

CPCTC and Triangle Congruence Proofs

Geometry Worksheet · Grade 9–10

Name: _____

Date: _____

Learning Objectives

- Understand and apply the CPCTC theorem (Corresponding Parts of Congruent Triangles are Congruent)
- Use angle bisector definitions and congruence postulates to write two-column proofs
- Prove that specific angles or sides are congruent using triangle congruence and CPCTC

Problems

1. What does CPCTC stand for?

2. If ray AB bisects angle CAD, what conclusion can you write using the definition of an angle bisector?

$$\angle CAB \cong \angle BAD$$

3. If ray AB bisects angle CBD, what two congruent angles can you identify?

$$\angle CBA \cong \angle ABD$$

4. In a two-column proof, if segment AB is shared by triangles CAB and DAB, what statement and reason do you write?

$$\overline{AB} \cong \overline{AB}$$

5. Given that $\angle CAB \cong \angle BAD$, $\angle CBA \cong \angle ABD$, and $AB \cong AB$, which triangle congruence postulate or theorem proves $\triangle CAB \cong \triangle DAB$?

$$\triangle CAB \cong \triangle DAB$$

6. Once you have proven $\triangle CAB \cong \triangle DAB$, how can you conclude that angle 1 ($\angle CAB$ side) is congruent to angle 2 ($\angle DAB$ side) using CPCTC?

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$$\angle 1 \cong \angle 2$$

7. In the quadrilateral with bisector AB, if $CB = 12$ and the triangles CAB and DAB are congruent, what is DB?

$$DB = 12$$

8. Write the correct order of steps for a two-column proof showing $\angle 1 \cong \angle 2$ given that AB bisects $\angle CAD$ and $\angle CBD$: which reason justifies the LAST step?

$$\angle 1 \cong \angle 2$$

9. Given quadrilateral CADB where AB bisects $\angle CAD$ and $\angle CBD$, write all four steps of the two-column proof proving $\angle CAB \cong \angle DAB$ ($\angle 1 \cong \angle 2$) with correct statements and reasons in order.

$$\triangle CAB \cong \triangle DAB \Rightarrow \angle 1 \cong \angle 2$$

10. In a different figure, triangles PQR and STU are congruent. If $PQ = 3x + 5$ and $ST = 5x - 7$, find the value of x and the length of PQ using CPCTC.

$$3x + 5 = 5x - 7$$

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CPCTC and Triangle Congruence Proofs — Answer Key

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Answer Key

1. Answer: Corresponding Parts of Congruent Triangles are Congruent

- Recall the abbreviation used in geometry proofs.
- CPCTC stands for Corresponding Parts of Congruent Triangles are Congruent.

2. Answer: Angle CAB is congruent to angle BAD

- An angle bisector divides an angle into two equal (congruent) parts.
- Therefore, $\angle CAB \cong \angle BAD$ by the definition of an angle bisector.

3. Answer: Angle CBA is congruent to angle ABD

- AB bisects $\angle CBD$ means it divides $\angle CBD$ into two equal angles.
- By the definition of an angle bisector, $\angle CBA \cong \angle ABD$.

4. Answer: $AB \cong AB$; Reflexive Property

- A segment is always congruent to itself.
- Write: $AB \cong AB$, Reason: Reflexive Property of Congruence.

5. Answer: ASA (Angle-Side-Angle)

- We have two pairs of congruent angles and the included side AB between them.
- By ASA (Angle-Side-Angle), $\triangle CAB \cong \triangle DAB$.

6. Answer: By CPCTC, corresponding angles of congruent triangles are congruent

- Since $\triangle CAB \cong \triangle DAB$ is established, all corresponding parts are congruent.
- Therefore $\angle 1 \cong \angle 2$ by CPCTC.

7. Answer: $DB = 12$

- Since $\triangle CAB \cong \triangle DAB$, corresponding sides are congruent by CPCTC.
- CB corresponds to DB, so $DB = 12$.

8. Answer: CPCTC

- The last step concludes that specific angles are congruent after triangle congruence is established.
- The reason for the last step is CPCTC (Corresponding Parts of Congruent Triangles are Congruent).

9. Answer: Step 1: AB bisects $\angle CAD$ (Given); Step 2: $\angle CAB \cong \angle BAD$ (Def. Angle Bisector); Step 3: AB bisects $\angle CBD$ (Given); Step 4: $\angle CBA \cong \angle ABD$ (Def. Angle Bisector); Step 5: $AB \cong AB$ (Reflexive); Step 6: $\triangle CAB \cong \triangle DAB$ (ASA); Step 7: $\angle 1 \cong \angle 2$ (CPCTC)

- List all given information first, then apply definitions and postulates in logical order.
- End with CPCTC after establishing triangle congruence via ASA.

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10. Answer: $x = 6$; $PQ = 23$

- By CPCTC, corresponding sides of congruent triangles are equal: $PQ = ST$, so $3x + 5 = 5x - 7$.
 - Solve: $12 = 2x \rightarrow x = 6$; $PQ = 3(6) + 5 = 23$.
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