



THE
GRANGE
ACADEMY

ASPIRE FOR EXCELLENCE

Numeracy Policy

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Raising the Standards of Numeracy at The Grange Academy

Rationale

'Mathematics equips pupils with a uniquely powerful set of tools to understand and change the world. These tools include logical reasoning, problem-solving skills, and the ability to think in abstract ways.'

Numeracy is a proficiency which is developed mainly 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 an understanding of the ways in which data are gathered by counting and measuring, and presented in graphs, diagrams, charts and tables.

This document provides information and calculation methods to allow a consistent approach to mathematics across the curriculum which will result in students mastering the skills.

Teachers of Mathematics should:

1. Provide support and advice to other departments with the use of the Numeracy and Calculations Policy, so that a correct and consistent approach is used in all subjects.
2. Provide information to other subject teachers on appropriate expectations of students and difficulties likely to be experienced in various age and ability groups.
3. Through liaison with other teachers, attempt to ensure that students have appropriate numeracy skills by the time they are needed for work in other subject areas.
4. Seek opportunities to use topics and examination questions from other subjects in mathematics lessons.

Teachers of subjects other than Mathematics should:

1. Ensure that they are familiar with correct mathematical language, notation, conventions and techniques, relating to their own subject, and encourage students to use these correctly.
2. Be aware of appropriate expectations of students and difficulties that might be experienced with numeracy skills.
3. Provide information for mathematics teachers on the stage at which specific numeracy skills will be required for particular groups.
4. Provide resources for mathematics teachers to enable them to use examples of applications of numeracy relating to other subjects in mathematics lessons.
5. Be aware of strategies and interventions being employed in the mathematics department to raise numeracy standards.

Areas for collaboration

Mental Arithmetic Techniques

Opportunities for students to develop mental strategies for calculations should be given and students should be encouraged to estimate answers to calculations before they start so that they can check whether their answers are correct, including when using a calculator.

Students can draw on many techniques for mental arithmetic and should be encouraged to use those methods that they are confident with. (see calculations policy for examples)

Written Calculations

It is now accepted by the Edexcel examining board that there may be more than one method that is suitable for calculations. However, to ensure consistency, The Grange Academy has standardised methods that all teachers should use to teach students. Examples below show the standardised methods for the 4 rules of number.

Addition and subtraction

789 + 642 becomes

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline 1 \quad 1 \end{array}$$

Answer: 1431

874 - 523 becomes

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$$

Answer: 351

932 - 457 becomes

$$\begin{array}{r} 8 \quad 12 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \end{array}$$

Answer: 475

932 - 457 becomes

$$\begin{array}{r} 1 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \\ \hline 5 \quad 6 \end{array}$$

Answer: 475

Short multiplication

24 × 6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \hline 2 \end{array}$$

Answer: 144

342 × 7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline 2 \quad 1 \end{array}$$

Answer: 2394

2741 × 6 becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ \hline 4 \quad 2 \end{array}$$

Answer: 16446

Long multiplication

24 × 16 becomes

$$\begin{array}{r} 24 \\ \times 16 \\ \hline 240 \\ 144 \\ \hline 384 \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{r} 124 \\ \times 26 \\ \hline 2480 \\ 744 \\ \hline 3224 \\ \hline 1 \quad 1 \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ \hline 1 \quad 1 \end{array}$$

Answer: 3224

Short division

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r} 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r} 1 \\ 11 \overline{) 496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer: 45 $\frac{1}{11}$

Long division

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r} 12 \\ 15 \overline{) 432} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

$\frac{12}{15} = \frac{4}{5}$

Answer: 28 $\frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28.8

Students should be encouraged to show all their workings when doing written calculations and must estimate their answer first, particularly when working with decimal numbers.

Vocabulary

The following are all important aspects of helping students with technical vocabulary of mathematics.

1. Display Key Words
2. Using a variety of words that mean the same thing (multiply, product)
3. Encouraging students to use sophisticated mathematical language (use of multiply rather than times)
4. Discuss words which have multiple meaning such as volume, product etc.
5. Partitioning words to understand meaning 'Quadrilateral' 'Quad' meaning four and 'lateral' meaning sides. This will help students to understand and remember some keywords and gives them strategies to understand unfamiliar words which they may come across.

6. Teacher must use and encourage the students to use the word calculation rather than sum. Sum means to add numbers together and is confused by some students when asked to complete a series of calculations.

Transfer of Skills

The mathematics department will deliver the National Curriculum knowledge, skills and understand through Mastery and problem solving. Where appropriate they will make references to the applications of Mathematics in other subject areas and where possible give contexts to topics.

The transfer of skills is something that students find difficult; this is why it is imperative that mathematics is taught consistently and in line with the calculations policy throughout school.

Department Links may include:

Department	Content
Art / Technology	Symmetry, paint mixtures as a ratio
Food Technology	Ratio recipes, reading scales
Geography	Representing data; compass bearings
History	Timelines, sequencing events
Computing	Representing data
MFL	Dates, counting in other languages
Music	Sequencing
PE	Collection of real data
RE	Interpretation/ comparison of data from secondary sources
Science	Calculating with formulae, three-way relationships

Specific Cross Curricular Mathematical Links

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 students will:-

- order numbers, including decimals
- calculate means and percentages
- use negative numbers when taking temperatures
- substitute values into formulae
- re-arrange equations
- decide which graph is the most appropriate to represent data and plot, interpret and make predictions from graphs.

