

## NUMERACY POLICY

### AIMS

- To develop and maintain standards in numeracy across the curriculum.
- To ensure consistency in methodology.
- To record agreed methods, vocabulary, notation etc.
- To assist the transfer of pupils' knowledge, skills and understanding between subjects.
- To indicate areas for collaboration between subjects.
- To ensure that students receive positive feedback about numeracy, when used across the curriculum.
- To support staff who are involved in teaching numeracy across the curriculum, in whatever subject area.
- To increase awareness of numeracy in all subjects

### GENERAL

- **The National Numeracy Strategy stresses the importance of mental methods of calculation, encouraging pupils to ask themselves, 'Can I do this in my head?' before they select any other calculation method.**
- Students will gain more and remember more if **understanding** is given prominence. The opportunity to articulate this will promote deeper understanding.
- The use of mathematics across the curriculum offers students an invaluable opportunity to apply their mathematical skills to real life situations.
- Students are expected to have their own **calculator, pair of compasses, ruler and a protractor.**

### CALCULATORS

- Use of calculators allows freedom from repetitive difficult calculations. However, students should be **discouraged from reaching for their calculator too soon**, without thinking first.
- Straightforward calculations should be done **mentally**.
- Errors in entering values often lead to nonsensical answers, so pupils should be encouraged to **estimate and check** their calculations.
- **Sensible rounding** is expected, i.e. appropriate accuracy with regard to the accuracy of the data and the process being used. 3 significant figures as a rule of thumb but staff to advise.
- Students should be encouraged to **write down their working out**, whether using a calculator or not. Writing only the answer should be actively discouraged.
- Pupils may need help in selecting the **correct sequence of operations** in calculations involving more than one step.
- Students may need advice when **interpreting the calculator display**. Consider the following examples:

Standard Form displays such as  $1.234^{-05}$  should be written as  $1.234 \times 10^{-5}$

An answer of 1.25 hours is **not** 1 hour 25 minutes.

An answer in pounds of 3.4 should be written as £3.40

### NUMBER

- In all paper and pen methods, the importance of **place value and neat column** keeping should be stressed.
- The traditional methods of long multiplication and division have been replaced by the following:

### The Grid Method:

$$246 \times 35$$

	<b>200</b>	<b>40</b>	<b>6</b>
<b>30</b>	6000	1200	180
<b>5</b>	1000	200	30

$$\begin{aligned} 246 \times 35 &= 6000 + 1200 + 180 + 1000 \\ &+ 200 + 30 \\ &= 8610 \end{aligned}$$

### Chunking:

$$246 / 35$$

$$\begin{array}{r} 246 \\ \underline{210} \phantom{0} \\ 35 \phantom{0} \\ \underline{35} \phantom{0} \\ 1 \phantom{0} \end{array} \quad \begin{array}{l} 35 \times 6 \\ 35 \times 1 \end{array}$$

Take away as many lots of 35 as you can. It doesn't matter if you underestimate, because you can take the rest away later!  
 $246 / 35 = 7 \text{ r } 1$

- **Mental addition is carried out from left to right** e.g.

$$2.8 + 4.6 = 2 + 4 + 0.8 + 0.6 = 6 + 1.4 = 7.4$$

- **Mental subtraction is carried out by 'counting on'** e.g.

$$246 - 35$$

$$\begin{array}{ccccccc} & +10 & & +1 & & +200 & & = 211 & \text{(or similar)} \end{array}$$

$$35 \longrightarrow 45 \longrightarrow 46 \longrightarrow 246$$

- When referring to decimals say "three point one four" rather than "three point fourteen".
- Use of commas, either as a continental decimal point or as a thousands separator is condoned, but we would recommend avoiding both due to potential ambiguity. The only exception to this is in Modern Languages where the decimal comma is expected.
- The equal sign indicates equality and should be used only once in each line of working. It is **not** just a symbol to link stages of working. E.g. the following is poor practice:  $6 \times (3 + 4) = 7 = 6 \times 7 = 42$  as students are equating unequal things.
- Whenever possible staff should emphasise the **link between fractions, decimals, ratios and percentages**. In mathematics lessons percentages are usually approached via either equivalent decimals or mental methods for more straightforward problems. The following examples illustrate the methodology:

$$\begin{aligned} &12.5\% \text{ of } \pounds 48 \\ &= 0.125 \times 48 \\ &\pounds 6.00 \end{aligned}$$

or mentally,

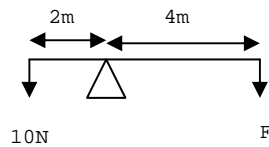
$$\begin{aligned} &12.5\% \text{ of } \pounds 48 \\ &=> 10\% \text{ of } 48 = 4.8 \\ &=> 5\% \text{ of } 48 = 2.4 \\ &=> 2.5\% \text{ of } 48 = 1.2 \\ &=> 12.5\% \text{ of } 48 \quad 4.8 + 1.2 = 6 = \pounds 6.00 \end{aligned}$$

Pupils would normally use 'jottings' to help them to work through this sort of calculation, although many pupils could do this in their heads.

