



## Maths Vocabulary Guide

“Approaches which explicitly aim to develop spoken vocabulary work best when they are related to current content being studied in school and when they involve the active use of the new vocabulary.” (The Education Endowment Foundation, 2014).

### Barriers to acquiring mathematical vocabulary

For children to participate effectively in mathematics lessons, they must acquire the appropriate vocabulary to enable them to explain their thinking and make progress in different areas of mathematical knowledge. There are several potential barriers to this, which teachers should consider when using language in mathematics lessons.

\*Many words used in mathematics are terms specific to the subject area which may rarely be encountered outside the lesson, for example, multiple, factor, denominator. It is important to introduce these words explicitly first, explaining their meanings clearly.

\*Some words used in mathematics have different meanings when used in an everyday English context, for example, face, take away, match, odd, lots of, product. It is important that children explore all the meanings they know for these words first, then focus on the mathematical definitions to understand how the terms are used in a mathematical context. Using specific mathematical vocabulary, such as ‘multiplied by’ instead of ‘lots of’ can help to avoid confusion.

\*Misconceptions can arise when mathematical vocabulary is used imprecisely.

\*It is important that teachers, teaching assistants and other adults are consistent in their use of mathematical language.

### Introducing new mathematical language

The words below are to be used to support teachers in identifying the words that the children need to understand and use in order to make good progress in mathematics. The word lists have been organised by year group to provide relevant vocabulary for each domain in the 2014 National Curriculum. Where appropriate, words have been further classified into specific areas. For example, the lists of words for the ‘Measurement’ domain contain words related to length, weight, capacity and volume, time, temperature and money, as well as general measurement vocabulary.

The words listed for each year group may include all the vocabulary from the previous year/s for reference, with new words for that year highlight in red from Year 1 onwards.

These lists will help teachers identify key language for a topic and integrate their use into lesson plans. They can then ensure that new vocabulary is introduced at the right time and that familiar words continue to be consolidated. When working on a particular topic it is helpful to display the appropriate vocabulary in the classroom. In this way, children are reminded of the words that they need to know and use. Though comprehensive, the checklists are not necessarily exhaustive and more words can be added if you wish.

### Mathematical Vocabulary

The National Curriculum explicitly states that we must teach children to “reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language”.

Once new mathematical language has been introduced, children must be allowed to try it out, misuse it, see when it works, and understand how it fits with what they already know. In this way, they will eventually make it their own. We therefore need to ensure that we give children opportunities to speak this mathematical language within conversations rather than simply practising the words. The final stage of embedding understanding of new mathematical vocabulary is learning to read and write the words, ultimately spelling them correctly.

It is important to introduce children to the correct vocabulary at the appropriate time and within a suitable context. It is often helpful to do this using relevant real-life objects, mathematical manipulatives and visual representations such as pictures and diagrams. All children need regular, planned opportunities to develop their mathematical vocabulary in order that they become familiar with the language and are not confused by mathematical terms.

They need to acquire the words necessary for them to take part in lessons and activities, respond to questions correctly and carry out tasks successfully.



## Early Years Foundation Stage

<b>Number and Place Value</b>		
about the same as	fewer, smaller, less	odd, even
as many as	fewest, smallest, least	one more, ten more
before/after	first, last, last but one	one, two, three... (to 20+)
between	first, second, third.... twentieth	order
close to	guess	ones
compare	how many...?	pair
count	is the same as	pattern
count (up) to	just over, just under	size
count in ones, twos, fives, tens	more, larger, bigger, greater	ten more, ten less
count on (from, to)	more/less	tens
count back (from, to)	most, biggest, largest, greatest	the same number as
digit	nearly	too many, too few
enough, not enough	next	zero
estimate	none	
few	number	
<b>Addition and subtraction</b>		
add, more, and	how many fewer is... than...?	how much more is...?
altogether	how many have gone?	make, sum, total
difference between	how many more to make....?	one more, 2 more... 10 more
double	how many more is ... than ...?	one less, two less, ten less...
how many are left/left over?	how much less is...?	take away
<b>Multiplication and division</b>		
doubling	number patterns	sharing
halving		
<b>Fractions</b>		
half	parts of a whole	quarter
<b>Measurement</b>		
about the same as	heavy, light	now, soon, early, late
bedtime, dinner time, playtime	high, low	old, older, oldest
before, after days of the week,	holds	quick, -er, -est, -ly
birthday, holiday	hour, o'clock	scales
clock, watch, hands	length, height, width, depth	size
container	long, short, tall	slow, slower, slowest, slowly
day, week	longer, shorter, taller, higher...	takes longer, takes less time
empty	longest, shortest, tallest...	thick, thin
far, near, close	measure	time
full	metre	today, yesterday, tomorrow
half full	morning, afternoon, evening, night	too much, too little
heavier than, lighter than	new, newer, newest	weigh, weighs, balances
heaviest, lightest	next, last	wide, narrow
<b>Money</b>		
buy, sell	pay	price, cost
coin	penny, pence, pound	spend, spent
money	price, cost	
<b>Geometry</b>		
2-D Shape	curved, straight	shape, pattern
3-D Shape	flat	size
face, edge, vertex, vertices	hollow, solid	sort
bigger, larger, smaller	make, build, draw	sphere
circle	pattern, repeating pattern	symmetrical
cone	pyramid	triangle



corner, side	rectangle (including square)	
cube	round	
<b>Position and direction</b>		
above, below	front, back	position
across	in front, behind	roll
along	left, right	slide
apart	middle, edge	stretch, bend
around	movement	through
beside, next to	next to, close, near, far	to, from, towards, away from
between	on, in	top, bottom, side
corner	opposite	turn
direction	outside, inside	up, down
forwards, backwards, sideways	over, under	whole turn, half turn
<b>Statistics</b>		
count, sort	group, set	list
<b>General</b>		
describe	pattern	what could we try next?
draw	puzzle	
how did you work it out?	recognise	