Art 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 scaling and ratio.

Food Technology :

- a great deal of measurement occurs, including working out times
- there are opportunities to calculate the quantity of ingredients required when a recipe is adapted to feed different numbers of people
- costs may need to be calculated

Computing:

Children will apply and use mathematics in a variety of ways when they solve problems using ICT.

For example:

- Flowol - sequence of instructions, including directional instructions
- Programming - problem solving
- Modelling - creating graphs
- Modelling - sums, averages, more than, less than, equals to
- Binary to hexadecimal - addition / subtraction
- Databases - recording data
- Searching the internet - Boolean searches
- General topics - measurements of pages and apps

Geography:

In geography students have opportunities to collect, present and interpret data. It is important that there is consistency in the way that data handling is taught in mathematics and geography. In addition, map work involves the use of coordinates (6 figure grid references), map scales and compass bearings.

History:

Although there would appear to be fewer opportunities for developing numeracy in history lessons, historical data can be analysed and presented in graphical form. Timelines can also be used to calculate the passage of time between historical events.

PE:

Athletic activities require measurement of height, distance, time and speed. There is an opportunity to calculate averages and use graphs to, for example, chart improvements in performance. Position and direction are used extensively in dance, gymnastics and ball games.

SMSC:

The discussion of moral and social issues is likely to lead to the use of primary and secondary data and the interpretation of graphs, charts and tables. Students should be encouraged to make reasoned and informed decisions, based on facts and to recognize biased data and misleading representations. By applying mathematics to problems set in financial and other real-life contexts students will develop their financial capability and awareness of the applications of mathematics in the workplace.

Music:

In music there are opportunities to explore

- time (time signatures and rhythm)
- the relationship between mathematics and the musical scale (using the idea of ratio)

English:

Members of the English department can help students improve their achievement in mathematics by teaching them to identify important information from texts. This will help them to better understand mathematical examination questions.

MFL:

Aspects of mathematics such as counting, calculations, money, the time and the date can be explored in MFL lessons.

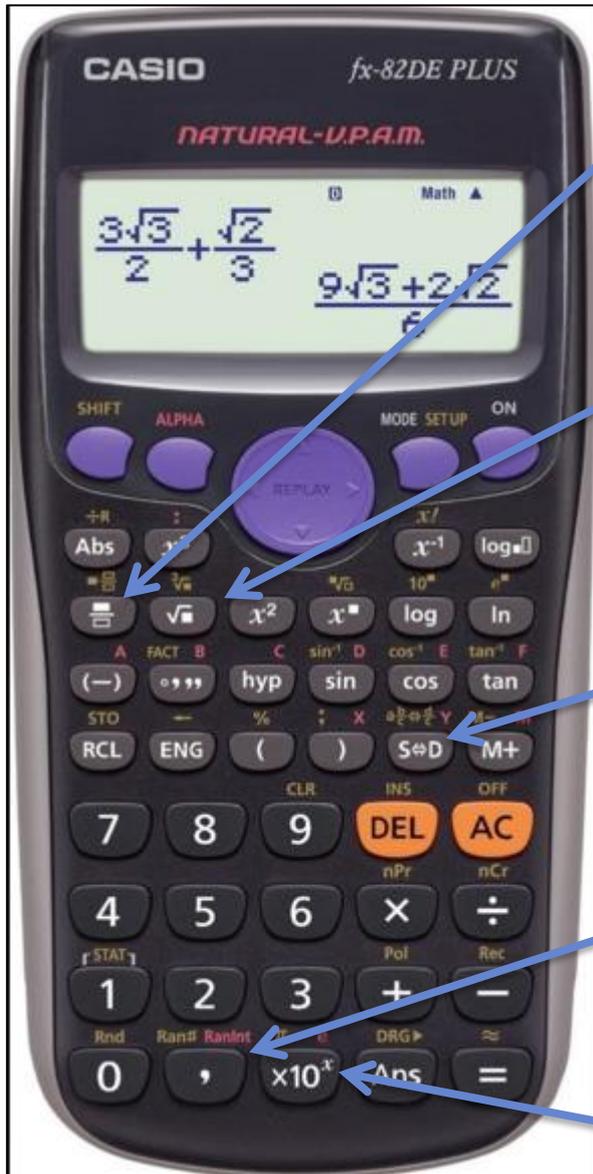
Intervention

Students' numeracy skills are monitored through different activities across the key stages during form time each week. If any students are not making reasonable progress during these activities, form time intervention will take place. Students will then work in small groups focussing on key numeracy topics to help them improve.

Calculators

All students should have access to a scientific calculator. In Mathematics lessons in the secondary phase, we encourage the students to use the **Casio FX-85GTPlus** calculator.

Functions that all secondary phase students should be familiar with:



Fraction Button

Use this button when performing calculations with fractions. The students must press shift and then the fraction button when they want to input mixed numbers (eg. $3 \frac{1}{2}$)

Square Root Button

Students should use this when finding the square root of a number. To find the cube root of a number press shift first.

S-D Button

This button will change your answer into a decimal.

Random Number Button

Press shift first and then this button to generate random numbers.

Standard Form Button

Use this button to input numbers in standard index form.