

Triangle Congruence Worksheet

WORKSHEET · PAGE 1 OF 4

Naming the postulate · write the three letters, or say why the parts are not enough

Name _____ Date _____ Score _____ / 22

THE FIVE THAT WORK, AND THE TWO THAT DO NOT**SSS** three sides • **SAS** two sides and the angle *between* them • **ASA** two angles and the side *between* them**AAS** two angles and a side *not* between them • **HL** right triangles: hypotenuse and one leg**SSA** and **AAA** are not postulates. SSA can describe two different triangles; AAA fixes the shape but not the size.**CPCTC** — corresponding parts of congruent triangles are congruent — is what you use *after* a proof, never inside one.**SECTION A Name the postulate**

Write SSS, SAS, ASA, AAS or HL. If the given parts are not enough, say so and name why.

- 1 Given $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{CA} \cong \overline{FD}$. Which postulate proves the triangles congruent?

Answer _____

- 2 Given $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\angle B \cong \angle E$. Which postulate proves the triangles congruent?

Answer _____

- 3 Given $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\overline{AB} \cong \overline{DE}$. Which postulate proves the triangles congruent?

Answer _____

- 4 Given $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\overline{BC} \cong \overline{EF}$. Which postulate proves the triangles congruent?

Answer _____

- 5 Given $\overline{AB} \cong \overline{DE}$, $\overline{CA} \cong \overline{FD}$, $\angle A \cong \angle D$. Which postulate proves the triangles congruent?

Answer _____

- 6 Given $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\angle A \cong \angle D$. Which postulate proves the triangles congruent?

Answer _____

- 7 Given $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$. Which postulate proves the triangles congruent?

Answer _____

8 $\triangle ABC$ and $\triangle DEF$ are right-angled at B and E . Given $\overline{CA} \cong \overline{FD}$, $\overline{AB} \cong \overline{DE}$, $\angle B \cong \angle E$. Which postulate proves the triangles congruent?

Answer _____

Triangle Congruence Worksheet

WORKSHEET · PAGE 2 OF 4

Finding the missing fact

SECTION B What else do you need?

Each pair is one fact short of a congruence proof. Name the missing fact and the postulate it completes.

- 9 $\overline{AB} \cong \overline{DE}$ and $\overline{BC} \cong \overline{EF}$. What one further fact would prove congruence by **SAS**?

Answer

- 10 $\angle A \cong \angle D$ and $\angle C \cong \angle F$. What one further fact would prove congruence by **ASA**?

Answer

- 11 $\overline{AB} \cong \overline{DE}$ and $\overline{CA} \cong \overline{FD}$. What would prove congruence by **SSS**?

Answer

- 12 $\angle B \cong \angle E$ and $\overline{AB} \cong \overline{DE}$. Name *two* different single facts, each of which would be enough.

Answer

- 13 The triangles are right-angled at B and E , and $\overline{CA} \cong \overline{FD}$ (the hypotenuses). What one further fact proves congruence by **HL**?

Answer

- 14 $\angle A \cong \angle D$, $\angle B \cong \angle E$ and $\angle C \cong \angle F$. What further fact is needed, and what does this tell you?

Answer

Triangle Congruence Worksheet

WORKSHEET · PAGE 3 OF 4

Deciding, with a reason

SECTION C Must they be congruent?

Answer yes or no, and justify it with a postulate or a counter-example.

- 15 Two triangles have $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$ and $\angle A \cong \angle D$. Must they be congruent?

Answer _____

- 16 Two triangles have all three pairs of angles congruent. Must they be congruent?

Answer _____

- 17 Two right triangles have congruent hypotenuses and one pair of congruent legs. Must they be congruent?

Answer _____

- 18 $\triangle ABC$ has $\overline{AB} = 5$, $\overline{BC} = 7$, $\angle B = 40^\circ$. $\triangle DEF$ has $\overline{DE} = 5$, $\overline{EF} = 7$, $\angle E = 40^\circ$. Must they be congruent?

Answer _____

- 19 Two triangles each have a side of 6 cm, a side of 8 cm and an angle of 50° . Must they be congruent?