## Year 1 - this includes words that are new to Year 1 and some Reception vocabulary

<b>Number and Calculation</b>		
1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> ...19 <sup>th</sup> , 20 <sup>th</sup>	estimate	number line
21, 22, 23...99,100	fewer (than)	number, numeral
above, below	first	odd, even
add (ition), subtract (ion)	forwards, backwards	ones, tens
altogether	guess	order
amount	how many...?	pair
between	how much, how many	plus
bonds	is the same as	roughly
close to	just over, just under	same, different
column (s)	larger, smaller	share
compare	left over	size
count (ing)	minus	sum
difference	more (than), less (than)	together
distance between	most, least	too many, too few
double, halve	multiple of	total
equal (to)	multiples	value
equivalent to	nearly	zero
<b>Addition and subtraction</b>		
add, more, and	how many have gone?	near halve
altogether	how many more is ... than ...?	number bonds/pairs
difference between	how many more to make...?	one less, two less, ten less...
double	make, sum, total	one more, two more...ten more
equals	missing number	subtract
how many are left/left over?	near double	
<b>Multiplication and division</b>		
array	grouping	multiplied by
dividing	halving	multiply
division	multiple	number patterns
doubling	multiplication	sharing
<b>Fractions</b>		
(one) (two) (three) quarters	fraction	sharing
(one) half	group (ing)	whole
bar	part	
equal parts	same size	
<b>Measurement (time, mass, length, capacity, money)</b>		
(weighing) scales	hour (hand)	once
after	how long ago?	quarter past/to
afternoon	how long will it be to...?	quick(er), late (r), slow (er)
balance	kilogram/kg	ruler
before	length	ruler
birthday	less than	second
capacity	light, lighter (than), lightest	short, shorter, shortest
centimetre/cm	litre, half litre	spring, summer, autumn, winter
container	long, longer, longest	takes longer, takes less time
day	mass	time
distance	measure	time
early(ier)	metre stick	today
empty	metre/m	tomorrow
evening	minute	twice
far	minutes past/to minute (hand)	volume
fast(er)	month	watch



full	month names	week
gram/g	more than	weekday names
half full, quarter full	morning	weekend
half past	new(er)	weigh
half past/to	next, first, last	weight
heavy, heavier (than), heaviest	night	year
holds	o'clock	yesterday
hour	old(er)	
<b>Money</b>		
amount	costs less	penny/p
buy, sell	costs more	pound/£
cheaper	how many...?	price, cost
coin	how much...?	spend, spent
coin values	note	total
<b>Geometry</b>		
2-D	hollow, solid	shape
3-D	make, build, draw	properties
bigger, larger, smaller	match	side (s)
corner, side	pattern	size
cube, cuboid, pyramid, sphere, cylinder	point, pointed	sort
curved, straight	rectangle, square, circle, triangle	symmetry, symmetrical
flat	round	
<b>Position and direction</b>		
above, below	direction	slide
apart	forwards, backwards	stretch
around	in front of	to, from, towards, away from
behind	inside, outside	top, middle, bottom
bend	left, right	underneath
between	movement	up, down
clockwise	near	whole turn, ½ turn, ¼ turn, ¾ turn
close	opposite	
corner	roll	
<b>Statistics</b>		
count, sort, vote	group, set	list, table



## Year 2 – in addition to Year 1 words

<b>Number and Calculation</b>		
< as 'less than' array	estimate	place holder
> as 'greater than'	estimation	place value
100, 200, 300 etc	exchange	predict
and so on up to	inverse	sequence
calculate	multiple	stands for, represents
commutative	multiplication	step counting
continue	numbers to 100	tally
count in 1s, 2s, 3s, 4s and so on	numeral	times tables
digit	one, two or three-digit number	
division	partition	
<b>Addition and subtraction</b>		
tens boundary		
<b>Multiplication and division</b>		
1 each, 2 each, 3 each... 10 each	left, left over	repeated addition
equal groups of	multiplication fact, division fact	row, column
group in pairs, threes...tens	multiplication table	times
groups of	once, twice, three times... ten times	
<b>Fractions</b>		
(one) (two) third (s)	numerator	third
'one and a quarter'	one and 2 quarters	twice as much
denominator	one and 3 quarters	two quarters
equivalent	one and a half	two thirds
grouping	one third	
half as much	sharing	
<b>Measurement (time, mass, length, capacity, temperature, money)</b>		
analogue	degrees	litre, millilitre
anticlockwise	five/ten/1/4 past/to	metre, centimetre, millimetre
celsius	gram, kilogram	temperature
clockwise	height, width	thermometer
<b>Money</b>		
amount	cost	price
change		
<b>Geometry</b>		
cone	polygon	vertical
edges	prism	vertices
faces	quadrilateral	
horizontal	symmetry	
<b>Position and direction</b>		
angle	right angle	rotation
curved	rotate	straight
<b>Statistics</b>		
block diagram	label, title	represent
category(ies)	least popular, least common	table
count, tally, sort, vote	list, table	tally chart
data	most popular, most common	
group, set	pictogram	
<b>General</b>		
compare, sort	how did you work it out?	problem, problem solving



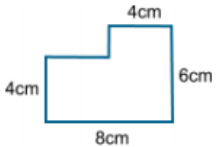
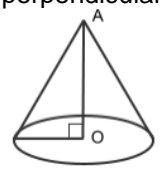
describe the pattern	investigate	puzzle
describe the rule	mental, mentally	recognise, describe, draw
explain your method	mental/written calculation	show how you ...
explain your thinking	pattern	what could we try next?



