

## NUMERACY ACROSS THE CURRICULUM POLICY



Numeracy is a proficiency which is developed not just in mathematics but also in other subjects. It is more than an ability to do basic arithmetic. It involves developing confidence and competence with numbers and measures. It requires understanding of the number system, a repertoire of mathematical techniques and an inclination and ability to solve quantitative or spatial problems in a range of contexts. Numeracy also demands understanding of the ways in which data is gathered by counting and measuring, and is presented in graphs and diagrams, charts and tables.

*(Framework for Teaching Mathematics: Years 7 to 9, 2001)*

The purpose of this numeracy policy is to enable all our staff to have consistent expectations of the pupils' use and understanding of mathematics across the curriculum and to promote the development of numeracy skills. Each department can make a contribution towards improving numeracy skills so that pupils become confident at tackling mathematics in any context. To do this, all subjects will incorporate relevant aspects of the policy and all subjects will use the agreed notation, formats and method when relevant.

As a **school** we aim to:

- promote a positive attitude to mathematics from staff and students alike;
- highlight and develop links between all subjects and mathematics;
- ensure consistent approaches to mathematics are used across the curriculum especially with relation to calculations, percentages, the use of calculators and handling data;
- build students' confidence in transferring skills that they have learnt in mathematics.

In order to achieve these aims we believe that **teachers** need to:

- raise the profile of mathematics in their subject by promoting the application of number at every available opportunity;
- be aware of the range of competence with number that pupils bring to the lesson;
- build pupils' confidence when they encounter difficulties;
- demonstrate the skills expected of pupils as identified below;

and **pupils** need to be encouraged to:

- estimate, and consider the reasonableness of an answer;
- use mental methods where possible for calculations;
- know when it is appropriate to use a calculator;
- use correct mathematical language;
- measure to an appropriate degree of accuracy.

Appendices to support the implementation of this policy:

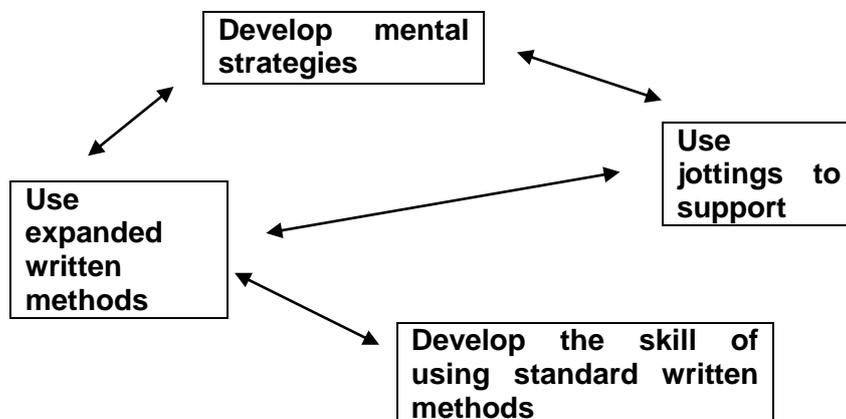
Appendix 1: Calculations skills

- “ 2a: Percentages
- “ 2b: The use of calculators
- “ 3: Guidance on a range of graphs and their purposes
- “ 4: Mathematics identified in other areas
- “ 5: NAC objectives Y7;8;9.
- “ 6: Action plan

## Appendix 1 - Calculation skills

The strategy stresses the importance of mental calculation methods. To calculate mentally lies at the heart of mathematics. Pupils are being encouraged to ask 'Can I do this in my head?' before they select any other calculation method.

### A route through calculations



**The skills of mental calculation** include an ability to:

- remember number facts and recall them without hesitation;
- use facts that are known to figure out new facts;
- draw on a repertoire of mental strategies;
- work out calculations, with some thinking time;
- understand and use the relationships between operations to work out answers and check results;
- approximate calculations to judge whether or not an answer is about the right size;
- solve numerical problems.

