## Terminology

**Variable (or an unknown)**
Is a letter used to represent a number, these can take any values.

**Expression**
Is made up numbers and/or letters representing unknown values where there is no equals symbol.
**Example**: $4a + 6$ or $a + b$.

**Terms**
Are the separate parts of expressions.
**Example:** in $5x + 3y - 4$, there are three terms $5x$, $+3y$ and $-4$

**Coefficients**
Are the numbers in front of the variable.
**Example:** in $6x$ the coefficient is 6, in $-7y^2$ it is -7.

**Equation**
Contains an 'equals' sign and at least one variable. A value can be found for the variable and this is known as solving the equation.

**Formula**
Is a special type of equation which is a rule for working things out such as area.
**Example:** the formula for the area of a rectangle is A = l x w where A = area, l = length and w = width

**Identity**
Looks like a formula but it is true for all values.
**Example**: $a + b \equiv b + a$ or $(x + 1)^2 \equiv x^2 + 2x + 1$

## Simplifying Expressions

To simplify an expression, you collect together all the terms that are alike.
Each term comes with the sign in front of it

**Examples**
Simplify the following:
1) $x + x + x + x + x = 5x$
2) $5e - 2e + e = 4e$
3) $4x + 2y - x + 5y + 6 = 3x + 7y + 6$
4) $3x^2 + 5x + 2x^2 - 4x = 5x^2 + x$
5) $5 \times 4g = 20g$
6) $3b \times 4c = 12bc$

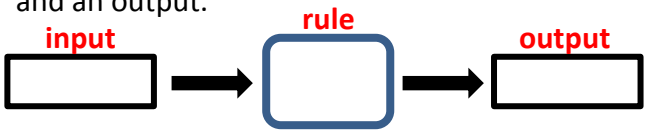
## Substitution

Is where you replace a letter with a number in a formula or expression, to calculate a value.

**Examples**
1) Find the value of 5c when c = 4
$5 \times c$
$5 \times 4 = 20$
2) Evaluate $3a^2$ when a = 5
$3 \times 5^2$
$3 \times 25 = 75$
3) The velocity of a car is given by v= u + at, find value of v when u=10, a= -2 and t=4
$v = u + a \times t$
$v = 10 + -2 \times 4$
$v = 10 - 8$
$v = 2$

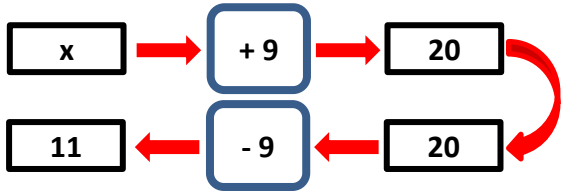
## Solving Equations

You can think of a function as being a box with a special rule... stuff goes in the box... and stuff comes out of the box.
We can use function machines to represent this, like the one below. It has an input, a rule, and an output.



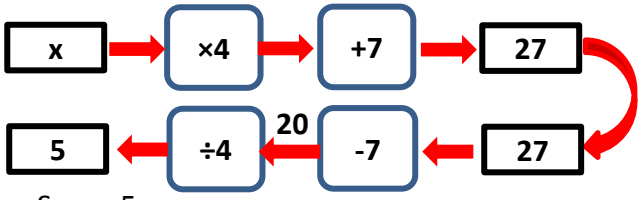

Function machines are used to help us solve equations. To find the starting value, you work backwards through the function machine. You always do the opposite (inverse) when working backwards.

**Examples**
1) Find the value of x if: $x + 9 = 20$




So $x = 11$

2) Find the value of x if: $4x + 7 = 27$



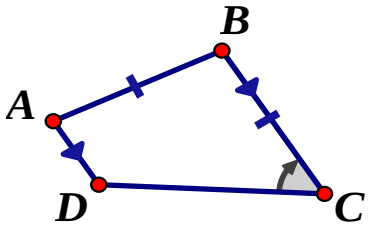

So $x = 5$

**Key Words**
Variable; Unknown; Expression; Term; Coefficient; Simplify; Equation; Formula; Identity; Substitution; Inverse; Solve.

**Linked Topics**
Times tables; Addition and Subtraction; Substitution; Solving and Forming Equations and Formulae; BIDMAS;

## Shape Notation

**Parallel** – lines that will never meet
**Perpendicular** – lines that intersect at a right-angle
**Adjacent** – 'Next too'




**Dashes** – show pairs of equal lines
**Arrows** – show pairs of parallel lines
**DC** – is the line from D to C
**D** – is a point or the vertex at D
**∠BCD** – is angle C (in-between B and D)
**ABCD** – is the quadrilateral

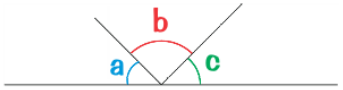
## Angle Notation

**Acute angle** – an angle measuring less than 90°
**Right angle** – an angle measuring 90° exactly
**Obtuse angle** – an angle measuring more than 90° but less than 180°
**Reflex angle** – an angle measuring more than 180° but less than 360°