- Be wary of using the % or fraction button. Pupils should be encouraged to use their **understanding of fractions and percentages** to solve problems.

## ALGEBRA

- Running through a formula with easy numbers may aid understanding.
- **Trial and improvement** is an acceptable mathematical method and can be used as a last resort.
- Take care when using terms such as 'cross-multiply' or 'swap sides, swap signs' as these imply a degree of understanding the students may not have. Pupils are taught to solve equations using the **balancing method**, where operations are performed to both sides of an equation. Less able pupils can often solve equations using a **flow diagram**. Similar methods are used for the rearrangement of formulae. Examples are given below:



$2 \times 10 = 4F$	
$20 = 4F$	divide both sides by 4
$5 = F$	
$F = 5 \text{ Newtons}$	

or

$F$	$\xrightarrow{\quad}$	$\times 4$	$\xrightarrow{\quad}$	$20$
$5$	$\xleftarrow{\quad}$	$/ 4$	$\xleftarrow{\quad}$	$20$
$F = 5 \text{ N}$				

## SHAPE, SPACE and MEASURES

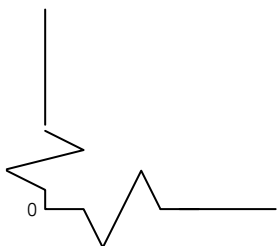
- The word '**similar**' in mathematics is used to describe objects that are exactly the same shape but **not** the same size, i.e. one is a **scaled** version of the other. '**Congruent**' implies same size as well.
- Appropriate units should always be used. E.g. Technology students need to be familiar with millimetres.
- In mathematics, bearings are always measured **clockwise from North** and are given as three figure bearings with the  $^{\circ}$  (degree) symbol.
- Mass and weight - Mass is the amount of matter in a body. It is measured in kg. The weight of an object is the force with which the Earth is pulling it downwards. Thus, strictly, weight should be measured in Newtons (the unit of force). On planet Earth 1 kg of matter exerts a downward force of 10N (its weight). When you stand on the bathroom scales your weight (i.e. force) compresses a spring. The manufacturers create a display that converts the amount of compression into mass i.e. the compression due to 10N reads as 1 kg on the display.
- Time – always write e.g. **15:11** (not a single dot).

## GRAPHS and HANDLING DATA

- All graphs should have a **title and labelled axes, with units marked**.
- Graphs – remember to go **across first, then up or down**. Squashing axes, e.g. in geography, is acceptable but ensure the scale is relevant and meaningful.
- When interpreting graphs make sure that students know what each "small square" represents on each axis.
- Line graphs (those where the points are joined by a line) **should be drawn with pencil and ruler** if straight or if curved drawn as a smooth curve with **a pencil and no ruler!** Points are usually plotted as small crosses (sometimes small dots if

appropriate). N.B. Graph-drawing software often uses its own symbols. Do not confuse a line graph with a scatter diagram, where the points are not joined, but a line of best fit is drawn.

- When reading the gradient of a line, ensure that students have an understanding of the **scale** on each axis.
- In mathematics, **degrees** (not percentages) are used when constructing pie charts and sectors are labelled according to what data they represent and not the size of the sector.
- Encourage students to consider whether or not an information graph axis needs necessarily to start from zero each time and the implications of this. If the scale does not start from 0, pupils should use a zigzag to indicate this:



The scale on each axis may be different, but each should **go up in equal steps**.

Bar charts are used to display discrete data (data that is counted). Histograms are used to display continuous data (data which is measured). Histograms are not drawn with gaps between the rectangles.

- Results should be **tabulated**, with units in the headings and all figures quoted to the same number of significant figures, before presentation as a chart or diagram.
- When using the term "**average**", be specific about which average, **mean, median or mode**, you want the students to find.
- Probabilities should be written as fractions or decimals.

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