**Standard written methods** are reliable and efficient procedures for calculating which, once grasped, can be used in many different contexts. They are of no use to someone who applies them inaccurately and who cannot judge whether the answer is reasonable. For each operation, the standard written method will be taught to most pupils, then refined and practised. Pupils are to be expected to be able explain their chosen method.

#### An example of the grid method of multiplication:

$346 \times 9$  is approximately  $350 \times 10 = 3500$

$$\begin{array}{r} 346 \times 9 \\ \times \quad \quad \quad \begin{array}{|c|c|c|} \hline 300 & 40 & 6 \\ \hline \end{array} \\ \hline 9 \quad \begin{array}{|c|c|c|} \hline 2700 & 360 & 54 \\ \hline \end{array} = 3114 \end{array}$$

$72 \times 38$  is approximately  $70 \times 40 = 2800$

$$\begin{array}{r} 72 \times 38 \\ \times \quad \quad \quad \begin{array}{|c|c|} \hline 70 & 2 \\ \hline \end{array} \\ \hline 30 \quad \begin{array}{|c|c|} \hline 2100 & 60 \\ \hline \end{array} \quad 2160 \\ 8 \quad \begin{array}{|c|c|} \hline 560 & 16 \\ \hline \end{array} \quad + 576 \\ \hline \quad \quad \quad \quad \quad \quad \quad 2736 \end{array}$$

### An example of 'chunking' for division

$196 \div 6$  is approximately  $200 \div 5 = 40$

$$\begin{array}{r} 6 \overline{) 196} \\ - 180 \quad 30 \times 6 \\ \hline 16 \\ - 12 \quad 2 \times 6 \\ \hline 4 \end{array}$$

Answer: 32 R 4

$972 \div 36$  is approximately  $1000 \div 40 = 25$

$$\begin{array}{r} 36 \overline{) 972} \\ - 720 \quad 20 \times 36 \\ \hline 252 \\ - 252 \quad 7 \times 36 \\ \hline 0 \end{array}$$

Answer: 27

### Appendix 2a - Percentages

Some percentage calculations can be done mentally for example:

10% of 45:  $45 \div 10 = 4.5$

20% of 45: Find 10% as above, then double.

15% of 45: Find 10% as above: 4.5

Halve 10% to give 5%:  $4.5 \div 2 = 2.25$

Add the results of 10% and 5% together to give 15%:  $4.5 + 2.25 = 6.75$

Alternatively, 15% could be found by calculating:  $15 \div 100 \times 45 = 6.75$

Some pupils will be comfortable calculating  $15 \div 100$  mentally and entering  $0.15 \times 45$  into a calculator.

### Appendix 2b - The use of calculators

In considering the use of calculators in the classroom teachers should bear in mind the following:

- Pupils should be encouraged to consider as a first resort which mental methods are appropriate (estimation, calculation, approximation);
- Pupils should have sufficient understanding of the calculation, and the numbers involved, to decide the most appropriate method: mental, pencil and paper or calculator;
- Pupils should have the technical skills required to use the basic facilities of a calculator efficiently, (e.g. how to enter numbers as money, measures, fractions, etc.);
- When using calculators pupils need to be aware of the processes required and are able to say whether their answer is reasonable;
- Pupils should be able to interpret the calculator display in context (e.g. 5.3 is £5.30 in money calculations) and rounding answers to an appropriate degree of accuracy;
- Pupils should use the correct order of operations – especially in multi-step calculations, such as  $(93.2 - 1.65) \times (15.6 - 5.77)$ .

## Appendix 3 - Graphs

The importance of this section is to try ensure pupils use the most appropriate graph for the data they are trying to display.

