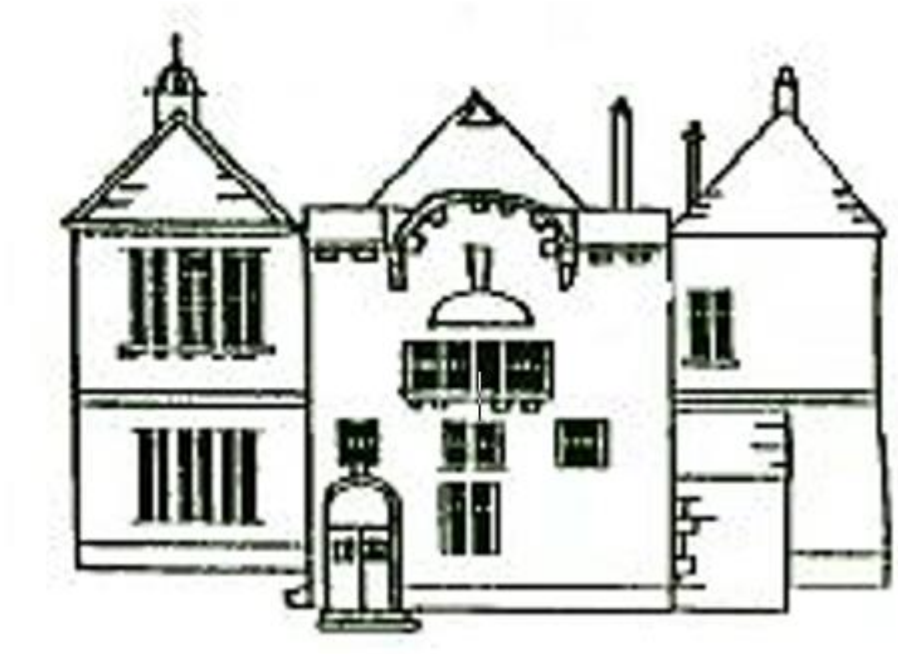
Busby Primary School

Curriculum for Excellence

A Guide for Parents and Carers to Support Learning at Home

NUMERACY
&
MATHEMATICS
SECOND LEVEL



This booklet outlines the skills pupils will develop in Numeracy and Mathematics within the Second Level.

This document makes clear the correct use of language and agreed methodology for delivering Curriculum for Excellence Numeracy and Mathematics experiences and outcomes within the Williamwood Cluster. The aim is to ensure continuity and progression for pupils which will impact on attainment.

We hope you will find this booklet useful in helping you to support your child at home.

Number and number processes
I have extended the range of whole numbers I can work with and having explored how decimal fractions are constructed, can explain the link between a digit, its place and its value.

Example	**Methodology**
2·05 *2·36* *0·5* *2·45 - decimal fraction* $\frac{1}{2}$ *- common fraction* **Correct Use of Language** Say: two point zero five, not two point nothing five. two point three six not two point thirty-six. zero point five not point five. Talk about decimal fractions and common fractions.	Ensure the decimal point is placed at middle height.

Number and number processes

Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others.

I have explored the contexts in which problems involving decimal fractions occur and can solve related problems using a variety of methods.

Having explored the need for rules for the order of operations in number calculations, I can apply them correctly when solving simple problems.

Example:

$$\begin{array}{r} 5\ \ 6 \\ +\ 3_1\ 9 \\ \hline 9\ \ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 2\ \ 6 \\ \times_2\ 4 \\ \hline 10\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 4\ \ 7 \\ \times\ 5_4\ 6 \\ \hline 2\ \ 8\ \ 2 \\ {}^3 2\ \ 3_1\ 5\ \ 0 \\ \hline 2\ \ 6\ \ 3\ \ 2 \\ \hline \end{array}$$

Correct Use of Language

For multiplying by 10, promote the digits up a column and add a zero for place holder.
For dividing by 10, demote the digits down a column and add a zero in the units' column for place holder if necessary.

Methodology

When "carrying", lay out the algorithm as in the example.
Put the addition or subtraction sign to the left of the calculation.

When multiplying by one digit, lay out the algorithm as in the example.

The "carry" digit always sits above the line.