Answer _____

- 20 In $\triangle ABC \cong \triangle DEF$, you know the triangles are congruent. What does CPCTC let you conclude about $\angle C$ and $\overline{BC}$?

Answer _____

Triangle Congruence Worksheet

WORKSHEET · PAGE 4 OF 4

Reasoning · answer in your own words

SECTION D Explain your reasoning

A short paragraph each.

21 SSA is not a congruence postulate, but HL is — and HL is a right triangle with two sides and a non-included angle. Explain why the right angle rescues it.

Answer _____

22 Why is CPCTC never used as a reason *for* proving two triangles congruent?

Answer _____

THE MISTAKE TO AVOID

Writing SAS when the angle is not between the two sides. The order of the letters is the whole point: S-A-S means side, *included* angle, side. If the angle sits outside the pair, you have SSA and no proof.

Answer Key

ANSWER KEY · PAGE 1 OF 3

Each postulate re-derived from the given parts at build time.

SECTION A

1. **SSS** — all three pairs of sides.
2. **SAS** — two sides and the angle between them.
3. **ASA** — two angles and the side between them.
4. **AAS** — two angles and a side that is not between them.
5. **SAS** — two sides and the angle between them.
6. **Not enough (ssa)**. Two sides and a non-included angle do not fix a triangle — the ambiguous case.
7. **Not enough (aaa)**. Equal angles fix the shape but not the size — the triangles are similar, not necessarily congruent.
8. **HL** — a right angle, the hypotenuse and one leg.

Answer Key

ANSWER KEY · PAGE 2 OF 3

Each postulate re-derived from the given parts at build time.

SECTION B

9. $\angle B \cong \angle E$ — the angle *between* the two given sides. An angle at A or C would give SSA, which is not enough.
10. $\overline{CA} \cong \overline{FD}$ — the side between the two given angles. Either other side would give AAS, which also works but is a different postulate.
11. $\overline{BC} \cong \overline{EF}$ — the third pair of sides.
12. $\angle A \cong \angle D$ gives ASA (the side $\overline{AB}$ lies between the two angles). $\overline{BC} \cong \overline{EF}$ gives SAS ($\angle B$ lies between the two sides). $\angle C \cong \angle F$ would give AAS and also works.
13. Either leg: $\overline{AB} \cong \overline{DE}$ or $\overline{BC} \cong \overline{EF}$.
14. Any one pair of corresponding sides. Three angles alone give *similar* triangles of any size; a single side fixes the scale and then AAS applies.

Answer Key

ANSWER KEY · PAGE 3 OF 3

Each postulate re-derived from the given parts at build time.

SECTION C

- 15. No.** This is SSA. With the angle not between the two sides, two different triangles can satisfy the same three facts — the same ambiguity that appears in the law of sines.
- 16. No.** They are similar: identical shape, possibly different size. A blueprint and the building it describes have equal angles and are not congruent.
- 17. Yes,** by HL. The third side is forced by Pythagoras, so it is really SSS in disguise — which is why HL works for right triangles though SSA does not in general.
- 18. Yes,** by SAS. $\angle B$ lies between the sides of lengths 5 and 7, and $\angle E$ lies between the matching pair, so the triangles are fully determined.
- 19. Not necessarily.** It depends where the 50° sits. Between the two sides it is SAS and they are congruent; opposite one of them it is SSA and they need not be.
- 20.** $\angle C \cong \angle F$ and $\overline{BC} \cong \overline{EF}$. Once congruence is proved, *every* pair of corresponding parts is congruent — that is what CPCTC means, and it is used *after* a congruence proof, never as part of one.

SECTION D

- 21.** In general SSA leaves two possible triangles, because the angle opposite a known side could be acute or obtuse. In a right triangle that choice disappears: the right angle is the largest, so every other angle must be acute. With the hypotenuse and one leg known, Pythagoras forces the third side, which makes it SSS.
- 22.** CPCTC is a consequence of congruence, not evidence for it. Using it to prove congruence assumes what you are trying to show. The order is always: establish congruence by SSS, SAS, ASA, AAS or HL first, then apply CPCTC to any remaining corresponding parts.