4.4 and 4.5 TRIANGLE CONGRUENCE CONJECTURES.

Ways to show two Triangles are Congruent:

- Side-Side-Side
- Side-Side-Angle
- Side-Angle-Angle
- Angle-Angle-Angle
- Angle-Side-Angle
- Side-Angle-Side
Construct a triangle, more than one if possible, using the following:

a) \[\text{Construct a triangle, more than one if possible, using the following: a) A \rightarrow B \rightarrow C \rightarrow B}\\

b) \[\text{Construct a triangle, more than one if possible, using the following: b) A \rightarrow B \rightarrow C \rightarrow C}\]

c) \[\text{Construct a triangle, more than one if possible, using the following: c) A \rightarrow C \rightarrow C}\]

Draw a triangle with the following interior angles 45, 45, 90.

Why did SSA not work?

Why did AAA not work?
Mark the following triangles given the stated congruent triangle conjecture.

\[ \triangle ABC \cong \triangle DEF \]

<table>
<thead>
<tr>
<th>SSS</th>
<th>SAA</th>
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<tbody>
<tr>
<td><img src="image1" alt="SSS Triangle" /></td>
<td><img src="image2" alt="SAA Triangle" /></td>
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<table>
<thead>
<tr>
<th>ASA</th>
<th>SAS</th>
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<tr>
<td><img src="image3" alt="ASA Triangle" /></td>
<td><img src="image4" alt="SAS Triangle" /></td>
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Determine which triangles are congruent and why?

Using your previous conjectures mark congruent angles and sides if they exist and then find the corresponding congruent triangle. State the reason the two triangles are congruent.

a. \( \triangle ADB \cong \triangle \) ______
b. \( \triangle STU \cong \triangle \) ______
c. \( \triangle EFX \cong \triangle \) ______
1. \( \triangle OHW \cong \triangle \) ________
Which conjecture supports the congruence statement? (If not enough info, write not enough info) ________

2. \( \overline{SA} \parallel \overline{SCD} \) (hint: transversal?), \( \overline{SAD} \cong \overline{SBC} \), \( \triangle ABC \cong \triangle \) ________
Which conjecture supports the congruence statement? (If not enough info, write not enough info) ________

3. \( \overline{SAC} \cong \overline{SBD} \), \( \overline{SAD} \cong \overline{SBC} \), \( \triangle ADB \cong \triangle \) ________
Which conjecture supports the congruence statement? ________
5. \( sQD \cong sAD, \ sQU \cong sAU \) If you construct segment \( DU \), you can show \( \triangle QDU \cong \triangle ADU \). Which conjecture tells you they are congruent? ______

![Diagram](image)

6. \( sAB \cong sCD, \ \angle CDB \cong \angle ABD \) Which conjecture tells you that \( \triangle ABD \cong \triangle CDB \)? ________

![Diagram](image)
In Exercises 1–3, name the conjecture that leads to each congruence.

1. \( \triangle PAT \cong \triangle IMT \)
2. \( \triangle SID \cong \triangle JAN \)
3. \( \overline{TS} \) bisects \( \overline{MA}, \overline{MT} \cong \overline{AT}, \) and \( \triangle MST \cong \triangle AST \)

In Exercises 4–9, name a triangle congruent to the given triangle and state the congruence conjecture. If you cannot show any triangles to be congruent from the information given, write “cannot be determined” and redraw the triangles so that they are clearly not congruent.

4. \( M \) is the midpoint of \( \overline{AB} \) and \( \overline{PQ}. \)
   \( \triangle APM \cong \triangle \) ______

5. \( KITE \) is a kite with \( KI = TI. \)
   \( \triangle KIE \cong \triangle \) ______

6. \( \triangle ABC \cong \) ______

7. \( \triangle MON \cong \) ______

8. \( \triangle SQR \cong \) ______

9. \( \triangle TOP \cong \) ______

10. Which conjecture supports each congruence statement?
    \( \triangle ABH \cong \triangle CBD \) ______
    \( \triangle HGF \cong \triangle DEF \) ______
    \( \triangle HFB \cong \triangle DFB \) ______
In Exercises 1–6, name a triangle congruent to the given triangle and state the congruence conjecture. If you cannot show any triangles to be congruent from the information given, write “cannot be determined” and explain why.

1. \( \triangle PIT \cong \triangle \) 

2. \( \triangle XVW \cong \triangle \) 

3. \( \triangle ECD \cong \triangle \) 

4. \( \overline{PS} \) is the angle bisector of \( \angle QPR \).

\( \triangle PQS \cong \triangle \) 

5. \( \triangle ACN \cong \triangle \) 

6. \( EFGH \) is a parallelogram.

\( GQ = EQ \).