Decimal point stays fixed and the numbers move when multiplying and dividing.
Do not say, "add on a zero", when multiplying by 10. This can result in 3·6× 10=3·60.

Number and number processes
I can show my understanding of how the number line extends to include numbers less than zero and have investigated how these numbers occur and are used.

Term/Definition

Negative numbers

Example

-4

$20^{o}C$

Correct Use of Language

Say negative four not, minus four.
Pupils should be aware of this as a common mistake, even in the media e.g. the weather.

Use minus as an operation for subtract.

Twenty degrees Celsius, not centigrade
Explain that it should be negative four, not minus four.

Fractions, decimal fractions and percentages

I have investigated the everyday contexts in which simple fractions, percentages or decimal fractions are used and can carry out the necessary calculations to solve related problems.

I can show the equivalent forms of simple fractions, decimal fractions and percentages and can choose my preferred form when solving a problem, explaining my choice of method.

I have investigated how a set of equivalent fractions can be created, understanding the meaning of simplest form, and can apply my knowledge to compare and order the most commonly used fractions.

Term/Definition	Methodology
Numerator: number above the line in a fraction. Showing the number of parts of the whole. **Denominator:** number below the line in a fraction. The number of parts the whole is divided into. **Example** *2·45 decimal fraction* $\frac{1}{2}$ *common fraction* *Start with* $4\frac{1}{10}$ *is written 4·1* $7\frac{9}{10}$ *is written 7·9 etc.* *Then* $3\frac{37}{100}$ *is written 3·37 etc.* *Finally* $6\frac{3}{4}$ *is the same as* $6\frac{75}{100}$ *which is 6·75*	Emphasise the connection between finding the fraction of a number and its link to division (and multiplication). Ensure that the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$ is highlighted. Use concrete examples to illustrate this. Show $\frac{1}{4}$ is smaller than $\frac{1}{2}$. Pupils need to understand equivalence before introducing other fractions such as $\frac{1}{3}$ or $\frac{1}{5}$. Accept all common language in use: Five pounds eighty , Five pounds eighty pence, Five eighty. Ensure the decimal point is placed at middle height. To find $\frac{3}{4}$ of a number, find one quarter first and then multiply by 3.

Correct Use of Language $\frac{1}{4}$ - Emphasise that it is one divided by four. *£5·80* – Say five pounds eighty to match the written form. **DON'T WRITE OR SAY** £5·80p. Say: two point zero five, not two point nothing five. (2·05) two point three six, not two point thirty-six.(2.36) zero point five not, point five. (0.5) Pupils should be aware of the phrases *state in lowest terms* or *reduce*. Talk about decimal fractions and common fractions to help pupils make the connection between the two.	**Simplifying fractions –** Say, "What is the highest number that you can divide the numerator and denominator by?" Check by asking, "Can you simplify again?" Finding equivalent fractions, particularly tenths and hundredths. Teach fractions first then introduce the relationship with decimals (tenths, hundredths emphasise connection to tens, units etc) then other common fractions e.g. $\frac{1}{4} = \frac{25}{100}$ = 0·25. Need to keep emphasising equivalent fractions. Starting with fractions, then teach the relationship with percentages, finally link percentages to decimals. 60% = $\frac{60}{100}$ = 0·6 Pupils need to be secure at finding common percentages of a quantity, by linking the percentage to fractions. e.g. 1%, 10%, 20%, 25%, 50%, 75% and 100%.

Time

I can use and interpret electronic and paper-based timetables and schedules to plan events and activities, and make time calculations as part of my planning.

Term/Definition	**Methodology**
a.m. - ante meridian p.m. - post meridian 24 hour time Speed	
Example *Calculating duration.* *8:35am→4:20pm* *8:35am→9:00am = 25mins* *(9:00am→12:00noon = 3h)* *12:00noon→4:00pm = 4h* *4:00pm→4:20pm = 20mins* *7hours 45minutes*	When calculating the duration pupils should clearly set out steps .
Correct Use of Language Be aware and teach the various ways we speak of time. 3:30pm Analogue – half past three in the afternoon. Digital - three thirty pm. Pupils should be familiar with : noon; midday; midnight; afternoon; evening; morning; night and the different conventions for recording the date. Say zero two hundred hours. (Children should be aware of different displays, e.g. 02:00, 02 00 and 0200) eight kilometres per hour. *8km/h* sixteen metres per second. *16m/s*	

Measurement

I can use my knowledge of the sizes of familiar objects or places to assist me when making an estimate of measure.

