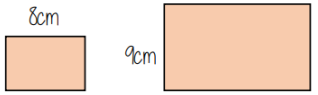
Identify similar shapes

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

Similar shapes

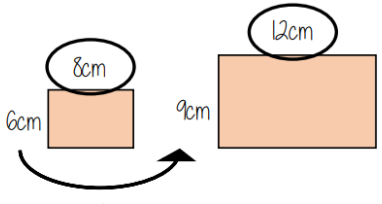


Scale Factor:
Both sides on the bigger shape are 1.5 times bigger

Compare sides: 6 : 9 = 2 : 3 ; 8 : 12 = 2 : 3

Both sets of sides are in the same ratio

Information in similar shapes



Compare the equivalent side on both shapes

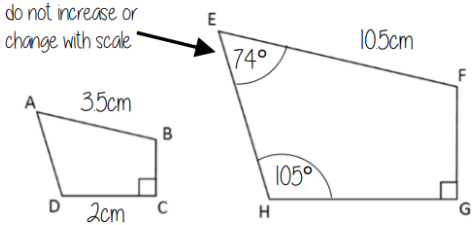
Scale Factor is the multiplicative relationship between the two lengths

Shape ABCD and EFGH are similar

Notation helps us find the corresponding sides

AB and EF are corresponding

Remember angles do not increase or change with scale

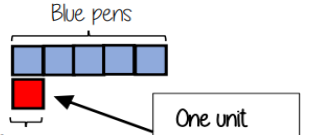


Finding a value given 1:n (or n:1) R

Inside a box are blue and red pens in the ratio 5:1
If there are 10 red pens how many blue pens are there?

Model the Question

Blue : Red
5 : 1
□ = one part
= 10 pens



Put back into the question

Blue : Red
5 : 1 (x 10) → 50 : 10 (x 10)

Blue pens = 5 x 10 = 50 pens

Red pens = 1 x 10 = 10 pens

There are 50 Blue Pens

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

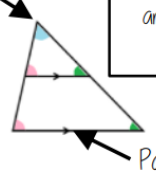
Two sides and the angle in-between them are equal in two triangles (it will also mean the third side is the same size on both shapes)

Right angle-hypotenuse-side

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

Similar triangles

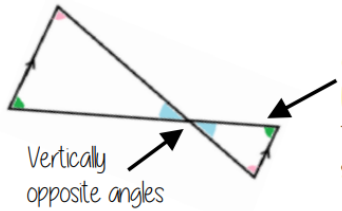
Shares a vertex



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

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

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

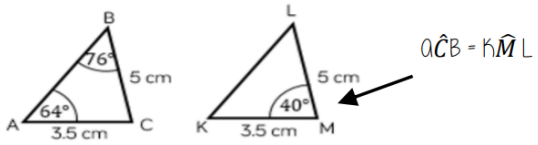


All the angles in both triangles are the same and so similar

Vertically opposite angles

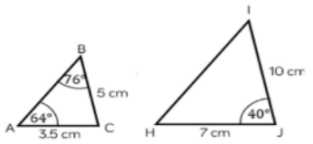
Congruence and Similarity

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



$A\hat{C}B = K\hat{M}L$

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



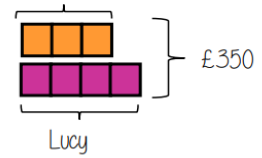
Because all angles are the same, but all sides are enlarged by 2 ABC and HIJ are **similar**

Sharing a whole into a given ratio R

James and Lucy share £350 in the ratio 3:4
Work out how much each person earns

Model the Question

James : Lucy
3 : 4



Find the value of one part

Whole: £350
7 parts to share between
(3 James, 4 Lucy)

£350 ÷ 7 = £50

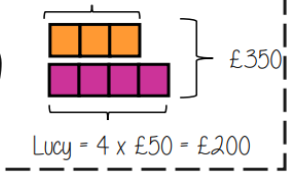
□ = one part
= £50

Put back into the question

James : Lucy
3 : 4 (x 50) → £150 : £200 (x 50)

James = 3 x £50 = £150

Lucy = 4 x £50 = £200



Similar areas and volumes

If two shapes are similar then their areas and volumes are also related.

