Milford Haven School
Ysgol Gyfun Aberdaugleddau

Milford Haven School

NUMERACY POLICY

2020/21

Numeracy Policy agreed by Governors:

Date adopted: _____

Date to be reviewed: _____

Policy created by:

Futures Leader for Numeracy, Mrs Emma Kedward

Milford Haven School Numeracy Policy

Mission Statement
Milford Haven School is dedicated to raising the standards of numeracy for all learners, so that they develop the skills necessary to cope confidently with the demands of further education, employment and adult life. We aim to achieve this through high quality teaching and learning opportunities and a rich intervention programme to engage, develop and inspire learners. Milford Haven School is committed to helping everyone reach their potential, reducing inequality and improving economic and social well-being, and the development of excellent numeracy skills are at the heart of this commitment.

MHS agreed definition of Numeracy
Numeracy is the ability to apply mathematical skills in the context of everyday life and to apply and identify mathematical reasoning to situations and concepts covered in other AOLEs (area of learning experiences).

It is the ability to use numbers, access, use and interpret mathematical information and apply it to everyday situations and solve problems in everyday 'real' life. To be able to interpret the data from bar charts, graphs and tables and have the confidence and skill to use numbers and mathematical approaches in all aspects of life.

The pupils describe numeracy in their own words as using their maths skills everyday to work out real-life situations and problems.

Why is Numeracy important to pupils at Milford Haven School?
To help pupils understand the importance of applying numeracy skills in their everyday life and outside of a maths lesson. Pupils need to understand that they are applying their numeracy skills to a variety of real life situations which ensures all pupils can become lifelong learners who acquire skills that will help them lead successful futures and ultimately survive and thrive.

It is important to develop their numerical skills to use in their day to day life and future careers, e.g. budgeting, food shops, wages, time, tax etc. Ultimately, preparing them for adult life and enabling them to leave school with the skills to succeed. We need numeracy to solve problems and make sense of numbers, time, patterns and shapes for activities like cooking, reading receipts, reading instructions and even playing sport.

The pupils state, in their own words, that numeracy is important to them for their future to be able to live, earn money and they use it in everyday life, even when they think they are not. If they don't learn the basic numeracy skills, they are going to struggle in their future lives.

All learners at Milford Haven School will experience a rich numeracy learning environment and support in achieving their potential. In line with the Welsh Government Numeracy Programmes and the Literacy and Numeracy Framework (LNF), it is our expectation that all learners will have the opportunity to apply and progress their numeracy skills across the curriculum in different subject areas, and in real life contexts. **All teachers and support staff, alongside other stakeholders, have a role in supporting learners' progress in numeracy.**

Aims of the Numeracy Policy

- To raise the profile of numeracy across the school.
- To improve standards of numeracy across the school.
- To support the transfer of pupils' knowledge, skills and understanding between subjects by ensuring consistency of practice including methods, vocabulary and notation.
- Make numeracy teaching an overt part of every AOLE, where it naturally arises.
- Enhancing the quality of learning and teaching of numeracy through worthwhile and beneficial opportunities in AOLEs.
- Providing consistency of approach to the teaching of numeracy across all AOLEs.
- Supporting all staff to become confident in numeracy skills in developing numerical reasoning, using number skills, using measuring skills and using data skills.

The School will implement this policy in conjunction with the following Welsh Government documentation:

- Literacy and Numeracy Framework Guidance
- Literacy and Numeracy Framework (LNF)
- New Curriculum for Wales Planning Guidance
- National Numeracy Tests

Maths and Numeracy AOLE & Future Leader for Numeracy will:

- Link a teacher of mathematics to an AOLE to offer advice, help and guidance when needed.
- Create a positive and attractive environment which celebrates numeracy.
- Run the Numeracy Ninjas programme in Year 7 and 8 (and other year groups where necessary) to fill gaps in pupils' basic mental calculation strategies and also to empower them with the numeracy skills and fluency required to fully access GCSE Maths concepts when they move to Key Stage 4.
- Identify pupils who require additional intervention to plug numeracy gaps. Intervention programmes for pupils in years 7, 8 and 9 led by a trained TA, supported by the Futures Leader for Numeracy and Director of Maths and Numeracy.
- Teachers analyse the WG tests and draw up an action plan to address weak areas.
- Action plan clearly identifies mapping of skills across the curriculum.
- Seek opportunities to use topics and examination questions from other subjects in mathematics lessons.
- Provide information about common misconceptions and errors which may occur during teaching of specific topics.
- Provide guidance to other AOLEs on what numeracy skills pupils are expected to have acquired by any given stage, so that teachers know whether a skill needs teaching for the first time or reinforcing.

- Termly evaluation of numeracy skills carried out to ensure appropriate progress is being made.

Other AOLEs and Leaders will:

- Create a positive and attractive environment which celebrates numeracy.
- Ensure that they are familiar with correct mathematical language, notation, conventions and techniques relating to their own subject and encourage pupils to use these correctly.
- Be aware of appropriate expectations of pupils and difficulties that might be experienced with numeracy skills.
- Explore possibilities for cross-curricular links with the Maths and Numeracy AOLE.
- Ensure a 'Numeracy Champion' is identified who attends Numeracy SIG meetings regularly and gives feedback to the AOLE, therefore allowing opportunities for sharing good practice incorporated into school CPD networks.

Mathematical skills can be consolidated and enhanced when pupils have the opportunity to apply and develop them across the curriculum. Poor skills, in particular, hold back pupil's progress and lower their self-esteem.

All teachers and support staff should consider pupil's ability to cope with the numerical demands of everyday life and provide opportunities for pupils to:

- Handle number and measurement competently, mentally, orally and in writing.
- Use calculators accurately and appropriately.
- Interpret and use numerical and statistical data represented in a variety of forms.

Consistency of Practice

Mathematics teachers and other subject teachers must co-operate on agreed strategies.

Teachers of mathematics should:

- Be aware of the mathematical techniques used in other subjects and provide assistance and advice to other AOLEs, so that a correct and consistent approach is used.
- Provide information to staff on appropriate expectations of students and difficulties likely to be experienced in various age and ability groups.
- Through liaison with other teachers, attempt to ensure that students have appropriate numeracy skills by the time they are needed for work in other subject areas.
- Seek opportunities to use topics and examination questions from other subjects in mathematics lessons.

Teachers of subjects other than mathematics should:

- Ensure that they are familiar with correct mathematical language, notation, conventions and techniques, relating to their own subject, and encourage students to use these correctly.
- Be aware of appropriate expectations of students and difficulties that might be experienced with numeracy skills.
- Provide information for mathematics teachers on the stage at which specific numeracy skills will be required for particular groups.
- Provide resources for mathematics teachers to enable them to use examples of applications of numeracy relating to other subjects in mathematics lessons.

The transfer of skills is something that many pupils find difficult. It is essential to start from the basis that pupils realise it is the same skill that is being used; sometimes approaches in subjects differ so much that those basic connections are not made.

Vocabulary

We must be consistent using the correct mathematical language at all times. Pupils should become confident that they know what a word means so that they can follow the instructions in a given question or interpret a mathematical problem. For example a pupil reading a question including the word perimeter should immediately recall what that is and start to think about the concept rather than struggling with the word and then wondering what it means and losing confidence in his / her ability to answer the question.