I can use the common units of measure, convert between related units of the metric system and carry out calculations when solving problems

I can explain how different methods can be used to find the perimeter and area of a simple 2D shape or volume of a simple 3D object.

Example

$A1 = lb$
$= 12 \times 4$
$= 48cm^2$

$A2 = lb$
$= 5 \times 4$
$= 20cm^2$

$\text{Total Area} = A1 + A2$
$= 48 + 20$
$= 68cm^2$

$1cm^3 = 1ml$
$1000cm^3 = 1000ml$
$= 1litre$

Correct Use of Language

$3cm^2$
Say 3 square centimetres not 3 centimetres squared or 3 cm two.

Abbreviation of *l* for litre.
Say 3 litres. *(3l)*

Abbreviation of ml for millilitres.
Say seven hundred millilitres.
(700ml)

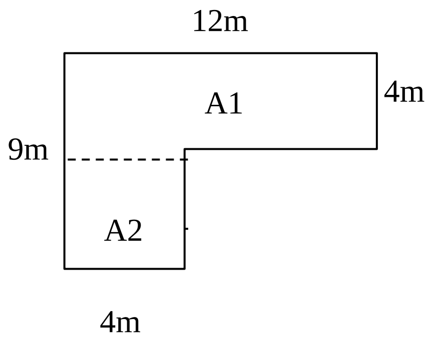
2.30m
5·43m
6·124kg

Pupils should understand how to write measurements (in m, cm, kg, g), how to say them and what they mean e.g. 5 metres 43cm.

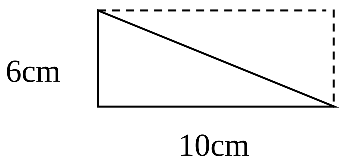
Methodology

To find the area of compound shapes:

- Split the shape into rectangles
- Label them as shown
- Fill in any missing lengths



Six kilograms and 124 grams, say six point one two four kilograms. Emphasise that perimeter is the distance around the <u>outside</u> of the shape.	

$A = l \times b$ Start with this and move to A = lb when appropriate.  **DO NOT USE** $A = \frac{1}{2}\, l \times b$ or $A = \frac{1}{2}\, lb$ as this leads to confusion later on with the base and height of a triangle.	Complete the surrounding rectangle if necessary. Area of rectangle = 10×6 = 60cm^2 Area of Triangle = $\frac{1}{2}$ the Area of rectangle = $\frac{1}{2}$ of 60 = 30cm^2
80 cm^3	Say 80 cubic centimetres **NOT** 80 centimetres cubed. Use litres or millilitres for volume with liquids. Use cm^3 or m^3 for capacity.

Patterns and relationships

Having explored more complex number sequences, including well-known named number patterns, I can explain the rule used to generate the sequence, and apply it to extend the pattern.

Term/Definition	Methodology
Prime numbers: numbers with only 2 factors, one and themselves. One is not defined as a prime number. 2, 3, 5, 7, 11, 13, 17, 19, … **Square numbers** 1, 4, 9, 16, 25, … Should be learned. **Triangular numbers** 1, 3, 6, 10, 15… Should be learned. **Example** *6, 12, 20, 30, …* **Correct Use of Language** Pupils also have to be able to continue the sequence when the steps are not constant, but not give a rule.	**See Algebra Appendix**

Expressions and equations
I can apply my knowledge of number facts to solve problems where an unknown value is represented by a symbol or letter.

Example	Methodology
Pupils should be introduced to single function machines and then double function machines. *3→21* *8→56* *10→70* **Correct Use of Language** Use “in” and “out” to raise awareness of “input” and “output.” Pupils should use the following terminology: Input; output; reverse; do the opposite; work backwards; inverse; undo etc. Outputs larger than the input, so the options are addition or multiplication Similarly if the outputs are smaller it implies subtraction or division.	Establish the operations that are an option. **See Algebra Appendix**

Properties of 2D and 3D shapes Having explored a range of 3D objects and 2D shapes, I can use mathematical language to describe their properties, and through investigation can discuss where and why particular shapes are used in the environment. Through practical activities, I can show my understanding of the relationship between 3D objects and their nets. I can draw 2D shapes and make representations of 3D objects using an appropriate range of methods and efficient use of resources.
Term/Definition **Congruent:** Two shapes are congruent if all the sides are the same length and all the angles are the same i.e. the shapes are identical. **Example** *The faces on a cube are congruent.* **Correct Use of Language** Pupils should be familiar with the word congruent.