1. Bar Charts –
  - Useful for discrete data.
  - Even scales should be labelled on each axes.
  - Each axes should also be labelled.
  - A Heading explaining what it is showing.
  - Bars should be of equal width and preferably not joined together.
2. Pie Charts –
  - Angle based on 360° or percentage based on 100%.
  - Sectors should be labelled
  - Can be 2D or 3D
3. Line graphs-
  - Heading and axes clearly labelled.
  - Only join points if continuous data or to see a trend

There are, of course, many more and if you are unsure please ask your mathematics link teacher or myself.

### Example 1 – Bar Charts

The table shows the frequency of vowels occurring in the first four lines of a book.

Vowel	a	e	i	o	u
Frequency	20	18	23	9	5

This is qualitative data.

Draw a bar chart for this data.

Choose a sensible scale.

Plot frequency on the vertical axis.

The height of each bar represents the frequency.

**Vowels in the first four lines**

Give your bar chart a title.

Leave gaps between the bars.

Label the axes.

You could plot this bar chart with horizontal bars:

**Vowels in the first four lines**

The length of each bar represents the frequency.

There is still a gap between the bars.

## Example 2 – Pie Chart

In a pet shop survey, people were asked about the pets they owned.

Pet	Dog	Cat	Bird	Fish	Other
Frequency	20	37	15	32	16

- (a) How many pets were recorded in total?  
 (b) Calculate the angle of the pie chart sector for each pet.  
 (c) Draw a pie chart to show this information.

(a)  $20 + 37 + 15 + 32 + 16 = 120$   
 120 pets were recorded

Total frequency = total number of pets.

(b)  $360^\circ$  represents 120 pets

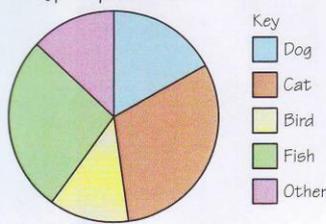
So  $\frac{360^\circ}{120} = 3^\circ$  represents 1 pet

The angle for one item is always  $\frac{360^\circ}{\text{total number of items}}$

Pet	Frequency	Sector angle calculation	Angle
Dog	20	$20 \times 3^\circ$	$60^\circ$
Cat	37	$37 \times 3^\circ$	$111^\circ$
Bird	15	$15 \times 3^\circ$	$45^\circ$
Fish	32	$32 \times 3^\circ$	$96^\circ$
Other	16	$16 \times 3^\circ$	$48^\circ$
Total	120	Total angle	$360^\circ$

Check that the angles add up to  $360^\circ$ .

(c) Type of pets owned



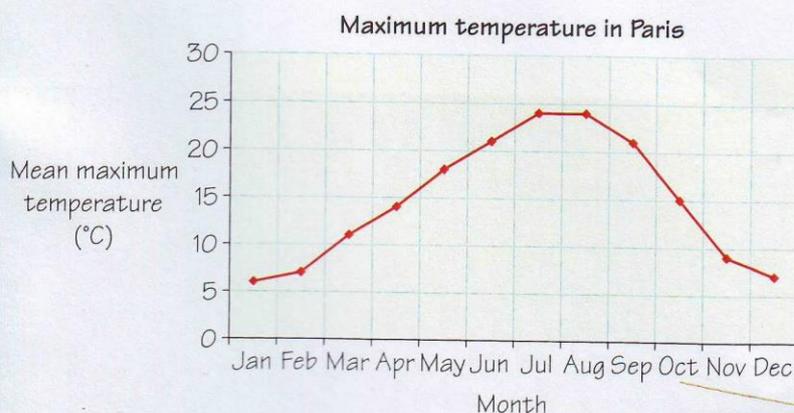
The key tells you what each sector represents.

## Example 3 – Line Graph

The table below shows the maximum temperature (in  $^\circ\text{C}$ ) in Paris in each month.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Max temp ( $^\circ\text{C}$ )	6	7	11	14	18	21	24	24	21	15	9	7

Draw a time series line graph to show this data.



