Glossary for Year-1 and Year-2 maths October 2019

The goal of this document is to explain maths concepts and terms used in school years 1 and 2. Some of the concepts will be new to most adults, but often the concept will be familiar and the adult will simply not know the specialised vocabulary used in the classroom.

In compiling this glossary we have reviewed glossaries produced by the National Centre for Excellence in the Teaching of Mathematics and by Parent Run, as well as other sources.

Entries which are not alphabetic are listed at the end.

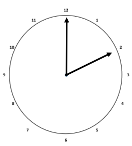
Addition is a **binary operation** which adds two numbers to give their sum. For whole numbers it is essentially the same as counting. Thus, as 6 is the count of six objects, and 3 is the count of three objects, 6+3 = 9, because 9 is the total count of six objects and three objects heaped together. '6+3' is read as '6 plus 3' or '6 and 3'. The addition of more than two numbers is defined through the **associative property** of addition. Sometimes "join", "sum", or "total" are used to signify addition.

Defining addition for **fractions** is more complicated and is introduced in later school years.

An **addend** is one of the two numbers added in an addition sum. Thus in 2+3=5 the addends are 2 and 3 and the sum is 5.

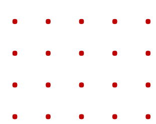
An **analogue clock** is a (usually) circular-faced clock with the numbers one to twelve around the outside and two hands, a shorter one to measure hours and a longer one to measure minutes. A 'digital clock' is a clock which displays numbers to denote the time, for example showing half past nine in the morning as 09:30.

The **angle** between two lines meeting at a point is how much you have to move one line **clockwise** or anti-**clockwise** to lie on top of the second line. A **right angle** is the angle a quarter of the way round the **circle**, for example, the angle between clock hands at 3 o'clock. All four angles in a **square** or **rectangle** are right angles.



The picture shows the clock hands at 2 o'clock, with the hour hand a sixth of the way round the dial. This shows an angle of '60 degrees', but note that using 'degrees' to measure angles comes only in later school years.

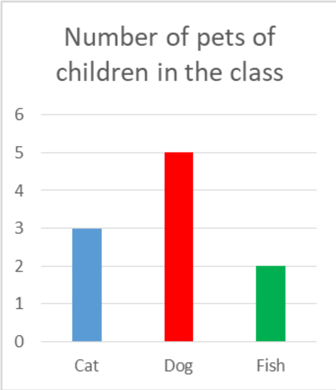
An **array** is a pictorial representation of rows of dots, to help children understand **multiplication**, **division**, and times tables. Thus 4 X 5 gives an array with 4 'rows' of 5 dots: Counting gives 4 X 5 = 20. This can also be described as 5 'columns' with 4 dots in each column.

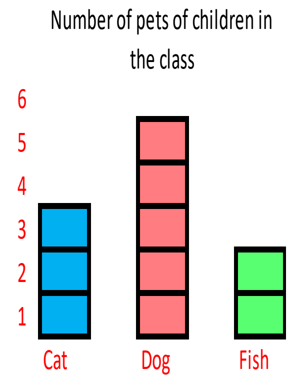


A group of numbers is in **ascending order** when they are in order from smallest to largest. For example, 2, 11, 13, 101. The opposite is **descending order**. A typical list of numbers such as 1, 8, 3, 12 is neither in ascending nor **descending order**.

The **associative property** is that when we add or multiply more than 2 numbers the grouping doesn't matter. So even though we define addition only for two numbers (2+3=5) we can use it for many numbers (2+3+4=9) since (2+3)+4 = 5+4 = 9 and 2+(3+4) = 2+7 = 9. **Subtraction** and **division** are ***not*** associative. For example, (4-2) -1 = 1 while 4 – (2-1) = 3.

A **bar chart i**s a chart that displays information (data) by using rectangular bars of different heights, showing the count of each item on a **vertical** axis.

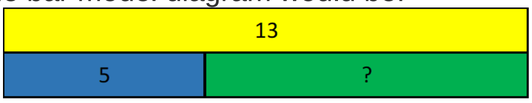




A 'block graph' or 'block diagram' is a bar chart where each bar is split into blocks so that you can easily count the number of items. Thus the cat bar is split into 3 blocks and the dog bar into 5.