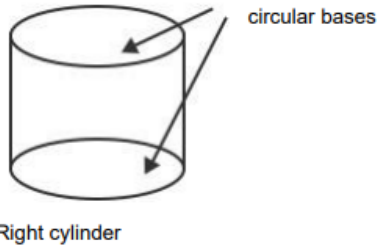
## NCETM National Curriculum Glossary (KS1)

Concept	Definition
Addend	A number to be added to another.
Addition	<p>The binary operation of addition on the set of all real numbers that adds one number of the set to another in the set to form a third number which is also in the set. The result of the addition is called the sum or total. The operation is denoted by the + sign. When we write <math>5 + 3</math> we mean 'add 3 to 5'; we can also read this as '5 plus 3'. In practice the order of addition does not matter: The answer to <math>5 + 3</math> is the same as <math>3 + 5</math> and in both cases the sum is 8. This holds for all pairs of numbers and therefore the operation of addition is said to be commutative.</p> <p>To add three numbers together, first two of the numbers must be added and then the third is added to this intermediate sum. For example, <math>(5 + 3) + 4</math> means 'add 3 to 5 and then add 4 to the result' to give an overall total of 12. Note that <math>5 + (3 + 4)</math> means 'add the result of adding 4 to 3 to 5' and that the total is again 12. The brackets indicate a priority of sub-calculation, and it is always true that <math>(a + b) + c</math> gives the same result as <math>a + (b + c)</math> for any three numbers a, b and c. This is the associative property of addition.</p> <p>Addition is the inverse operation to subtraction, and vice versa. There are two models for addition: Augmentation is when one quantity or measure is increased by another quantity. i.e. "I had £3.50 and I was given £1, then I had £4.50". Aggregation is the combining of two quantities or measures to find the total. E.g. "I had £3.50 and my friend had £1, we had £4.50 altogether.</p>
Algebra	<p>The part of mathematics that deals with generalised arithmetic. Letters are used to denote variables and unknown numbers and to state general properties. Example: <math>a(x + y) = ax + ay</math> exemplifies a relationship that is true for any numbers a, x and y. Adjective: algebraic.</p>
Analogue clock	<p>A clock usually with 12 equal divisions labelled 'clockwise' from the top 12, 1, 2, 3 and so on up to 11 to represent hours. Commonly, each of the twelve divisions are further subdivided into five equal parts providing sixty minor divisions to represent minutes. The clock has two hands that rotate about the centre. The minute hand completes one revolution in one hour, whilst the hour hand completes one revolution in 12 hours. Sometimes the Roman numerals XII, I, II, III, IV, V, VI, VII, VIII, IX, X, XI are used instead of the standard numerals used today.</p>
Angle	An angle is a measure of rotation and is often shown as the amount of rotation required to turn one-line segment onto another where the two line segments meet a point.
Anticlockwise	In the opposite direction from the normal direction of travel of the hands of an analogue clock.
Array	An ordered collection of counters, numbers etc. in rows and columns.
Associative	<p>A binary operation <math>*</math> on a set S is associative if <math>a * (b * c) = (a * b) * c</math> for all a, b and c in the set S. Addition of real numbers is associative which means <math>a + (b + c) = (a + b) + c</math> for all real numbers a, b, c. It follows that, for example, <math>1 + (2 + 3) = (1 + 2) + 3</math>.</p> <p>Similarly, multiplication is associative. Subtraction and division are not associative because:  <math>1 - (2 - 3) = 1 - (-1) = 2</math>, whereas <math>(1 - 2) - 3 = (-1) - 3 = -4</math> and <math>1 \div (2 \div 3) = 1 \div \frac{2}{3} = \frac{3}{2}</math>, whereas <math>(1 \div 2) \div 3 = \frac{1}{2} \div 3 = \frac{1}{6}</math>.</p>
Axis of symmetry	<p>A line about which a geometrical figure, or shape, is symmetrical or about which a geometrical shape or figure is reflected in order to produce a symmetrical shape or picture. Reflective symmetry exists when for every point on one side of the line there is another point (its image) on the other side of the line which is the same perpendicular distance from the line as the initial point.</p> <p>Example: a regular hexagon has six lines of symmetry; an equilateral triangle has three lines of symmetry.</p>
Bar chart	A format for representing statistical information. Bars, of equal width, represent frequencies and the lengths of the bars are proportional to the frequencies (and often equal to the frequencies). Sometimes called bar graph. The bars may be vertical or horizontal depending on the orientation of the chart.

Binary operation	A rule for combining two numbers in the set to produce a third also in the set. Addition, subtraction, multiplication and division of real numbers are all binary operations.									
Block graph	A simple format for representing statistical information. One block represents one observation. Example: A birthday graph where each child places one block, or colours one square, to represent himself / herself in the month in which he or she was born. 									
Capacity	The volume of a material (typically liquid or air) held in a vessel or container. Note: the term 'volume' is used as a general measure of 3- dimensional space and cannot always be used as synonymously with capacity. e.g. the volume of a cup is the space taken up by the actual material of the cup (a metal cup melted down would have the same volume); whereas the capacity of the cup is the volume of the liquid or other substance that the cup can contain. A solid cube has a volume but no capacity. Units include litres, decilitres, millilitres; cubic centimetres (cm <sup>3</sup> ) and cubic metres (m <sup>3</sup> ). A litre is equivalent to 1000 cm <sup>3</sup> .									
Cardinal number	A cardinal number denotes quantity, as opposed to an ordinal number which denotes position within a series. 1, 2, 5, 23 are examples of cardinal numbers. First (1st), second (2nd), third (3rd) etc. denote position in a series, and are ordinals.									
Carroll diagram	A sorting diagram named after Lewis Carroll, author and mathematician, in which numbers (or objects) are classified as having a certain property or not having that property Example: Use the diagram below to classify all the integers from 1 to 33. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Even</th> <th>Not even</th> </tr> </thead> <tbody> <tr> <th>Multiple of three</th> <td>6, 12, 18, 24, 30</td> <td>3, 9, 15, 21, 27, 33</td> </tr> <tr> <th>Not multiple of three</th> <td>2, 4, 8, 10, 14, 16, 20, 22, 24, 26, 28, 32</td> <td>1, 5, 7, 11, 13, 17, 19, 23, 25, 29, 31</td> </tr> </tbody> </table>		Even	Not even	Multiple of three	6, 12, 18, 24, 30	3, 9, 15, 21, 27, 33	Not multiple of three	2, 4, 8, 10, 14, 16, 20, 22, 24, 26, 28, 32	1, 5, 7, 11, 13, 17, 19, 23, 25, 29, 31
	Even	Not even								
Multiple of three	6, 12, 18, 24, 30	3, 9, 15, 21, 27, 33								
Not multiple of three	2, 4, 8, 10, 14, 16, 20, 22, 24, 26, 28, 32	1, 5, 7, 11, 13, 17, 19, 23, 25, 29, 31								
Categorical data	Data arising from situations where categories (unordered discrete) are used. Examples: pets, pupils' favourite colours; states of matter – solids, liquids, gases, gels etc; nutrient groups in foods – carbohydrates, proteins, fats etc; settlement types – hamlet, village, town, city etc; and types of land use – offices, industry, shops, open space, residential etc									
Centi-	Prefix meaning on-hundredth (of)									
Centilitre	Symbol: cl. A unit of capacity of volume equivalent to one-hundredth of a litre.									
Centimetre	Symbol: cm. A unit of linear measure equivalent to one hundredth of a metre.									
Chart	Another word for table or graph.									
Chronological	Relating to events that occur in a time ordered sequence.									
Circle	The set of all points in a plane which are at a fixed distance (the radius) from a fixed point (the centre) also in the plane. Alternatively, the path traced by a single point travelling in a plane at a fixed distance (the radius) from a fixed point (the centre) in the same plane. One half of a circle cut off by a diameter is a semi-circle. The area enclosed by a circle of radius $r$ is $\pi r^2$ .									
Circular	<ol style="list-style-type: none"> <li>In the form of a circle.</li> <li>Related to the circle, as in circular function.</li> </ol>									
Clockwise	In the direction in which the hands of an analogue clock travel. Anti-clockwise or counter-clockwise are terms used for the opposite direction.									
Column graph	A bar graph where the bars are presented vertically.									

