

# YEAR 10 — SIMILARITY...

## Congruence, similarity & enlargement

### What do I need to be able to do?

By the end of this unit you should be able to:

- Enlarge by a positive scale factor
- Enlarge by a fractional scale factor
- Identify similar shapes
- Work out missing sides and angles in similar shapes
- Use parallel lines to find missing angles
- Understand similarity and congruence

### Keywords

**Enlarge:** to make a shape bigger (or smaller) by a given multiplier (scale factor)

**Scale Factor:** the multiplier of enlargement

**Centre of enlargement:** the point the shape is enlarged from

**Similar:** when one shape can become another with a reflection, rotation, enlargement or translation

**Congruent:** the same size and shape

**Corresponding:** items that appear in the same place in two similar situations

**Parallel:** straight lines that never meet (equal gradients)

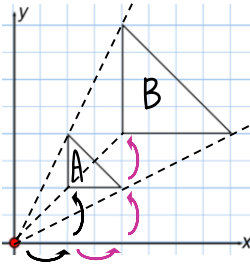
### Positive scale factors R

Enlargement from a point

Enlarge shape A by SF 2 from (0,0)

The shape is enlarged by 2

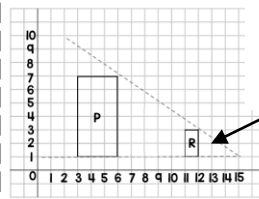
The distance from the point enlarges by 2



### Fractional scale factors R

Fractions less than 1 make a shape **SMALLER**

R is an enlargement of P by a scale factor  $\frac{1}{3}$  from centre of enlargement (15,1)



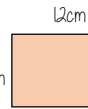
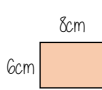
SF:  $\frac{1}{3}$  - R is three times smaller than P

### Identify similar shapes



Angles in similar shapes do not change.  
e.g. if a triangle gets bigger the angles can not go above  $180^\circ$

Similar shapes

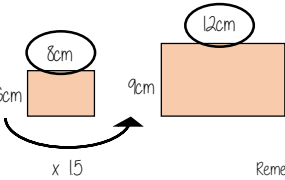


Scale Factor:  
Both sides on the bigger shape are 1.5 times bigger

Compare sides:  $6 : 9$  and  $8 : 12$   
 $2 : 3$  and  $2 : 3$

Both sets of sides are in the same ratio

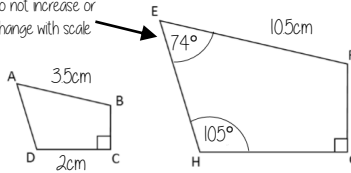
### Information in similar shapes



Compare the equivalent side on both shapes

Scale Factor is the multiplicative relationship between the two lengths

Remember angles do not increase or change with scale

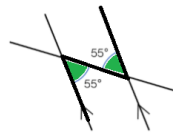


Notation helps us find the corresponding sides

OB and EF are corresponding

### Angles in parallel lines R

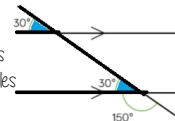
Alternate angles



Because alternate angles are equal the highlighted angles are the same size

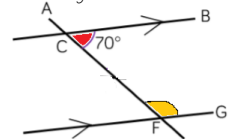
Corresponding angles

Because corresponding angles are equal the highlighted angles are the same size



### Co-interior angles

Because co-interior angles have a sum of  $180^\circ$  the highlighted angle is  $110^\circ$

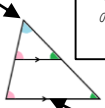


Os angles on a line add up to  $180^\circ$  co-interior angles can also be calculated from applying alternate/ corresponding rules first

### Similar triangles

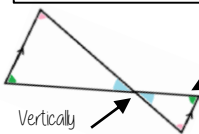
Shares a vertex

Because corresponding angles are equal the highlighted angles are the same size



Parallel lines — all angles will be the same in both triangle

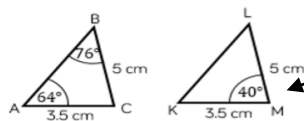
Os all angles are the same this is similar — it only one pair of sides are needed to show equality



All the angles in both triangles are the same, and so similar

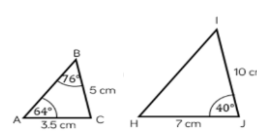
### Congruence and Similarity

Congruent shapes are identical — all corresponding sides and angles are the same size



$\triangle ABC \cong \triangle KLM$

Because all the angles are the same and  $AC = KM$   $BC = LM$  triangles ABC and KLM are congruent



Because all angles are the same, but all sides are enlarged by 2 ABC and HIJ are similar

### Conditions for congruent triangles

Triangles are congruent if they satisfy any of the following conditions

Side-side-side

All three sides on the triangle are the same size

Angle-side-angle

Two angles and the side connecting them are equal in two triangles

Side-angle-side

Two sides and the angle in-between them are equal in two triangles (it will also mean the third side is the same size on both shapes)

Right angle-hypotenuse-side

The triangles both have a right angle, the hypotenuse and one side are the same