

Triangle Proof Lab

Choose the facts that prove triangles match.

HIGH SCHOOL • MA.912.GR.1.2

MA.912.GR.1.2 "Prove triangle congruence or similarity using Side-Side-Side, Side-Angle-Side, Angle-Side-Angle, Angle-Angle-Side, Angle-Angle and Hypotenuse-Leg."

NAME _____

DATE _____

You will need: Pencil; Ruler

PROOF SHORTCUTS

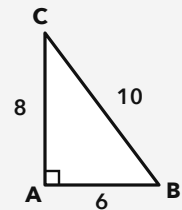
A proof matches corresponding facts, explains why a theorem applies, and states the triangles in corresponding order. Congruence uses SSS, SAS, ASA, AAS, or HL for right triangles. AA proves similarity, which alone does not establish congruence. An included angle lies between the given sides; an included side joins the given angles.

WORKED EXAMPLE

Use the figure. Triangle ABC is compared with $\triangle DEF$, where $DE=6$, $DF=8$, and $EF=10$. Prove the triangles congruent.

1. $AB=DE=6$, $AC=DF=8$, and $BC=EF=10$.
2. All three pairs of corresponding sides are congruent.
3. Use SSS with $A \leftrightarrow D$, $B \leftrightarrow E$, and $C \leftrightarrow F$.

Answer: $\triangle ABC \cong \triangle DEF$ by SSS.



PRACTICE 4 problems

- 1** In $\triangle ABC$ and $\triangle DEF$, $AB=DE=11$, $BC=EF=13$, and $\angle B \cong \angle E$. Prove the triangles congruent. Justify your conclusion using the matching facts and a theorem.

ANSWER _____

- 2** In $\triangle JKL$ and $\triangle MNO$, $\angle J \cong \angle M$, $\angle K \cong \angle N$, and $JK=MN=14$. Prove the triangles congruent. Justify your conclusion using the matching facts and a theorem.

ANSWER _____

- 3** In $\triangle PQR$ and $\triangle XYZ$, $\angle P \cong \angle X=36^\circ$, $\angle Q \cong \angle Y=71^\circ$, and $PR=XZ=15$. Prove the triangles congruent. Justify your conclusion using the matching facts and a theorem.

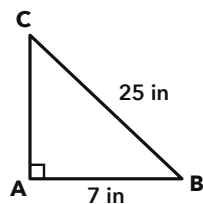
ANSWER _____

- 4** In $\triangle RST$ and $\triangle UVW$, $\angle R \cong \angle U=48^\circ$ and $\angle S \cong \angle V=77^\circ$. What can you prove? Justify your conclusion using the matching facts and a theorem.

ANSWER _____

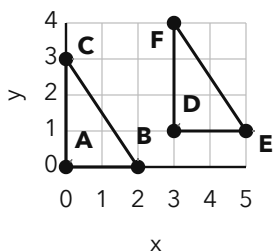
APPLY IT Show your work

- 1** A skate park uses the right-triangular support shown. A second right support, $\triangle DEF$, has $DE=7$ in and $EF=25$ in, with EF as its hypotenuse. Are the supports congruent? Justify the theorem using the given facts.



ANSWER _____

- 2** A game club plots two triangular logo decals on the grid. Are the decals congruent? Name a theorem. Show how the coordinate distances justify your theorem.



ANSWER _____

CHALLENGE One step up

Triangles ABC and DEF have $AB=DE=17$, $AC=DF=12$, and $\angle B \cong \angle E=35^\circ$. Can you prove them congruent using SSS, SAS, ASA, AAS, AA, or HL? Explain.

WORK SPACE AND ANSWER

PRACTICE 1

In $\triangle ABC$ and $\triangle DEF$, $AB=DE=11$, $BC=EF=13$, and $\angle B \cong \angle E$. Prove the triangles congruent. Justify your conclusion using the matching facts and a theorem.

$AB = DE$ and $BC = EF$ are two corresponding side pairs. $\angle B \cong \angle E$ is between those sides in each triangle. Therefore $\triangle ABC \cong \triangle DEF$ by SAS.

PRACTICE 2

In $\triangle JKL$ and $\triangle MNO$, $\angle J \cong \angle M$, $\angle K \cong \angle N$, and $JK=MN=14$. Prove the triangles congruent. Justify your conclusion using the matching facts and a theorem.

$\angle J \cong \angle M$ and $\angle K \cong \angle N$ give two corresponding angle pairs. $JK = MN$ is the included side joining those angles. Therefore $\triangle JKL \cong \triangle MNO$ by ASA.

PRACTICE 3

In $\triangle PQR$ and $\triangle XYZ$, $\angle P \cong \angle X=36^\circ$, $\angle Q \cong \angle Y=71^\circ$, and $PR=XZ=15$. Prove the triangles congruent. Justify your conclusion using the matching facts and a theorem.

$\angle P \cong \angle X = 36^\circ$ and $\angle Q \cong \angle Y = 71^\circ$ give two corresponding angle pairs. $PR = XZ$ is not the side between those two given angles. Therefore $\triangle PQR \cong \triangle XYZ$ by AAS.

PRACTICE 4

In $\triangle RST$ and $\triangle UVW$, $\angle R \cong \angle U=48^\circ$ and $\angle S \cong \angle V=77^\circ$. What can you prove? Justify your conclusion using the matching facts and a theorem.

$\angle R \cong \angle U = 48^\circ$ and $\angle S \cong \angle V = 77^\circ$. Two corresponding angle pairs are equal, so $\triangle RST \sim \triangle UVW$ by AA. These facts do not prove congruence because no equal corresponding length is given.

APPLY IT 1

Yes. $\triangle ABC \cong \triangle DEF$ by HL. Both triangles are right: A is marked right, and $\angle D$ is right because EF is the hypotenuse of right triangle DEF. $BC = EF = 25$ in are corresponding hypotenuses and $AB = DE = 7$ in are corresponding legs. Thus $\triangle ABC \cong \triangle DEF$ by HL.

APPLY IT 2

Yes. $\triangle ABC \cong \triangle DEF$ by SSS. $AB = DE = 2$ and $AC = DF = 3$ from horizontal and vertical changes. $BC = EF = \sqrt{(2^2 + 3^2)} = \sqrt{13}$. All three corresponding sides match, so $\triangle ABC \cong \triangle DEF$ by SSS.

CHALLENGE

No. $AB = DE$, $AC = DF$, and $\angle B \cong \angle E$ give SSA: the angle is not between the two known sides. Two triangles fit these data, so the listed congruence theorems do not prove the triangles congruent. AA alone proves only similarity, and no two equal angle pairs are given.

Require matching facts, a valid theorem with its conditions, and a correctly ordered conclusion. Accept paragraph proofs or a student-created statement/reason table; accept equivalent vertex orders that preserve correspondence. Accept ASA for practice 3 if the student first derives the third equal angle pair. AA establishes similarity only. For the challenge, identifying the non-included angle and SSA ambiguity is sufficient; no trigonometric calculation is required.