Bar modelling is a method for children to visualise many numerical problems and hence to understand better how to solve them. For example, Ana has13 sweets and Ben has 5. How many more sweets does Ana have than Ben?

The bar model diagram would be:



The diagram should be roughly to scale so as to represent the real-life problem.

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A **binary operation** is a rule which takes two numbers and gives a third number. Examples are **addition** and **subtraction**.

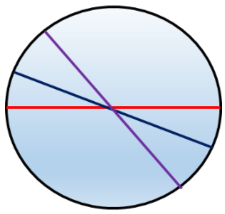
Cardinal numbers count objects and tell us about quantity (one, two, three, four, 26, 528, etc.). This is in contrast to **ordinal numbers** which note position in a series.

A **Carroll diagram** (named after Lewis Carroll) organises data according to whether each item has or does not have specific properties.

The information is presented in rows and columns. Thus:

	Even	Odd
Multiple of 3	6, 12, 18, 24, 30	3, 9, 15, 21, 27, 33
Not multiple of 3	2, 4, 8, 10, 14, 16, 20, 22, 26, 28, 32	1, 5, 7, 11, 13, 17, 19, 23, 25, 29, 31

A **circle** is a 2D curved shape, every point of which is the same distance from a special point called the 'centre':



The **circumference** is both the curved line around the edge of a circle and the length of this line.

The diagram also shows 3 separate **diameters** of the circle – these are the straight lines from the circumference to itself through the centre, where all the diameters meet. Half a **diameter**, from the centre to the circumference, is a **radius**.

Something moving in a **circle** in a **clockwise** direction is moving in the same direction as the hands on the clock. Something moving 'anti-clockwise' is moving in the opposite direction.

In the **column method** of **addition** and **subtraction**, numbers are set up in columns of units, tens, hundreds, etc. Units may be called 'ones'. Column headers may be included, written as H, T, U.

	H	T	U
		3	5
+		6	7
	1	0	2

	T	U
	4	4
-	2	6
	1	8

The **commutative property** is that we can swap the order of numbers within **addition** or **multiplication** without affecting the results of the calculation; thus 2+4 = 4+2 and 6X7 = 7X6. Note that **subtraction** and **division** are ***not*** commutative. For example, 4÷2 = 2 and 2÷4 = ½.

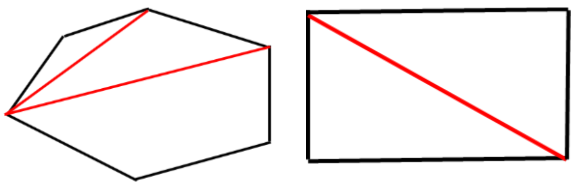
Data handling is the term for all of the techniques used to collect and represent data which can be described using numbers. Examples in this glossary are **bar charts** and **tally charts**.

A **data set** is the data collected in a data handling exercise, with a focus on the numerical elements.

The **denominator** is the bottom number of a fraction. So in the fraction 3/8 the denominator is 8, and in ½ the denominator is 2.

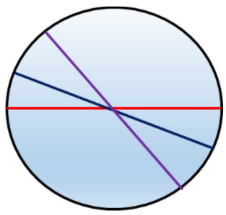
When numbers are in **descending order**, they are ordered from largest to smallest. For example, 88, 77, 23, 18, 5, 0. The opposite is **ascending order**. A typical list of numbers such as 1, 8, 3, 12 is neither in descending nor **ascending order**.

A **diagonal** is a straight line joining two 'nonadjacent vertices' of a shape, that is, two corners of a shape that are not next to each other. The diagrams show two separate diagonals of a **hexagon** and one diagonal of a **rectangle**.



A **diameter** is a straight line going through the centre of a **circle**, connecting two points on the **circumference**. 'The diameter of a circle' can also refer to the length of this line.

The diagram shows 3 separate diameters meeting at the centre. Half a diameter, from the centre to the **circumference**, is a **radius**.



The **difference** between two numbers is the larger number minus the smaller.