Common fraction	A fraction where the numerator and denominator are both integers. Also known as simple or vulgar fraction. Contrast with a compound or complex fraction where the numerator or denominator or both contain fractions.
Commutative	A binary operation $*$ on a set $S$ is commutative if $a * b = b * a$ for all $a$ and $b \in S$ . Addition and multiplication of real numbers are commutative where $a + b = b + a$ and $a \times b = b \times a$ for all real numbers $a$ and $b$ . It follows that, for example, $2 + 3 = 3 + 2$ and $2 \times 3 = 3 \times 2$ . Subtraction and division are not commutative since, as counter examples, $2 - 3 \neq 3 - 2$ and $2 \div 3 \neq 3 \div 2$ .
Compare	In mathematics when two entities (objects, shapes, curves, equations etc.) are compared one is looking for points of similarity and points of difference as far as mathematical properties are concerned. Example: compare $y = x$ with $y = x^2$ . Each equation represents a curve, with the first a straight line and the second a quadratic curve. Each passes through the origin, but on the straight line the values of $y$ always increase from a negative to positive values as $x$ increases, but on the quadratic curve the $y$ -axis is an axis of symmetry and $y \geq 0$ for all values of $x$ . The quadratic has a lowest point at the origin; the straight line has no lowest point
Compensation (in calculation)	A mental or written calculation strategy where one number is rounded to make the calculation easier. The calculation is then adjusted by an appropriate compensatory addition or subtraction. Examples: <ul style="list-style-type: none"> <li>• <math>56 + 38</math> is treated as <math>56 + 40</math> and then 2 is subtracted to compensate.</li> <li>• <math>27 \times 19</math> is treated as <math>27 \times 20</math> and then 27 (i.e. <math>27 \times 1</math>) is subtracted to compensate.</li> </ul>
Composite shape	A shape formed by combining two or more shapes. 
Concrete objects	Objects that can be handled and manipulated to support understanding of the structure of a mathematical concept. Materials such as Dienes (Base 10 materials), Cuisenaire, Numicon, pattern blocks are all examples of concrete objects.
Cone	A cone is a 3-dimensional shape consisting of a circular base, a vertex in a different plane, and line segments joining all the points on the circle to the vertex. If the vertex $A$ lies directly above the centre $O$ of the base, then the axis of the cone $AO$ is perpendicular to the base and the shape is a right circular cone. 
Conjecture	An educated guess (or otherwise!) of a particular result, which is as yet unverified.
Consecutive	Following in order. Consecutive numbers are adjacent in a count. Examples: 5, 6, 7 are consecutive numbers. 25, 30, 35 are consecutive multiples of 5. In a polygon, consecutive sides share a common vertex and consecutive angles share a common side.
Continuous data	Data arising from measurements taken on a continuous variable (examples: lengths of caterpillars; weight of crisp packets). Continuous data may be grouped into touching but non-overlapping categories. (Example height of pupils [ $x$ cm] can be grouped into $130 \leq x < 140$ ; $140 \leq x < 150$ etc.) Compare with discrete data.
Corner	In elementary geometry, a point where two or more lines or line segments meet. More correctly called vertex, vertices (plural). Examples: a rectangle has four corners or vertices; and a cube has eight corners or vertices.
Count (verb)	The act of assigning one number name to each of a set of objects (or sounds or movements) in order to determine how many objects there are. In order to count reliably children, need to be able to: <ul style="list-style-type: none"> <li>• Understand that the number words come in a fixed order</li> <li>• Say the numbers in the correct sequence;</li> <li>• Organise their counting (e.g. say one number for each object and keep track of which things they have counted);</li> <li>• Understand that the final word in the count gives the total</li> <li>• Understand that the last number of the count remains unchanged irrespective of the order (conservation of number)</li> </ul>