If the **length** scale factor between the two shapes = k

then the **area** scale factor between the two shapes = k^2

and the **volume** scale factor between the two shapes = k^3

e.g. If the length scale factor was 5, then the area scale factor would be $5^2 = 25$, and the volume scale factor would be $5^3 = 125$.

If starting with a volume scale factor, cube root this to find the length scale factor, then square for the area scale factor.

If starting with the area scale factor, square root to find the length scale factor, then cube for the volume scale factor.

Inverse Proportion

e.g. C varies inversely with the square root of r.

When C equals 20, r equals 4.

a) Find the value of C when r = 16

b) Find the value of r when C = 4

First, find the equation linking C and r.

$C \propto \frac{1}{\sqrt{r}}$

$C = \frac{k}{\sqrt{r}}$

$20 = \frac{k}{\sqrt{4}}$

$20 \times \sqrt{4} = k = 40$

$C = \frac{40}{\sqrt{r}}$

a) r = 16

$C = \frac{40}{\sqrt{16}} = \frac{40}{4} = 10$

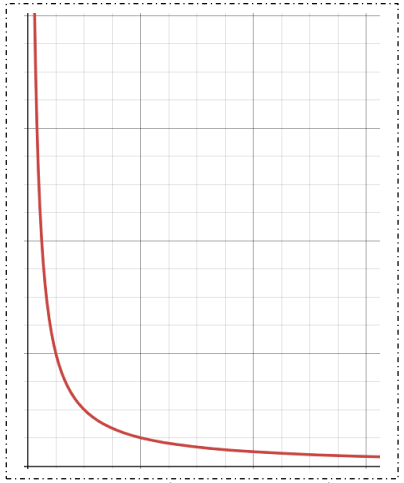
b) C = 4

$4 = \frac{40}{\sqrt{r}}$ $(\times \sqrt{r})$

$4\sqrt{r} = 40$ $(\div 4)$

$\sqrt{r} = 10$ (square)

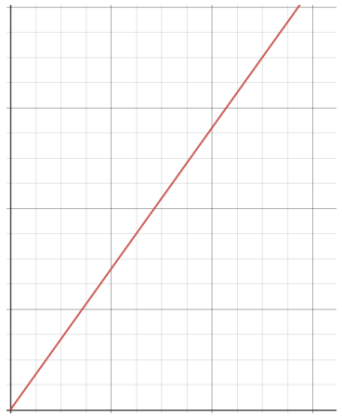
$r = 10^2 = 100$



y is inversely proportional to x

$y \propto \frac{1}{x}$

Direct Proportion

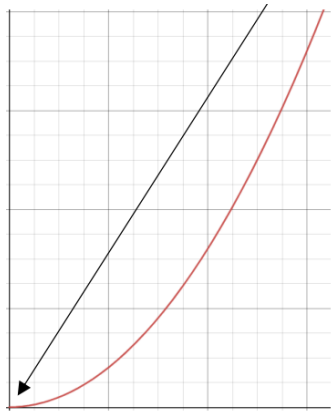


Linear proportionality

y is directly proportional to x

$y \propto x$

All direct proportion graphs start at (0, 0)



Quadratic proportionality

y is directly proportional to x^2

$y \propto x^2$

e.g. E varies directly with the square of f.

When E equals 56, f equals 2.

a) Find the value of E when f = 0.5

b) Find the value of f when E = 224

First, find the equation linking E and f.

$E \propto f^2$

$E = kf^2$

$56 = k \times 2^2$

$56 = 4k$

$k = 56 \div 4 = 14$

$E = 14f^2$

a) f = 0.5

$E = 14 \times 0.5^2$

$E = 3.5$

b) E = 224

$224 = 14f^2$ (divide by 14)

$16 = f^2$ (square root)

$4 = f$

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