Congruent Shapes

Shapes can be congruent. And I bet you really want to know what that means — I can already picture your eager face. Well, lucky you — I've written a page all about it.
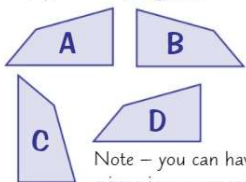
Congruent — Same Shape, Same Size (Grade 2)

Congruence is another ridiculous maths word which sounds really complicated when it's not:

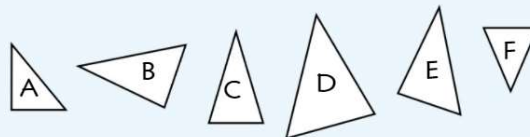**If two shapes are CONGRUENT, they are EXACTLY THE SAME — the SAME SIZE and the SAME SHAPE.**

There ain't room for the two of us in this town, pal.

These shapes are all congruent:

A B
C D

Note — you can have mirror images or rotations.

EXAMPLE: Two of the triangles below are congruent. Write down the letters of the congruent triangles.

A B C D E F

Just pick out the two triangles that are exactly the same — remember that the shape might have been rotated or reflected. By eye, you can see that the congruent triangles are **B and E**.

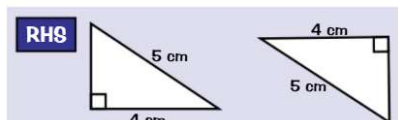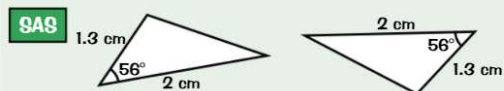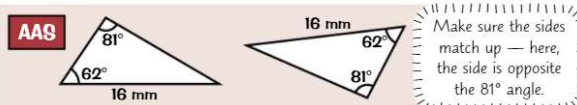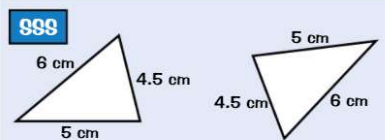### Conditions for Congruent Triangles (Grade 5)

Two triangles are congruent if one of the four conditions below holds true:

1) **SSS** three sides are the same
2) **AAS** two angles and a corresponding side match up
3) **SAS** two sides and the angle between them match up
4) **RHS** a right angle, the hypotenuse and one other side all match up

The hypotenuse is the longest side of a right-angled triangle — the one opposite the right angle.

SSS
6 cm 4.5 cm 5 cm 4.5 cm 6 cm 5 cm

AAS
81° 62° 16 mm 62° 16 mm 81°

Make sure the sides match up — here, the side is opposite the 81° angle.

SAS
1.3 cm 56° 2 cm 2 cm 56° 1.3 cm

RHS
5 cm 4 cm 4 cm 5 cm

Similar Shapes

Similar shapes are exactly the same shape, but can be different sizes (they can also be rotated or reflected).

SIMILAR — same shape, different size.

A B
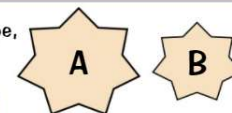
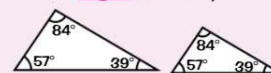### Similar Shapes Have the Same Angles (Grade 5)
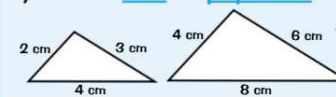
Generally, for two shapes to be similar, all the angles must match and the sides must be proportional. But for triangles, there are three special conditions — if any one of these is true, you know they're similar.
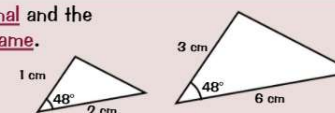
Two triangles are similar if:

1) All the angles match up.
84° 57° 39° 84° 57° 39°

2) All three sides are proportional.
2 cm 3 cm 4 cm 6 cm 4 cm 8 cm

Here, the sides of the bigger triangle are twice as long as the sides of the smaller triangle.

3) Any two sides are proportional and the angle between them is the same.
1 cm 48° 2 cm 3 cm 48° 6 cm

Watch out — if one of the triangles has been rotated or flipped over, it might look as if they're not similar, but don't be fooled.

EXAMPLE: Tony says, "Triangles ABC and DEF are similar." Is Tony correct? Explain your answer.

B 2 cm 104° 3 cm A C E 6 cm 9 cm D 46° 30° F
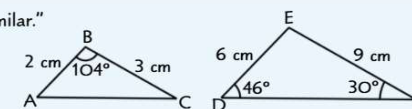
Check condition 3 holds — start by finding the missing angle in triangle DEF:

Angle DEF = 180° − 46° − 30° = 104° so angle ABC = angle DEF

Now check that AB and BC are proportional to DE and EF:

DE ÷ AB = 6 ÷ 2 = 3 and EF ÷ BC = 9 ÷ 3 = 3 so DE and EF are 3 times as long as AB and BC.

Tony is correct — two sides are proportional and the angle between them is the same so the triangles are similar.

Use Similarity to Find Missing Lengths (Grade 5)

You might have to use the properties of similar shapes to find missing distances, lengths etc. — you'll need to use scale factors (see p.77) to find the lengths of missing sides.
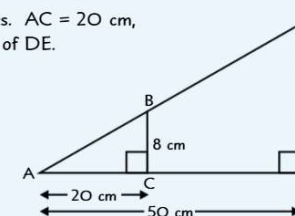
EXAMPLE: ABC and ADE are similar right-angled triangles. AC = 20 cm, AE = 50 cm and BC = 8 cm. Find the length of DE.

The triangles are similar, so work out the scale factor:

scale factor = $\frac{50}{20}$ = 2.5

Now use the scale factor to work out the length of DE:

DE = 8 × 2.5 = 20 cm

D B 8 cm A 20 cm C 50 cm E

How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice**: Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards**: Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps**: Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it**: Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it**: Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.

GLUE HERE