Examples

- When referring to decimals say “three point one four” rather than “three point fourteen”.
- Read numbers out in full, so for 3400 say “three thousand, four hundred” rather than “three, four, zero, zero”.

- It is important to use the correct mathematical term for the types of average being used, i.e. mean, mode or median.
- Encourage pupils to be less dependent on simple words e.g exposing them to the word “multiplied by” as a replacement for “times”.
- Highlighting word sources e.g. quad means 4, lateral means side so that pupils can use them to help remember meanings. This applies to both prefixes and suffixes.
- Discussion about words that have different meanings in Mathematics from everyday life e.g. take away, product, similar etc.

Role & Use of Calculators

Each AOLE needs to decide and then plan into identified tasks whether calculators are banned, ignored, allowed, encouraged or compulsory. Consideration the following questions:

1. Where in your subject do you expect to be able to use a calculator?
2. Are there, and should there be, situations in your subject when you would not wish pupils to use a calculator?

Some pupils are over dependent on using calculators for simple calculations. In order to support the improvement of numeracy skills, it is essential that pupils are encouraged to use non-calculator methods where possible. It is, however, necessary to give consideration to the ability of the pupil and the objectives of the task in hand. In order to complete a task successfully it may be necessary for pupils to use a calculator for what you perceive to be a relatively simple calculation. Before completing the calculation pupils should be encouraged to make an estimate of the answer. Having completed the calculation on the calculator they should consider whether the answer is reasonable in the context of the question.

It is expected for all pupils to bring their own scientific calculator to lessons when required.

In deciding when pupils use a calculator in lessons we should ensure that:

- pupils’ first resort should be mental methods.
- pupils have sufficient understanding of the calculation to decide the most appropriate method: mental, pencil and paper or calculator.
- pupils have the technical skills required to use the basic facilities of a calculator constructively and efficiently, the order in which to use keys, how to enter numbers as money, measures, fractions, etc.
- pupils understand the four arithmetic operations and recognise which to use to solve a particular problem.
- when using a calculator, pupils are aware of the processes required and are able to say whether their answer is reasonable.
- pupils can interpret the calculator display in context (e.g. 5.3 is £5.30 in money calculations).

- we help pupils, where necessary, to use the correct order of operations, especially in multi-step calculations, such as (3.2 - 1.65) x (15.6 - 5.77).

Measures
Due to different metric measurements used across the AOLEs, particularly in SciTech, we need to help pupils with this so that they can use all the divisions of a metre confidently, converting between them and having a sense of the relative size of them and visualising what a particular dimension looks like.
Pupils need to be aware that a door is approximately 2 metres tall, a bag of sugar is 1 kilogram and a can of cola is 330ml. These three examples can form the basis of pupils understanding metric units

Methods
It is important that all AOLEs are consistent with methods used for calculations to avoid confusion. This does not disallow the possibility of introducing a new method in order to improve understanding or part of a lesson designed to investigate alternative methods.

Number

Reading and writing numbers
Pupils must be encouraged to write numbers simply and clearly. Most pupils are able to read, write and say numbers up to a thousand, but even quite able older pupils have difficulty with larger numbers.

It is now common practice to use spaces rather than commas between each group of three figures. e.g. 34 000 not 34,000 though the latter will still be found in many textbooks and cannot be considered incorrect. In reading large figures pupils should know that the final three figures are read as they are written as hundreds, tens and units.

Reading from the left, the next three figures are thousands and the next group of three are millions.
e.g. 3 027 251 is three million, twenty seven thousand two hundred and fifty one.
Ask pupils ‘what is 10 less than this number?’ for example. What is the value of the 7? The answer is seven thousand or 7000, ‘thousand’ or 1000 are wrong.

Estimate and Check
Before completing any calculation, pupils should be encouraged to estimate a rough value for what they expect the answer to be. This should be done by rounding the numbers and mentally calculating the approximate answer. After completing the calculation they should be asked to consider whether or not their answer is reasonable in the context of the question.

Mental Calculations
Pupils should be encouraged to carry out calculations mentally using a variety of strategies but there will be significant differences in their ability to do so. It is helpful if

teachers discuss with pupils **how** they have made a calculation. Any method which produces the correct answer is acceptable, for example:
53 + 19 = 53 + 20 – 1
284 – 56 = 284 – 60 + 4
32 x 8 = 32 x 2 x 2 x 2
76 ÷ 4 = (76 ÷ 2) ÷ 2

All pupils should be able to use some pencil and paper methods involving simple addition, subtraction, multiplication and division. Some less able pupils will find difficulty in recalling multiplication facts to complete such calculations successfully.

Pupils should be encouraged to find their way through a problem.
e.g. if a pupil cannot calculate 7 x 6 then they most likely could calculate 7 + 7 + 7 + 7 + 7 + 7 and this should be encouraged.

Pupils should be encouraged to use inverses to check their calculations. For example, if a pupil calculates 542 + 1 676 = 2 218 they should always check that 2 218 – 1 676 = 542.

Working out
In all arithmetic, the importance of place value and neat column keeping should be stressed.
E.g £3.50 x 0.85 + £3.50

This is poor practice: £3.50 x 0.85 = 2.975 + 3.50 = 6.475 = £6.48

This is good practice: 3.50 x 0.85 + 3.50 = 2.975 + 3.50
= 6.475
= £6.48

The whole calculation is shown and subsequent equals signs are aligned vertically.

Tip: When using decimals in lessons, it is good to relate this to money.
e.g. Get them to think what 76p is in pounds (£0.76) and remember never write a £ and p sign together.

Addition
Encourage pupils to use a range of strategies, not just the traditional column method.

Methods 1 and 2 below are methods of partitioning numbers; method 3 is the more traditional method with ‘carrying’.

283 + 146

1

	200	80	3
+	100	40	6
=	300 +	120 +	9 = 429

2

283	
+ 146	
9	(add units first)
120	(then add tens)
300	(then add hundreds)
= 429	

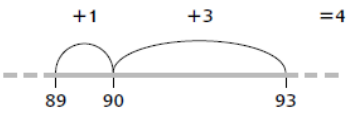
3

$$\begin{array}{r} 283 \\ +\ 146 \\ \hline 429 \\ {\scriptstyle 1} \end{array}$$

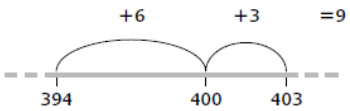
Subtraction
Subtraction causes more problems for pupils.

Encourage pupils to ‘count on’ rather than write out a formal subtraction. Below shows how to do this using a number line, though a number line is not always necessary.

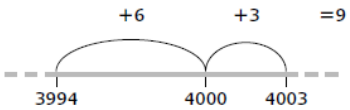
93 – 89



403 – 394



4003 – 3994



The following two examples show traditional column subtraction. The first is one that pupils will generally do correctly; the second one will see most pupils make mistakes because of the ‘borrowing’ requirement.

