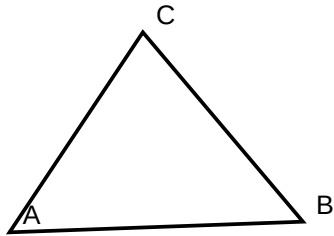


GRADE 8 MATHEMATICS

TRIANGLES & CONGRUENCE

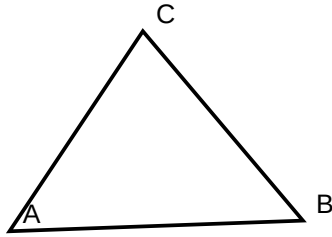


REVISED PRINT-FRIENDLY EDITION

6 worksheets + 6 answer keys • Standard text-only mathematical notation for reliable printing

Worksheet 1 - Triangle Classification & Properties

Show your working. Give reasons where requested.



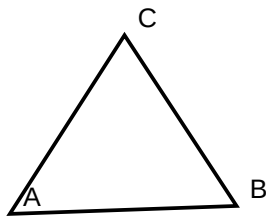
1. Classify by sides: 7, 7, 7 cm; 5, 5, 8 cm; 6, 8, 10 cm.
2. Classify by angles: 90 degrees, 35 degrees, 55 degrees; 60 degrees, 60 degrees, 60 degrees; 110 degrees, 30 degrees, 40 degrees.
3. In triangle ABC, angle A = 48 degrees and angle B = 67 degrees. Find angle C.
4. An isosceles triangle has equal angles of 52 degrees. Find the third angle.
5. An equilateral triangle has perimeter 42 cm. Find each side.
6. The angles of a triangle are in the ratio 2:3:4. Find all three angles.
7. Can 4 cm, 7 cm and 12 cm form a triangle? Explain.
8. A triangle has sides 9 cm, 9 cm and 14 cm. Find the perimeter and classify it by sides.
9. One angle of an isosceles triangle is 100 degrees. What are the other two angles?
10. Challenge: An exterior angle is 128 degrees and one opposite interior angle is 53 degrees. Find the other opposite interior angle.

Answer Key 1 - Triangle Classification & Properties

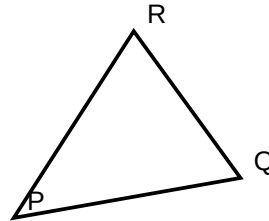
1. Equilateral; isosceles; scalene.
2. Right; acute; obtuse.
3. 65 degrees.
4. 76 degrees.
5. 14 cm.
6. 40 degrees, 60 degrees, 80 degrees.
7. No; $4 + 7 = 11$, which is less than 12.
8. 32 cm; isosceles.
9. 40 degrees, 40 degrees.
10. 75 degrees.

Worksheet 2 - Congruence Criteria

Show your working. Give reasons where requested.



CONGRUENT



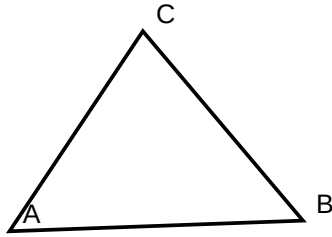
1. Three corresponding sides are 6 cm, 8 cm and 10 cm. Which criterion proves the triangles are congruent?
2. Two sides are 7 cm and 9 cm with included angle 42 degrees equal. Which criterion proves congruence?
3. Two angles are 50 degrees and 70 degrees with the included side 8 cm equal. Which criterion proves congruence?
4. Two angles are 35 degrees and 80 degrees and a corresponding non-included side is 10 cm. Which criterion proves congruence?
5. Two right triangles have equal hypotenuses of 13 cm and one corresponding leg of 5 cm. Which criterion proves congruence?
6. Three corresponding angles are equal. Does this prove congruence? Explain.
7. Triangle ABC has sides 9 cm, 11 cm and 14 cm. Triangle PQR has corresponding sides 11 cm, 14 cm and 9 cm. Are they congruent?
8. Two equal sides are known, but the angle between them is unknown. Can congruence be concluded?
9. Two right triangles have equal hypotenuse and one equal acute angle. Is that enough?
10. Why must SAS use the included angle?

