

Geometry - Congruent Triangles and Rigid Motions - Answer Key

Common Core G-CO.B.7, G-CO.B.8 · maths-pdf.fr/en/

Use this answer key to check the 20 problems on congruent triangles. Every solution shows the formula or theorem used, each step of the work, and the final answer in bold. If an answer differs from yours, compare the steps line by line to find where the work changed.

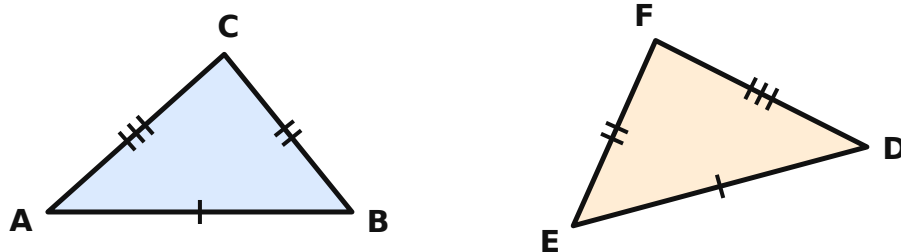
Geometry · Common Core State Standards: **G-CO.B.7, G-CO.B.8**

Exercise 1 - Corresponding parts

A matches D, so $m\angle D = 48^\circ$. B matches E and C matches F, so $EF = BC = 9$.

$m\angle D = 48^\circ$, $EF = 9$

Exercise 2 - Name the test: SSS



SSS: three pairs of congruent sides.

Each pair of corresponding sides is marked congruent (three pairs).

SSS

Exercise 3 - Name the test: SAS

Two pairs of sides are marked and the 50° angle is between them.

SAS

Exercise 4 - Name the test: **ASA**

Two pairs of angles are marked and the side between them is marked.

ASA

Exercise 5 - Name the test: **AAS**

QR is opposite P and YZ is opposite X, so the side is not between the two angles.

Two angles and a non-included side give **AAS**.

Yes, by AAS

Exercise 6 - Name the test: **HL**

Right triangles with a congruent hypotenuse and a congruent leg: **HL**.

With leg 5 and hypotenuse 13, the other leg is $\sqrt{13^2 - 5^2} = \sqrt{144} = 12$.

HL; 12

Exercise 7 - Why **SSA** fails

The side of length 6 can swing to meet the base in two different places, giving two different triangles.

SSA is not a valid test.

Not enough information: SSA does not prove congruence

Exercise 8 - Angles with **x**

Corresponding angles are equal.

$$3x + 5 = 5x - 21$$

$$26 = 2x$$

$$x = 13$$

$$m\angle A = 3(13) + 5 = 44^\circ$$

$$x = 13, m\angle A = 44^\circ$$

Exercise 9 - Sides with x

$$2x+3=4x-9$$

$$12=2x$$

$$x=6$$

$$AB=2(6)+3=15$$

$$x = 6, AB = 15$$

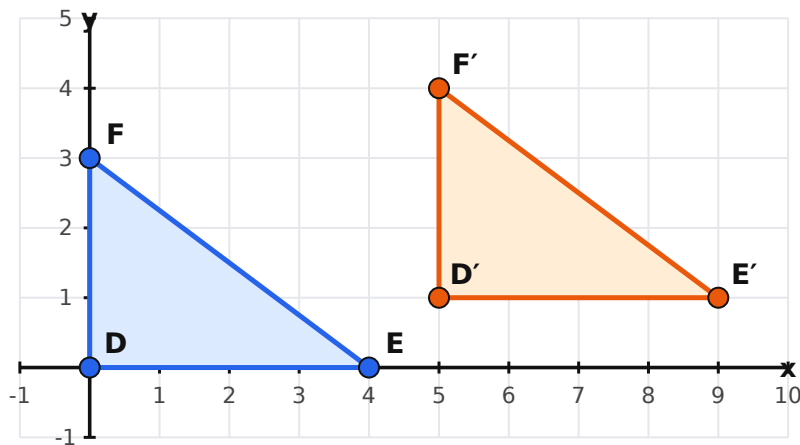
Exercise 10 - Missing side

The side opposite the same vertex must match: EF corresponds to BC, so $EF=12$.

$$9+12+15=36$$

$$EF = 12, \text{ perimeter } 36$$

Exercise 11 - Translation shows congruence



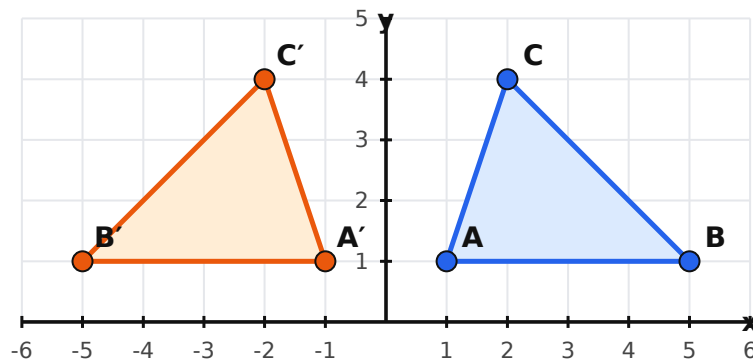
A translation preserves side lengths.

