

Geometry · Congruent Triangles: SSS, SAS, ASA, AAS and HL · Worksheet

Common Core G-CO.B.6, G-CO.B.7, G-CO.B.8, G-SRT.B.5 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 24 problems cover the full Common Core standards G-CO.B.6, G-CO.B.7, G-CO.B.8, and G-SRT.B.5. You will name corresponding parts, use rigid motions on the coordinate plane, choose between SSS, SAS, ASA, AAS, and HL, and finish two-column proofs that end with CPCTC.

The first problems build vocabulary. The last six are word problems and multi-step tasks, so show every step and mark the diagrams as you go.

GeometryCommon Core: G-CO.B.6 · G-CO.B.7 · G-CO.B.8 · G-SRT.B.5

Problem 1: Name corresponding parts

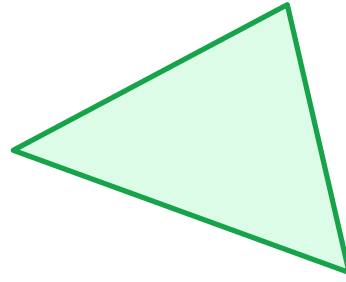
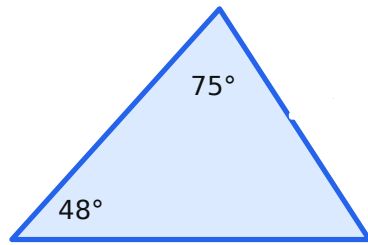
$\triangle ABC \cong \triangle DEF$. List the three pairs of corresponding sides and the three pairs of corresponding angles.

Problem 2: Read a congruence statement

$\triangle PQR \cong \triangle XYZ$. Find the side that corresponds to $\overline{QR}$, the angle that corresponds to $\angle R$, and the side congruent to $\overline{PR}$.

Problem 3: Find missing measures

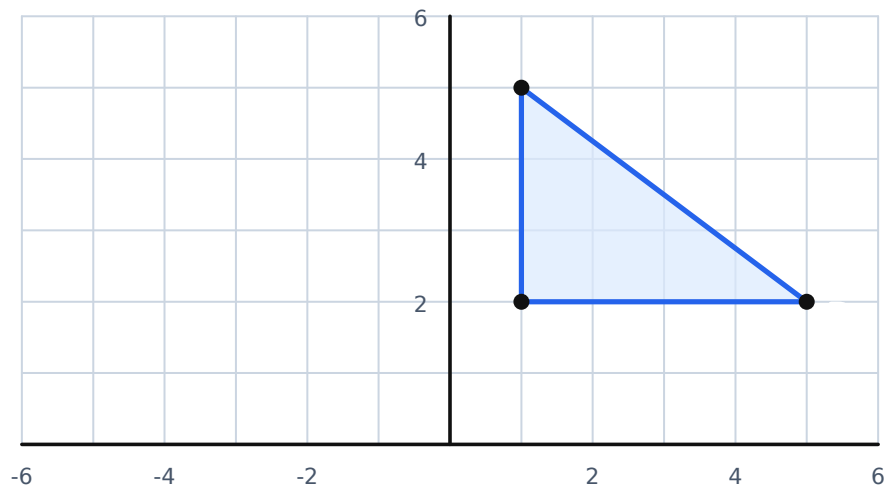
$\triangle ABC \cong \triangle DEF$ with $AB = 9$ in, $BC = 12$ in, $m\angle A = 48^\circ$, and $m\angle C = 75^\circ$. Find DE , EF , $m\angle D$, and $m\angle F$.



Not drawn to scale.

Problem 4: Reflect a triangle

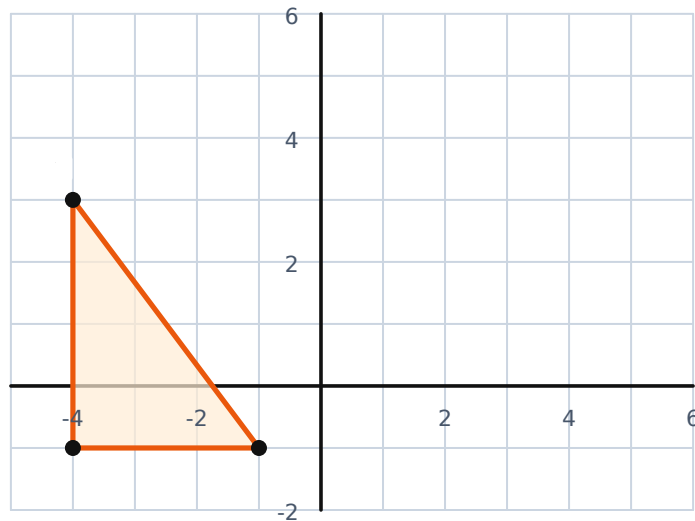
Triangle ABC has vertices $A(1,2)$, $B(5,2)$, and $C(1,5)$. Reflect it across the y -axis to get $\triangle A'B'C'$. Write the image coordinates, then compare the side lengths of the two triangles.