The **distributive property** is that '**multiplication** distributes over **addition**'. Thus 21 = 3 X (5+2) = (3X5) + (3X2) = 15+6 = 21.

One **whole number** is **divisible** by another if it is a **multiple** of the second number. Thus since 3 X 4 = 12, 12 is a multiple of 3 (and also 12 is a multiple of 4).

Division is a **binary operation** which equates to **sharing** a number of objects equally among a number of people. It takes two numbers, the 'dividend' and the 'divisor', and outputs their 'quotient'. In 10÷5 = 2, 10 is the dividend, 5 is the divisor, and 2 is the quotient. The quotient is the whole number which when multiplied by the divisor gives the dividend. Thus 10÷5 = 2 since 2X5 = 10. Division is therefore the **inverse operation** to **multiplication**. '10 ÷5' is read as '10 divided by 5'.

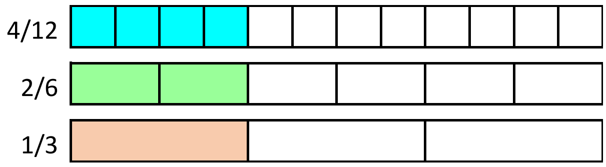
Often division cannot be done exactly, because there is no **whole number** which multiplies the divisor to give the dividend. For example, there is no **whole number** which multiplied by 5 gives 13. The highest multiple of 5 less than 13 is 10, so we write that 13 ÷ 5 = 2 **remainder** 3, which means that 2X5 = 10 and adding 3 gives you 13. This makes sense, since if we had 13 objects we could give 2 to each of 5 people and have 3 left over.

If you allow the quotient to be a **fraction** rather than a **whole number**, you can always find an exact quotient without using r**emainders**. This is done in later school years.

Division can also be defined in terms of ‘repeated subtraction’ in the same way that **multiplication** is defined in terms of **repeated addition**.

An **equality** is a **number sentence** where one side equals the other, such as 4+4 = 10-2.

Two **fractions** are **equivalent** when they have the same numeric value, but are expressed using a different **numerator** and **denominator**.
’Simplifying a **fraction’** means finding an equivalent **fraction** where the **numerator** and **denominator** are smaller. For example, 4/12 can be simplified to 2/6 or 1/3.



An **estimate** is sometimes called a 'clever guess'. Estimating means roughly calculating or judging a number or value. It is an important part of learning to work with numbers.

An **even number** is a **whole number** that can be divided into two equal groups, or, equivalently, is **divisible** by 2. Even numbers always end in 2, 4, 6, 8 or 0. A **whole number** which is not even is **odd**.

Exchange is another term used for **regrouping**, especially for **subtraction**.

Expanded notation is writing numbers or **number sentences** in which the numbers are **partitioned**. Thus 67 + 43 could be written as 60 + 7 + 40 + 3.

A **factor** is a **whole number** that divides a given **whole number** without a **remainder**. Thus both 3 and 6 are factors of 18, because 18 = 3X6.

A **fraction** is written as one **whole number** over another, for example ¾. The lower number, the **denominator**, cannot be 0. Fractions are numbers, but they are usually not **whole numbers**. If the **numerator** (the top line) is 1, then the meaning of the fraction is that it is that part of one which multiplied by the **denominator** equals one Thus ½ is the number which multiplied by 2 gives you 1, and 1/3 is the number which multiplied by 3 gives you one. This is easiest to understand by looking at pictures of shapes cut into equal pieces. The whole shape is assumed to equal 1.

1/2	1/2

1/3	1/3	1/3

½ or 1/3 or any fraction with a **numerator** of 1 and a **denominator** greater than 1 is less than 1, and therefore is not a **whole number**.

A fraction such as 4/5 is defined to be 1/5 + 1/5 + 1/5 + 1/5, that is the same **multiplication** by 4 using **repeated addition** that is used in the definition of **multiplication** for **whole numbers**. By following through the definition, you can see that 5/5 (or any fraction where the **numerator** equals the **denominator**) equals 1.

A fraction where the **numerator** is greater than the **denominator**, such as 6/5, will therefore be greater than 1. Such a fraction is called an ‘improper fraction’.