457 – 323

$$\begin{array}{r} 4\ 5\ 7 \\ -\ 3\ 2\ 3 \\ \hline 1\ 3\ 4 \\ \hline \end{array}$$

543 – 327

$$\begin{array}{r} 5\ {}^{3}\cancel{4}\ {}^{1}3 \\ -\ 3\ 2\ 7 \\ \hline 2\ 1\ 6 \\ \hline \end{array}$$

Subtraction from 3000, 4000, 5000 etc. causes problems for even able pupils as they rely on their preferred method of ‘borrowing’; even though it is not the most efficient. 5000 – 3765 can easily be changed to 4999 – 3764 which needs no borrowing so pupils generally get this right.

Multiplication and Division by 10,100,1000…
When a number is multiplied by 10 its value has increased tenfold and each digit will move one place to the left so multiplying its value by 10.

When multiplying by 100 each digit moves two places to the left, and so on… Any empty columns will be filled with zeros so that place value is maintained when the numbers are written without column headings.
E.g. 46 x 100 = 4 600

Th	H	T	U
		4	6
4	6	0	0

The same method is used for decimals.

E.g. 5.34 x 10 = 53.4

H	T	U	.	t	h
		5	.	3	4
	5	3	.	4	

Pupils should **not be told to move the decimal point.**
Division moves digits to right, again the decimal point does not move and a similar process to the above examples is used.

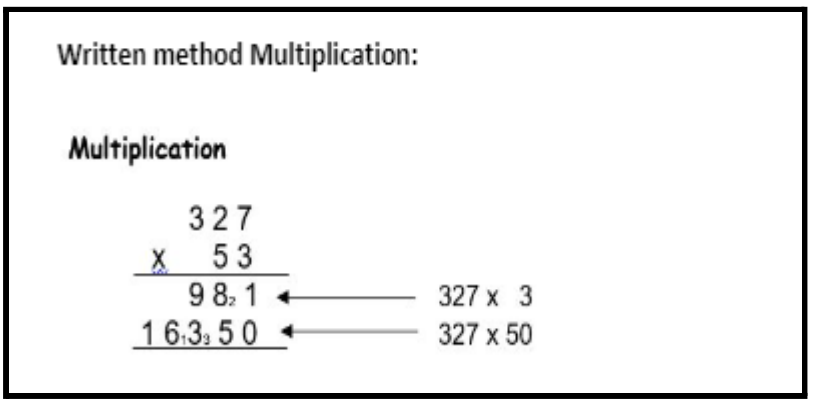
Multiplication
Below are the methods promoted by the Maths department for long multiplication:

327 x 53 Estimate: 300 x 50 = 15 000 (***do this to check if the final answer of multiplying is reasonable.)***

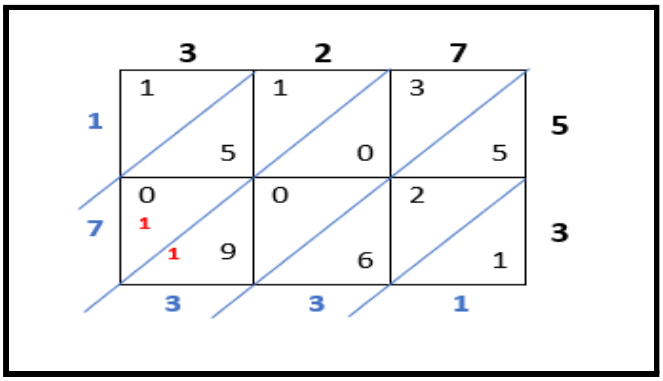
Grid Method

X	300	20	7	**Total**
50	15 000	1 000	350	16 350
3	900	60	21	981
Total	15 900	1 060	371	**17 331**

Long Multiplication

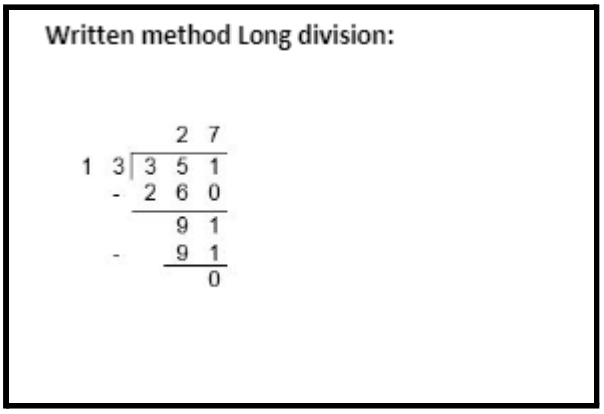


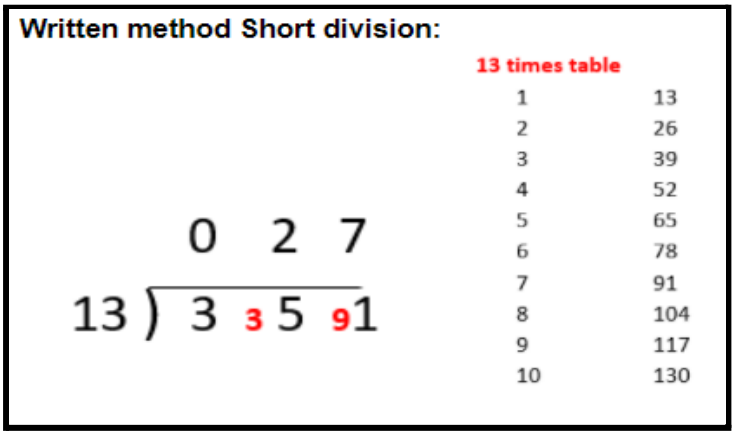
Chinese Box Method



Division

Long and short division are both acceptable, although short division is used more often. Best tip is to always write the timestable down the side of the page before you complete short division.





BIDMAS - Order of Operations
It is important that pupils follow the correct order of operations for arithmetic calculations. Most will be familiar with the mnemonic BIDMAS:

- Brackets
- Indices
- Division & Multiplication (equal priority - where both exist, you go from left to right)
- Addition & Subtraction (equal priority - where both exist, you go from left to right)

This shows the order in which calculations should be completed, for example:

5 + 3 x 4	= 5 + 12	5 + 3 x 4	= 8 x 4
	= 17		= 32 (incorrect)

The important facts to remember are that the Brackets are done first, then Indices, Multiplication and Division and finally, Addition and Subtraction, for example:

(i)
(5 + 3) x 4
= 8 x 4
= 32

(ii)
$5 + 6^2 \div 3 - 4$
$= 5 + 36 \div 3 - 4$
$= 5 + 12 - 4$
$= 13$

Use of the '=' sign
Pupils often use the ' = ' sign incorrectly. When doing a series of operations they sometimes write mathematical sentences which are untrue, for example:

5 x 4 = 20 + 3 = 23 – 8 = 15 But 5 x 4 $\neq$15

It is important that all teachers encourage pupils to write such calculations correctly:
5 x 4 = 20

20 + 3 = 23

23 – 8 = 15

The ' = ' sign should only be used when both sides of an operation have the same value. There is no problem with a calculation such as:

43 + 57 = 40 + 3 + 50 + 7 = 90 + 10 = 100

since each part of the calculation has the same value.

The '≈' (approximately equal to) sign should be used when estimating answers.
e.g. 2 378 – 412
≈ 2 400 – 400 = 2 000

Calculating percentages of a quantity
Methods for calculating percentages of a quantity vary depending upon the percentage required. Pupils should be aware that fractions, decimals and percentages are different ways of representing part of a whole and know the simple equivalents.