Temperature ( $^\circ\text{C}$ ) and time (months) are continuous data, so we can draw a line graph.

Join the points with straight lines.

This line shows the trend from October to November was a fall in temperature. It does not show actual temperature values.

For a graph showing changes over time, always put the time on the horizontal axis.

## **Appendix 4 - Mathematics identified in other curriculum areas**

### **Art**

symmetry; tessellation, ratio, enlargement, 2D and 3D shapes, patterns.

### **Design and Technology**

measurement; costing - based on material and food; weighing; explore pattern; store and retrieve information; make amend and present information using a spreadsheet; collect information and store in data base; scale drawings; proportion and ratio; relationships in 2-D and 3-D; fractions.

### **English**

presentation of data; order and logical argument, proof.

### **Geography**

*Year 7:* bar graphs; line graphs; pie charts; time (span/size); make deductions; sequence of events; area on maps; grid references; record interpret; co-ordinates; percentages; averages.

*Year 8:* imperial units; distribution of rainfall and temperature; simple hypothesis tests; scatter graphs; latitude and longitude; time zones.

*Year 9:* distribution of population; histograms; mean; median; mode.

*Years 10 and 11:* a range of statistical and data handling skills are used particularly with coursework.

### **Modern Foreign Languages**

Language, different words imperial/metric - culture; order –counting in different countries; calculations in different countries; currency conversions; time.

### **Music**

Counting; using symbolism; transcribing; fractions; time; vocabulary e.g. semi

### **PE**

Planning tournaments; league tables; distance - time measures; historical record and comparisons with future measures.

### **Science**

*Year 7:* charts and graphs; interpreting; select and advise; distance traveled; use instruments for measuring weight, height, diameter; recording results in bar charts and line graphs; sort into groups; interpret pictograms and bar charts; scatter-graphs; understand mass, weight; accuracy of calculation; rounding; averages (mean); pie charts; spreadsheets.

*Year 8:* volume measures; compound measures; formulae; accuracy of measurement; directed numbers; significant figures.

*Year 9:* proportion and ratio; patterns/trends; percentages; formulae -substitution; standard form.

*Year 10:* formulate, hypothesise, identify and control variables; suggest simple questions and design investigations to answer them; identify and manipulate dependent and independent variables.

*Year 11:* vectors.

### **RE**

Sequencing of events, chronology of events, lives etc. Plans, time lines, diagrams and tables

