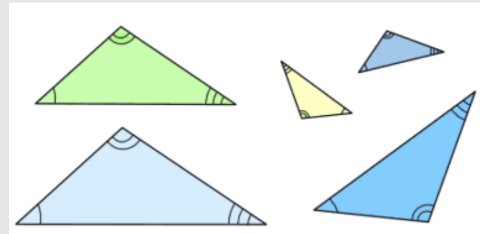
SIMILAR TRIANGLES

Similar triangles have:

- all their angles **equal**
- corresponding sides have the same ratio



These triangles are **SIMILAR.**

(Equal angles have been marked with the same number of arcs)

If one shape can become another using **Resizing** (dilation, contraction, compression, enlargement) then these Shapes are **Similar**!

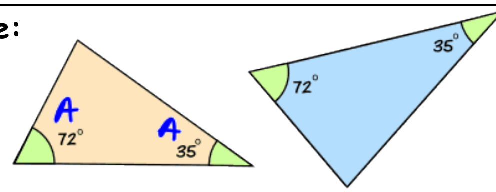
How to Find if Triangles are Similar

But we don't need to know all three sides and all three angles ...**two or three out of the six** is usually enough. There are **three** ways to find if two triangles are similar: **AA**, **SAS** and **SSS**:

AA

AA stands for "angle, angle" and means that the triangles have two of their angles equal.
If two triangles have two of their angles equal, the triangles are **similar**.

Example:



SAS

SAS stands for "side, angle, side" and means that we have two triangles where:

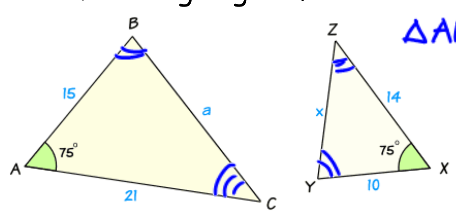
- the ratio between two sides is the same as the ratio between another two sides
- and we we also know the included angles are equal.

If two triangles have two pairs of sides in the same ratio and the included angles are also equal, then the triangles are similar.

Example

In this example we can see that:

- one pair of sides is in the ratio of 21 : 14 = **3 : 2**
- another pair of sides is in the ratio of 15 : 10 = **3 : 2**
- there is a matching angle of 75° in between them



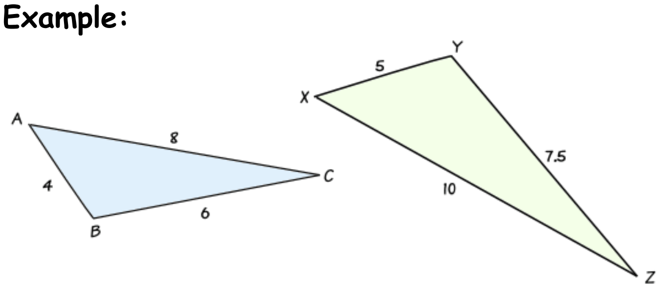
$\triangle ABC \sim \triangle XYZ$

SSS

SSS stands for "side, side, side" and means that we have two triangles with all three pairs of corresponding sides in the **same ratio**.

If two triangles have three pairs of sides in the same ratio, then the triangles are similar.

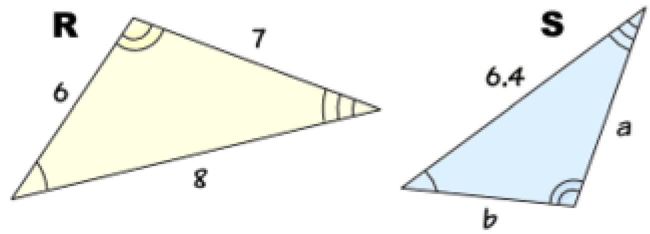
Example:



CORRESPONDING SIDES

In similar triangles, the sides facing the equal angles are always in the same ratio.

For example:



Triangles **R** and **S** are similar. The equal angles are marked with the same numbers of arcs.