E.g. 10% = $\frac{1}{10}$ 12% = 0.12

Where percentages have simple fraction equivalents, fractions of the amount can be calculated.
e.g. To find 50% of an amount, halve the amount.

Most other percentages can be found by finding 10%, by dividing by 10, and then finding multiples or fractions of that amount.
e.g. To find 30% of an amount first find 10% by dividing the amount by 10 and then multiply this by three.
30% = 3x10%

Similarly: 5% = half of 10% and 15% = 10% + 5%

Most other percentages can be calculated in this way.

To find 1%, divide the amount by 100, then multiplied by the required percentage. We use this method when the number is not an easy multiple or fraction of 10%.
e.g. To find 23% of 55cm
1% = 55 ÷100 = 0.55
23% = 0.55 x 23 = 12.65cm

When using the calculator it is usual to think of the percentage as a fraction or a decimal. Pupils should be encouraged to convert the question to a sentence containing mathematical symbols. ('of' means ×), for example:

Find 27% of £350 becomes:
$\frac{27}{100}$x 350 or 0.27 × 350 and this is how it should be entered into the calculator (= £94.50)

Calculating one number as a percentage of another
This is one of the most essential numeracy techniques pupils need to be able to do effortlessly, for example, converting a test score of 43 out of 70 to a percentage, pupils should know and understand the following steps:

1)Write '47 out of 70' as a fraction $\frac{43}{70}$
2)Convert the fraction to a decimal $\frac{43}{70}$ = 0.61428...
3)×100 to convert the decimal to a percentage 0.6142... × 100 = 61.428...%
4)Round the percentage to an appropriate degree of accuracy
61.4% to 1 dp

In practice, this can entered on a calculator simply as 43 ÷ 70 × 100 or $\frac{43}{70}$x 100 using the fraction button.

Data Handling

There are different types of data. The type of data will determine the most suitable way to display the data.

- Qualitative data, also called categorical data is data in words e.g. colours of cars in a car park. Qualitative data is easier to work with, usually displayed in a pictogram, bar chart or pie chart.
- Quantitative data is numerical data, there are two types:

Discrete data is data that is counted; data is usually only whole numbers or simple fractions such as shoe size 6½. Discrete data is fairly easy to work with and is displayed in a similar way to qualitative data, unless the data is grouped.

Continuous data is data that is measured; data can be measured to many decimal places if measuring equipment allows such as foot length 23.65cm (2 d.p.). Continuous data is usually grouped due to the large range of possible numbers. It is usually displayed in a frequency diagram, sometimes known as a histogram.

It is important that graphs and diagrams are drawn on the appropriate paper:

- Bar charts and line graphs on squared or graph paper.
- Pie charts on plain paper.

Pupils must follow the SPLAT success Criteria when drawing bar and line graphs.

S Scale	Appropriate horizontal and vertical scales are chosen Use a scale that will take up most of the graph paper The scale must go up in equal amounts - be uniform
P Plot	Plot the point or height of bar carefully and accurately Make sure the point is plotted with a neat dot or X Use a ruler to line up with the y-axis as you draw the height of any bar
L Label	Label each axis identifying the data and units Label the y axis (vertical) e.g. 'Frequency', 'Number of.....', etc Label the x-axis (horizontal) e.g. 'Time (hours)', 'Length (cm)', 'Colours', etc
A Axis	The axis is drawn as a straight line using a ruler and pencil The scale must be written on the left of the y-axis and below the x-axis
T Title	Use a meaningful title to explain the purpose of the graph

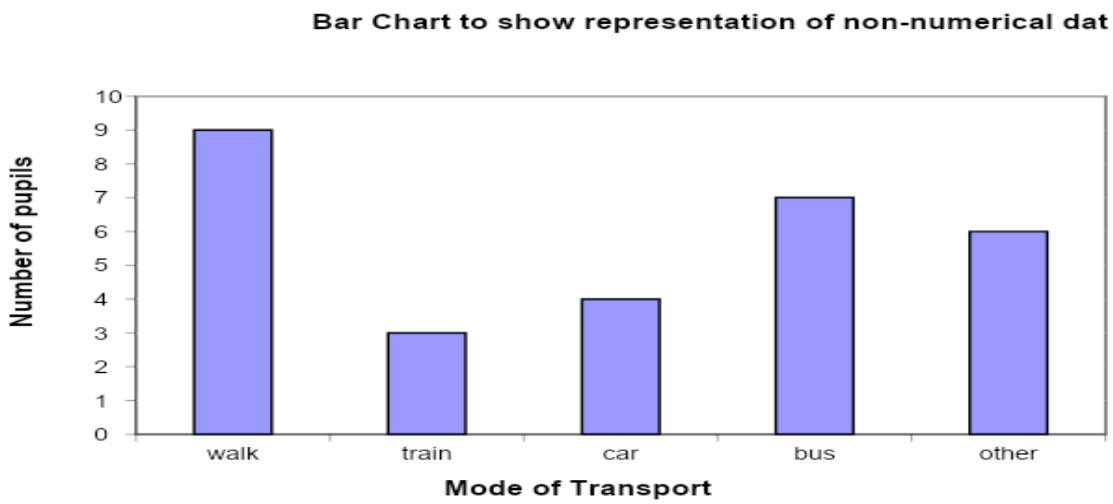
Bar Charts

These are the diagrams most frequently used in areas of the curriculum other than mathematics. The way in which the graph is drawn depends on the type of data to be processed.

Graphs should be drawn with gaps between the bars if the data categories are qualitative (colours, makes of car, names of pop star, etc.). There should also be gaps if the data is discrete, that is numeric but can only take a particular value (shoe size, KS3 level, etc.).

If the data is numerical then the horizontal axis should be a number scale and a 'stick bar chart' is best with equal spacing.

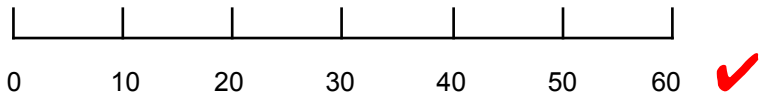
Although bar charts are generally seen as easy to draw, pupils will still need support to get them right. If pupils get competent in drawing the vertical scale it will support extending data work into frequency diagrams of continuous data. It is important that pupils' bar charts are accurate, with gaps when needed and vertical axes correctly labelled as below:



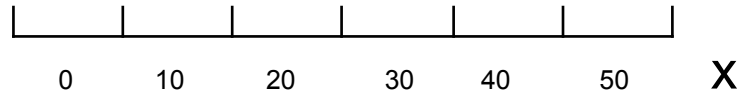
Displaying continuous data

Where the data is continuous, e.g. lengths, the horizontal scale should be set out and marked as below:

E.g.