$$ABC: AB=4, AC=3, BC=\sqrt{16+9}=5.$$

$$DEF: D(5, 1), E(9, 1), F(5, 4), \text{ so } DE=4, DF=3, EF=\sqrt{16+9}=5.$$

Both have sides 3, 4, 5, so the triangles are congruent by SSS

Exercise 12 - Reflection and distance



Reflection across the y-axis.

$A'(-1, 1)$, $B'(-5, 1)$, $C'(-2, 4)$.

$$AC = \sqrt{1^2 + 3^2} = \sqrt{10} \text{ and } A'C' = \sqrt{1^2 + 3^2} = \sqrt{10}.$$

$$BC = \sqrt{3^2 + 3^2} = 3\sqrt{2} \text{ and } B'C' = \sqrt{3^2 + 3^2} = 3\sqrt{2}.$$

The lengths match, so the triangles are congruent

Exercise 13 - Which are congruent?

Triangles 1 and 2 have the same three side lengths, so they are congruent by SSS.

Triangle 3 has a side of 6, so it is not congruent to the others.

Triangles 1 and 2, by SSS

Exercise 14 - Included angle?

In triangle A the angle is included; in triangle B it is not.

That is the SSA pattern, which does not prove congruence.

No, not necessarily

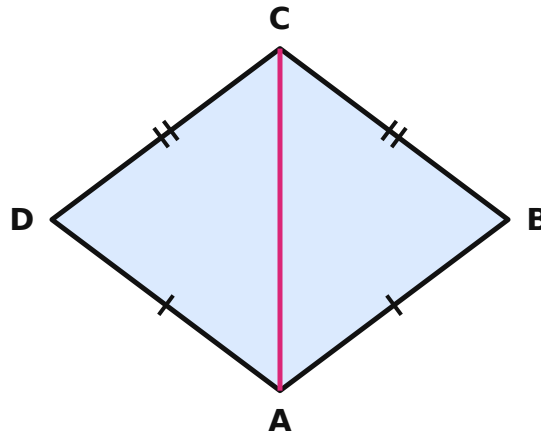
Exercise 15 - Choose the missing fact

ASA needs the other angle at the ends of AB: $m\angle A = m\angle D$.

SAS needs the other side that makes the included angle B: $BC = EF$.

ASA: $m\angle A = m\angle D$; SAS: $BC = EF$

Exercise 16 - Bridge truss



SSS applies: $AB = AD$, $CB = CD$, $AC = AC$.

$AB = AD$ (given), $CB = CD$ (given), $AC = AC$ (shared). So the triangles are congruent by SSS.

By CPCTC, $\angle BAC$ matches $\angle DAC$, so it is also 38° .

SSS; $m\angle BAC = 38^\circ$

Exercise 17 - River width

Triangles TAM and PBM each have a right angle (at A and B).

$AM = BM = 30$ yards (she walked equal distances).

The vertical angles at M are congruent.

So the triangles are congruent by ASA, and by CPCTC $AT = BP = 42$.

AT = 42 yards

Exercise 18 - Ladders

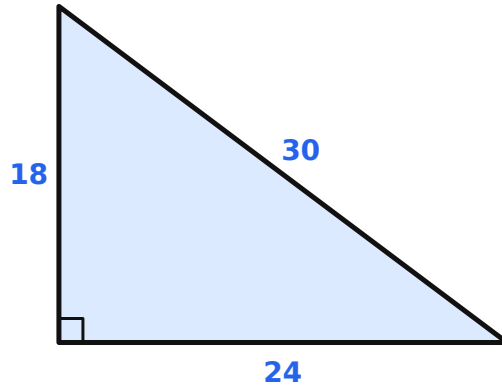
Each ladder forms a right triangle with hypotenuse 13 and a leg of 5, so the triangles are

congruent by HL.

The height is the other leg: $\sqrt{13^2 - 5^2} = 12$.

Both reach 12 feet

Exercise 19 - Triangular flags



Each flag is a 18-24-30 right triangle.

Each flag has two sides and the included angle equal, so any two flags are congruent by SAS.

Longest side: $\sqrt{18^2 + 24^2} = \sqrt{900} = 30$.

Congruent by SAS; 30 inches

Exercise 20 - Crossing braces

$AE = DE$ (given), $BE = CE$ (given), $\angle AEB$ and $\angle DEC$ are vertical angles, so they are congruent.

The triangles are congruent by SAS, and by CPCTC $DC = AB = 9$.

SAS; DC = 9