Angle, symmetry and transformation Through practical activities which include the use of technology, I have developed my understanding of the link between compass points and angles and can describe, follow and record directions, routes and journeys using appropriate vocabulary.	
Term/Definition 060^{o}	**Methodology** Say zero six zero degrees.

<table>
<tr><td colspan="2">I can display data in a clear way using a suitable scale, by choosing appropriately from an extended range of tables, charts, diagrams and graphs, making effective use of technology.</td></tr>
<tr><td>Term/Definition

Histogram: no spaces between the bars, unlike a bar graph. (Used to display grouped data.)

Continuous Data: can have an infinite number of possible values within a selected range.
(Temperature, height or length)

Discrete Data: can only have a finite or limited number of possible values. (Shoe size, number of siblings)

Non-numerical data: data which is non-numerical (Favourite flavour of crisps)

Use a bar graph, pictogram or pie chart to display discrete data or non-numerical data.</td><td>Methodology

See Information Handling Appendix</td></tr>
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Appendix 1: Common Methodology for Algebra

Common Methodology - Algebra

Overview

Algebra is a way of thinking, i.e. a method of seeing and expressing relationships, and generalising patterns - it involves active exploration and conjecture. Algebraic thinking is not the formal manipulation of symbols.

Algebra is not simply a topic that pupils cover in Secondary school. From Primary One, pupils **lay the foundations for algebra**. This includes:

Early, First and Second Level

- Writing equations e.g. 16 add 8 equals?
- Solving equations e.g. $2 + \square = 7$
- Finding equivalent forms

e.g. $24 = 20 + 4 = 30 - 6$

$24 = 6 \times 4 = 3 \times 2 \times 2 \times 2$

- Using inverses or reversing e.g. $4 + 7 = 11 \rightarrow 11 - 7 = 4$
- Identifying number patterns

Early/First Level - Language

4 + 5 = 9 is the start of thinking about equations, as it is a statement of equality between two expressions.

Move from “makes” towards “equals” when concrete material is no longer necessary. Pupils should become familiar with the different vocabulary for addition and subtraction as it is encountered.

Second, Third and Fourth Level

Expressing relationships

- Drawing graphs
- Factorising numbers and expressions
- Understanding the commutative, associative and distributive laws

First/Second Level – Recognise and explain simple relationships

Establish the operation(s) that are an option.

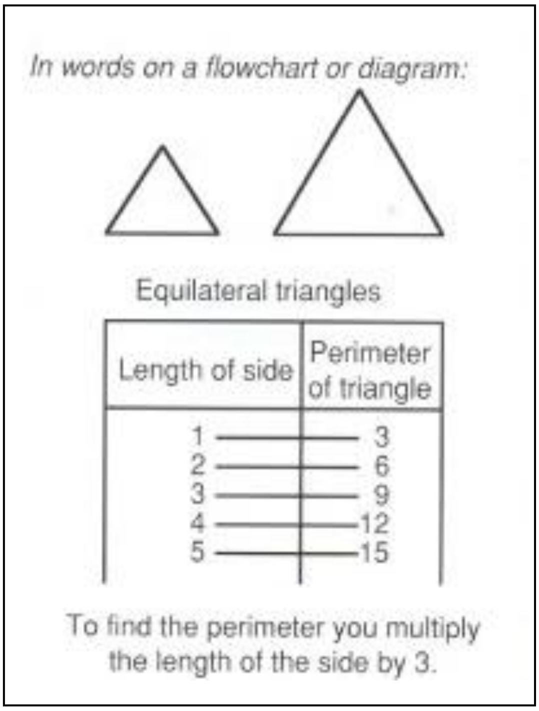
3→21
8→56
10→70

The outputs are larger than the input, so the options are either addition or multiplication.