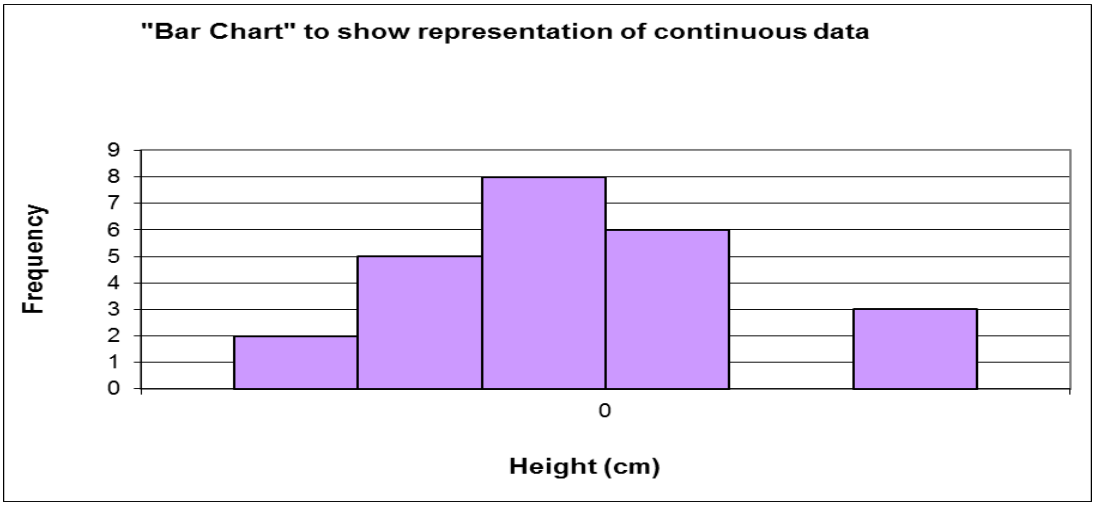
NOT



This is a common error pupils make. The more often it can be reinforced across the curriculum the better.

Bar charts for continuous data need to be labelled very carefully on the horizontal axes as below:

Bar charts for continuous data are usually called 'frequency diagrams' or histograms'.



Pie Charts
To calculate the angles in a pie chart pupils should first work out the multiplier.
e.g. 180 pupils were asked their favourite core subject.

Each pupils has 360 ÷ 180 = 2, this is the multiplier

Subject	Number of pupils	Pie Chart Angle
English	63	63 x 2 = 126º
Mathematics	75	75 x 2 = 150º
Science	42	42 x 2 = 84º
Total	180	360º

Pupils need to be reminded that a full circle must add to 360°.
Any calculations of angles should be rounded to the nearest degree only at the final stage of the calculation. If the number of items to be shown is 47 each item will need:

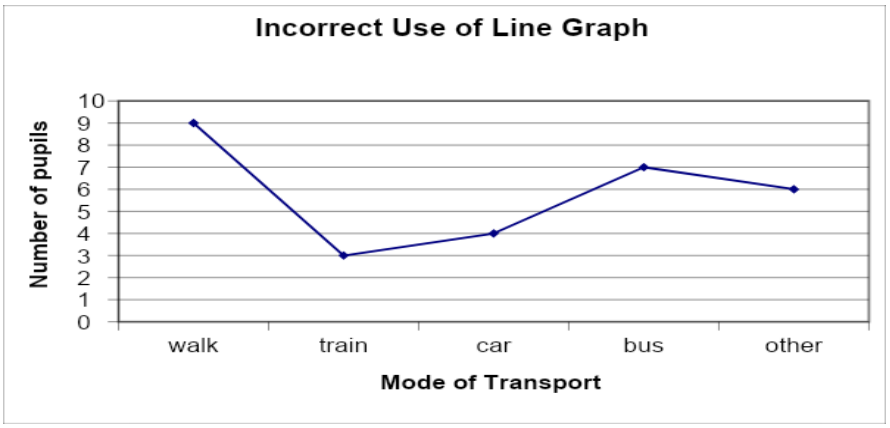
360 ÷ 47 = 7.659574468° ≈ 8°

This complete number should be used as the multiplier. The angle will have to be rounded to the nearest whole number. If the angles do not add to 360° due to rounding then the largest angle should be changed so that the angles do add to 360°.

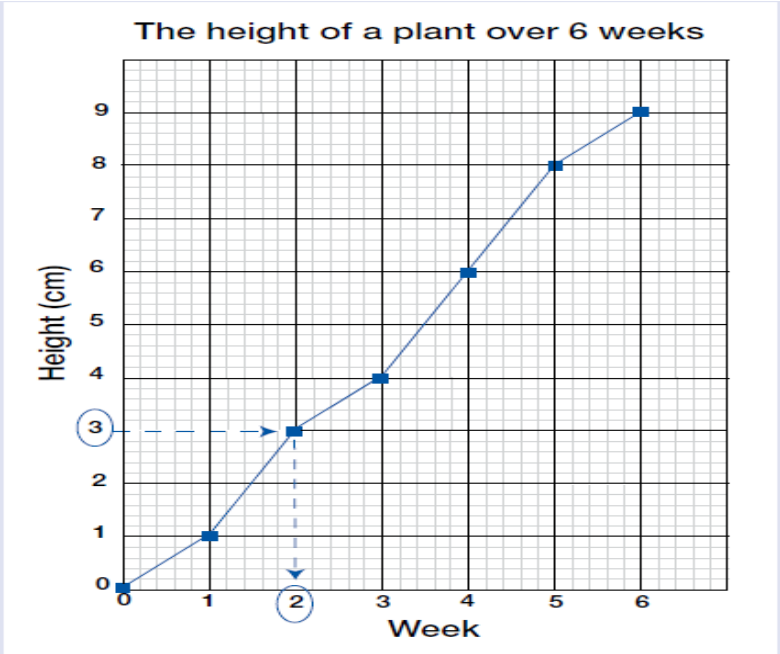
Both the angle and group should be labelled in each sector.

Line Graphs
Line graphs should only be used with data in which the order in which the categories are written is significant, such as measurements over time.

Points are joined if the graph shows a trend or when the data values between the plotted points make sense to be included. For example the measure of a patient's temperature at regular intervals shows a pattern but a definitive value was not measured at every time shown on the graph.



The line that joins 'walk' and 'train' has no meaning.



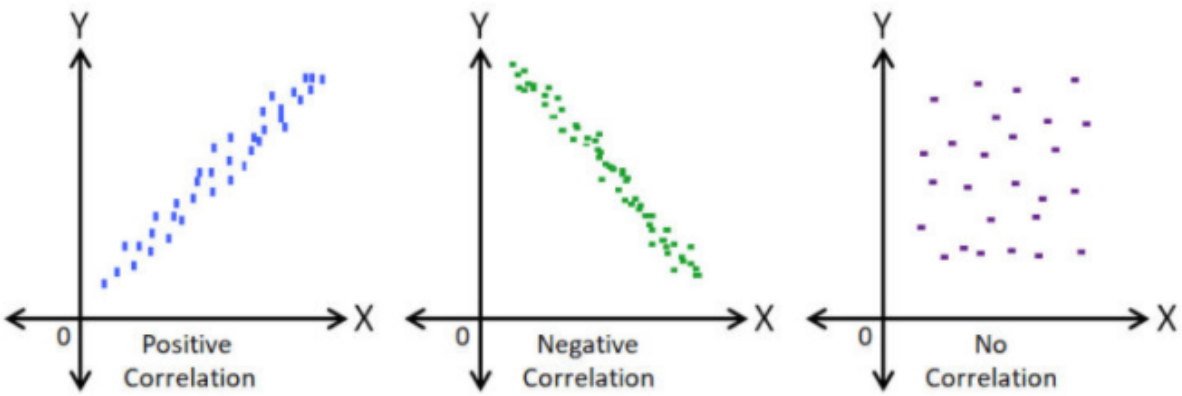
The height of the plant was measured at weekly intervals. Although half weekly intervals were not recorded it makes sense that an estimate could be made.