Counter example	Where a hypothesis or general statement is offered, an example that clearly disproves it.
Cube	In geometry, a three-dimensional figure with six identical, square faces. Adjoining edges and faces are at right angles. In number and algebra, the result of multiplying to power of three, $n^3$ Is read as 'n cubed' or 'n to the power of three' Example: Written $2^3$ , the cube of 2 is $(2 \times 2 \times 2) = 8$ .
Cuboid	A three-dimensional figure with six rectangular faces.
Cylinder	A three-dimensional object whose uniform cross-section is a circle. A right cylinder can be defined as having circular bases with a curved surface joining them, this surface formed by line segments joining corresponding points on the circles. The centre of one base lies over  the centre of the second.
2-D; 3-D	Short for 2-dimensional and 3-dimensional. A figure is two-dimensional if it lies in a plane. A solid is three-dimensional and occupies space (in more than one plane). A plane is specified by ordered pairs of numbers called coordinates, typically $(x,y)$ . Points in 3-dimensional space are specified by an ordered triple of numbers, typically $(x, y, z)$ .
Data	Information of a quantitative nature consisting of counts or measurements. Initially data are nearly always counts or things like percentages derived from counts. When they refer to measurements that are separate and can be counted, the data are discrete. When they refer to quantities such as length or capacity that are measured, the data are continuous. Singular: datum.
Denomination (currency)	The face value of coins. In the smallest denomination of UK currency (known as Sterling) is 1p and the largest denomination of currency is a £50 note.
Describe (KS1) in mathematics (as distinct from its everyday meaning), difference means the numerical	When the curriculum asks pupils to 'describe' a mathematical object, transformation or the features of a graph, or anything else of a mathematical nature, it is asking pupils to refine their skills to hone in on the essential mathematical features and to describe these as accurately and as succinctly as possible.
Diagram	A picture, a geometric figure or a representation.
Difference	In mathematics (as distinct from its everyday meaning), difference means the numerical difference between two numbers or sets of objects and is found by comparing the quantity of one set of objects with another. e.g. the difference between 12 and 5 is 7; 12 is 5 more than 7 or 7 is 5 fewer than 12. Difference is one way of thinking about subtraction and can, in some circumstances, be a more helpful image for subtraction than 'takeaway' – e.g. $102 - 98$ .
Digit	One of the symbols of a number system most commonly the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. Examples: the number 29 is a 2-digit number; there are three digits in 2.95. The position or place of a digit in a number conveys its value.
Digital clock	A clock that displays the time as hours and minutes passed, usually since midnight. Example: four thirty in the afternoon is displayed as 16:30.
Directed number	A number having a direction as well as a size e.g. -7, + 10, etc. Such numbers can be usefully represented on a number line extending in both directions from zero.
Direction	The orientation of a line in space. e.g. north, south, east, west; up, down, right, left are directions.
Divide	To carry out the operation of division.
Dividend	In division, the number that is divided e.g. in $15 \div 3$ , 15 is the dividend.
Division	1. An operation on numbers interpreted in a number of ways. Division can be sharing – the number to be divided is shared equally into the stated number of parts; or grouping – the number of groups of a given size is found. Division is the inverse operation to multiplication.

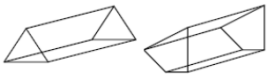


	2. On a scale, one part. Example: Each division on a ruler might represent a millimetre.
Double	1. To multiply by 2. Example: Double 13 is $(13 \times 2) = 26$ . 2. The number or quantity that is twice another. Example: 26 is double 13. In this context, a 'near double' is one away from a double. Example: 27 is a near double of 13 and of 14. (N.B. spotting near doubles can be a useful mental calculation strategy e.g. seeing $25 + 27$ as 2 more than double 25.
Edge	A line segment, joining two vertices of a figure. A line segment formed by the intersection of two plane surfaces. Examples: a square has four edges; and a cuboid has twelve edges.
Equal	Symbol: = read as 'is equal to' or 'equals'. and meaning 'having the same value as'. Example: $7 - 2 = 4 + 1$ since both expressions, $7 - 2$ and $4 + 1$ have the same value, 5.
Equivalent fractions	Fractions with the same value as another. For example: $\frac{4}{8}$ , $\frac{5}{10}$ , $\frac{8}{16}$ are all equivalent fractions and all are equal to $\frac{1}{2}$ .
Even number	An integer that is divisible by 2.
Face	One of the flat surfaces of a solid shape. Example: a cube has six faces; each face being a square.
Facts	i.e. Multiplication / division/ addition/ subtraction facts. The word 'fact' is related to the four operations and the instant recall of knowledge about the composition of a number. i.e. an addition fact for 20 could be $10+10$ ; a subtraction fact for 20 could be $20-9=11$ . A multiplication fact for 20 could be $4 \times 5$ and a division fact for 20 could be $20 \div 5 = 4$ .
Fluency	To be mathematically fluent one must have a mix of conceptual understanding, procedural fluency and knowledge of facts to enable you to tackle problems appropriate to your stage of development confidently, accurately and efficiently.
Fraction	The result of dividing one integer by a second integer, which must be non- zero. The dividend is the numerator and the non-zero divisor is the denominator. See also common fraction, decimal fraction, equivalent fraction, improper fraction, proper fraction, simple fraction, unit fraction and vulgar fraction.
Frequency	The number of times an event occurs; or the number of individuals (people, animals etc.) with some specific property.
General statement	A statement that applies correctly to all relevant cases. e.g. the sum of two odd numbers is an even number.
Generalise	To formulate a general statement or rule.
Geometrical	Relating to geometry, the aspect of mathematics concerned with the properties of space and figures or shapes in space.
Gram	Symbol: g. The unit of mass equal to one thousandth of a kilogram.
Hour	A unit of time. One twenty-fourth of a day. 1 hour = 60 minutes = 3600 ( $60 \times 60$ ) seconds.
Hundred square	A 10 by 10 square grid numbered 1 to 100. A similar grid could be numbered as a 0-99 grid.
Inequality	When one number, or quantity, is not equal to another. Statements such as $a \neq b$ , $a < b$ , $a \leq b$ , $a > b$ or $a \geq b$ are inequalities. The inequality signs in use are: $\neq$ means 'not equal to'; $A \neq B$ means 'A is not equal to B' $<$ means 'less than'; $A < B$ means 'A is less than B' $>$ means 'greater than'; $A > B$ means 'A is greater than B' $\leq$ means 'less than or equal to'; $A \leq B$ means 'A is less than or equal to B' $\geq$ means 'greater than or equal to'; $A \geq B$ means 'A is greater than or equal to B'
Infinite	Of a number, always bigger than any (finite) number that can be thought of. Of a sequence or set, going on forever. The set of integers is an infinite set.
Inverse operations	Operations that, when they are combined, leave the entity on which they operate unchanged. Examples: addition and subtraction are inverse operations e.g. $5 + 6 - 6 = 5$ . Multiplication and division are inverse operations e.g. $6 \times 10 \div 10 = 6$ . Squaring and taking the square root are inverse to each other: $= \sqrt{x^2}$ $= (\sqrt{x})^2$ $= x$ ; similarly, with cube and cube root, and any integer power n and nth root. Some operations, such as reflection in the x-axis, or 'subtract from 10' are self-inverse i.e. they are inverses of themselves.