Answer Key 2 - Congruence Criteria

1. SSS.
2. SAS.
3. ASA.
4. AAS.
5. RHS.
6. No. AAA proves similarity, not necessarily congruence.
7. Yes, by SSS.
8. No; the information is insufficient.
9. Yes; AAS or equivalent right-triangle reasoning.
10. The included angle fixes the relationship between the two given sides; without it, different triangles can result.

Worksheet 3 - Corresponding Parts & Missing Measurements

Show your working. Give reasons where requested.



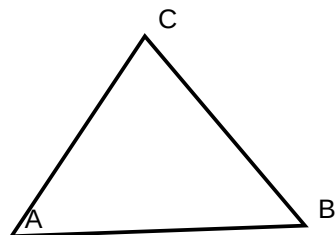
1. If triangle ABC is congruent to triangle PQR, match AB, BC and angle C.
2. If triangle ABC is congruent to triangle DEF, $AB = 12$ cm, $BC = 9$ cm and angle $C = 58$ degrees. Find DE, EF and angle F.
3. If triangle LMN is congruent to triangle XYZ and $LM = 15$ cm, $MN = 11$ cm, $LN = 13$ cm, find XY, YZ and XZ.
4. A congruent triangle has angles 47 degrees, 68 degrees and 65 degrees. What are the corresponding angles in the other triangle?
5. Triangle ABC is congruent to triangle DEF. $AB = 2x + 3$ and $DE = 15$. Find x.
6. Triangle ABC is congruent to triangle DEF. Angle $A = 3x + 5$ degrees and angle $D = 80$ degrees. Find x.
7. A corresponding side is $4x - 1$ cm and the matching side is 23 cm. Find x.
8. If triangle JKL is congruent to triangle MNP, angle $J = 72$ degrees and angle $N = 49$ degrees. Find angle K and angle M.
9. Two congruent triangles have perimeters 36 cm and P cm. Find P.
10. Triangle ABC is congruent to triangle DEF. $AB = 3x + 2$ and $DE = 5x - 8$. Find x and the common side length.

Answer Key 3 - Corresponding Parts & Missing Measurements

1. AB corresponds to PQ; BC corresponds to QR; angle C corresponds to angle R.
2. 12 cm; 9 cm; 58 degrees.
3. 15 cm, 11 cm, 13 cm.
4. 47 degrees, 68 degrees and 65 degrees.
5. $x = 6$.
6. $x = 25$.
7. $x = 6$.
8. Angle K = 59 degrees; angle M = 72 degrees.
9. 36 cm.
10. $x = 5$; common side = 17 cm.

Worksheet 4 - Congruence Reasoning & Proof

Show your working. Give reasons where requested.



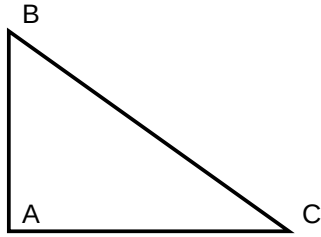
1. Given $AB = DE$, $BC = EF$ and $AC = DF$. Prove triangle ABC is congruent to triangle DEF.
2. Given $AB = DE$, angle B = angle E and $BC = EF$. Prove the triangles are congruent.
3. Given angle A = angle D, $AB = DE$ and angle B = angle E. Prove the triangles are congruent.
4. Given angle A = angle D, angle C = angle F and $AB = DE$. Prove the triangles are congruent.
5. In right triangles ABC and DEF, angle B = angle E = 90 degrees, $AC = DF$ and $AB = DE$. Prove congruence.
6. If triangle ABC is congruent to triangle DEF, explain why $BC = EF$ and angle A = angle D.
7. Triangles ABC and ADC share side AC. $AB = AD$ and $BC = CD$. Explain why they are congruent.
8. Triangles ABD and CBD share side BD. Angle ABD = angle CBD and $AB = CB$. Prove congruence.
9. A student says AAA proves congruence. Correct the statement.
10. Why can CPCTC be used only after congruence is established?