The full calculations for adding, subtracting, multiplying, and dividing fractions are taught in later school years. This includes the definition of a fraction as being equivalent to **division**, so that, for example, 4/5 = 4 ÷ 5.

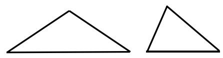
A **hexagon** is a **2D** shape whose edge is 6 straight lines with 6 corners. A hexagon is a 6-sided **polygon**.
A **horizontal** line is a straight line that runs from right to left, like the horizon. You read on horizontal lines.

An **inequality** is a **number sentence** where one side is bigger or small than the other, such as 8 > 6 or 3X3 < 2X5.

An **improper fraction** is a **fraction** where the **numerator** is bigger than the **denominator**, for example 7/3. An improper fraction is greater than 1.For example, since 3/3 = 1, 7/3 > 1.

Inverse operations are opposite operations in which one reverses the effect of the other. **Subtraction** is the inverse of **addition** and **division** is the inverse of **multiplication**. Thus 12-8 = 4, and 4+8 = 12. Similarly, 16÷2 = 8 and 8X2 = 16.

An **irregular polygon** is a **polygon** which is not **regular**. That is, there are at least two sides which are not the same length or there are at least two corners at which the angles are different. 'Special' polygons can be irregular. Thus a rectangle which is not a square is an irregular polygon, even though it has four angles the same and two pairs of sides the same.



Irregular triangles: The left one has two sides the same but one different, so it is irregular. It also has one angle different. (The two equal sides give it the special name: 'isosceles triangle'.) The right-hand triangle has all its sides and angles different.

Carrying out a **mathematical investigation** means applying skills and knowledge to solving problems. Investigations differ from **word problems** because there isn't always just one way to work them out and the solution might have to be found through trial and error. There could be several acceptable answers.

A **mixed number** is made up of a **whole number** and a **fraction**, for example 9½.

A **multiple** is a number that can be divided by another number a certain number of times without a **remainder**. For example, 20 is a multiple of 4 and it is also a multiple of 5, because 20= 4X5.

Multiplication is a binary operation which equates to **repeated addition**. Thus 6X7 (read as '6 times 7' or '6 multiplied by 7') is 7+7+7+7+7+7, which is six sevens added together. The answer 42 is the **product**. Children learn times tables and other calculation methods so that they can do multiplication directly without needing to do **repeated addition**.

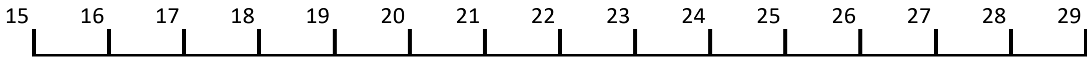
Number is not defined in this glossary! This is because you learn about more and more types of number as you progress through school and beyond. The glossary does define **whole numbers** and **fractions**, which are important types of number. Often people say 'number' when they really mean **whole number**.

Number bonds are the pairs of **whole numbers** that add to make a given number. Thus number bonds to 10 are 0+10, 1 + 9, 2 + 8, 3 + 7, 4 + 6, 5 + 5; 6+4, 7+3, 8+2, 9+1, and 10+0.

Number facts are basic **addition**, **subtraction**, **multiplication** and **division** calculations that children should learn to recall instantly. For example, a **multiplication** fact for 18 could be 2 X 9, and an **addition** fact for 16 could be 7+9. Similarly a **subtraction** fact for 20 could be 20-9=11. Number facts can be used to simplify and speed mental calculations.

A **number line** is a line with numbers written at intervals along its length. In early years number lines will have only **whole numbers**, although later in their education children will meet number lines with **fractions** and ‘decimals’. The line can start and finish at any numbers. ‘Number ladder’ is sometimes used to refer to a number line. Examples are:

and



A **number sentence** is an arrangement of numbers and symbols giving a true statement. Thus 6 + 7 = 13 is an **addition** number sentence, 45 - 6 < 40 is a **subtraction** number sentence, and 4 x 3 = 6 X 2 is a **multiplication** number sentence.

A **number square** is a rectangular grid of squares in which cells are numbered sequentially. A common number square is a 10 by 10 grid numbered from 1 to 100. Many classrooms have a number square on a wall.

