Your notes

GCSE Maths: revision notes

Similarity and congruence

Contents

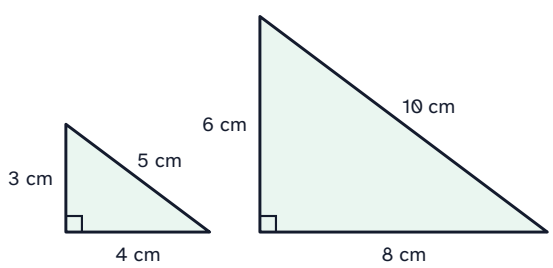
1. Congruent shapes
2. Similar shapes
3. Areas and volumes of similar shapes (Higher)
4. Worked examples
5. Key terms
6. Quick questions
7. What to do next

Congruent shapes

- **Congruent** shapes are exactly the same shape and size. One may be rotated or reflected.
- Two triangles are **congruent** if one of these is true: SSS (all three sides match), SAS (two sides and the angle between them), ASA (two angles and the side between them), or RHS (right angle, hypotenuse and one other side).
- Three matching angles (AAA) do not prove congruence: the triangles could be different sizes.

Similar shapes

- **Similar** shapes have equal angles, and their sides are in the same ratio. One is an enlargement of the other.
- **Scale factor** = new length ÷ matching old length. If matching sides are 4 cm and 6 cm, the **scale factor** is 1.5, so a 10 cm side becomes 15 cm.
- Match the **corresponding sides** carefully. Redrawing the triangles the same way round helps.

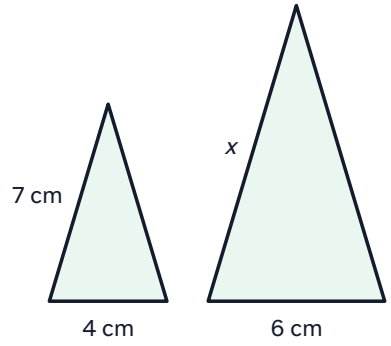


Areas and volumes of similar shapes (Higher)

- If the length **scale factor** is k, the area **scale factor** is k^2 and the volume **scale factor** is k^3.
- Two **similar** cylinders have heights of 3 cm and 6 cm, so k = 2. If the small one has a volume of 50 cm^3, the large one has a volume of $50 \times 2^3 = 400$ cm^3.
- To go back from an area **scale factor** to k, take the square root: an area **scale factor** of 9 gives k = 3.

Worked examples

Two triangles are similar. A side of 4 cm on the small one matches a side of 6 cm on the big one. Another side on the small one is 7 cm. Find the matching side on the big one.



Find the scale factor: big ÷ small. **6 ÷ 4 = 1.5**

Multiply the small side by the scale factor. **7 × 1.5 = 10.5**

Answer: 10.5 cm

Key terms

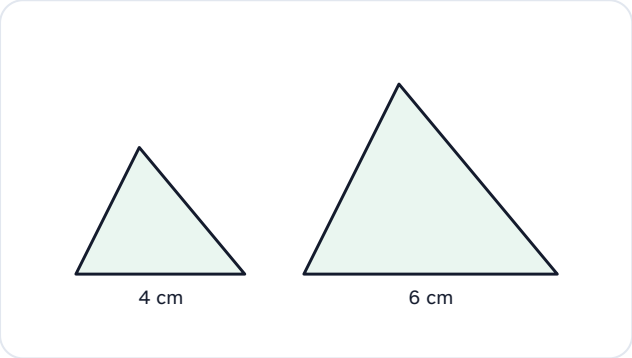
Congruent	Exactly the same shape and size.
Similar	The same shape, with all lengths multiplied by the same scale factor.
Scale factor	The number that lengths are multiplied by to get from one shape to a similar one.
Corresponding sides	Sides in matching positions on two shapes.
SSS	Side, side, side: all three sides match.
SAS	Side, angle, side: two sides and the angle between them match.
ASA	Angle, side, angle: two angles and the side between them match.
RHS	Right angle, hypotenuse, side.

Your notes

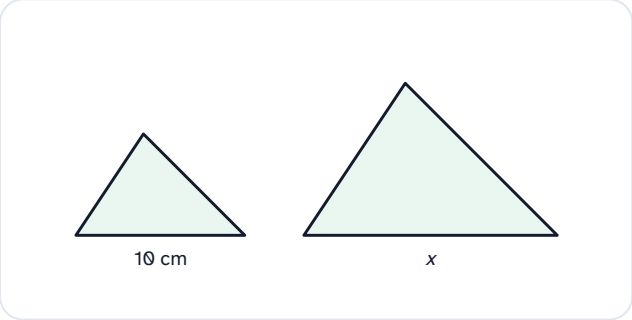
Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What does congruent mean?
2. What does similar mean?
3. Which of these does NOT prove two triangles are congruent?
4. What does RHS stand for?
5. Two similar triangles have corresponding sides of 4 cm and 6 cm. What is the scale factor?



6. Two similar shapes have a scale factor of 1.5. A side on the small shape is 10 cm. How long is the matching side on the large shape?



7. What do similar shapes always have in common?
8. Two similar shapes have a length scale factor of 3. What is the area scale factor? (Higher)

Answers

1. Exactly the same shape and size
2. The same shape, with sides in the same ratio
3. AAA
4. Right angle, hypotenuse, side
5. 1.5
6. 15 cm
7. Their angles are equal
8. 9

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Your notes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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