18→9
14→7
6→3

The outputs are smaller than the input, so the options are either subtraction or division.

In this case, outputs are larger so the options are addition or multiplication. Add 2 works for the first one but
2 add 2 gives 4, we need the answer 6, addition does not work.
For multiplication, look at which table the output values are in. Ensure you check the answer.



Length of side	Perimeter of triangle
1	3
2	6
3	9
4	12
5	15

To find the perimeter you multiply the length of the side by 3.

Second Level – Use and devise simple rules

Pupils need to be able to use notation to describe general relationships between 2 sets of numbers, and then use and devise simple rules.

Pupils need to be able to deal with numbers set out in a table horizontally, set out in a table vertically or given as a sequence.

A method should be followed, rather than using "trial and error" to establish the rule.

At Second Level pupils have been asked to find the rule by establishing the single operation used. (+5, ×3, ÷2)

Example 1: Complete the following table, finding the n^{th} term.

In this example, the output values are still increasing, however, addition or multiplication on their own do not work, so this must be a two-step operation.

Input	1	2	3	4	5		n
Output	5	7	9	11	13		?

Look at the outputs. These are going up by 2 each time. This tells us that we are multiplying by 2. (This means × 2.)

Now ask:

1 multiplied by 2 is 2, how do we get to 5? Add 3.
2 multiplied by 2 is 4, how do we get to 7? Add 3.
This works, so the rule is:

Multiply by 2 then add 3.

Check using the input 5: $5 \times 2 + 3 = 13$

We use n to stand for any number
So the n^{th} term would be $\boldsymbol{n \times 2 + 3}$ which is rewritten as

$\boldsymbol{2n + 3}$

<u>Example 2:</u> Find the 20th term.

Input	Output	
1	7	
2	10	+3
3	13	+3
4	16	
5	19	
6	22	
n	$3n + 4$	
20		

To find the 20th term it is best to find the n^{th} first.

Look at the output values. These are going up by 3 each time. This tells us that we are multiplying by 3. (This means × 3.)

Now ask:

1 multiplied by 3 is 3, how do we get to 7? Add 4.
2 multiplied by 3 is 6, how do we get to 10? Add 4.
This works so the rule is

Multiply by 3 then add 4.

Check using 6: $6 \times 3 + 4 = 22$

We use n to stand for any number
So the n^{th} term would be $\boldsymbol{n \times 3 + 4}$ which is rewritten as

$\boldsymbol{3n + 4}$

To get the 20th term we substitute $n = 20$ into our formula.

$3n + 4$
$=3\times20 + 4$
$=60 + 4$
$=64$

So the 20th term is 64.

<u>Example 3</u>:

For the following sequence find the term that produces an output of 90.

Input	Output	
1	2	
2	10	+8
3	18	+8
4	26	
5	34	
6	42	
n	$8n - 6$	
	90	

We go through the same process as before to find the n^{th} term, which is $\mathbf{8n - 6}$.

Now we set up an equation.

$$
\begin{aligned}
8n - 6 &= 90 \\
+6 \quad & \quad +6 \\
8n &= 96 \\
\div 8 \quad & \quad \div 8 \\
n &= 12
\end{aligned}
$$

Therefore the 12^{th} term produces an output of 90.

Second/Third Level – Using formulae

Pupils meet formulae in ‘Area’, ‘Volume’, ‘Circle’, ‘Speed, Distance, Time’ etc. In all circumstances, working must be shown which clearly demonstrates strategy, (i.e. selecting the correct formula), substitution and evaluation.

<u>Example :</u>

Find the area of a triangle with base 8cm and height 5cm.

$$A = \tfrac{1}{2}bh$$
$$A = \tfrac{1}{2} \times 8 \times 5$$
$$A = 20$$

Remember the importance of the substitution.

Area of triangle is 20 cm^2

Appendix 2:
Common Methodology
for Information Handling

Information Handling

Discrete Data

Discrete data can only have a finite or limited number of possible values.

Shoe sizes are an example of **discrete** data because sizes 39 and 40 mean something, but size 39·2, for example, does not.

Continuous Data

Continuous data can have an infinite number of possible values within a selected range.
e.g. temperature, height, length.