The **numerator** is the top number of a **fraction**. Thus in 3/8, the numerator is 3 and in 1/9 the numerator is 1. A fraction with 1 as its numerator is called a ‘unit fraction’.

An **odd number** is a **whole number** that cannot be divided into two equal groups, or equivalently is not divisible by 2. Odd numbers end in 1, 3, 5, 7, or 9.   A **whole number** which is not odd is **even**.

The four mathematical **operations** are addition, subtraction, multiplication and division.

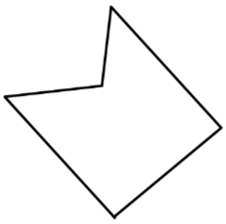
Ordinal numbers (first, second, third, 4th, 23rd, etc.) tell the position of an item in a list.

Partitioning means separating numbers into the tens, units, hundreds, etc. that make them up. Thus 296 is 200 + 90 + 6. Partitioning helps children understand **place value**. The terms ‘units’ and ‘ones’ are used interchangeably, although individual schools may prefer one or the other.

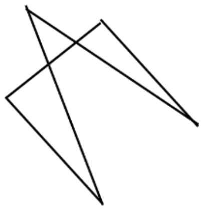
The **perimeter** is both the edge of a **2D** shape and the distance around the edge.

Place value is the value of each digit in a number. It means for example, that 582 is made up of 500, 80 and 2, rather than 5, 8 and 2, so that the ‘5’ means 5 hundreds, not 5 ones.

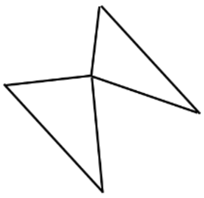
A **polygon** is a **2D** shape whose edge is made of straight lines which meet in pairs at their corners but do not otherwise overlap. A polygon will have the same number of corners (or ‘vertices’) as it has sides. Common polygons are **triangles** (3-sided) and **squares** and **rectangles** (4-sided).



A 5-sided polygon (‘pentagon’)



Not a polygon – overlapping sides



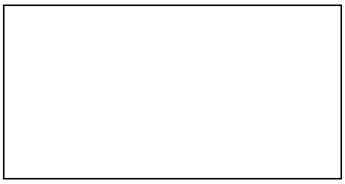
Not a polygon – 4 sides meet at a corner

The **product** of two numbers is the result you get when you multiply them together. For example, 12 is the product of 3 and 4, and 20 is the product of 4 and 5.

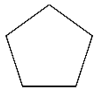
The **radius** is a straight line from the centre of a **circle** to its **circumference**, or the length of this line.

The **range** is the difference between the lowest number and the highest number in a data set.

A **rectangle** is a 4-sided **polygon** in which each pair of opposite sides are the same length and the **angles** at the four corners are all **right angles**. (A normal sheet of paper is a rectangle.)



A **regular polygon** is a **polygon** in which all the sides are the same length and the angles at all the corners are the same. A **square** is a regular 4-sided polygon, and there is a regular polygon for each number of sides.



A regular 'pentagon' – a 5-sided **polygon**

Regrouping is the operation used within **addition** or **subtraction** of taking ten ones and regrouping them into a ten (or vice versa). Thus to add 18 and 17, you start by adding the units 8 and 7. This gives 15, which we regroup into 5 ones and a ten. We now have three tens to add, giving 30, so the answer is 35.

The term **exchange** is often used in place of regrouping, especially in **subtraction**.

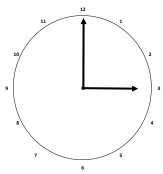
A **subtraction** example would be 24 minus 8. You cannot subtract 8 from 4, so you regroup the 20 into ten plus ten and regroup one ten into ten ones. (In a written calculation you make a note of this so you don't forget.) Added to the 4, this gives 14 ones, so we can do 14-8 = 6. We have to remember that the original 20 is now 10, so the answer is 16.

Different schools may have differences in the detail with which they do regrouping, but the basic ideas and process will be as above.

A **remainder** is needed to show the result of a **division** calculation where the dividend is not an exact multiple of the divisor. Thus 7 ÷ 2 = 3 remainder 1, since if you divide 7 toy cars equally between 3 children, each child will get 2 cars and there will be 1 car left over.