Kite	A quadrilateral with two pairs of equal, adjacent sides whose diagonals consequently intersect at right angles.																																
Length	The extent of a line segment between two points. Length is independent of the orientation of the line segment.																																
Line	A set of adjacent points that has length but no width. A straight line is completely determined by two of its points, say A and B. The part of the line between any two of its points is a line segment.																																
Litre	Symbol: l. A metric unit used for measuring volume or capacity. A litre is equivalent to 1000cm <sup>3</sup> .																																
Mass	A characteristic of a body, relating to the amount of matter within it. Mass differs from weight, the force with which a body is attracted towards the earth's centre. Whereas, under certain conditions, a body can become weightless, mass is constant. In a constant gravitational field weight is proportional to mass.																																
Maximum value (in a noncalculus sense)	The greatest value. Example: The maximum temperature in London yesterday was 18oC.																																
Measure	1. The size in terms of an agreed unit. 2. Measure is also used as a verb, to find the size.																																
Measuring tools	These record numerical quantities of continuous variables, often by comparison with scaled calibrations on the device that is used, or using digital technology. For example, a ruler measures length, a protractor measures angles, a thermometer measures temperature; weighing scales measure mass, a stop watch measures time duration, measuring vessels to measure capacity, and so on.																																
Mental calculation	Referring to calculations that are largely carried out mentally, but may be supported with a few simple written jottings.																																
Minimum value (in a noncalculus sense)	The least value. Example: The expected minimum temperature overnight is 6C.																																
Minus	A name of the symbol – representing the operation of subtraction.																																
Minute	Unit of time. One-sixtieth of an hour. 1 = 60 seconds.																																
Missing number problems	A problem of the type $7 = \square - 9$ often used as an introduction to algebra.																																
Multiple	For any integers a and b, a is a multiple of b if a third integer c exists so that $a = bc$ Example: 14, 49 and 70 are all multiples of 7 because $14 = 7 \times 2$ , $49 = 7 \times 7$ and $70 = 7 \times 10$ .. -21 is also a multiple of 7 since $-21 = 7 \times -3$ .																																
Multiplicand	A number to be multiplied by another. e.g. in $5 \times 3$ , 5 is the multiplicand as it is the number to be multiplied by 3.																																
Multiplication	Multiplication (often denoted by the symbol "x") is the mathematical operation of scaling one number by another. It is one of the four binary operations in arithmetic (the others being addition, subtraction and division). Because the result of scaling by whole numbers can be thought of as consisting of some number of copies of the original, whole-number products greater than 1 can be computed by repeated addition; for example, 3 multiplied by 4 (often said as "3 times 4") can be calculated by adding 4 copies of 3 together: $3 \times 4 = 3 + 3 + 3 + 3 = 12$ Here 3 and 4 are the "factors" and 12 is the "product". Multiplication is the inverse operation of division, and it follows that $7 \div 5 \times 5 = 7$ . Multiplication is commutative, associative and distributive over addition or subtraction.																																
Multiplication table	An array setting out sets of numbers that multiply together to form the entries in the array, for example: <table border="1" data-bbox="459 1706 1019 1881"> <thead> <tr> <th>Multipliers</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>2</td> <td>2</td> <td>4</td> <td>6</td> </tr> <tr> <td>3</td> <td>3</td> <td>6</td> <td>9</td> </tr> <tr> <td>4</td> <td>4</td> <td>8</td> <td>12</td> </tr> <tr> <td>5</td> <td>5</td> <td>10</td> <td>15</td> </tr> <tr> <td>6</td> <td>6</td> <td>12</td> <td>18</td> </tr> <tr> <td>7</td> <td>7</td> <td>14</td> <td>21</td> </tr> </tbody> </table>	Multipliers	1	2	3	1	1	2	3	2	2	4	6	3	3	6	9	4	4	8	12	5	5	10	15	6	6	12	18	7	7	14	21
Multipliers	1	2	3																														
1	1	2	3																														
2	2	4	6																														
3	3	6	9																														
4	4	8	12																														
5	5	10	15																														
6	6	12	18																														
7	7	14	21																														
Multiply	Carry out the process of multiplication.																																
Notation	A convention for recording mathematical ideas. Examples: Money is recorded using decimal notation e.g. £2.50 Other examples of mathematical notation include $a + a = 2a$ , $y = f(x)$ and $n \times n \times n = n^3$ .																																
Number bond	A pair of numbers with a particular total e.g. number bonds for ten are all pairs of whole numbers with the total 10.																																
Number line	A line where numbers are represented by points upon it.																																



