

Triangle Match Moves

Use rigid motions to justify congruence.

HIGH SCHOOL • MA.912.GR.2.7

MA.912.GR.2.7 "Justify the criteria for triangle congruence using the definition of congruence in terms of rigid transformations."

NAME _____

DATE _____

CONGRUENCE BY MOTION

Triangles are congruent when translations, rotations, and possibly reflections can map one exactly onto the other. SSS, SAS, ASA, AAS, and HL give enough matching information to force that mapping.

WORKED EXAMPLE

Triangle ABC has side lengths 7, 9, and 11. Triangle DEF has matching side lengths 7, 9, and 11. Justify that the triangles are congruent.

1. Translate and rotate so the 7-unit sides match.
2. Reflect if needed so matching vertices are on the same side.
3. The third vertex is fixed by distances 9 and 11 from the matched endpoints.
4. A rigid motion maps one triangle onto the other.

Answer: Triangle ABC is congruent to triangle DEF by SSS.

PRACTICE 5 problems

- 1** Both triangles have side lengths 3, 4, and 5. Name the criterion and justify it with rigid motions.

ANSWER _____

- 2** Both triangles have sides 6 and 8 with an included angle of 45 degrees. Name the criterion.

ANSWER _____

- 3** Both triangles have angles 52 degrees and 68 degrees, with the side between them measuring 10 cm. Name the criterion.

ANSWER _____

- 4** Both triangles have angles 35 degrees and 75 degrees, plus a 12-cm side that is not between those angles. Name the criterion.

ANSWER _____

- 5** Two right triangles each have a hypotenuse of 13 cm and a leg of 5 cm. Name the criterion.

ANSWER _____

APPLY IT Show your work

- 1** A skate park uses two triangular ramp panels. Each panel has side lengths 14 ft, 15 ft, and 16 ft. Can one panel replace the other without changing its shape?

WORK SPACE

ANSWER _____

- 2** Two triangular stage-light panels are right triangles. Each has a hypotenuse of 17 cm and one leg of 8 cm. Are the panels congruent?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Can SSA, two sides and a nonincluded angle, always prove triangles congruent? Explain using rigid motions.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Both triangles have side lengths 3, 4, and 5. Name the criterion and justify it with rigid motions.	SSS; matching three sides lets a rigid motion align all vertices.
2	Both triangles have sides 6 and 8 with an included angle of 45 degrees. Name the criterion.	SAS; the two sides and included angle fix the triangle, so a rigid motion can map it.
3	Both triangles have angles 52 degrees and 68 degrees, with the side between them measuring 10 cm. Name the criterion.	ASA; the angles and included side fix the triangle, so a rigid motion can map it.
4	Both triangles have angles 35 degrees and 75 degrees, plus a 12-cm side that is not between those angles. Name the criterion.	AAS; two angles and a side fix the triangle, so a rigid motion can map it.
5	Two right triangles each have a hypotenuse of 13 cm and a leg of 5 cm. Name the criterion.	HL; the hypotenuse and one leg fix a right triangle, so a rigid motion can map it.

PART 2 • APPLY IT

1. **Yes. The panels are congruent by SSS.** All three corresponding side lengths match. A rigid motion can align the panels exactly.
2. **Yes. The panels are congruent by HL.** Both are right triangles with matching hypotenuse and leg. HL guarantees a rigid motion maps one panel to the other.

CHALLENGE

No. SSA can make two different triangle shapes, so no single rigid motion must map one triangle onto the other.

Accept equivalent rigid-motion language, including translate, rotate, or reflect. For the challenge, accept any clear statement that SSA can be ambiguous and may produce noncongruent triangles.