**Member of staff with Lead Responsibility for this policy: Mrs L Lewis (Head of Maths)**

**Approved: Governing Body**

**Policy reviewed: March 2015**

**Policy due to be reviewed March 2017**

**APPENDIX 5 NUMERACY ACROSS THE CURRICULUM OBJECTIVES:**

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including <i>extension objectives</i> )
<p><b>Have a sense of the size of a number and where it fits into the number system</b></p>	<p><b>Place value, ordering and rounding</b></p> <ul style="list-style-type: none"> <li>Recognise and extend number sequences.</li> <li>Estimate by approximating (round to nearest 10, 100 or 1000).</li> </ul>	<p><b>Place value, ordering and rounding</b></p> <ul style="list-style-type: none"> <li>Compare and order decimals; know that when comparing measurements they must be in the same units.</li> <li>Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.</li> </ul>	<p><b>Place value, ordering and rounding</b></p> <ul style="list-style-type: none"> <li>Round decimals to the nearest whole number or to one or two decimal places.</li> </ul> <p><b>Integers, powers and roots</b></p> <ul style="list-style-type: none"> <li>Use squares, positive and negative square roots, cubes and cube roots, and index notation for small positive integer powers.</li> </ul>	<p><b>Place value, ordering and rounding</b></p> <ul style="list-style-type: none"> <li>Multiply and divide by any integer power of 10.</li> <li><i>Understand upper and lower bounds; round numbers to three decimal places and a given number of significant figures.</i></li> <li><i>Begin to write numbers in standard form.</i></li> </ul> <p><b>Integers, powers and roots</b></p> <ul style="list-style-type: none"> <li>Use simple instances of the index laws.</li> </ul>
<p><b>Recall mathematical facts confidently</b></p> <p><b>Calculate accurately and efficiently, both mentally and with pencil and paper, drawing on a range of calculation strategies</b></p>	<p><b>Calculations with whole numbers and decimals</b></p> <ul style="list-style-type: none"> <li>Understand and use the relationships between the four operations, and the principles of the arithmetic laws.</li> <li>Use brackets.</li> <li>Add and subtract two two-digit numbers mentally.</li> <li>Use column addition and subtraction of numbers involving decimals.</li> <li>Know multiplication facts to <math>10 \times 10</math>, and quickly derive associated division facts.</li> <li>Multiply a two-digit number by a single-digit number mentally.</li> </ul>	<p><b>Calculations with whole numbers and decimals</b></p> <ul style="list-style-type: none"> <li>Know and use the order of operations, including brackets.</li> <li>Use standard column procedures to add and subtract whole numbers and decimals with up to two places.</li> <li>Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.</li> </ul>	<p><b>Calculations with whole numbers and decimals</b></p> <ul style="list-style-type: none"> <li>Use the order of operations, including brackets, with more complex calculations.</li> <li>Use standard column procedures for multiplication and division of integers and decimals; understand where to position the decimal point by considering equivalent calculations.</li> </ul>	<p><b>Calculations with whole numbers and decimals</b></p> <ul style="list-style-type: none"> <li>Understand the effects of multiplying and dividing by numbers between 0 and 1.</li> </ul>
