{XW} \cong \overline{ZW}$



Given: $\overline{AB} \parallel \overline{DC}$, $\overline{AB} \perp \overline{BC}$

E is the midpoint of \overline{AC} and \overline{BD} .

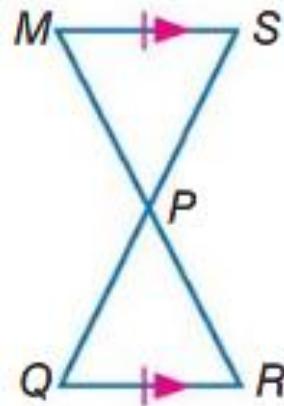
Prove: $\overline{AC} \cong \overline{DB}$



Write a flow proof.

Given: $\overline{MS} \cong \overline{RQ}$, $\overline{MS} \parallel \overline{RQ}$

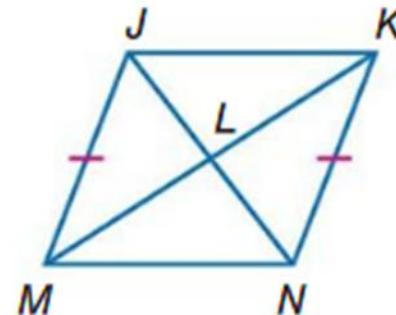
Prove: $\triangle MSP \cong \triangle RQP$



Write a paragraph proof.

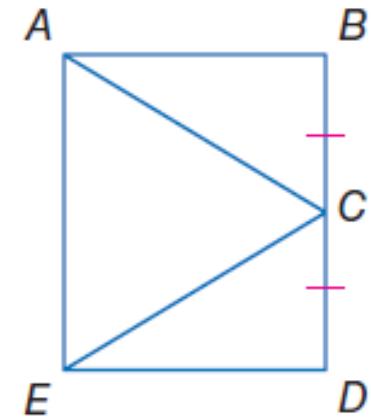
Given: $\overline{JM} \cong \overline{NK}$; L is the midpoint of \overline{JN} and \overline{KM} .

Prove: $\angle MJL \cong \angle KNL$



Proof Example

PROOF If $ABDE$ is a rectangle and $\overline{BC} \cong \overline{DC}$, prove that $\overline{AC} \cong \overline{EC}$.



Proof Example

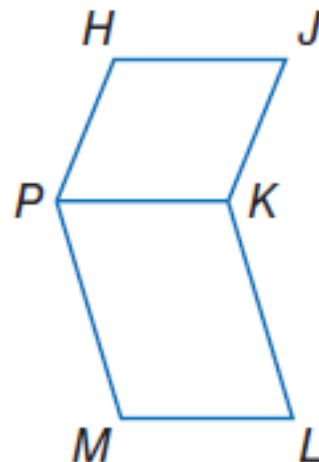


Check Your Progress

4. Write a two-column proof.

Given: $\square HJKP$ and $\square PKLM$

Prove: $\overline{HJ} \cong \overline{ML}$



Given: GFBA and HACD are parallelograms

Prove: Angle F congruent to Angle D