Non-Numerical Data (Nominal Data)

Data which is non-numerical.
e.g. favourite TV programme, favourite flavour of crisps.

Tally Chart/Table (Frequency table)

A tally chart is used to collect and organise data prior to representing it in a graph.

Averages

Pupils should be aware that mean, median and mode are different types of average.

Mean: add up all the values and divide by the number of values.
Mode: is the value that occurs most often.
Median: is the middle value or the mean of the middle pair of an ordered set of values.

Pupils are introduced to the mean using the word average. In society average is commonly used to refer to the mean.

Range

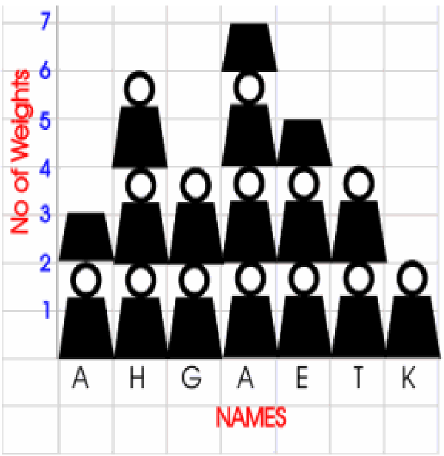
The difference between the highest and lowest value.

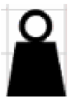
Pictogram/pictograph

A pictogram/pictograph should have a title and appropriate *x* (horizontal) and *y*-axis (vertical) labels. If each picture represents a value of more than one, then a key should be used.

NAMES	WEIGHTS
ANDREW	3
HELEN	6
GARY	4
ALEX	7
ELAINE	5
THERESA	4
KEVIN	2
TOTAL	31
MEAN	4.4

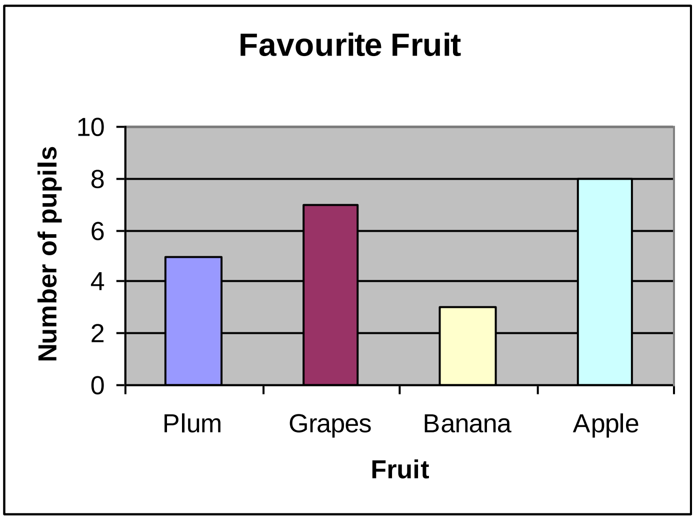
The weight each pupil managed to lift




represents two units

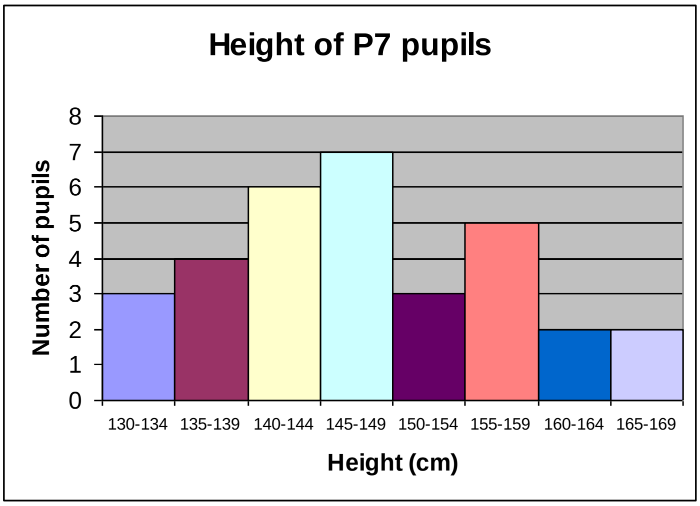
Bar Chart/Graph

A bar chart is a way of displaying discrete or non-numerical data. A bar chart should have a title and appropriate *x* and *y*-axis labels. An even space should be between each bar and each bar should be of an equal width. Leave a space between the *y*-axis and the first bar. When using a graduated axis, the intervals must be evenly spaced.