Triangle ABC and the y -axis.

Problem 5: Translate a triangle

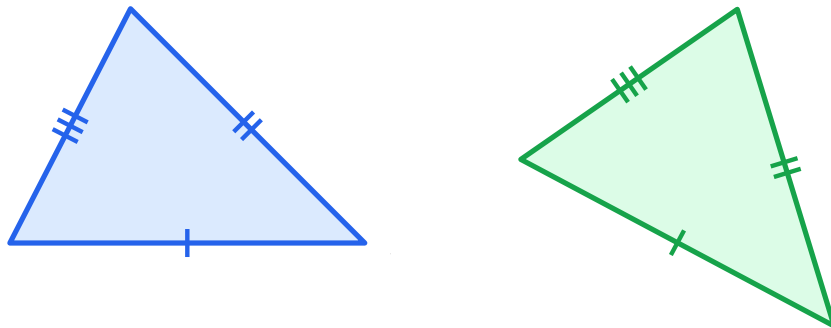
Triangle LMN has vertices $L(-4,-1)$, $M(-1,-1)$, and $N(-4,3)$. Translate it 6 units right and 2 units up. Find the image vertices and show that the two triangles are congruent.



Triangle LMN before the translation.

Problem 6: Name the criterion: pair 1

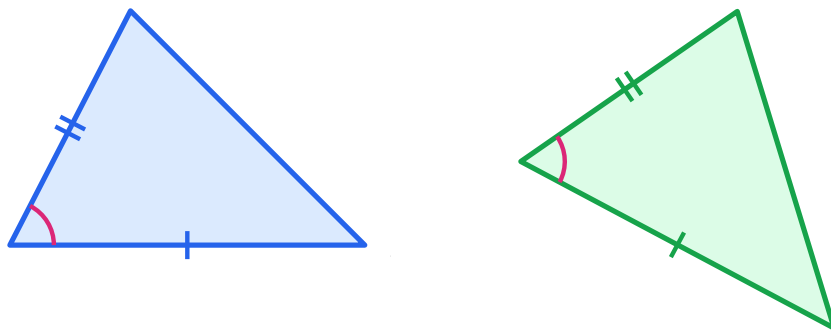
The markings show congruent parts. Name the criterion that proves $\triangle ABC \cong \triangle DEF$, or write *not enough information*.



Triangles for pair 1.

Problem 7: Name the criterion: pair 2

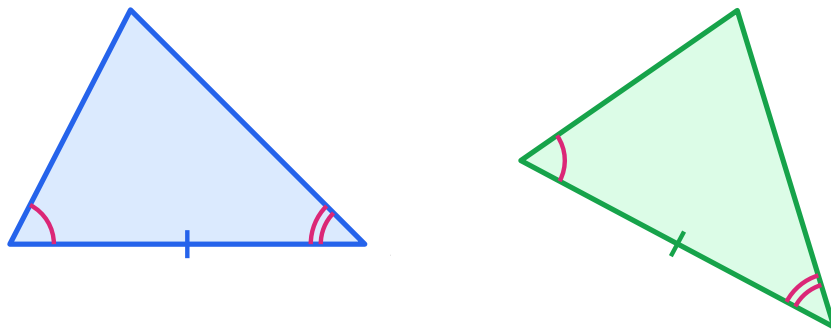
The markings show congruent parts. Name the criterion that proves $\triangle ABC \cong \triangle DEF$, or write *not enough information*.



Triangles for pair 2.