What are the corresponding lengths?

- The lengths **7** and **a** are corresponding (they face the angle marked with one arc)
- The lengths **8** and **6.4** are corresponding (they face the angle marked with two arcs)
- The lengths **6** and **b** are corresponding (they face the angle marked with three arcs)

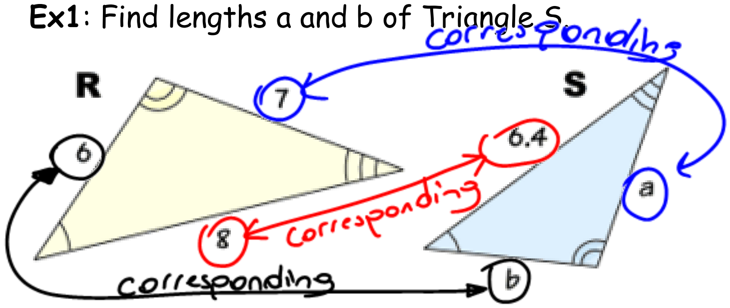
CALCULATING THE LENGTHS OF CORRESPONDING SIDES

It may be possible to calculate lengths we don't know yet. We need to:

Step 1: Find **the ratio** of corresponding sides in pairs of similar triangles.

Step 2: Use that ratio to find the unknown lengths.

Ex1: Find lengths a and b of Triangle S



$$S \rightarrow \frac{6.4}{8} = \frac{a}{7} \qquad \frac{6.4}{8} = \frac{b}{6}$$
$R \rightarrow$

scale factor

$$0.8 = \frac{a}{7} \qquad 0.8 = \frac{b}{6}$$

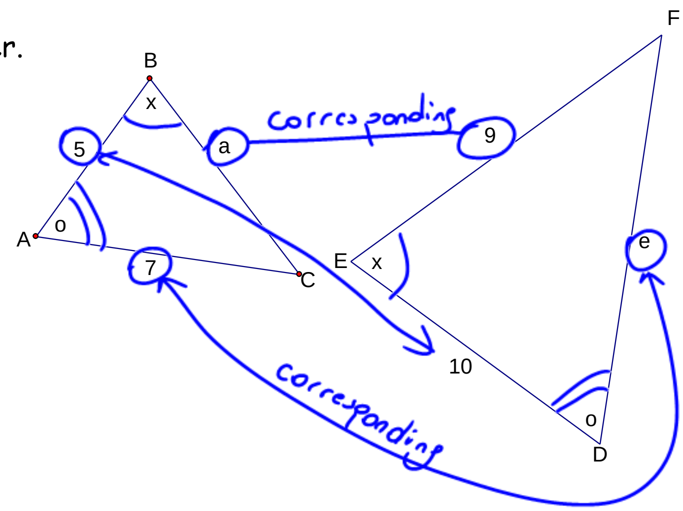
$$7 \times 0.8 = a \qquad 6 \times 08 = b$$

$$\boxed{a = 5.6} \qquad \boxed{b = 4.8}$$

Example 1:

a. Explain why ΔABC ~ ΔDEF. Justify your answer.

2 angles of each triangle is the same AA



scale factor

b. Determine the values of a and e.

$$\frac{10}{5} = \frac{e}{7} \qquad \frac{10}{5} = \frac{9}{a}$$

$$7 \cdot 2 = \frac{e}{7} \cdot 7 \qquad a \cdot 2 = \frac{9}{a} \cdot a$$

$$2 \cdot 7 = e \qquad \frac{2a}{2} = \frac{9}{2}$$

$$\boxed{e = 14} \qquad \boxed{a = 4.5}$$

∴ a is 4.5
e is 14

Example 2: Are the two triangles in the diagram similar? Explain your reasoning.

They are similar b/c the scale factor is 5.

$$\frac{20}{4} = \frac{15}{3} = \frac{25}{5} = 5$$