Scatter graphs

These are used to compare two sets of numerical data. The two values are plotted on two axes labelled as for continuous data. If there is a correlation between the two sets of data then a 'line of best fit 'should be drawn.

Pupils should be encouraged to have the same amount of points above and below the line.

If mean values have been calculated then the line of best fit should go through the plotted mean point.



<u>Lines of best fit</u>

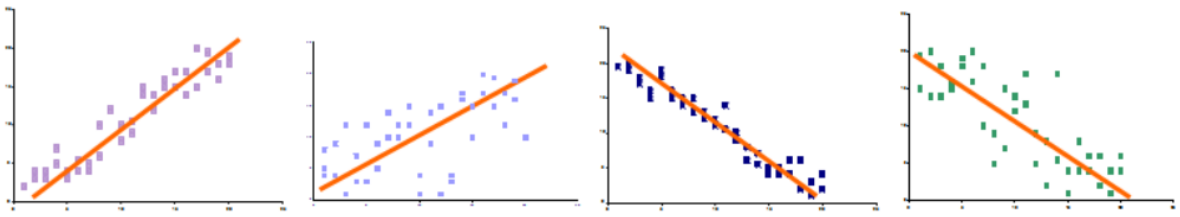
Lines of best fit rarely go through the origin.

The degree of correlation between the two sets of data is determined by the proximity of the points to the 'line of best fit'.

Pupils should be encouraged to have the same amount of points above and below the line.

If mean values have been calculated then the line of best fit should go through the plotted mean point.

If the points are scattered with no pattern at all then there is no correlation.



Questionnaires
Some rules have to be followed to achieve success in writing or criticising questionnaires.

Questions should be clear and short with option choices given wherever possible.
These options choices should cover all options, so the use of the option 'other' is frequently used.
If possible the choices should be numeric e.g. 0 to 10, 11 to 20, 21 to 30, over 30.
Avoid ambiguous options such as 'a lot' or 'often' as these mean different things to different people.

Time limits should be given to questions such as 'how often do you…….. a month?'

Personal or embarrassing questions should be avoided.
Leading questions such as 'do you agree…' should be avoided.

Any source of bias needs to be avoided such where questionnaires are completed and by who.

Sample size needs to be at least 30 to be valid.

Using Data
Range
The range of a set of data is the difference between the highest and the lowest data values.
e.g. If in an examination the highest mark is 80% and the lowest mark is 45%, the range is 35% because 80% - 45% = 35%

(The range is always an overall value, so it is NOT 45% - 80%)

Averages
Three different averages are commonly used:

Mean – is calculated by adding up all the values and dividing by the number of values.

Median – is the middle value when a set of values has been arranged in order.

Mode - is the most common value. It is sometimes called the modal class. There can be more than one mode, or there can be no mode if no piece of data occurs more often than others.

Example: for the following values: 3, 2, 5, 8, 4, 3, 6, 3, 2,

Mean = $\frac{3 + 2 + 5 + 8 + 4 + 3 + 6 + 3 + 2}{9} = \frac{36}{9} = 4$

Median – is 3 because 3 is in the middle when the values are put in order.

2, 2, 3, 3, 3, 4, 5, 6, 8

Mode - is 3 because 3 is the value which occurs most often.

Numeracy Framework

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Developing mathematical proficiency	**Conceptual understanding**	I can make connections so that basic mathematical concepts can be transferred during play and classroom activities.	I can make connections so that mathematical concepts can be transferred during play and classroom activities.	I can make connections so that mathematical concepts can be built on and deepened.	I can make connections so that mathematical concepts can be built on and deepened.	I can make connections so that mathematical concepts can be built on and deepened.
				I can draw on my understanding of the basic structures of mathematics and can apply them in different contexts.	I can draw on my understanding of the basic structures of mathematics and can apply them in different contexts.	I can draw on my understanding of the basic structures of mathematics and can apply them in different contexts.
				I can explain and express concepts, and find examples (or non-examples).	I can explain and express concepts, and find examples (or non-examples).	I can explain and express concepts, and find examples (or non-examples).
		I can understand and use basic mathematical concepts in a variety of ways.	I can represent a concept in different ways, flowing between different representations including verbal, concrete, visual, digital and abstract.	I can represent a concept in different ways, flowing between different representations including verbal, concrete, visual, digital and abstract.	I can represent a concept in different ways, flowing between different representations including verbal, concrete, visual, digital and abstract.	I can represent a concept in different ways, flowing between different representations including verbal, concrete, visual, digital and abstract.
		I can explore answers within the context of the problem and I am beginning to consider whether answers are sensible.	I can interpret answers within the context of the problem and consider whether answers are sensible.	I can interpret answers within the context of the problem and consider whether answers, including calculator, analogue and digital displays, are sensible.	I can interpret answers within the context of the problem and consider whether answers, including calculator, analogue and digital displays, are sensible.	I can interpret answers within the context of the problem and consider whether answers, including calculator, analogue and digital displays, are sensible.
	Logical reasoning	I can use everyday and mathematical language to talk about my own ideas and choices.	I can use everyday and mathematical language to talk about and explain my own ideas and choices.	I can construct and develop a mathematical argument.	I can construct and develop a mathematical argument.	I can construct and develop a mathematical argument.
				I can justify my procedures and predictions.	I can justify my procedures, predictions and conjectures.	I can justify my procedures, predictions and conjectures.
			I can verify results and solutions.	I can verify results and solutions.	I can verify and prove results and solutions.	I can verify and prove results and solutions.
				I can explain results and procedures precisely using appropriate mathematical language.	I can explain results and procedures precisely using appropriate mathematical language.	I can explain results and procedures precisely using appropriate mathematical language.
	Fluency	I am beginning to apply relevant facts and techniques.	I can identify relevant facts and techniques in order to apply an efficient method.	I can use firmly established, memorable and usable facts and techniques in order to apply the most efficient methods.	I can use firmly established, memorable and usable facts and techniques in order to apply the most efficient methods.	I can use firmly established, memorable and usable facts and techniques in order to apply the most efficient methods.
			I can use checking strategies to decide if answers are reasonable.	I can select and apply appropriate checking strategies.	I can select and apply appropriate checking strategies.	I can select and apply appropriate checking strategies.
				I can use a calculator effectively and efficiently to carry out calculations.	I can use a scientific calculator effectively and efficiently to carry out calculations using the available range of function keys.	I can use a scientific calculator effectively and efficiently to carry out calculations using the available range of function keys.

