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 x 4g = 20g
6) 3b x 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 x c
5 x 4 = <u>20</u>
2) Evaluate $3a^2$ when a = 5
3×5^2
3 x 25 = <u>75</u>
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 x t
v = 10 + -2 x 4
v = 10 - 8
<u>v = 2</u>

Expanding Brackets

To expand a single bracket, the term on the outside of the bracket needs to be multiplied by each term on the inside of the bracket.

Examples
1) Expand 2(3m + 5) = <u>6m + 10</u>
2) Expand 4r(2r – 3) = <u>8r2 – 12r</u>
3) Expand and simplify: 2(4m+3) +3(5m+2)
= 8m + 6 + 15m + 6
= <u>23m + 12</u>

Solving Equations

To solve an equation you find the value of the unknown by isolating it on one side by performing inverse operations.
Solutions can be integers, decimals, fractions and negative numbers.

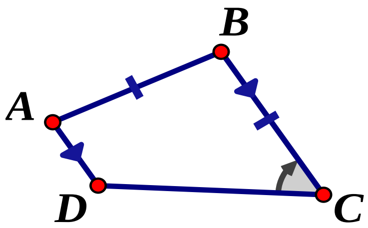
Examples
1) Solve; f – 5 = -1
Add 5 to both sides: +5 +5
<u>f = 4</u>

2) Solve; 4y + 1 = 9
Subtract 1: -1 -1
4y = 8
Divide by 4: ÷4 ÷4
<u>y = 2</u>

Key Words
Variable; Unknown; Expression; Term; Coefficient; Simplify; Equation; Formula; Identity; Substitution; Inverse; Brackets; Solve; Expanding

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

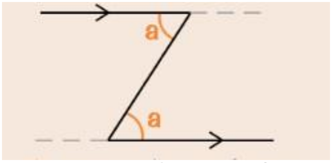
Shape Notation



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

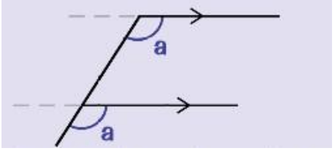
Parallel Line Rules

1) Alternate angles are equal



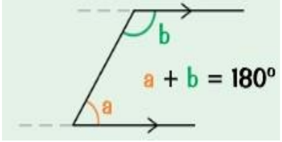
They are found in a Z-shape

2) Corresponding angles are equal



They are found in a F-shape

3) Supplementary angles add up to 180°

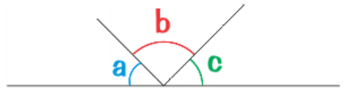


They are found in a C-shape

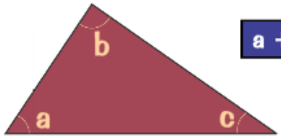
Angle Facts

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

$a + b + c = 180°$

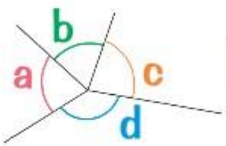


2) Angles in a triangle add up to 180°



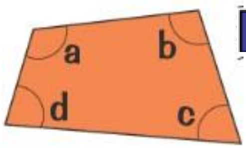
$a + b + c = 180°$

3) Angles around a point add up to 360°



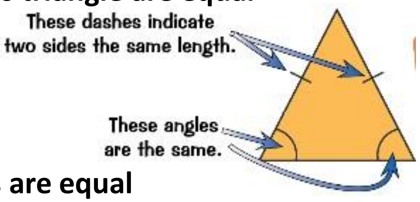
$a + b + c + d = 360°$

4) Angles in a quadrilateral add up to 360°

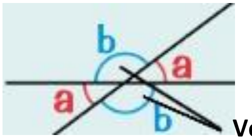


$a + b + c + d = 360°$

5) Base angles in an isosceles triangle are equal



6) Vertically opposite angles are equal

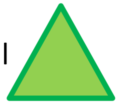


Vertically opposite angles

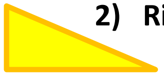
Shape Properties

Triangles (3 sided)

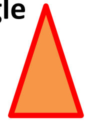
1) Equilateral Triangle
- ➢ All sides and angles equal
- ➢ Angles are 60°