Repeated addition is a method of defining **multiplication** as well as a way of helping children understand it. For example, 3 times 5 is presented as 3 rows of 5 dots and the children calculate it as 5+5+5. This is related to 3X5 in the five-times table.

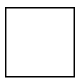
A **right angle** is where two straight lines meet a quarter of the way round a **circle** – like clock hands at 3 o'clock. This is measured as '90 degrees' but note that using degrees to measure angles comes only in later school years.



Rounding numbers means adjusting the digits (up or down) to make **estimates** or rough calculations. Typically, you round numbers to the nearest 10, 100, or 1,000. Numbers ending in 5, 50, or 500 are halfway between 10s, 100s, or 1,000s, and are usually 'rounded up' to the higher number. Thus if you are rounding to 10s, 23 would be rounded to 20, and 125 to 130.

Share is a term used in the definition of **division** and in **word problems** to indicate **division**. Children learn that by sharing equally into groups they are dividing.

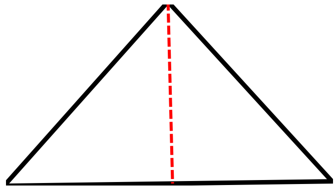
A **square** is a **rectangle** in which all four sides are the same length. It is thus a **regular** 4-sided **polygon** in which all four **angles** are **right angles**.



Subtraction is a **binary operation** which takes a larger and a small number and outputs their difference. The difference is the number which when added to the smaller number gives the larger number. Thus 10-5 = 5 as 5+5 = 10. Subtraction is thus the **inverse operation** to **addition**. '10-5' is read as '10 minus 5' or '10 take away 5'. Sometimes "deduct from", "decrease by", or "reduce by" are used to signify subtraction.

The **sum** of two numbers is the answer from adding them. Thus the sum of 5 and 4 is 9.

A shape is **symmetric** if a dividing line (the 'mirror line' or axis of symmetry') can be drawn on it, so that one side of the shape can be folded across the mirror line and be exactly on top of the other side of the shape. The diagram shows a triangle with two equal sides with its dotted mirror line – demonstrating that the shape is symmetric. Note that a shape may have several axes of symmetry – for example a square has four.



A **tally chart** uses marks representing numbers to count data items quickly and efficiently. One vertical mark is used to represent each unit; when five objects are counted the fifth line is crossed through the first four. Thus a tally chart would look like:

Pets of children in class

Pet	**Tally**	**Count**
Fish	III	3
Cat	~~IIII~~ II	7
Dog	~~IIII~~ ~~IIII~~ II	12

A **triangle** is a **2D** shape with three straight sides and three corners. It is a 3-sided polygon.

A **two-step problem** is a **word problem** that requires two operations to solve it; a multi-step problem requires more than two operations before the solution can be found.

A **vertical** line is a straight line which runs up and down the page, from top to bottom. When you are standing up, you are vertical.

A **whole number** is one of the set 0, 1, 2, 3, 4,… where each member of the set is 1 more than the member before. There is no biggest whole number – the list goes on for ever. There are numbers which are not whole numbers – for example **fractions**.

A **word problem** (also known as a 'story problem') is a 'real-life' scenario where a problem needs to be solved using a mathematical calculation.

> ('greater than') and < ('less than') symbols show the relationship between two numbers. For example, 56 > 34 or 34 < 56. Children remember 'the crocodile mouth opens to eat the big number'. A number is neither greater than nor less than itself; it equals itself, thus 6=6.

The **12-hour clock** runs from 12 midnight to 12 noon and then from 12 noon to 12 midnight.

The **24-hour clock** uses the numbers 00:00 to 24:00 to represent hours and minutes. Thus 09:30 is half past nine in the morning, and 21:30 is half past nine in the evening. (Midnight is 24:00 of the day before and also 00:00 of the next day).

2D shapes are 'two-dimensional', or 'flat'. This is actually a very sophisticated concept, but the basic idea is that they can be drawn on paper, in contrast to solid 'three-dimensional' shapes. Examples of 2D shapes are **triangles**, **rectangles**, **squares**, and **circles**.

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