Problem 8: Name the criterion: pair 3

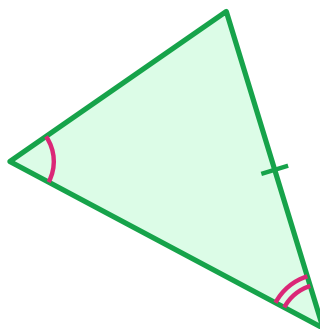
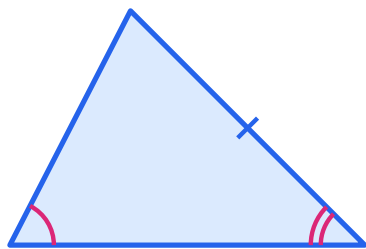
The markings show congruent parts. Name the criterion that proves $\triangle ABC \cong \triangle DEF$, or write *not enough information*.



Triangles for pair 3.

Problem 9: Name the criterion: pair 4

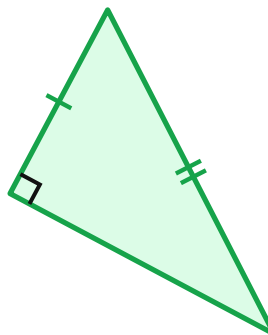
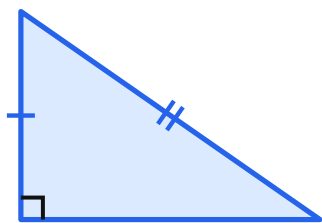
The markings show congruent parts. Name the criterion that proves $\triangle ABC \cong \triangle DEF$, or write *not enough information*.



Triangles for pair 4.

Problem 10: Name the criterion: pair 5

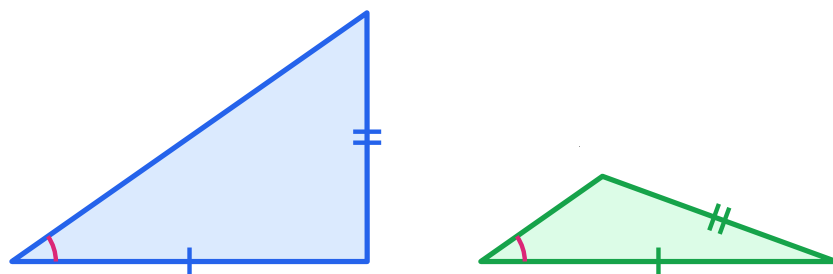
The markings show congruent parts. Name the criterion that proves $\triangle ABC \cong \triangle DEF$, or write *not enough information*.



Triangles for pair 5.

Problem 11: Name the criterion: pair 6

The markings show congruent parts. Name the criterion that proves $\triangle ABC \cong \triangle DEF$, or write *not enough information*.



Triangles for pair 6.

Problem 12: Solve for x with sides

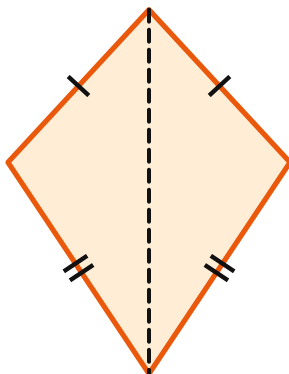
$\triangle ABC \cong \triangle DEF$, $AB = (3x+2)$ in, and $DE = (5x-10)$ in. Find x and AB .

Problem 13: Solve for x with angles

$\triangle ABC \cong \triangle DEF$, $m\angle B = (4x+7)^\circ$, and $m\angle E = (6x-13)^\circ$. Find x and $m\angle B$.

Problem 14: Triangles in a kite

In kite ABCD, $\overline{AB} \cong \overline{AD}$ and $\overline{CB} \cong \overline{CD}$. Diagonal $\overline{AC}$ splits the kite into $\triangle ABC$ and $\triangle ADC$. (a) Name the side the triangles share and the property that makes it congruent to itself. (b) Name the criterion that proves $\triangle ABC \cong \triangle ADC$. (c) Which angle is congruent to $\angle B$? Give the reason.

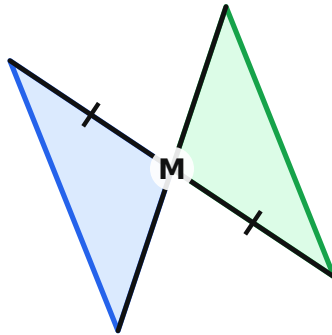


Kite ABCD with diagonal AC.