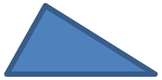
2) Right-angle Triangle
- ➢ One 90° angle



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

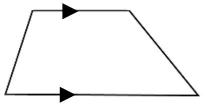


4) Scalene Triangle
- ➢ No equal sides
- ➢ No equal angles

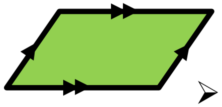


Quadrilateral (4 sided)

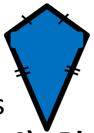
1) Trapezium
- ➢ 1 pair of parallel sides



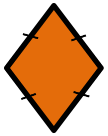
2) Parallelogram
- ➢ 2 pairs of parallel sides
- ➢ Opposite sides are equal



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; Alternate; Corresponding; Supplementary

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.

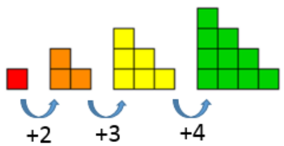
Example: $5^3 = 5 \times 5 \times 5 = 125$

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

Arithmetic (linear) 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.

Term to Term Rule

The term to term rule shows the difference between each number in a sequence.

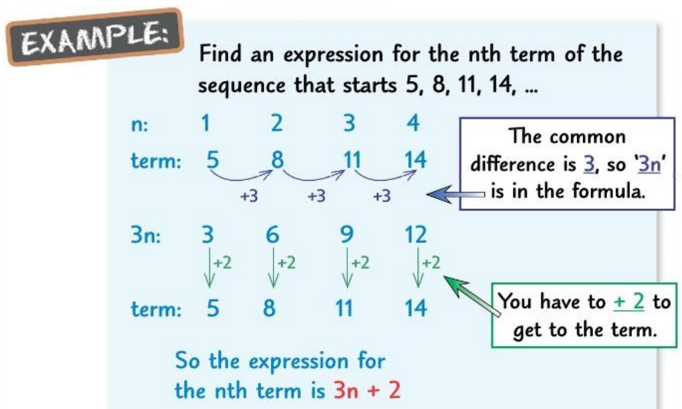
To write a sequence given the term to term rule, you will always be given the staring number then the rule.

Example: Start at 3 add 4 each time.

3, 7, 11, 15…

+ 4 + 4 + 4 …

nth Term of a Linear Sequence



1) **Find the common difference:**

- This tells you what to multiply n by

2) **Work out what to add or subtract**

- For n=1, '3n' is 3 so add 2 to get the term (5).

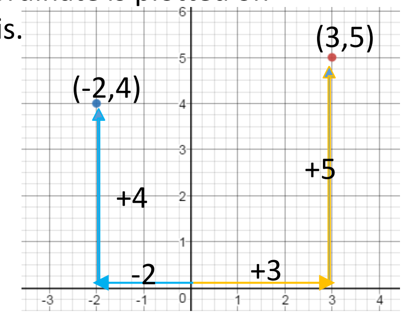
3) **Put both bits together**

Plotting Coordinates

$x \longrightarrow (3, 5) \longleftarrow y$

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

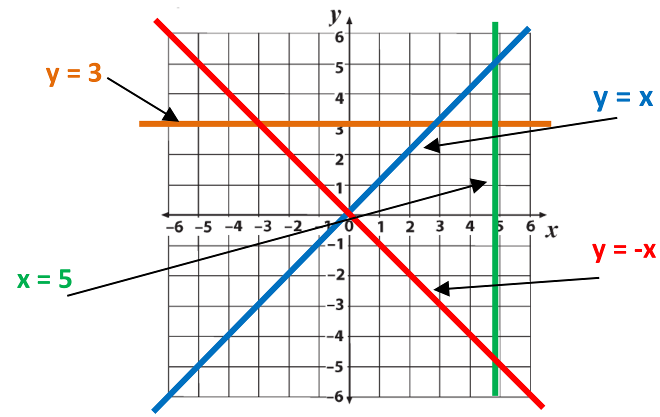
The x-coordinate is plotted on the horizontal (x) axis and the y-coordinate is plotted on the vertical (y) axis.



Gradient – the amount you go up or down when you go right 1 unit

Y-intercept – where the line crosses (intercepts) the y-axis.

Special Lines



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