<p><b>Calculate using fractions, decimals and percentages and use proportional reasoning to simplify and solve problems</b></p>	<p><b>Fractions, decimals, percentages, ratio and proportion</b></p> <ul style="list-style-type: none"> <li>Reduce a fraction to its simplest form by cancelling common factors.</li> <li>Use a fraction as an 'operator' to find fractions of numbers or quantities.</li> <li>Order a mixed set of numbers or measurements with up to three decimal places.</li> <li>Understand percentage as the number of parts in every 100.</li> <li>Find simple percentages of small whole-number quantities.</li> </ul>	<p><b>Fractions, decimals, percentages, ratio and proportion</b></p> <ul style="list-style-type: none"> <li>Simplify fractions by cancelling all common factors.</li> <li>Recognise the equivalence of percentages, fractions and decimals.</li> <li>Calculate simple percentages and fractions of quantities.</li> <li>Use ratio notation, reduce a ratio to its simplest form, and divide a quantity into two parts in a given ratio.</li> <li>Solve simple problems about ratio and proportion using informal strategies.</li> </ul>	<p><b>Fractions, decimals, percentages, ratio and proportion</b></p> <ul style="list-style-type: none"> <li>Add and subtract fractions by writing them with a common denominator; calculate fractions of quantities.</li> <li>Calculate percentages and find the outcome of a given percentage increase or decrease.</li> <li>Reduce a ratio expressed in different units to its simplest form; divide a quantity into two or more parts in a given ratio.</li> <li>Use the unitary method to solve simple word problems involving ratio and direct proportion.</li> </ul>	<p><b>Fractions, decimals, percentages, ratio and proportion</b></p> <ul style="list-style-type: none"> <li>Add, subtract, multiply and divide fractions; cancel common factors before multiplying or dividing.</li> <li>Compare two ratios; interpret and use ratio in a range of contexts.</li> <li>Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole.</li> </ul>
<p><b>Use calculators appropriately and efficiently, and select from the display the number of figures appropriate to the context of a calculation</b></p>	<p><b>Calculator methods</b></p> <ul style="list-style-type: none"> <li>Develop calculator skills and use a calculator effectively.</li> </ul>	<p><b>Calculator methods</b></p> <ul style="list-style-type: none"> <li>Carry out calculations with more than one step using brackets and the memory; use the square root and sign change keys.</li> <li>Enter numbers and interpret the display in different contexts (decimals, percentages, money, metric measures).</li> </ul>	<p><b>Calculator methods</b></p> <ul style="list-style-type: none"> <li>Carry out more difficult calculations effectively and efficiently using the function keys for sign change, powers, roots and fractions; use brackets and the memory.</li> <li>Enter numbers and interpret the display (negative numbers, fractions, decimals, percentages, money, metric measures, time).</li> </ul>	<p><b>Calculator methods</b></p> <ul style="list-style-type: none"> <li>Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation.</li> <li>Use the constant, <math>\pi</math> and sign change keys, function keys for powers, roots and fractions, brackets and the memory.</li> </ul>

