Numeracy Policy

Last Review: February 2024
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Committee : Teaching & Learning

This document provides information and guidelines for a uniform approach to numeracy across the whole curriculum, both for Maths teachers and for all other teachers. It is not intended to be a prescription for teaching although some advice is given.

Numeracy is much more than just knowing about numbers and number operations. It requires mastering and recalling the practical understanding and encourages the inclination to problem-solve using mathematical reasoning. Numeracy develops and enhances an analytical approach in dealing with measurement and handling data.

At JCoSS, raising numeracy attainment for all pupils is the responsibility of all staff, not just the responsibility of the Maths department. Although the Maths department's work will explicitly teach numeracy skills which are embedded in all aspects of its work, all staff are required to support the development of numeracy skills across the curriculum in their own subject areas and day to day teaching. If all staff take a common approach to numeracy, students will receive a consistent and strong message about the high value we place on numeracy.

Aspects of numeracy / Using and Applying Mathematics

In 'Using and Applying mathematics' to solve problems, students use a variety of thinking skills which should be transferable to other subject areas.
These include:

- breaking the problem down into more manageable parts,
- logical deduction,
- hypothesising,
- predicting and testing,
- proving.

The four principal numeracy skills are: Number, Algebra, Shape, Space and Measure and Handling data.

Responsibilities

SLT

- SLT will be responsible for the implementation of the policy and its updates.
- SLT should model and maintain the highest standards of Numeracy in written communications, displays and on the VLE.
- SLT should keep numeracy high in the school's agenda through a variety of means including the school's planning and evaluation cycle.
- SLT provides support for under-achievement in numeracy by timetabling:
  - Classes set by ability with targeted support from LSAs.
  - Withdrawal (numeracy support) groups in Key Stage 3
  - Additional support at KS4 as required.

HODs/HOFs

- HODs/HOFs are responsible for promoting Numeracy in their own subject areas by such strategies as providing opportunities for using data, graph work, timelines, percentages etc.

- HODs/HOFs should sample work regularly to review the impact of NAC and to plan necessary interventions.

Subject teachers

- All teaching staff have access to information regarding students' numeracy from CAT tests which students sit on entry to the school.
- All teaching staff should follow the guidance and adapt teaching and learning strategies for individual pupils.
- Teachers should help students to understand that if they are struggling with Maths now, they can improve with time and effort. Most successful people will fail at times along the way and mistakes will help them learn. Students will be discouraged from saying they are "bad" at Maths and instead will be taught that "everybody can" in Maths. Students will be taught that mistakes are a part of the learning process; it is okay to make mistakes as long as you learn from them.

Appendix 1: Suggested Approaches

Number

- In all arithmetic, the importance of place value should be stressed.
- It is better to present sums initially in a horizontal format, to encourage some form of mental calculation or estimation.
- Language involving plus/positive and minus/negative often causes confusion. All of these terms should be used regularly.
- When referring to decimals, say "three point one four" rather than "three point fourteen".
- In a line of working, an "equals" sign should appear only once. Working should develop down the page, with equal signs in line and not all on the same line.
- (The following is **poor** practice: 6 x (3 + 4) = 7 = **6 x 7** = 42, as students are equating unequal things.)
- Emphasise the link between fractions, decimals, ratios, and percentages. The % button needs to be used with care. Note, however, that the fraction button is very useful.
- The correct written form of numbers in standard form must be used, i.e., a calculator display of 1.5763^{04} must be written as 1.5763×10^4

Algebra

- When teaching this, take care when using terms like "cross-multiply" and "swap sides - swap signs" as these can lead to misunderstandings. Instead, use the balance method (see a Maths teacher for more detail.)
- Running through a formula with "easy" numbers may aid student understanding.
- Trial and improvement is an acceptable mathematical method.

Shape, Space and Measures

- The word "similar" in mathematics is used to describe objects that are exactly the same shape, but not necessarily the same size - one object is an exact scaled version of the other.
- Work is done in mathematics on common Imperial units and their metric equivalents. Technology needs students to be particularly familiar with millimetres.
- Appropriate units must always be stated, e.g., in answers, graph axes etc.
- Try not to add to the common confusion of 'mass' with 'weight'!
    - Mass is a measure of the amount of a substance and is measured in kg.
    - On planet Earth, 1 kg of anything exerts a force of 10N in the direction of the Earth – what we call it 'weight'. This is due to the gravitational pull of the Earth.
    - On other planets, or on the Moon, the gravitational pull is different and so the force exerted by 1 kg varies, e.g., in outer space there is virtually no gravitational pull, so you would be 'weightless' (but not 'mass-less').
    - 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. This is the simplest way of determining mass but is not the same thing.