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Developing mathematical proficiency	**Strategic competence**	I can select the appropriate equipment and resources to help me.	I can identify the required information, and select appropriate equipment and resources.	I can recognise, model and apply the underlying mathematical structures and ideas within problems, in order to formulate and solve them.	I can recognise, model and apply the underlying mathematical structures and ideas within problems, in order to formulate and solve them.	I can recognise, model and apply the underlying mathematical structures and ideas within problems, in order to formulate and solve them.
		I can suggest what I might need to do to complete the task or reach a solution.	I can identify steps to complete the task or reach a solution.	I can identify, measure or obtain required information to complete the task.	I can identify, measure or obtain required information to complete the task.	I can identify, measure or obtain required information to complete the task.
				I can identify what further information might be required and select what information is most appropriate.	I can identify what further information might be required and select what information is most appropriate.	I can identify what further information might be required and select what information is most appropriate.
		I can explore appropriate mathematics and techniques to use.	I can select appropriate mathematics and techniques to use.	I can select, trial and evaluate a variety of possible approaches and break problems into a series of tasks.	I can select, trial and evaluate a variety of possible approaches and break complex problems into a series of tasks.	I can select, trial and evaluate a variety of possible approaches and break complex problems into a series of tasks.
				I can prioritise and organise the relevant steps needed to complete the task or reach a solution.	I can prioritise and organise the relevant steps needed to complete the task or reach a solution.	I can prioritise and organise the relevant steps needed to complete the task or reach a solution.
			I can choose an appropriate mental or written strategy and know when it is appropriate to use a calculator.	I can choose an appropriate mental or written strategy and know when it is appropriate to use a calculator.	I can choose an appropriate mental or written strategy and know when it is appropriate to use a calculator.	I can choose an appropriate mental or written strategy and know when it is appropriate to use a calculator.
	Communicating with symbols			I can communicate my answers using correct mathematical form.	I can communicate my answers using correct mathematical form.	I can communicate my answers using correct mathematical form.
			I can use appropriate notation, symbols and units of measurement.	I can use appropriate notation, symbols and units of measurement.	I can use appropriate notation, symbols and units of measurement, including compound measures.	I can use appropriate notation, symbols and units of measurement, including compound measures.
		I can explore informal, personal methods of recording, moving towards using symbols.	I can devise and refine informal, personal methods of recording, moving to using words and symbols in number sentences.	I can refine methods of recording calculations.	I can refine methods of recording calculations.	I can refine methods of recording calculations.

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Understanding the number system helps us to represent and compare relationships between numbers and quantities	**The number system**	I can count reliably, forwards and backwards, to beyond 10.	I can read, write and interpret numbers using figures and words up to at least 1000.	I can read and write numbers to 1 million and numbers to 3 decimal places.	I can read and write numbers of any size.	I can recognise and define limitations on accuracy of measurements, *e.g. upper and lower bounds.*
		I can notice, read and write numbers from 0 to beyond 10, and relate a number to its respective quantity.		I can use the terms square and square root.	I can use the terms cube, cube root and reciprocal.	
		I can compare and order numbers beyond 10.	I can compare, round and estimate with numbers up to 100.	I can estimate by rounding to the nearest 10, 100, 1000 or whole number.	I can show awareness of the need for standard form and its representation on a calculator.	
		I can demonstrate an understanding of one-to-one correspondence by matching pairs of objects or pictures.	I can count in different steps of uniform size, and recognise odd and even numbers.		I can use and interpret numbers in standard form within calculations.	
		I can use my visual sense of number to make estimates and comparisons.	I can check subtraction using addition.		I can use rounding to estimate and check answers.	
		I can explore estimates by using counting or measuring.	I can check halving using doubling.		I can present answers to a given number of decimal places or significant figures.	
					I can make and justify estimates and approximations of calculations.	
					I can choose the appropriate degree of accuracy to present answers.	
	Relationships within the number system		I can use halves and quarters.	I can use understanding of simple fraction, decimal and percentage equivalences, *e.g. find 25% of 60cm and know that this is equivalent to ¼ of 60cm.*	I can use equivalence of fractions, decimals and percentages to select the most appropriate one for a calculation.	
			I can halve 2-digit numbers in the context of number, money and measures.	I can simplify a calculation by using fractions in their simplest terms.	I can recognise that some fractions are recurring decimals, *e.g. ⅓ is 0.333.*	
			I can find fractional quantities linked to known multiplication facts, e.g. *⅓ of 18, ⅕ of 15.*	I can use and interpret different representations of fractions, *e.g. mixed numbers and improper fractions.*	I can use powers and understand the importance of powers of 10.	
				I can use equivalence of fractions, decimals and percentages to compare proportions.		

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Understanding the number system helps us to represent and compare relationships between numbers and quantities	**Calculation**	I can understand and use the concept of 'one more' in my play.	I can find differences within at least 100.	I can use mental strategies to recall multiplication tables up to 10 x 10 and use to solve division problems.	I can use the four operations and the connections between them, *e.g. apply division as the inverse of multiplication.*	I can use multipliers as an efficient method when working with percentages, *e.g. multiply by 1.2 to increase an amount by 20%.*
		I can understand and use the concept of 'one less' in my play.	I can use mental strategies to add and subtract at least 2-digit numbers.	I can multiply numbers and decimals by a multiple of 10, *e.g. 15 x 30, 1.4cm x 20.*	I can use efficient written methods to add and subtract numbers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places.	I can use and understand the idea of reverse percentage to find an original quantity.
		I can combine two groups of objects to find 'how many altogether?'.	I can use partitioning to double and halve 2-digit numbers.	I can halve 3-digit numbers in the context of number, money and measures.	I can use appropriate strategies for multiplication and division, including application of known facts to derive others, *e.g. use 7 x 6 to derive 0.7 x 6.*	
		I can take away objects to find 'how many are left?'.	I can use mental strategies to recall number facts within 20.	I can calculate a percentage, fraction and decimal of any quantity with a calculator where appropriate.	I can use efficient methods for multiplication and division of whole numbers and decimals, including decimals such as 0.6 or 0.06.	
		I can find and use number facts to compose a number (up to 10) in different ways.	I can recall 2, 3, 4, 5 and 10 multiplication tables and use to solve multiplication and division problems.	I can use ratio and proportion to calculate quantities.	I can use the order of operations including brackets and powers.	
			I can multiply numbers by 10.	I can calculate percentage quantities based on 10%, *e.g. 20%, 5%, 15%.*	I can calculate a percentage increase or decrease.	
			I can check multiplication using repeated addition.	I can add and subtract numbers using whole numbers and decimals.	I can express one quantity as a percentage of another.	
				I can multiply 2- and 3-digit numbers by a 2-digit number.	I can calculate percentages of quantities using non-calculator methods where appropriate.	
				I can divide 3-digit numbers by a 2-digit number.	I can use ratio and proportion including map scales.	
				I can use a range of strategies to check calculations including the use of inverse operations, equivalent calculations and the rules of divisibility.		

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Understanding the number system helps us to represent and compare relationships between numbers and quantities	**Financial literacy**	I can exchange money for items and use the language of money.	I can use different combinations of money to pay for items up to at least £2 and calculate the change.	I can add and subtract totals less than £100 using correct notation, *e.g. £28.18 + £33.45.*	I can calculate using foreign money and exchange rates.	I can understand and demonstrate the real-life process of foreign exchange.
		I can demonstrate an awareness of the purpose of money through role play and in real-life situations.	I can order and compare items up to £10.	I can manage money, compare costs from different retailers and determine what can be bought within a given budget.	I can make informed decisions relating to discounts and special offers.	
				I can make comparisons between prices and understand which is best value for money.		
				I can use profit and loss in buying and selling calculations.	I can carry out calculations relating to VAT, saving and borrowing.	I can understand and calculate income tax and understand the implications of taxation.
				I can realise that budgeting is important.	I can appreciate the basic principles of budgeting, saving (including understanding compound interest) and borrowing.	
				I can understand the advantages and disadvantages of using bank accounts.	I can understand the advantages and disadvantages of using bank accounts, including bank cards.	
				I can plan and track money and savings by keeping accurate records.	I can understand the risks involved in different ways of saving and investing.	
					I can use and understand efficient methods of calculating compound interest.	
					I can describe why insurance is important and understand the impact of not being insured.	