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including <i>extension objectives</i> )
<b>Use simple formulae and substitute numbers in them</b>	<b>Reasoning and generalising</b> <ul style="list-style-type: none"> <li>Develop from explaining a generalised relationship in words to expressing it in a formula, using letters as symbols.</li> </ul>	<b>Equations, formulae and identities</b> <ul style="list-style-type: none"> <li>Use simple formulae; substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.</li> </ul>	<b>Equations, formulae and identities</b> <ul style="list-style-type: none"> <li>Use formulae; substitute integers into simple formulae, including examples that lead to an equation to solve.</li> </ul>	<b>Equations, formulae and identities</b> <ul style="list-style-type: none"> <li>Use more complex formulae; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject.</li> </ul>
<b>Measure and estimate measurements, choosing suitable units and reading numbers correctly from a range of meters, dials and scales</b>	<b>Measures</b> <ul style="list-style-type: none"> <li>Use, read and write standard metric units.</li> <li>Convert smaller to larger units, and vice versa.</li> <li>Know rough equivalents between common metric and imperial units.</li> <li>Record estimates and readings from scales to a suitable degree of accuracy.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Measure, estimate, calculate and solve problems involving length, area, mass, capacity and angle.</li> <li>Read and interpret scales on a range of measuring instruments.</li> <li>Convert one metric unit to another (e.g. g to kg).</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Measure, estimate, calculate and solve problems involving length, area, volume, capacity, mass, angle and bearings.</li> <li>Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons).</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Measure, estimate, calculate and solve problems in a variety of contexts.</li> <li>Convert between area measures (<math>\text{mm}^2</math> to <math>\text{cm}^2</math>, <math>\text{cm}^2</math> to <math>\text{m}^2</math>, and vice versa).</li> <li><i>Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction.</i></li> </ul>
<b>Calculate simple perimeters, areas and volumes, recognising the degree of accuracy that can be achieved</b>	<b>Measures</b> <ul style="list-style-type: none"> <li>Calculate the perimeter and area of simple compound shapes that can be split into rectangles.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles.</li> <li>Calculate the surface area of cubes and cuboids.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Use formulae for the area of a triangle, parallelogram and trapezium.</li> <li>Use the formula for the volume of a cuboid.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Use the formulae for the circumference and area of a circle.</li> <li>Calculate the surface area and volume of right prisms.</li> </ul>
<b>Understand and use measures of time and speed, and rates such as £ per hour or miles per litre</b>	<b>Measures</b> <ul style="list-style-type: none"> <li>Appreciate different times around the world.</li> <li>Solve problems using time.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Measure, estimate, calculate and solve problems involving time.</li> </ul> <b>Sequences, functions and graphs</b> <ul style="list-style-type: none"> <li>Begin to plot and interpret the graphs of simple linear functions arising from real-life situations.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li>Measure, estimate, calculate and solve problems involving time.</li> </ul> <b>Sequences, functions and graphs</b> <ul style="list-style-type: none"> <li>Plot the graphs of linear functions arising from real-life problems; discuss and interpret graphs arising from real situations.</li> </ul>	<b>Measures and mensuration</b> <ul style="list-style-type: none"> <li><i>Understand and use measures of speed, and other compound measures such as density and pressure.</i></li> <li><i>Solve problems involving constant or average rates of change.</i></li> </ul> <b>Sequences, functions and graphs</b> <ul style="list-style-type: none"> <li>Plot graphs of functions arising from real-life problems; interpret graphs arising from real situations, including distance–time graphs.</li> </ul>
<b>Draw plane figures to given specifications and appreciate the concept of scale in geometrical drawings and maps</b>	<b>Construction</b> <ul style="list-style-type: none"> <li>Measure and draw lines to nearest mm.</li> <li>Measure and draw acute and obtuse angles to the nearest degree.</li> </ul> <b>Coordinates</b> <ul style="list-style-type: none"> <li>Read and plot coordinates in all four quadrants.</li> </ul> <b>Transformations</b> <ul style="list-style-type: none"> <li>Recognise where a shape will be after: reflection; two translations; a rotation of <math>90^\circ</math> about one of its vertices.</li> </ul>	<b>Construction</b> <ul style="list-style-type: none"> <li>Use a ruler and protractor to measure and draw lines to the nearest millimetre and angles to the nearest degree.</li> </ul> <b>Coordinates</b> <ul style="list-style-type: none"> <li>Use coordinates in all four quadrants.</li> </ul> <b>Transformations</b> <ul style="list-style-type: none"> <li>Recognise reflection symmetry and rotation symmetry in 2-D shapes.</li> <li>Recognise translations of 2-D shapes.</li> </ul>	<b>Construction</b> <ul style="list-style-type: none"> <li>Use straight edge and compasses to construct: the mid-point and perpendicular bisector of a line segment; the bisector of an angle; the perpendicular from a point to a line; the perpendicular from a point on a line.</li> </ul> <b>Lines, angles and shapes</b> <ul style="list-style-type: none"> <li>Begin to use plans and elevations.</li> </ul> <b>Transformations</b> <ul style="list-style-type: none"> <li>Enlarge 2-D shapes, given a centre of enlargement and a positive whole-number scale factor.</li> <li>Make simple scale drawings.</li> </ul>	<b>Construction</b> <ul style="list-style-type: none"> <li>Use straight edge and compasses to construct triangles.</li> </ul> <b>Lines, angles and shapes</b> <ul style="list-style-type: none"> <li>Analyse 3-D shapes through 2-D projections, including plans and elevations.</li> </ul> <b>Transformations</b> <ul style="list-style-type: none"> <li>Identify the scale factor of an enlargement.</li> <li>Use and interpret maps and scale drawings.</li> </ul>

