



Numeracy across the curriculum

Numeracy is a proficiency that involves confidence and competence with numbers, measures and data. 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 matter for the Academy as a whole. Each department should identify the contribution it can make towards numeracy and other mathematical skills in their curriculum area so that pupils become confident at using and applying mathematics in a range of contexts.

The West Lakes Academy policy is that:

Numeracy is a key skill within students' learning and all students are entitled to quality experiences in this area.

The development of numeracy is the responsibility of all staff and the approaches in the Academy 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 Numeracy Coordinator when appropriate in order to support their teaching of the numeracy aspect.

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

- Estimation and rounding
- Number and number processes
- Fractions, decimals and percentages
- Substitution and formulae
- Money
- Time
- Measurement
- Data and analysis
- Ideas of chance and uncertainty

Curriculum areas should aim:

- To ensure that they include **key words** and specific referencing that will **support numeracy and learning** in their area.
- **Use the support tools** that will be available throughout the school in different formats.
- **Numeracy planning drop-in sessions** have and will be available within INSET sessions throughout the year. Furthermore, the **VLE platform** will be used to promote and share helpful resources and tools.

Form tutors will take the opportunity to **promote and extend numeracy skills** by utilising the Numeracy resources that will be made available on a weekly basis throughout the academic year.

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 when appropriate. However departments should ensure students have access to calculators when they are necessary.

The Maths Department (and the vast majority of students) use Casio fx 85GT scientific calculators. Maths teachers also have calculator emulators which project an electronic copy of the calculator for use on the interactive boards.

It is recognised that where calculators are to be used their correct use may have to be taught. Teachers should also encourage students to estimate answers before using the calculators.

Methods and Presentation:

Where a student is gaining success with a particular method it is important that s/he is not confused or forced to use 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: $£3.50 \times 0.85 = 2.975 + 3.50 = 6.475 = £6.48$

This is good practice: $£3.50 \times 0.85 = 2.975$
 $2.98 + 3.50 = £6.48$

Within Maths lessons students are encouraged to work down a page not across.

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, ie. 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 the 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 (using inverse operations).

Rough Conversions between Metric and Imperial:

In the Maths Department we use the following conversions:

1 inch \approx 2.5 cm	1 yard \approx 1 m	1 kg \approx 2.2 lbs
2 pints \approx 1 litre	1 mile \approx 1.6 km	1 oz \approx 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 calculators 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 2.5×10^{-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 3.64×10

$$= 36.4$$

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'

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

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, eg: 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 (pupils tend to make them too small)

An alternative reminder for developing accurate graph work is:

Sscales

Axes

Labels

Title

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 should not 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, eg. 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 (eg. 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. 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.