Number sentence	A mathematical sentence involving numbers. Examples: $3 + 6 = 9$ and $9 > 3$ .
Number square	A square grid in which cells are numbered in order.
Number track	A numbered track along which counters might be moved. The number in a region represents the number of single moves from the start.
Numeral	A symbol used to denote a number. The Roman numerals I, V, X, L, C, D and M represent the numbers one, five, ten, fifty, one hundred, five hundred and one thousand. The Arabic numerals 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are used in the Hindu-Arabic system giving numbers in the form that is widely used today.
Oblong	Sometimes used to describe a non-square rectangle – i.e. a rectangle where one dimension is greater than the other.
Octagon	A polygon with eight sides. Adjective: octagonal, having the form of an octagon.
Ordinal number	A term that describes a position within an ordered set. Example: first, second, third, fourth ... twentieth etc.
Partition	<ol style="list-style-type: none"> <li>1. To separate a set into subsets.</li> <li>2. To split a number into component parts. Example: the two-digit number 38 can be partitioned into <math>30 + 8</math> or <math>19 + 19</math>.</li> <li>3. A model of division. Example: <math>21 \div 7</math> is treated as 'how many sevens in 21?'</li> </ol>
Pattern	A systematic arrangement of numbers, shapes or other elements according to a rule.
Pentagon	A polygon with five sides and five interior angles. Adjective: pentagonal, having the form of a pentagon.
Pictogram	A format for representing statistical information. Suitable pictures, symbols or icons are used to represent objects. For large numbers one symbol may represent a number of objects and a part symbol then represents a rough proportion of the number.
Pictorial representations	<p>Pictorial representations enable learners to use pictures and images to represent the structure of a mathematical concept. The pictorial representation may build on the familiarity with concrete objects. E.g. a square to represent a Dienes 'flat' (representation of the number 100).</p> <p>Pupils may interpret pictorial representations provided to them or create a pictorial representation themselves to help solve a mathematical problem.</p>
Place value	The value of a digit that relates to its position or place in a number. Example: in 1482 the digits represent 1 thousand, 4 hundreds, 8 tens and 2 ones respectively; in 12.34 the digits represent 1 ten, 2 ones, 3 tenths and 4 hundredths respectively.
Plus	A name for the symbol +, representing the operation of addition.
Polygon	A closed plane figure bounded by straight lines. The name derives from many angles. If all interior angles are less than $180^\circ$ the polygon is convex. If any interior angle is greater than $180^\circ$ , the polygon is concave. If the sides are all of equal length and the angles are all of equal size, then the polygon is regular; otherwise it is irregular. Adjective: polygonal.
Position	Location as specified by a set of coordinates in a plane or in full 3-dimensional space. On the large scale, location on the earth is specified by latitude and longitude coordinates.
Pound sterling (money)	Symbol £. A unit of money. $\text{£}1.00 = 100$ pence. $\text{£}1$ is commonly called a pound.
Prism	<p>A solid bounded by two congruent polygons that are parallel (the bases) and parallelograms (lateral faces) formed by joining the corresponding vertices of the polygons. Prisms are named according to the base e.g. triangular prism, quadrangular prism, pentagonal prism etc. Examples:</p>  <p>If the lateral faces are rectangular and perpendicular to the bases, the prism is a right prism.</p>
Product	The result of multiplying one number by another. Example: The product of 2 and 3 is 6 since $2 \times 3 = 6$ .
Property	Any attribute. Example: One property of a square is that all its sides are equal.
Pyramid	A solid with a polygon as the base and one other vertex, the apex, in another plane. Each vertex of the base is joined to the apex by an edge. Other faces are triangles that meet at the apex. Pyramids are named according to the base: a triangular



	pyramid (which is also called a tetrahedron, having four faces), a square pyramid, a pentagonal pyramid etc.
Quadrilateral	A polygon with four sides.
Quantity	Something that has numerical value, for example: 5 bananas.
Quarter turn	A rotation through $90^\circ$ , usually anticlockwise unless stated otherwise.
Rectangle	A parallelogram with an interior angle of $90^\circ$ . Opposite sides are equal. If adjacent sides are also equal the rectangle is a square. If adjacent sides are not equal; the rectangle is sometimes referred to as an oblong. A square is a (special type) of rectangle but a rectangle is not a square. The use of the word 'oblong' (favoured by some) resolves this issue. An oblong is a rectangle which is not square.
Relation/relationship	A common property of two or more items. An association between two or more items.
Repeated addition	The process of repeatedly adding the same number or amount. One model for multiplication. Example $5 + 5 + 5 + 5 = 5 \times 4$ .
Repeated subtraction	The process of repeatedly subtracting the same number or amount. One model for division. Example $35 - 5 - 5 - 5 - 5 - 5 - 5 - 5 = 0$ so $35 \div 5 = 7$ remainder 0.
Rotation	In 2-D, a transformation of the whole plane which turns about a fixed point, the centre of rotation. A is specified by a centre and an (anticlockwise) angle.
Row	A horizontal arrangement.
Rule	Generally, a procedure for carrying out a process. In the context of patterns and sequences a rule, expressed in words or algebraically, summarises the pattern or sequence and can be used to generate or extend it.
Scale (noun)	A measuring device usually consisting of points on a line with equal intervals.
Score	<ol style="list-style-type: none"> <li>To earn points or goals in a competition. The running total of points or goals.</li> <li>The number twenty.</li> </ol>
Second	<ol style="list-style-type: none"> <li>A unit of time. One-sixtieth of a minute.</li> <li>Ordinal number as in 'first, second, third, fourth ...'.</li> </ol>
Sequence	A succession of terms formed according to a rule. There is a definite relation between one term and the next and between each term and its position in the sequence. Example: 1, 4, 9, 16, 25 etc.
Set	A well-defined collection of objects (called members or elements).
Share (equally)	Sections of this page that are currently empty will be filled over the coming weeks. One model for the process of division.
Side	A line segment that forms part of the boundary of a figure. Also edge.
Sign	A symbol used to denote an operation. Examples: addition sign +, subtraction sign -, multiplication sign $\times$ , division sign $\div$ , equals sign = etc. In the case of directed numbers, the positive + or negative - sign indicates the direction in which the number is located from the origin along the number line.
Simple fraction	A fraction where the numerator and denominator are both integers. Also known as <u>common fraction</u> or <u>vulgar fraction</u> .
Sort	To classify a set of entities into specified categories.
Square	<ol style="list-style-type: none"> <li>A quadrilateral with four equal sides and four right angles.</li> <li>The square of a number is the product of the number and itself. Example: the square of 5 is 25. This is written <math>5^2 = 25</math> and read as five squared is equal to twenty-five.</li> </ol>
Standard unit	Uniform units that are agreed throughout a community. Example: the metre is a standard unit of length. Units such as the hand span are not standard as they vary from person to person.
Subtract	Carry out the process of subtraction.
Subtraction	The inverse operation to addition. Finding the difference when comparing magnitude. Take away.
Subtrahend	A number to be subtracted from another.
Sum	The result of one or more additions.
Surface	A set of points defining a space in two or three dimensions.
Symbol	A letter, numeral or other mark that represents a number, an operation or another mathematical idea. Example: L (Roman symbol for fifty), > (is greater than).
Symmetry	A plane figure has symmetry if it is invariant under a reflection or rotation i.e. if the effect of the reflection or rotation is to produce an identical-looking figure in the same position. Adjective: symmetrical.



