

Triangle Congruence: SSS and SAS Postulates

Geometry Worksheet · Grade 8–10

Name: _____

Date: _____

Learning Objectives

- Identify and apply the Side-Side-Side (SSS) Postulate to prove triangle congruence
- Identify and apply the Side-Angle-Side (SAS) Postulate to prove triangle congruence
- Write two-column proofs using SSS and SAS postulates, including the Reflexive Property of Congruence

Problems

1. State the SSS Postulate in your own words: if _____ sides of one triangle are congruent to _____ sides of another triangle, then the two triangles are congruent.

2. Given that triangle ABC has sides $AB = 5$, $BC = 7$, and $AC = 9$, and triangle DEF has sides $DE = 5$, $EF = 7$, and $DF = 9$, which postulate proves the triangles are congruent?

$$AB \cong DE, BC \cong EF, AC \cong DF$$

3. In a diagram, triangles PQR and STU share the property that $PQ \cong ST$ and $QR \cong TU$, but PR and SU are not marked congruent. Can you conclude the triangles are congruent by SSS? Explain.

4. Two triangles share a common side CB. Write the statement and reason that justifies $CB \cong CB$ in a two-column proof.

$$CB \cong CB$$

5. In quadrilateral ABCD with diagonal CB, you are given $AB \cong CD$ and $AC \cong BD$. Name the third pair of congruent sides needed to prove $\triangle ABC \cong \triangle DCB$ by SSS.

$$CB \cong CB$$

6. Complete the two-column proof: Given $AB \cong CD$ and $AC \cong BD$ in quadrilateral ABCD with diagonal CB, prove $\triangle ABC \cong \triangle DCB$ by listing all three statements and reasons.

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$$\triangle ABC \cong \triangle DCB$$

7. State the SAS Postulate: if two sides and the _____ angle between them in one triangle are congruent to two sides and the _____ angle of another triangle, then the triangles are congruent.

8. In triangles XYZ and MNP, you are given $XY \cong MN$, $\angle Y \cong \angle N$, and $YZ \cong NP$. Which postulate proves $\triangle XYZ \cong \triangle MNP$, and why?

$$XY \cong MN, \angle Y \cong \angle N, YZ \cong NP$$

9. Determine whether $\triangle ABC \cong \triangle DEF$ given $AB = 8$, $BC = 10$, $\angle B = 45^\circ$, $DE = 8$, $EF = 10$, and $\angle E = 45^\circ$. State the postulate used.

$$AB = DE = 8, BC = EF = 10, \angle B = \angle E = 45^\circ$$

10. In the diagram, M is the midpoint of both diagonals AC and BD of quadrilateral ABCD (i.e., $AM \cong MC$ and $BM \cong MD$), and $\angle AMB \cong \angle CMD$. Write a complete two-column proof to show $\triangle AMB \cong \triangle CMD$, stating which postulate applies.

$$\triangle AMB \cong \triangle CMD$$

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Triangle Congruence: SSS and SAS Postulates — Answer Key

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Answer Key

1. Answer: three; three

- Recall the SSS (Side-Side-Side) Postulate definition.
- If all three sides of one triangle are congruent to all three corresponding sides of another triangle, then the triangles are congruent.

2. Answer: SSS Postulate

- Check all three pairs of corresponding sides: $AB = DE = 5$, $BC = EF = 7$, $AC = DF = 9$.
- Since all three pairs of corresponding sides are congruent, apply the SSS Postulate to conclude $\triangle ABC \cong \triangle DEF$.

3. Answer: No; all three pairs of sides must be congruent for SSS.

- SSS requires all three pairs of corresponding sides to be congruent.
- Only two pairs are marked congruent, so SSS cannot be applied.

4. Answer: Statement: $CB \cong CB$; Reason: Reflexive Property of Congruence

- Recognize that CB is a shared (common) side between the two triangles.
- Any segment is congruent to itself by the Reflexive Property of Congruence.

5. Answer: $CB \cong CB$ (Reflexive Property)

- The given information provides $AB \cong CD$ and $AC \cong BD$.
- The diagonal CB is shared by both triangles, so $CB \cong CB$ by the Reflexive Property, giving the third pair.

6. Answer: 1) $AB \cong CD$ (Given); 2) $AC \cong BD$ (Given); 3) $CB \cong CB$ (Reflexive); Conclusion: $\triangle ABC \cong \triangle DCB$ by SSS

- Statement 1: $AB \cong CD$ — Reason: Given.
- Statement 2: $AC \cong BD$ — Reason: Given.
- Statement 3: $CB \cong CB$ — Reason: Reflexive Property of Congruence.
- Conclusion: $\triangle ABC \cong \triangle DCB$ — Reason: SSS Postulate.

7. Answer: included; included

- Recall the SAS (Side-Angle-Side) Postulate definition.
- The angle must be the included angle — the angle formed between the two congruent sides.

8. Answer: SAS Postulate; $\angle Y$ is the included angle between XY and YZ .

- Identify the two pairs of congruent sides: $XY \cong MN$ and $YZ \cong NP$.
- The angle $\angle Y$ ($\cong \angle N$) is between sides XY and YZ , making it the included angle.
- Apply the SAS Postulate to conclude $\triangle XYZ \cong \triangle MNP$.

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9. Answer: Yes, $\triangle ABC \cong \triangle DEF$ by the SAS Postulate.

- Identify the two pairs of congruent sides: $AB = DE = 8$ and $BC = EF = 10$.
 - The included angles are equal: $\angle B = \angle E = 45^\circ$.
 - Since two sides and the included angle are congruent, apply the SAS Postulate.
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10. Answer: $\triangle AMB \cong \triangle CMD$ by the SAS Postulate.

- Statement 1: $AM \cong MC$ — Reason: M is the midpoint of AC (Given).
 - Statement 2: $BM \cong MD$ — Reason: M is the midpoint of BD (Given).
 - Statement 3: $\angle AMB \cong \angle CMD$ — Reason: Given (or Vertical Angles Theorem if applicable).
 - Conclusion: $\triangle AMB \cong \triangle CMD$ — Reason: SAS Postulate (two sides and the included angle are congruent).
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