Numeracy across the curriculum	Start of Year 7	Year 7	Year 8	Year 9 (including <i>extension objectives</i> )
<p><b>Understand the difference between the mean, median and mode and the purpose for which each is used</b></p>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• Begin to find the median and mean of a set of data.</li> <li>• Find the mode and range of a set of data.</li> </ul>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• For small sets of discrete data: find the mode, median and range, and the modal class for grouped data; calculate the mean, using a calculator for a larger number of items.</li> <li>• Compare two simple distributions using the range and one of the mode, median or mean.</li> </ul>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• Calculate statistics, including with a calculator; recognise when it is appropriate to use the range, mean, median and mode and, for grouped data, the modal class; calculate a mean using an assumed mean; construct and use stem-and-leaf diagrams.</li> <li>• Compare two distributions using the range and one or more of the mode, median and mean.</li> </ul>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• <i>Find the median and quartiles for large datasets.</i></li> <li>• Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics.</li> </ul>
<p><b>Collect data, discrete and continuous, and draw, interpret and predict from graphs, diagrams, charts and tables</b></p>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• Solve a problem by representing, extracting and interpreting data in tables, graphs, charts and diagrams.</li> </ul>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• Collect small sets of data from surveys and experiments.</li> <li>• Construct, on paper and using ICT: bar-line graphs; frequency diagrams for grouped discrete data; pie charts.</li> <li>• Interpret diagrams and graphs, and draw simple conclusions.</li> </ul>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• Collect data by observation, controlled experiment (including data logging), or questionnaire.</li> <li>• Construct, on paper and using ICT: pie charts for categorical data; bar charts and frequency diagrams for discrete and continuous data; simple line graphs for time series; simple scatter graphs.</li> <li>• Interpret tables, graphs and diagrams for both discrete and continuous data.</li> </ul>	<p><b>Handling data</b></p> <ul style="list-style-type: none"> <li>• Gather data from specified secondary sources, including printed tables and lists from ICT-based sources; determine sample size; design data collection sheets.</li> <li>• Construct, on paper and using ICT: scatter graphs; line graphs for time series; <i>lines of best fit</i>.</li> <li>• Have a basic understanding of correlation.</li> </ul>
<p><b>Have some understanding of the measurement of probability and risk</b></p>	<p><b>Probability</b></p> <ul style="list-style-type: none"> <li>• Use the language associated with probability to discuss events, including those with equally likely outcomes.</li> </ul>	<p><b>Probability</b></p> <ul style="list-style-type: none"> <li>• Use the vocabulary and ideas of probability, drawing on experience.</li> <li>• Use the probability scale from 0 to 1.</li> </ul>	<p><b>Probability</b></p> <ul style="list-style-type: none"> <li>• Use the vocabulary of probability when interpreting the results of an experiment; appreciate that random processes are unpredictable.</li> <li>• Know that if the probability of an event occurring is <math>p</math>, then the probability of it not occurring is <math>1 - p</math>.</li> <li>• Estimate probabilities from experimental data.</li> </ul>	<p><b>Probability</b></p> <ul style="list-style-type: none"> <li>• Use the vocabulary of probability in interpreting results involving uncertainty and prediction.</li> <li>• <i>Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments.</i></li> </ul>
<p><b>Use and apply mathematics to solve problems</b> <b>Explain methods and justify reasoning and conclusions, using correct mathematical terms</b> <b>Judge the reasonableness of solutions and check them when necessary</b> <b>Give results to an appropriate degree of accuracy</b></p>	<p><b>Applying mathematics</b></p> <ul style="list-style-type: none"> <li>• Identify and use appropriate operations (including combinations of operations) to solve word problems involving numbers and quantities.</li> <li>• Explain methods and reasoning.</li> </ul> <p><b>Checking results</b></p> <ul style="list-style-type: none"> <li>• Check the results of calculations.</li> </ul>	<p><b>Applying mathematics</b></p> <ul style="list-style-type: none"> <li>• Solve word problems and investigate in a range of contexts.</li> <li>• Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources.</li> <li>• Explain and justify methods and conclusions, orally and in writing.</li> </ul> <p><b>Checking results</b></p> <ul style="list-style-type: none"> <li>• Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.</li> </ul>	<p><b>Applying mathematics</b></p> <ul style="list-style-type: none"> <li>• Use logical argument to establish the truth of a statement.</li> <li>• Represent problems and interpret solutions in algebraic, geometric or graphical form, using correct notation and appropriate diagrams.</li> <li>• Give solutions to an appropriate degree of accuracy in the context of the problem.</li> </ul> <p><b>Checking results</b></p> <ul style="list-style-type: none"> <li>• Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.</li> </ul>	<p><b>Applying mathematics</b></p> <ul style="list-style-type: none"> <li>• Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT.</li> <li>• Give solutions to an appropriate degree of accuracy, <i>recognising limitations on the accuracy of data and measurements.</i></li> </ul> <p><b>Checking results</b></p> <ul style="list-style-type: none"> <li>• Check results using appropriate methods.</li> </ul>