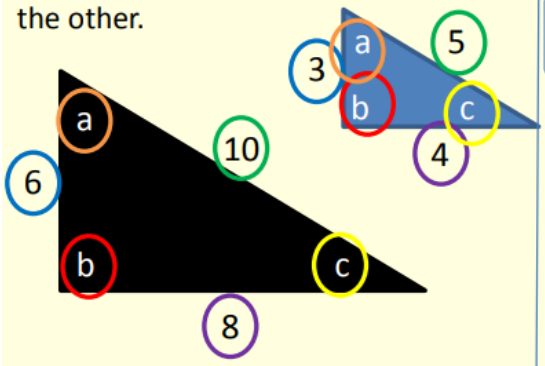
SIMILARITY

When shapes look the same but are different sizes, they are mathematically ***similar***. This means their *corresponding* ("matching") **angles** are **equal**, and their *corresponding* **sides** are in the **same ratio**. One shape is an *enlargement* of the other.



Congruence and similarity definitions
How to find missing sides

VECTORS

Column vectors describe horizontal and vertical "movement", a bit like how co-ordinates describe position. They look similar, but they're arranged in a column (hence the name), as shown below:

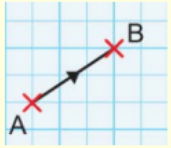
Column vectors

$\begin{pmatrix} x \\ y \end{pmatrix}$ horizontal movement / vertical movement

To get from A to B, you go 3 right, 2 up:

$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ (**a**)

Reverse: $\overrightarrow{BA} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$ (**-a**)



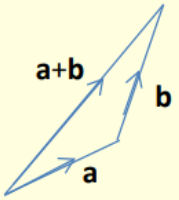
Vectors are labelled with a lower case letter, either **bold** or underlined.

You can combine vectors by adding their x and y values to give a *resultant* vector:

$\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ $\mathbf{a+b} = \begin{pmatrix} 3+4 \\ 2+1 \end{pmatrix} \begin{pmatrix} 7 \\ 3 \end{pmatrix}$

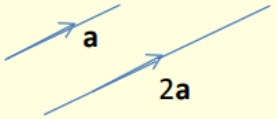
It would look like this:

We do this to move between points that don't have a vector between them – you can only go the way you know!

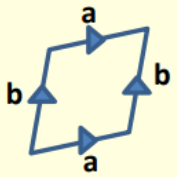


Vectors can also be multiplied:

$2\mathbf{a} = \begin{pmatrix} 3x2 \\ 2x2 \end{pmatrix} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$



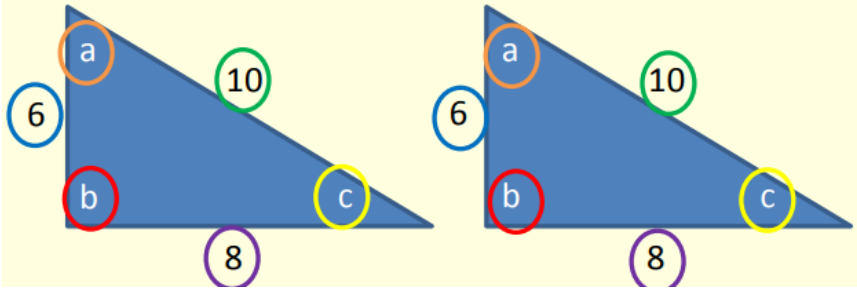
Parallel vectors can be represented using the same letter:



Algebraic vectors

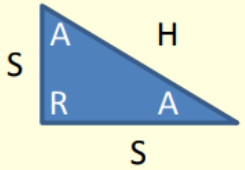
CONGRUENCE

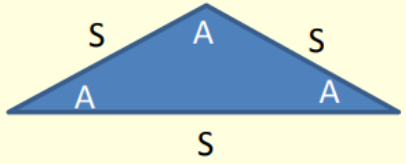
When shapes are identical, they are ***congruent***. All *corresponding* lengths and angles are **equal** – you could fit one perfectly on top of the other.



You can prove two triangles are congruent by showing that any of these combinations are matching (Video here):

SSS (all three sides)
SAS (two sides and the angle between them)
ASA (two angles and the side which connects them)
AAS (two angles and the side after the second angle)
RHS (right angle, hypotenuse and one other side)*





*only applies to right-angled triangles

Quadratic functions contain a term in x^2 but no higher power of x.

Video 266

Cubic functions contain a term in x^3 but no higher power of x.

Video 344

Cubic functions can contain terms in x^2, x, and number terms.

When a cubic function is equal to zero it may have one, two, or three solutions. The solution to a cubic function equalling zero is there the graph crosses the x-axis. The solutions are commonly called **roots**.

Video 264

The **reciprocal** function ($y = \frac{1}{x}$) of a cubic function has the x- and y-axes as **asymptotes** to the graph.

Video 346

An **asymptote** is a line that the graph gets closer and closer to, but never actually touches.

When a graph has x and y in **direct proportion**, $y = kx$

Video 254

When a graph has x and y **inversely proportional** to each other, $y = \frac{k}{x}$

Video 255

The graph of two quantities that are inversely proportional is a reciprocal graph.

Simultaneous equations are equations that are both true for a pair of variables (letters).

Video 296

Simultaneous equations can be solved graphically by plotting both equations on the same coordinate grid. The point at which the lines cross (the point of **intersection**) has the coordinates that are the solution.

Simultaneous equations can also be solved by the elimination method. To do this, the coefficients of either the x or y terms must be equal (or equal with the opposite sign).

Video 295

Subtract (or add) the two equations to eliminate one of the terms. The remaining term can now be evaluated.

The **subject** of a formula is the letter on its own side of the equals sign.

Video 7

You can change the subject of a formula using **inverse operations** (subtract to move an added term to the other side, etc).

Video 8

An **even number** is a multiple of 2. $2m$ and $2n$ are general terms for even numbers where m and n are integers.

Key Points:

https://tinyurl.com/ybfxnjsj

Knowledge Check:

https://tinyurl.com/y9nl3tka

An **equation** has an equals sign (=). You can solve it to find one value of the letter (unknown/variable).

An **identity** has an equivalent (triple bar) sign (≡). The left hand side equals the right hand side for all values of the letter (unknown/variable).