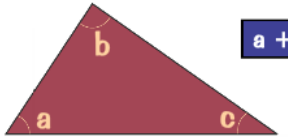
## Angle Facts

1) **Angles on a straight line add up to 180°**

a + b + c = 180°

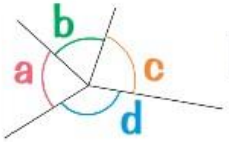



2) **Angles in a triangle add up to 180°**



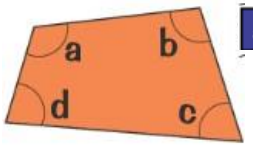

a + b + c = 180°

3) **Angles around a point add up to 360°**



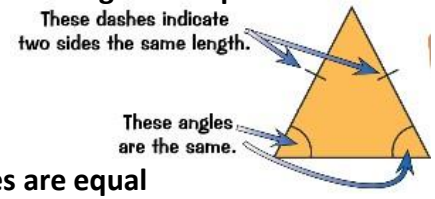

a + b + c + d = 360°

4) **Angles in a quadrilateral add up to 360°**

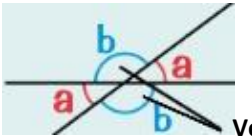



a + b + c + d = 360°

5) **Base angles in an isosceles triangle are equal**




6) **Vertically opposite angles are equal**



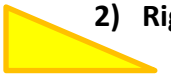

Vertically opposite angles

## Shape Properties

**Triangles** (3 sided)

1) **Equilateral Triangle**
- All sides and angles equal
- Angles are 60°

2) **Right-angle Triangle**
- One 90° angle

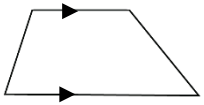


3) **Isosceles Triangle**
- 2 equal sides
- 2 equal angles

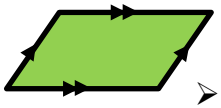
4) **Scalene Triangle**
- No equal sides
- No equal angles

**Quadrilateral** (4 sided)

1) **Trapezium**
- 1 pair of parallel sides



2) **Parallelogram**
- 2 pairs of parallel sides
- Opposite sides are equal



3) **Kite**
- 2 pairs of adjacent equal sides
- 1 pair of equal opposite angles

4) **Rhombus**
- Opposite sides are parallel
- Opposite angles are equal

**Key Words**
Angle; Triangle; Quadrilateral; Parallel lines; Perpendicular; Adjacent; Vertically opposite; Equilateral; Isosceles; Scalene; Right-angle; Trapezium

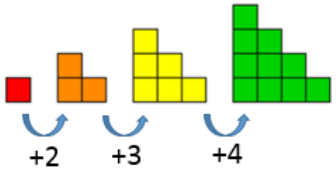
**Linked Topics**
Constructing triangles; Measuring and drawing angles; Angles around parallel lines; Interior and exterior angles of polygons; Geometry problems

## Special Sequences

Square Numbers
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144…
A square number is the answer you get when you multiple a number by itself.
**Example:** $3^2 = 3 \times 3 = 9$

Cube numbers
1, 8, 27, 64, 125, 169, 196, 216, 279, 1000…
A cube number is the answer you get when you multiply a number by itself 3 times.
**Example:** $5^3 = 5 \times 5 \times 5 = 125$

Triangular number
1, 3, 6, 10, 15, 21, 28, 36, 45, 55…
They form a triangle. The difference between terms increases by 1 each time.
**Example:**




**Position** – the place in a sequence i.e. the 1st, 2nd, 3rd, 10th, 50th, 100th number etc.
**Term** – any number in a sequence i.e. 6 is a term in the following sequence: 2, 4, 6, 8, 10

## Term to Term Rule

The term to term rule shows the difference between each number in a sequence.
To write a sequence given the term to term rule, you will always be given the staring number then the rule.
**Example:** Start at 3 add 4 each time.

**3, 7, 11, 15…**
**+ 4 + 4 + 4 …**

## Position to Term Rule

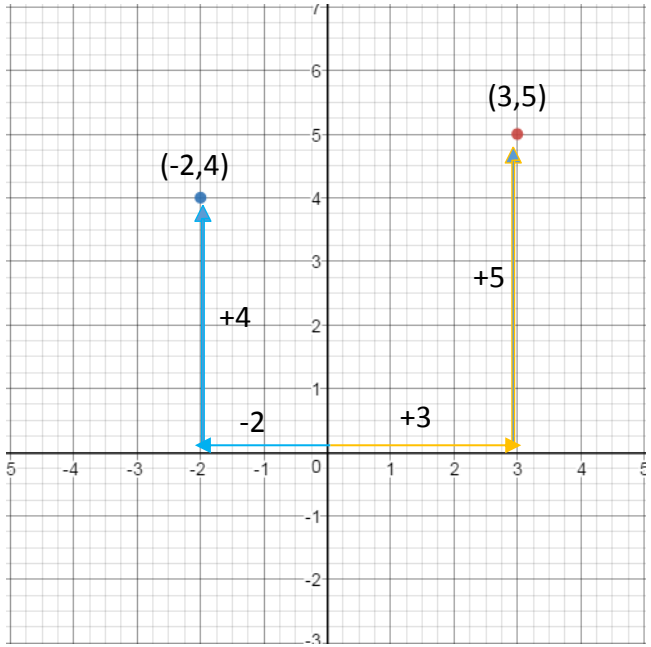
The position to term rule shows you what to do with the position number to get the term number. This will help you find terms within the sequence such as the 100th term, without having to write out the whole sequence.
**Example:** If the rule is ×2 +7
(1 x 2) + 7 = 9 (2 x 2) + 7 = 11 (3 x 2) + 7 = 13

**Arithmetic sequence** – if you add or subtract the same number to get from one term to the next.
**Geometric sequence** – if you multiply or divide by the same number to get from one term to the next.

## Plotting Coordinates


Each coordinate has an $x$-value and a $y$-value. This allows us to plot them on a graph.

The $x$-coordinate is plotted on the horizontal ($x$) axis and the $y$-coordinate is plotted on the vertical ($y$) axis.




**Key Words**
Position; Term; Pattern; Sequence; Cube; Arithmetic/Geometric; Square; Rule; Triangular; Coordinate; Axis; Vertical; Horizontal; Plot

**Linked Topics**
Finding the nth term rule for a linear sequence and quadratic sequence; Using sequences to solve problems; Plotting linear and quadratic graphs; Equation of a line