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Learning about geometry helps us understand shape, space and position, and learning about measurement helps us quantify in the real world	**Measurement**	I can use non-standard units of measure to discuss my sense of size.	I can use non-standard units to measure.	I can read and interpret scales or divisions on a range of measuring instruments.	I can represent and use compound measures, using standard units.	I can understand and use a variety of compound measures.
		I can use direct comparisons with: • length, height and distance, *e.g. longer/shorter than* • weight/mass, *e.g. heavier/lighter than* • capacity, *e.g. holds more/less than.*	I can progress to use standard units of measure: • length: I can measure on a ruler to the nearest 0.5cm • weight/mass: I can use 5g, 10g and 100g weights to measure and compare the mass of objects • capacity: I can read scale to to the nearest 100ml.	I can record measurements in different ways, *e.g. 1.3kg = 1kg 300g, 4.2cm = 4cm 2mm.*	I can read and interpret scales on a range of measuring instruments.	
				I can convert metric units of length to smaller units, *e.g. cm to mm, m to cm, km to m.*	I can demonstrate an understanding of the relationship between a formula representing a measurement and the units used.	
				I can use the language of imperial units in daily use, *e.g. miles, pints.*	I can use the common units of measure, convert between related units of the metric system and carry out calculations.	
					I can use rough metric equivalents of imperial units in daily use.	
		I can anticipate events related to elements of daily routines and use the terms 'before' and 'after'.	I can use the concept of time in terms of my daily and weekly activities and the seasons of the year.	I can read and use analogue and digital clocks.	I can interpret fractions of a second appropriately.	
		I can use the basic concept of time in terms of my daily activities.	I can use standard units of time to read 'o'clock', 'half past', 'quarter past' and 'quarter to' using both analogue and 12-hour digital clocks.	I can use and interpret calendars, timetables and schedules to plan events and activities, and make calculations as part of the planning journey.		
		I can demonstrate a developing sense of how long tasks and everyday events take.		I can carry out practical activities involving timed events and explain which unit of time is the most appropriate.		
				I can time events in minutes and seconds, and order the results.		
				I can estimate how long a journey takes.	I can use timetables and time zones to calculate travel time.	
				I can measure and record temperatures involving positive and negative readings.	I can convert temperatures between appropriate temperature scales.	

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Learning about geometry helps us understand shape, space and position, and learning about measurement helps us quantify in the real world	**Shape and space**	I can discuss the properties of shapes that I use in my everyday learning.	I can discuss the properties of two-dimensional and three-dimensional shapes that I use in my everyday learning.	I can recognise that perimeter is the distance around a shape.	I can find circumferences of circles using my understanding of π.	I can apply proportional change to two-dimensional designs.
				I can measure and calculate perimeter.	I can calculate the areas of two-dimensional simple and compound shapes, including circles.	
				I can find areas by counting squares, progressing to calculating the area of squares and rectangles using formulae.	I can apply the formulae for the volume of simple prisms.	
				I can use mathematical language to accurately describe two-dimensional and three-dimensional shapes.		
				I can find volumes by counting and other practical methods.		
	Position	I can explore movements and directions.	I can use the language of position.	I can use grid references to specify location.		
		I can describe position.	I can use the four compass points to describe directions.	I can use coordinates to find position.		
	Angle		I can recognise half and quarter turns, clockwise and anti-clockwise.	I can use angle as a measure of rotation.	I can measure and draw angles.	I can measure and draw angles.
					I can apply understanding of bearings and scale to interpret maps and plans, and to create plans and drawings to scale.	

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Learning that statistics represent data and that probability models chance helps us make informed inferences and decisions	**Collecting data**	I have collected data found in my environment.	I can collect information by voting or sorting.	I can collect relevant data to answer posed questions.	I can collect own data for a survey, *e.g. through designing a questionnaire*.	I can collect data in a suitable way according to my hypothesis.
					I can plan how to collect data to test a simple hypotheses.	
					I can collect both quantitative and qualitative data.	
	Representing data	I can sort and match sets of objects or pictures by recognising similarities and can communicate my choices.	I can sort and classify objects using more than one criterion.	I can select and construct appropriate charts, diagrams and graphs with suitable scales.	I can select and construct appropriate charts, diagrams and graphs with suitable scales.	I can select and construct appropriate charts, diagrams and graphs with suitable scales.
		I can present work orally, pictorially and in written form, and use a variety of ways to represent collected data.	I can present work orally, in objects, pictorially and in written form, and use a variety of ways to represent collected data with suitable scales including: • lists, tally charts, tables and diagrams • bar charts and bar line graphs labelled in 2s, 5s and 10s • pictograms where one symbol represents more than one unit using a key • Venn and Carroll diagrams.	I can represent data using: • lists, tally charts, tables, diagrams and frequency tables • bar charts, grouped data charts, line graphs and conversion graphs • pictograms where one symbol represents more than one unit using a key • Venn and Carroll diagrams.	I can construct frequency tables for sets of data in equal class intervals, selecting groups as appropriate.	
		I can use mark-making to begin to record collections.			I can construct and interpret graphs and diagrams (including pie charts) to represent discrete or continuous data, choosing an appropriate scale.	
					I can construct graphs to represent data including scatter diagrams to investigate correlation.	

Numeracy Framework

Strand	Element	Progression step 1	Progression step 2	Progression step 3	Progression step 4	Progression step 5
Learning that statistics represent data and that probability models chance helps us make informed inferences and decisions	**Interpreting data**	I can interpret information presented in charts and diagrams, and draw appropriate conclusions.	I can extract and interpret information presented in charts, timetables, diagrams and graphs.	I can extract and interpret information from an increasing range of diagrams, timetables and graphs (including pie charts).	I can interpret graphs that describe real-life situations, including those used in the media, recognising that some graphs may be misleading.	I can interpret graphs that describe real-life situations, including those used in the media, recognising that some graphs may be misleading.
					I can interpret mathematical information; drawing inferences from graphs, diagrams and data, including discussion on limitations of data.	I can interpret mathematical information; drawing inferences from graphs, diagrams and data, including discussion on limitations of data.
			I can draw conclusions from data and recognise that some conclusions may be misleading or uncertain.	I can draw conclusions from data and recognise that some conclusions may be misleading or uncertain.	I can draw conclusions from data and recognise that some conclusions may be misleading or uncertain.	I can draw conclusions from data and recognise that some conclusions may be misleading or uncertain.
				I can use mean to interpret a simple data set.	I can use mean, median, mode and range to compare data (continuous and discrete), and can choose the most appropriate average.	
					I can explore trends and extreme values (outliers) for data sets.	
					I can examine results critically, select and justify choice of statistics, recognising the limitations of any assumptions and their effect on the conclusions drawn.	