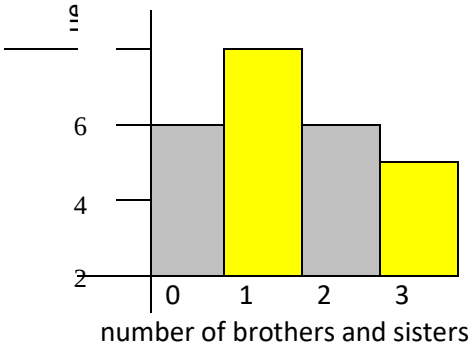
Summary: *it is better to use the term 'mass' instead of 'weight'*.

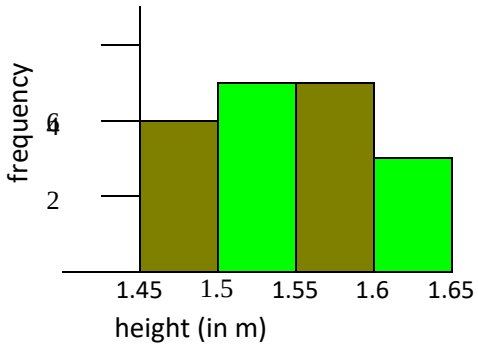
- We use the following language for bearings:
  - bearings always start with 0° from North.
  - bearings are always measured clockwise.
  - bearings need the ° (degree) symbol.
  - bearings need 3 figures.

Handling Data

- Always use degrees when constructing pie charts, label sectors with the data or a key.
- All graphs should have a title and labelled axes, with units marked.
- When interpreting graphs, make sure students know what each "small square" represents on **each** axis.
- Encourage students to always consider whether an information graph axis should or should not start from zero in a particular case; and the implication of this.
- Bar charts are used to display discrete data (data which is counted). Histograms have no gaps and are used to display continuous data (data which is measured).

Note the labelling of the axes:





- When using the term "average" please say "mean average" (or median).
- Probabilities should be written as fractions, decimals, or percentages and definitely not as "1 in 7" or "1 out of 7" or "1:7".
- When reading off the gradient of a line, ensure that students have a full understanding of the scale on each axis.
- Line graphs should either be straight lines drawn with a ruler and pencil; **or** smooth curves drawn with a pencil and no ruler.

Calculators

- Use of calculators allows freedom from repetitive difficult calculations. Students should have open access to their own calculators but be encouraged to use them sensibly e.g., not for working out simple calculations.
- It is good practice to always estimate answers before using a calculator.
- Sensible rounding is expected (staff to advise re subject requirements).
- Students should be encouraged to set down method working, whether using a calculator or not. Answers only are not acceptable.
- Care must be taken when students are using basic calculators as the order of operations is often not always in-built (remember "BODMAS" – brackets, orders, divide/multiply, add/subtract). New scientific calculators often do calculations in the order they are entered e.g. sine 30, $\sqrt{50}$ …

<u>Suggested areas for Numeracy across the curriculum.</u>

<u>ART</u> – Symmetry; use of paint mixing as a ratio context.
<u>ENGLISH</u> – comparison of 2 data sets on word and sentence length.

FOOD TECHNOLOGY – recipes as a ratio context, reading scales, measurement conversions.
GEOGRAPHY – representing data, use of Spreadsheets, map scales.
HISTORY – timelines, sequencing events.
ICT – representing data; considered use of graphs.
MFL – Dates, sequences and counting in other languages; use of basic graphs and surveys to practise foreign language vocabulary and reinforce interpretation of data.
MUSIC – addition of fractions in context of musical notes.
PHYSICAL EDUCATION – collection of real data for processing in Maths, distance speed time.
RELIGIOUS EDUCATION – interpretation and comparison of data gathered from secondary sources (internet) on e.g. developing and developed world.
RESISTANT MATERIALS – measuring skills, units of area and volume.
SCIENCE – calculating with formulae, 3-way relationships.
TEXTILES – scale, practical equipment, proportion.