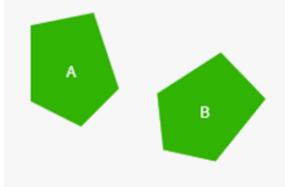


## Congruence

If two shapes are congruent they are exactly the same size, they have the same sized lengths and angles.

The symbol for congruence is  $\cong$ , so we would say that  $A \cong B$ .

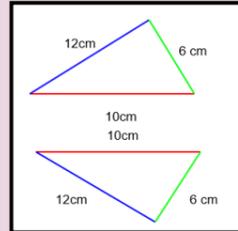


- Congruence is **symmetric**: if  $X \cong Y$  then also  $Y \cong X$ .
- Congruence is **reflexive**: any shape is congruent to itself. For example,  $A \cong A$ .
- Congruence is **transitive**: if  $X \cong Y$  and  $Y \cong Z$  then also  $X \cong Z$ .



### Congruency rule 1: SSS

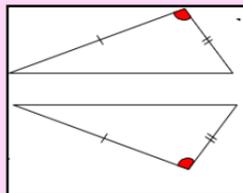
Congruency Criteria: All sides are the same.



The three sides of the triangles are the same, therefore they are congruent

### Congruency rule 1: ASA

Congruency Criteria: 2 sides and one angle are the same.



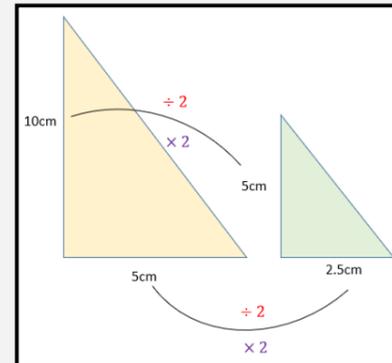
The triangles have 2 sides the same length and an angle the same size, therefore they are congruent.

Shapes are similar if:

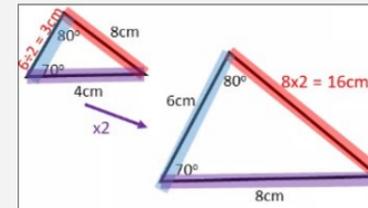
They are the same shape

They have the same sized angles

Each length is directly proportional to the length of the corresponding shape



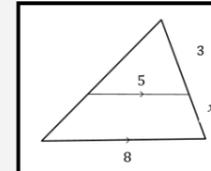
The yellow triangle is twice as large as the green triangle. The ratios of the lengths are the same, therefore the triangles are similar.



Although similar shapes can have different lengths, the angles must stay the same.

## Similarity

### Finding a missing side in a similar shape



Steps:

- 1) Split the shapes into two
- 2) Highlight the corresponding sides
- 3) Divide the longer side by the shorter side (this gives you the scale factor)

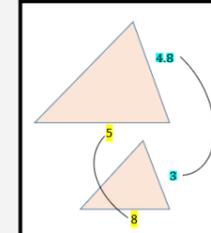
$$8 \div 5 = 1.6$$

- 4) Multiply the smaller side by the scale factor to find the missing side

$$3 \times 1.6 = 4.8$$

- 5) Subtract 3 from 4.8 to get x

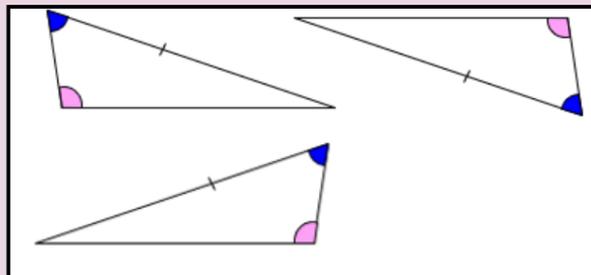
$$4.8 - 3 = 1.8$$



## Unit 12: Similarity and Congruence

### Congruency rule 3: ASA

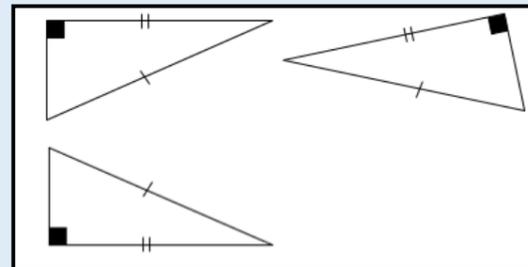
Congruency Criteria: Two angles the same size and one side the same length.



The triangles have 2 angles that are the same size and one side that is the same length, therefore the triangles are congruent.

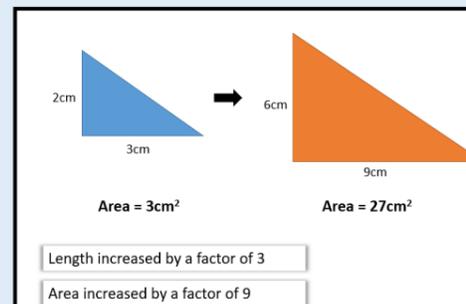
### Congruency rule 4: RHS

Congruency Criteria: The two triangles share a right angle, the same length hypotenuse and one side the same length.



The triangles have a right angle, the same length Hypotenuse and a side the same length, Therefore they are congruent.

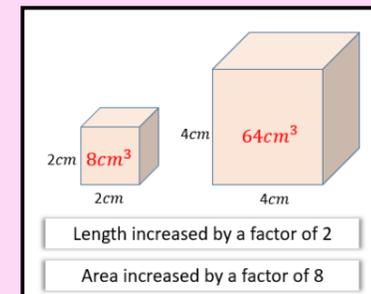
### Similarity with Area



We can see that if the length increases by a scale factor  $k$ , the area increases by this squared, i.e.  $k^2$ .

	Shape X		Shape Y
Length:	2m	$\times 5$	10m
Area:	$3\text{m}^2$	$\times 25$	$75\text{m}^2$

### Similarity with Volume



We can see that if the length increases by a scale factor  $k$ , the volume increases by this cubed, i.e.  $k^3$ .

	Shape A		Shape B
Length:	6cm	$\times 3$	18cm
Area:	$30\text{cm}^2$	$\times 9$	$270\text{cm}^2$
Volume:	$80\text{cm}^3$	$\times 27$	$2160\text{cm}^3$

## Congruency

## Similarity with area and volume