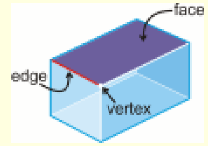
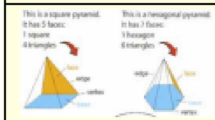
***Face:*** the flat edge of a 3D shape ***Edge:*** the lines where two faces meet

***Vertex (pl. vertices):*** the corners that edges meet at

V5



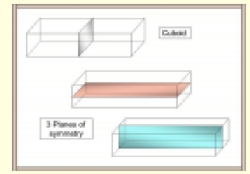



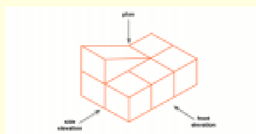
***Pyramids:*** have a base that can be any shape and sloping triangular slides that meet at a point

***Right prism:*** the sides are at right angles (perpendicular)

***Plane:*** is a flat surface

***Plane of symmetry:*** is when a plane cuts a shape in half so that the part on one side of the plane is identical to the other





***Plan:*** is the view from above an object

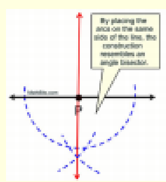
***Front elevation:*** is the view of the front of an object

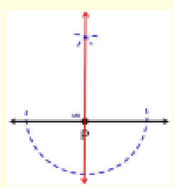
***Side elevation:*** is the view from the side of an object

***Drawing an accurate triangle:*** you can draw this with a **ruler** and **protractor** if you know three measurements (length of 2 sides and 1 angle OR length of 1 side and 2 angles)

V81
V82
V83

***Scale:*** A scale is a ratio that shows the relationship between a drawn length and a real length, e.g. on a map.



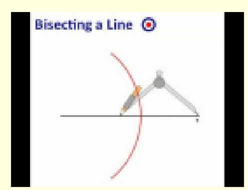


***Angle bisector:*** Cuts an angle exactly in half.

V72

***Constructions:*** Are accurate drawings made using a pair of compasses.

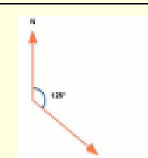
***Bisecting a line:*** Means to cut exactly in half




V78

***Locus (pl. loci):*** A set of all points that obey a given rule. A locus creates a bounded *region*.

***Bearing:*** Is an angle measured in degrees clockwise from north.



# Unit 16 Foundation



## Expanding and factorising quadratics (double brackets)

Expanding a quadratic is just like multiplying 2-digit numbers – use a multiplication grid, then add your answers:

$$(x+2)(x+3) = x^2 + 2x + 3x + 6$$
$$= x^2 + 5x + 6$$

| × | $(x$ | $+2)$ |
|---|---|---|
| $(x$ | $x^2$ | $+2x$ |
| $+3)$ | $+3x$ | $+6$ |

(2+3) (2x3)

It's no coincidence!

Video 14: Expanding quadratics

Factorising a quadratic is the opposite of expanding it – you're putting it back into brackets (if you can). You can still use the grid, but do it in reverse:

$$x^2 + 7x + 12 = (x+3)(x+4)$$

| × | $(x$ | $+3)$ |
|---|---|---|
| $(x$ | $x^2$ | $+3x$ |
| $+4)$ | $+4x$ | $+12$ |

We know from expanding that the two numbers in my brackets will add to make 7, and multiply to make 12, so they must be 3 and 4 ($3x + 4x = 7x$ and $3 \times 4 = 12$)

Video 118: Factorising quadratics

## Solving quadratics

Quadratic equations are written as equal to y, like so:

$$y = x^2 + bx + c$$

To find the solutions, we make them equal to 0 because the "*solutions*" are the "*x-intercepts*", where the graph crosses the x-axis. On the x-axis, the y-value would be zero (because we haven't moved up or down).

$$x^2 + 7x + 12 = 0$$

Then we can factorise to give two answers (one of the brackets must = 0).

$$(x+3)(x+4) = 0$$
$$x + 3 = 0 \text{ or } x + 4 = 0$$
$$\boldsymbol{x = -3 \text{ or } x = -4}$$

Video 266: Solving quadratics by factorising

If we can't factorise (sometimes the numbers don't work), we can use the **quadratic formula**:

$$\text{when } x^2 + bx + c = 0, \qquad x = \frac{b^2 \pm \sqrt{4c}}{2}$$

Video 267: Using the quadratic formula

## Plotting a Quadratic Graph

To plot a quadratic, make the expression equal to y, then make a table using different values of x. For example:

$$y = x^2 - 4x + 5$$

If $x = 1, y = (1)^2 - (4 \times 1) + 5$

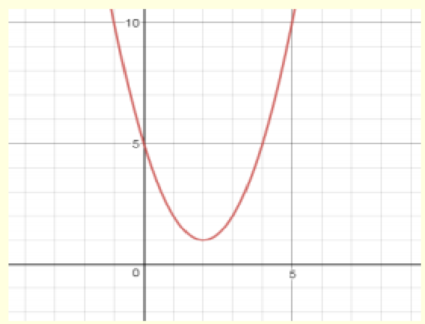
If $x = 1, y = 2$

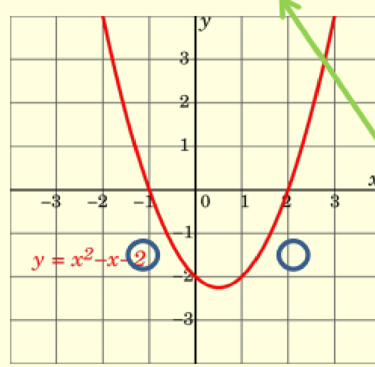
| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 5 | 2 | 1 | 2 | 5 |

Video 264: Plotting a quadratic graph

Video 265: Sketching a quadratic graph using key coordinates

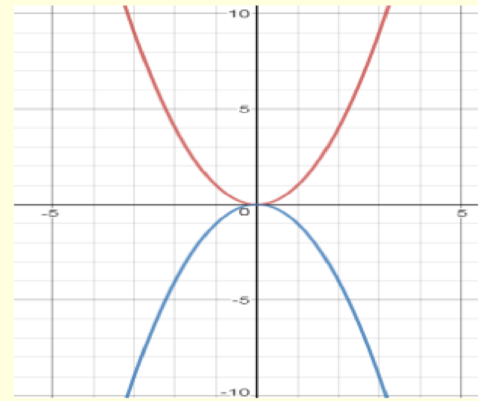
Based on the table above, the coordinates to plot would be: **(0, 5) (1, 2) (2, 1) (3, 2) (4, 5)**




## Recognising a quadratic shape

All $y = x^2$ graphs will have the same symmetrical curved shape you see below, even if you can't see all of it. At any point on the line, the y-coordinate is the **square** of the x=coordinate




The upside down graph shows the equation $y = -x^2$, which is just the reflection of the positive version (the y-values have all become negative).

On the diagram, the solutions are **-1** and **2** (circled), because that's where y = 0.

Some quadratics **(like the one over there)** do not cross the x-axis. This means they have no "solutions", because the y value never reaches 0!