1. Histogram

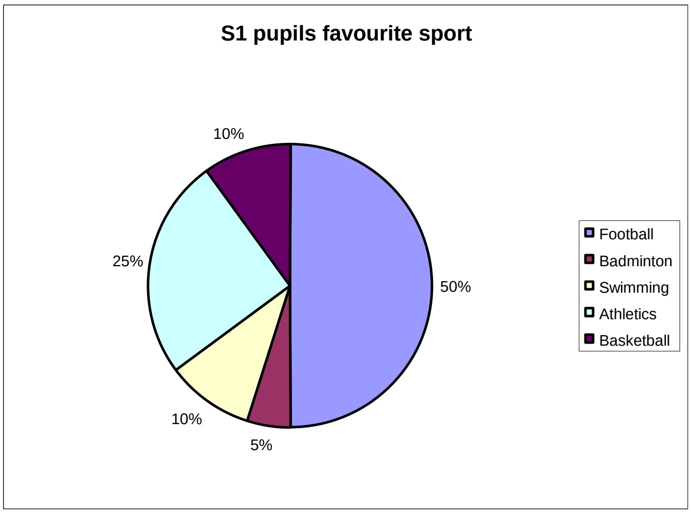
A histogram is a way of displaying grouped data. A histogram should have a title and appropriate *x* and *y*-axis labels. There should be no space between each bar. Each bar should be of an equal width. When using a graduated axis, the intervals must be evenly spaced.



Pie Charts

A pie chart is a way of displaying discrete or non-numerical data.

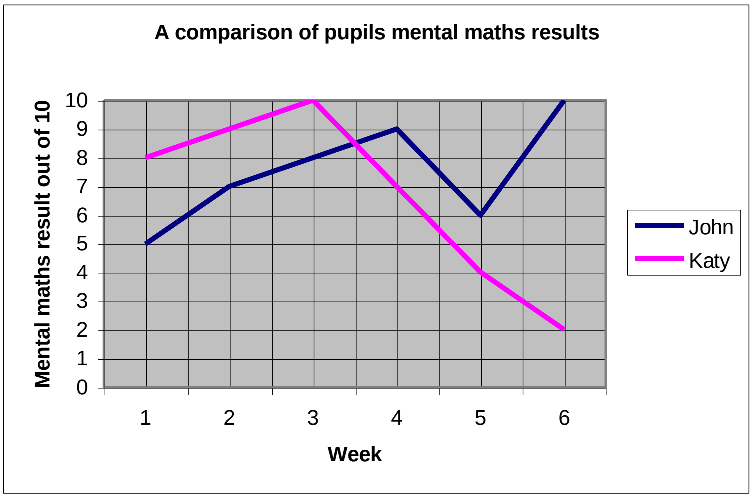
It uses percentages or fractions to compare the data. The whole circle (100% or one whole) is then split up into sections representing those percentages or fractions. A pie chart needs a title and a key.



Line Graphs

Line graphs compare two quantities (or variables). Each variable is plotted along an axis. A line graph has a vertical and horizontal axis. So, for example, if you wanted to graph the height of a ball after you have thrown it, you could put time along the horizontal, or *x*-axis, and height along the vertical, or *y*-axis.

A line graph needs a title and appropriate *x* and *y*-axis labels. If there is more than one line graph on the same axes, the graph needs a key.



Scattergraphs (Scatter diagrams)

A scattergraph allows you to compare two quantities (or variables). Each variable is plotted along an axis. A scattergraph has a vertical and hrizontal axis. It needs a title and appropriate *x* and *y*-axis labels. For each piece of data a point is plotted on the diagram. The points are not joined up.

A scattergraph allows you to see if there is a connection (correlation) between the two quantities. There may be a positive correlation when the two quantities increase together e.g. sale of umbrellas and rainfall. There may be a negative correlation were as one quantity increases the other decreases e.g. price of a car and the age of the car. There may be no correlation e.g. distance pupils travel to school and pupils' heights.