The Acorns School

Numeracy across the Curriculum

Numeracy is a proficiency that involves confidence and competence with numbers and measures. It requires an understanding of the number system, a repertoire of computational skills and an inclination and ability to solve number problems in a variety of contexts. Numeracy also demands practical understanding of the ways in which information is gathered by counting and measuring, and is presented in graphs, diagrams, charts and tables.

Mathematical skills can be consolidated and enhanced when pupils have opportunities to apply and develop them across the curriculum. Poor numeracy skills, in particular, hold back pupils' progress and can lower their self-esteem. To improve these skills is a whole-school matter. Each department should identify the contribution it makes towards numeracy and other mathematical skills so that pupils become confident at tackling mathematics in any context.

The school policy is that:

Numeracy is a key skill in students' learning and all students are entitled to quality experiences in this area and that the teaching of numeracy is the responsibility of all staff and the school's approaches should be as consistent as possible across the curriculum.

Curriculum areas will endeavour to ensure that materials presented to students will match their capability both in subject content and in numerical demands. They will liaise with the Mathematics department when appropriate in order to support their teaching of numeracy.

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

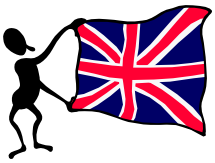
- handle number and measurement competently, mentally, orally and in writing;
- use calculators accurately and appropriately;
- interpret and use numerical and statistical data represented in a variety of forms.

Making links between mathematics and other subjects

You need to look for opportunities for drawing mathematical experience out of a wide range of children's activities. Mathematics contributes to many subjects of the curriculum, often in practical ways. Activities such as recording the growth of a plant or an animal, measuring temperature and rainfall, or investigating the cog wheels in a bicycle can provide data or

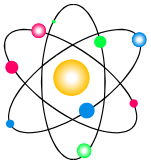
starting points for discussion in your mathematics lessons as well as opportunities to apply and use mathematics in real contexts.

English:



Mathematics lessons can help to develop and support pupils' literacy skills: for example, by teaching mathematical vocabulary and technical terms, by asking children to read and interpret problems to identify the mathematical content, and by encouraging them to explain, argue and present their conclusions to others. Equally, English lessons can support your mathematics lesson. For example, non-fiction texts can be chosen in which mathematical vocabulary, graphs, charts and tables have to be interpreted.

Science:

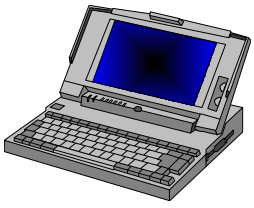


Almost every scientific investigation or experiment is likely to require one or more of the mathematical skills of classifying, counting, measuring, calculating, estimating, and recording in tables and graphs. In science pupils will, for example, order numbers, including decimals, calculate means and percentages, use negative numbers when taking temperatures, substitute into formulae, re-arrange equations, decide which graph is the most appropriate to represent data, and plot, interpret and predict from graphs.

Art, Design and Technology:

Measurements are often needed in art and design and technology. Many patterns and constructions are based on spatial ideas and properties of shapes, including symmetry. Designs may need enlarging or reducing, introducing ideas of multiplication and ratio. When food is prepared a great deal of measurement occurs, including working out times, adapting recipes, and calculating cost; this may not be straightforward if only part of a packet of ingredients has been used.

Information and Communications Technology:



Children will apply and use mathematics in a variety of ways when they solve problems using ICT. For example, they will collect and classify data, enter it into data handling software, produce graphs and tables, and interpret and explain their results. Their work in control includes the measurement of distance and angle, using uniform non- standard then standard measures. When they use computer models and simulations they will draw on their abilities to manipulate numbers and identify patterns and relationships.

Physical Education

Athletic activities require measurement of height, distance, time and speed. Use graphs to plot the improvement over time and compare the strengths and weaknesses of the pupils with the group.

Scale drawing of the athletics field and of different courts.

Cross-curricular guidance:

This document should provide information and guidelines to help produce consistency across the curriculum - it is not intended to be a prescription for teaching although some advice is given.

Approaches

- It is recognised that not all students in a teaching group will have the same numerical skills and where unsure of an appropriate 'numerical level' teachers will consult with the Mathematics Department.
- All teachers will discourage students from writing down answers only and encourage students to show their numerical working out within the main body of their work.
- All teachers will encourage the use of estimation particularly for checking work.
- All teachers will encourage students to write mathematically correct statements.
- It is recognised that there is never only one correct method and students will be encouraged to develop their own correct methods where appropriate rather than be taught 'set' ways.
- Wherever possible students will be allowed and encouraged to 'vocalise' their maths - a necessary step towards full understanding for many students.
- All students should be helped to understand the methods they are using or being taught - students gain more and are likely to remember much more easily if they understand rather than are merely repeating by rote.

Calculators:

In order to improve numeracy skills, it is essential that students should be encouraged to use non-calculator methods whenever possible. However, departments should ensure students have access to calculators when they are necessary.