\( \triangle EQL \cong \triangle \) 

Review:

Construct the \( \triangle ABC \) so that it is congruent to \( \triangle PSR \) using ASA

Construct the \( \triangle ABC \) so that it is congruent to \( \triangle PSR \) using SSS

Construct the \( \triangle ABC \) so that it is congruent to \( \triangle PSR \) using SAS
4.6 CPCTC

1. $\triangle ABC \cong \triangle \underline{\text{_______}}$.
Which conjecture supports the congruence statement? _________

Because of _________ both triangles are congruent. Which means

$sAC \cong sDB, \ \angle CBD \cong \angle BCA, \ and \ \angle CAB \cong \angle BDC$

CPCTC ----- Corresponding Parts of Congruent Triangles are Congruent

2. $\triangle ABC \cong \triangle \underline{\text{_______}}$
Which conjecture supports the congruence statement? _________

Because of _________ both triangles are congruent. Which means

$sAB \cong sED, \ sBC \cong sDC, \ \angle B \cong \angle D, \ and \ \angle DCE \cong \angle BCA$

3. $\underline{sAB \perp sCD}, \ sAB \cong sCD, \ EC \perp sCD, \ \angle A \cong \angle D, \ \triangle ABC \cong \triangle \underline{\text{_______}}$
Which conjecture supports the congruence statement? _________

Because of _________ both triangles are congruent. Which sides and angles are congruent?
1. Give the shorthand name for each of the four triangle congruence conjectures.

In Exercises 2–5, use the figure at right to explain why each congruence is true. \(WXYZ\) is a parallelogram.

2. \(\angle WYZ \cong \angle YZX\)  
3. \(\angle WZX \cong \angle YXZ\)

4. \(\triangle WZX \cong \triangle YXZ\)  
5. \(\angle W \cong \angle Y\)

For Exercises 6 and 7, mark the figures with the given information. To demonstrate whether the segments or the angles indicated are congruent, determine that two triangles are congruent. Then state which conjecture proves them congruent.

6. \(M\) is the midpoint of \(WX\) and \(YZ\). Is \(YW \cong ZX\)? Why?

7. \(\triangle ABC\) is isosceles and \(\overline{CD}\) is the bisector of the vertex angle. Is \(\overline{AD} \cong \overline{BD}\)? Why?

In Exercises 8 and 9, use the figure at right to write a paragraph proof for each statement.

8. \(\overline{DE} \cong \overline{CF}\)  
9. \(\overline{EC} \cong \overline{FD}\)

10. \(TRAP\) is an isosceles trapezoid with \(TP = RA\) and \(\angle PTR \cong \angle ART\). Write a paragraph proof explaining why \(\overline{TA} \cong \overline{RP}\).
4.7 FLOWCHART THINKING

1. Provide each missing reason or statement in the flow-chart proof.

Given: \( SHR \cong SSE \)
\[ \angle R \cong \angle S \]

Show: \( SHU \cong SEU \)

Flow-chart Proof:

\[
\begin{align*}
&\text{Given} \\
&\angle R \cong \angle S \\
&\angle HUR \cong \angle EUS \\
&\triangle HRU \cong \triangle ESU \\
&\text{Prove: } \angle HU \cong \angle EU
\end{align*}
\]

5. From the picture fill in the given and prove: \( \angle O \cong \angle K \)

\[
\begin{align*}
&\text{GIVEN} \\
&\text{GIVEN} \\
&\angle O \cong \angle K
\end{align*}
\]
6. Find the two congruent triangles and draw them next to each other, then write a proof.

Given: \( \triangle PRS \cong \triangle PQS \)
\( \triangle PRT \cong \triangle PQS \)

Prove: \( \angle PRT \cong \angle PQS \)

7. From the picture fill in the given and

Prove: \( \triangle OYW \cong \triangle OWT \)

8. Given: \( \angle D \cong \angle C \)
\( \triangle DCE \cong \triangle SEC \)

Prove: \( \triangle ABE \cong \triangle ABE \)
Complete the flowchart for each proof.

1. **Given:** \( PQ \parallel SR \) and \( PQ \cong SR \)
   **Show:** \( SP \cong QR \)
   **Flowchart Proof**
   
   - Given
   - \( PQ \parallel SR \)
   - \( \triangle PQS \cong \)______
   - \( SP \cong QR \)
   - \( QS \cong \)______

2. **Given:** Kite \( KITE \) with \( KE \cong KI \)
   **Show:** \( KT \) bisects \( \angle EKI \) and \( \angle ETI \)
   **Flowchart Proof**
   
   - \( KE \cong KI \)
   - \( KITE \) is a kite
   - \( \triangle KET \cong \)______
   - \( \angle ETK \cong \angle ITK \)
   - Definition of bisect

3. **Given:** \( ABCD \) is a parallelogram
   **Show:** \( \angle A \cong \angle C \)
   **Flowchart Proof**
   
   - \( AB \parallel CD \)
   - \( ABCD \) is a parallelogram
   - Definition of
   - Same segment
   - \( \angle A \cong \angle C \)