Problem 15: Proof with parallel segments

Given: $\overline{AC} \parallel \overline{BD}$, and M is the midpoint of $\overline{AB}$. Points C, M, and D lie on one line. Prove

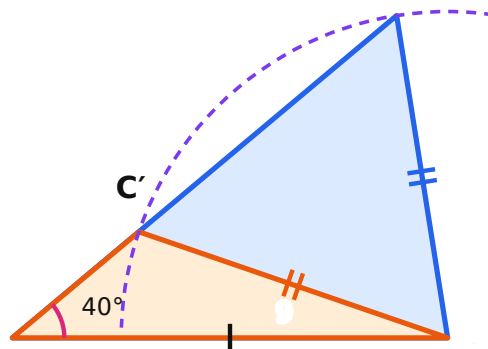
$\triangle AMC \cong \triangle BMD$. Write a two-column proof.



Parallel segments AC and BD.

Problem 16: Why SSA fails

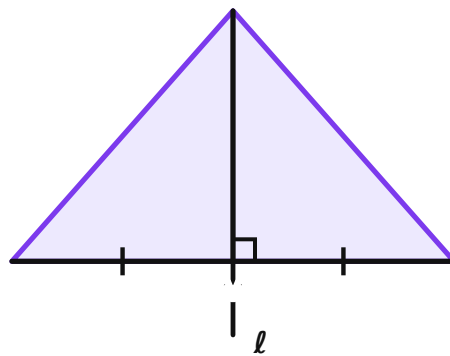
Triangles ABC and ABC' both have $m\angle A = 40^\circ$, $AB = 12$ in, and $BC = BC' = 9$ in. Measuring gives AC of about 13.8 in and AC' of about 4.6 in. Explain why the triangles are not congruent even though they have two congruent sides and a congruent angle.



Two triangles that share A, AB, and BC.

Problem 17: Points on a perpendicular bisector

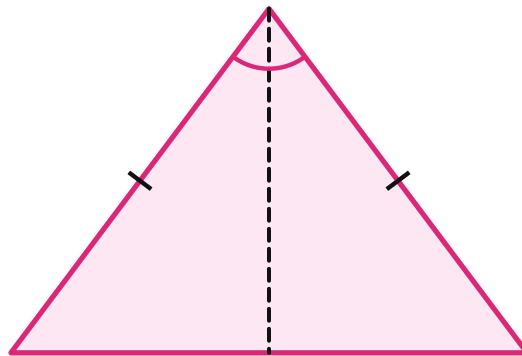
Line ℓ is perpendicular to $\overline{AB}$ at its midpoint M, and P is any point on ℓ . Prove that $\overline{PA} \cong \overline{PB}$.



Point P on the perpendicular bisector of AB.

Problem 18: Base angles of an isosceles triangle

In $\triangle ABC$, $\overline{AB} \cong \overline{AC}$, and $\overline{AD}$ bisects $\angle BAC$ with D on $\overline{BC}$. Prove $\angle B \cong \angle C$.



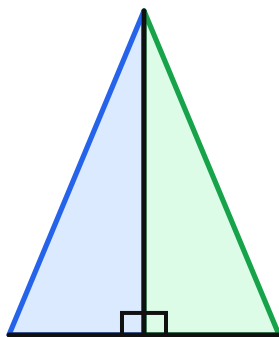
Isosceles triangle ABC with angle bisector AD.

Problem 19: Flower beds

Maya is planting two triangular flower beds. Bed 1 has sides of 12 ft, 16 ft, and 20 ft. Bed 2 has sides of 16 ft, 20 ft, and 12 ft. (a) Are the beds congruent? Name the criterion. (b) Show that each bed has a right angle, then find the area of one bed. (c) Mulch costs \$0.75 per square foot. What does it cost to mulch both beds?

Problem 20: Truss braces

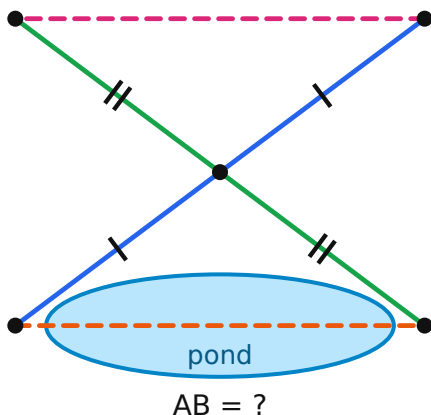
A roof truss is an isosceles triangle ABC with a vertical post $\overline{BD}$ perpendicular to the base $\overline{AC}$. The rafters $\overline{AB}$ and $\overline{BC}$ are each 13 ft, and $AD = 5$ ft. (a) Which criterion proves $\triangle ABD \cong \triangle CBD$? (b) Find DC . (c) Find the length of the post BD and the length of the base AC .