It is recognised that where calculators are to be used their correct use may

have to be taught.

Methods and Presentation:

Where a student is gaining success with a particular method it is important that s/he is not confused by being given another method. This does not disallow the possibility of introducing alternatives in order to improve understanding or as part of a lesson deliberately designed to investigate alternative methods, provided students can manage this without confusion.

Working out:
In all arithmetic, the importance of place value and neat column keeping should be stressed. In a line of workings an "equals" sign should only appear once.

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 = 2.975
2.98 + 3.50 = £6.48

Language:

When referring to decimals say "three point one four" rather than "three point fourteen". Read numbers out in full, so say three thousand four hundred rather than three, four, zero, zero.
It is important to use the correct mathematical term for the type of average being used, i.e. mean, median or mode.

Mean	Total of values of sample ÷ sample size.
	[The term average is commonly used when referring to the mean]
Median	Middle value of sample when sample values are arranged in order size.
Mode	Sample values which occur most frequently.

Checking:
Encourage students to check divisions by multiplication and subtractions by adding.

Rough Conversions between Metric and Imperial:
In the Maths Department we teach the following conversions:

1 inch ≈ 2.5 cm	1 yard ≈ 1 m	1 kg ≈ 2.2 lbs
2 pints ≈ 1 litre	1 mile ≈ 1.6 km	1 oz ≈ 25 g

Pupils should be expected to record the units they are using when answering a question.

Standard Form:
Students need to be aware of how their calculator's express standard form and what it means.
E.g. on some calculators $5 \div 200 = 2.5^{-2}$
It should be noted that this should be recorded as 2.5 x 10^{-2} and that it is equivalent to 0.025

Multiples of ten:
When multiplying by ten do not teach the 'rule' add a nought or move the decimal point along one but rather explain that the numbers move one place to the left relative to the decimal place. So 3 . 6 4 x 10

Time:
Pupils should never record 3hrs and 30 mins as 3.30hrs but as 3.5hrs.
[When working with time it is possible to use the degrees/mins/secs key on many calculators.]

Equations:

The terms "cross-multiply" and "swap sides – swap signs" can lead to misunderstandings, as part of any explanation of how to solve equations and so should be avoided.

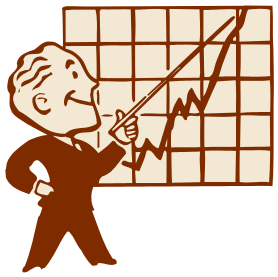
To teach solution of linear equations we use the 'balancing method' or a flow diagram
To solve: $3x - 7 = 5$

Balance Method:
$3x - 7 = 5$ (add 7 to both sides)
$3x - 7 + 7 = 5 + 7$
$3x = 12$ (divide both sides by 3)
$3x \div 3 = 12 \div 3$
$x = 4$

Flow Chart Method:

START: x $\rightarrow$ [x3] $\rightarrow$ [-7] $\rightarrow$ 3x - 7 (you now UNDO)
END: 4 $\leftarrow$ [÷3] $\leftarrow$ [+7] $\leftarrow$ 5
X = 4

Guidelines for Constructing/Using Graphs and Charts



Students should be encouraged to:

- use a sharp pencil.
- label both axes and give a title
- use independent variable on *x*-axis, and dependant variable on the *y*-axis, e.g.: if graphing temperature of a cooling liquid, time should go on the *x*-axis and temperature on the *y*-axis. [The temperature of the liquid is dependant on the time of the reading.]
- label lines not spaces, unless a bar-chart with discrete data
- use equally spaced intervals
- use convenient scales
- mark points by a small cross not a dot
- draw graphs on squared or graph paper
- to draw graphs of a sensible size (they tend to make them too small)

Pupils should be exposed to Bar Charts, Pie Charts, Pictograms, Line graphs and Cumulative frequency curves. Histograms are only tackled by higher level students.

Students need to be taught when each type of graph is appropriate. (This is very important as students will generally produce the type of graph they last met without much thought to appropriateness.)

Bar-charts — the bars should be of equal width and equally spaced
the bars do not have to touch for discrete data
frequency should be on the y (vertical) axis.

Discrete data

Data is described as discrete if specific values only can be used, e.g. shoe size is discrete as sizes such as 4.8 and 5.77 cannot exist.

Continuous data

Data is described as continuous if all values can exist, eg. height and weight are continuous data as potentially any value could be measured.

Pie Charts

Sectors should be labelled (e.g. Car, Blue….) or there should be a key.
Do not be surprised if the total of all the angles is 360° plus or minus one or two degrees. This will almost certainly be due to the rounding that may be necessary. In these cases, either add or take the one or two degrees from the largest angle.

Histograms

Do not use the term Histogram unless the bar widths are unequal and relative frequency is plotted along the y axis. This is only taught to those in the top set in Years 10 and 11. Students need to appreciate the connection between the area and the frequency.

Scaling

If axes do not start from zero, a break represented by a zig-zag line should be shown on the axis.

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November 2024 JH