Table	<p>1. An orderly arrangement of information, numbers or letters usually in rows and columns.</p> <p>2. See multiplication table</p>															
Take away	<p>1. Subtraction as reduction</p> <p>2. Remove a number of items from a set.</p>															
Tally	<p>Make marks to represent objects counted; usually by drawing vertical lines and crossing the fifth count with a horizontal or diagonal strike through.</p> <p>A Tally chart is a table representing a count using a Tally</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">Favourite Pets</th> </tr> <tr> <th>Pet</th> <th>Tally Marks</th> <th>Number</th> </tr> </thead> <tbody> <tr> <td>Cat</td> <td>    </td> <td>10</td> </tr> <tr> <td>Dog</td> <td>    </td> <td>4</td> </tr> <tr> <td>Rabbit</td> <td>    </td> <td>6</td> </tr> </tbody> </table>	Favourite Pets			Pet	Tally Marks	Number	Cat		10	Dog		4	Rabbit		6
Favourite Pets																
Pet	Tally Marks	Number														
Cat		10														
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Temperature	<p>A measure of the hotness of a body, measured by a thermometer or other form of heat sensor.</p> <p>Two common scales of temperature are the Fahrenheit scale (<math>^{\circ}\text{F}</math>) and the Celsius (or centigrade scale) which measures in <math>^{\circ}\text{C}</math>. These scales have reference points for the freezing point of water (<math>0^{\circ}\text{C}</math> or <math>32^{\circ}\text{F}</math>) and the boiling point of water (<math>100^{\circ}\text{C}</math> or <math>212^{\circ}\text{F}</math>).</p> <p>The relation between <math>^{\circ}\text{F}</math> and <math>^{\circ}\text{C}</math> is <math>^{\circ}\text{F} = 9/5(^{\circ}\text{C}) + 32</math>.</p>															
Time	<p>1. Progress from past, to present and to future</p> <p>2. Time of day, in hours, minutes and seconds; clocks and associated vocabulary</p> <p>3. Duration and associated vocabulary</p> <p>4. Calendar time in days, weeks, months, years</p> <p>5. Associated vocabulary such as later, earlier, sooner, when, interval of time, clock today, yesterday, tomorrow, days of the week, the 12 months of a year, morning, a.m., afternoon, p.m., noon, etc.</p>															
Total	<p>1. The aggregate. Example: the total population - all in the population.</p> <p>2. The sum found by adding.</p>															
Triangle	A polygon with three sides. Adjective: triangular, having the form of a triangle.															
Triangular number	<p>1. A number that can be represented by a triangular array of dots with the number of dots in each row from the base decreasing by one.</p> <div style="text-align: center;"> </div> <p>Example: The triangular number 10 represented as a triangular array of dots.</p> <p>2. A number in the sequence 1, 1 + 2, 1 + 2 + 3, 1 + 2 + 3 + 4 etc. 55 is a triangular number since it can be expressed as, 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10.</p>															
Turn	A rotation about a point: a quarter turn is a rotation of $90^{\circ}$ . A half turn is a rotation of $180^{\circ}$ , a whole turn is a rotation of $360^{\circ}$ .															
Unit	A standard used in measuring e.g. the metre is a unit of length; the degree is a unit of turn/angle, etc.															
Unit fraction	A fraction that has 1 as the numerator and whose denominator is a non-zero integer. Example: $\frac{1}{2}$ , $\frac{1}{3}$															
Vertex	The point at which two or more lines intersect. Plural: vertices.															
Vertical	At right angles to the horizontal plane. The up-down direction on a graph or map.															
Volume	A measure of three-dimensional space. Usually measured in cubic units; for example, cubic centimetres ( $\text{cm}^3$ ) and cubic metres ( $\text{m}^3$ ).															
Weight	In everyday English weight is often confused with mass. In mathematics, and physics, the weight of a body is the force exerted on the body by the gravity of the earth, or any other gravitational body.															
Zero	<p>1. Nought or nothing; zero is the only number that is neither positive nor negative.</p> <p>2. Zero is needed to complete the number system. In our system of numbers:</p> <p style="text-align: center;"> <math>a - a = 0</math> for any number <math>a</math>.  <math>a + (-a) = 0</math> for any number <math>a</math>;  <math>a + 0 = 0 + a = a</math> for any number <math>a</math>;  <math>a - 0 = a</math> for any number <math>a</math>;  </p>															



	<p><math>a \times 0 = 0 \times a = 0</math> for any number <math>a</math>; division by zero is not defined as it leads to inconsistency. 3. In a place value system, a place-holder. Example: 105. 4. The cardinal number of an empty set.</p>
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## Effective questioning

Whilst children may be able to remember new terms, learning the meanings of words requires more than memorisation. To help children understand mathematical ideas and support them in using mathematical terms correctly, it is vital to employ a variety of questioning techniques to promote good dialogue in mathematics lessons. Effective questioning should include both closed and open questions. Encouraging children to explain their thinking and methods is also vitally important. Planning open questions that have more than one answers or more than one route to arrive at an answer gives more children a chance to respond. Open questions can also offer greater challenge and extension opportunities for higher-attaining children, encouraging them to search for alternative, less obvious or more general answers.

The ability to recall and apply knowledge is key to becoming fluent in the fundamentals of mathematics. However, children should also be asked questions that require a higher level of thinking. This is important to develop conceptual understanding, to encourage children to follow lines of enquires and justify their reasoning, and to assist them in seeking solutions to problems.

Questions that can help to develop more complex thinking, include those which require children to:

**\*predict or hypothesise**

- roughly how much is 51 multiplied by 47?
- estimate the number of counters in the tray

**\*represent mathematical ideas**

- how could you show that on a number line?
- can you represent the problem using counters?

**\*apply mathematics to solve problems**

- how could we count these?
- how could you test a number to see if it is divisible by 6?

**\*make generalisations**

- what does that tell us about numbers that have a 5 or 0 in the ones position?
- what can we say about the total angles in a quadrilateral?

**\*reason mathematically**

- I have 58p in my pocket, what coins could they be?
- why is the product of two odd numbers always odd?

**Useful question starters**

When planning open questions, the following question stems and sentence starters can be helpful:

- Explain why...
- I wonder why...
- How do you know...?
- Does anyone know...?
- What will happen if...?
- How will you know...?
- How will we find out...?
- Can you describe...?
- Convince me...
- Is there another way?
- What makes you think that?