Roof truss with post BD.

Problem 21: Distance across a pond

Jamal wants the distance AB across a pond, but he cannot walk through it. He drives a stake at C , then extends line AC past C to D so that $CD = AC$, and extends line BC past C to E so that $CE = BC$. He measures $DE = 84$ yd. Explain why $AB = 84$ yd.



Jamal's stakes around the pond.

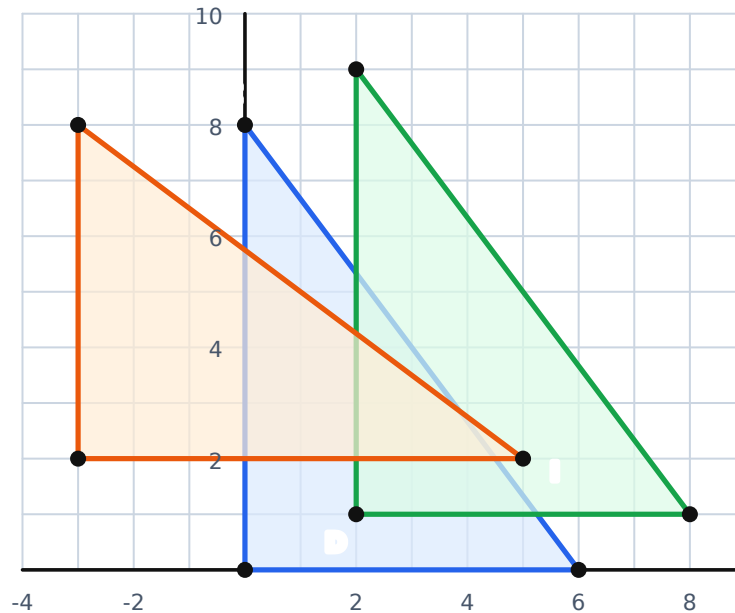
Problem 22: Perimeter and angle from congruence

$\triangle ABC \cong \triangle DEF$. The measures are $AB = (2x+3)$ in, $DE = (4x-9)$ in, $BC = (5y-4)$ in, $EF = (3y+10)$ in, $AC = 22$ in, $m\angle A = (3z+9)^\circ$, and $m\angle D = (5z-21)^\circ$. (a) Find x , y , and z . (b) Find the perimeter of $\triangle DEF$. (c) Find $m\angle A$.

Problem 23: Congruent triangles on a grid

Triangle ABC has $A(0,0)$, $B(6,0)$, and $C(0,8)$. Triangle DEF has $D(2,1)$, $E(8,1)$, and $F(2,9)$. Triangle GHI has $G(-3,2)$, $H(-3,8)$, and $I(5,2)$. (a) Describe the translation that maps $\triangle ABC$

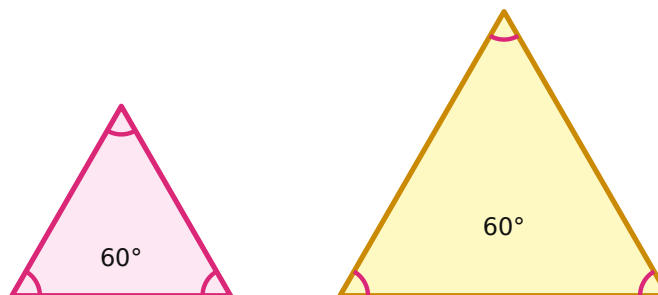
onto $\triangle DEF$. (b) Show that $\triangle ABC \cong \triangle GHI$ using side lengths and a right angle. (c) Find the length of the hypotenuse of each triangle.



Three triangles on the coordinate plane.

Problem 24: Ethan's claim about equal angles

Ethan says any two triangles with angles of 60° , 60° , and 60° must be congruent because all their angles match. One triangle has sides of 4 ft and the other has sides of 6 ft. (a) Find the perimeter of each triangle. (b) Explain why Ethan is wrong. (c) What one extra fact about the triangles would make them congruent by AAS?



Both triangles have three 60 degree angles.