Answer Key 4 - Congruence Reasoning & Proof

1. SSS.
2. SAS.
3. ASA.
4. AAS.
5. RHS.
6. CPCTC: corresponding parts of congruent triangles are equal.
7. SSS; AC is common.
8. SAS; BD is common.
9. AAA proves similarity, not congruence; size may differ.
10. Congruence is what guarantees equality of corresponding parts.

Worksheet 5 - Applications of Congruent Triangles

Show your working. Give reasons where requested.



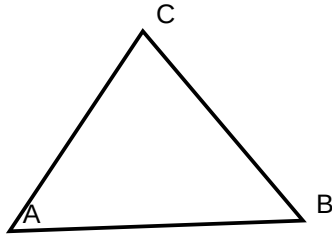
1. Two triangular roof supports are congruent. One has sides 2.4 m, 3.1 m and 3.6 m. Find the other side lengths.
2. A triangular sign is reflected to make an identical sign. Why are the triangles congruent?
3. A rectangle is divided by a diagonal into two triangles. Explain their congruence.
4. Two congruent triangular garden beds each have perimeter 27 m. One side is 9 m. Find the corresponding side.
5. Congruent right-triangle supports have hypotenuse 10 m and one leg 6 m. Find the other leg.
6. One triangular panel has angles 45 degrees, 55 degrees and 80 degrees. Find the angles of its congruent partner.
7. A kite is split into two congruent triangles. One half has sides 12 cm, 15 cm and 18 cm. Find the kite perimeter.
8. A triangular frame has sides 14 cm, 14 cm and 18 cm. Find the perimeter of a congruent frame.
9. Two congruent right-triangle ramps have rise 0.75 m and run 3 m. Find the ramp length.
10. How can congruence help a surveyor reproduce a triangular measurement pattern?

Answer Key 5 - Applications of Congruent Triangles

1. 2.4 m, 3.1 m, 3.6 m.
2. Reflection preserves lengths and angles.
3. SSS: opposite sides are equal and the diagonal is common.
4. 9 m.
5. 8 m.
6. 45 degrees, 55 degrees and 80 degrees.
7. 90 cm.
8. 46 cm.
9. Approximately 3.09 m.
10. Corresponding lengths and angles are equal, so the same geometry can be reproduced.

Worksheet 6 - Triangles & Congruence Challenge

Show your working. Give reasons where requested.



1. The angles of a triangle are $(2x + 10)$ degrees, $(3x - 5)$ degrees and $(4x + 4)$ degrees. Find x and all angles.
2. An isosceles triangle has vertex angle 36 degrees. Find the base angles.
3. Triangle ABC is congruent to triangle DEF. $AB = 4x - 3$ and $DE = 2x + 9$. Find x and AB.
4. Two congruent triangles each have perimeter 50 cm. Two sides are 17 cm and 14 cm. Find the third side.
5. A pair of right triangles has hypotenuse 25 cm and one leg 7 cm. Find the other leg.
6. Triangle ABC is congruent to triangle PQR with P corresponding to B, Q corresponding to C and R corresponding to A. $AB = 13$ cm, $BC = 16$ cm, $AC = 19$ cm. Find PQ, QR and PR.
7. Do 8 cm, 10 cm and 18 cm form a triangle? Explain.
8. Two triangles have sides 7 cm and 11 cm and included angle 60 degrees. A second triangle has the same data. What can be concluded?
9. Two angles and a corresponding non-included side are known. Which criterion applies?
10. Give one set of information that proves congruence and one that does not, with reasons.

Answer Key 6 - Triangles & Congruence Challenge

1. $x = 19$; 48 degrees, 52 degrees, 80 degrees.
2. 72 degrees, 72 degrees.
3. $x = 6$; $AB = 21$ cm.
4. 19 cm.
5. 24 cm.
6. $PQ = 16$ cm, $QR = 19$ cm, $PR = 13$ cm.
7. No; $8 + 10 = 18$, but the sum must be greater than the third side.
8. The triangles are congruent by SAS.
9. AAS.
10. SSS proves congruence; AAA does not because it fixes shape but not size.