

THE SYDNEY RUSSELL SCHOOL



Numeracy Strategy



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Introduction

“A Numerate pupil is one who has the ability to cope confidently with the mathematical needs of adult life. There should be an emphasis on the wider aspects of numeracy and not purely the skills of computation.”

The Cockcroft report 1982

Numeracy is a proficiency which 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. Numerate students are confident enough to tackle mathematical problems without going immediately to teachers or friends for help.

- ◆ have a sense of the size of a number and where it fits into the number system;
- ◆ know by heart number facts such as number bonds, multiplication tables, doubles and halves;
- ◆ use what they know by heart to figure out answers mentally;
- ◆ calculate accurately and efficiently, both mentally and with pencil and paper, drawing on a range of calculation strategies;
- ◆ recognise when it is appropriate to use a calculator, and be able to do so effectively;
- ◆ make sense of number problems, including non-routine problems, and recognise the operations needed to solve them;
- ◆ explain their methods and reasoning using correct mathematical terms;
- ◆ judge whether their answers are reasonable and have strategies for checking them where necessary;
- ◆ suggest suitable units for measuring, and make sensible estimates of measurements; and
- ◆ explain and make predictions from the numbers in graphs, diagrams, charts and tables.

The National Numeracy Strategy DfEE

Aims

Our aim is to raise the achievement of all students by seeking to develop their numeracy skills by a consistent and accurate application across the curriculum. Through standardising the approach, it will enable students to recognise mathematics in a wider variety of situations and thus allowing them to transfer their numeracy skills in a broader context, not purely the skills of computation. It is important to recognise that all teachers are teachers of numeracy. It is the key to success and the long-term sustainable improvement in attainment.

Sydney Russell School will;

- Adopt a whole-school approach to Numeracy across the curriculum in order to raise standards of attainment for all students.
- Recognise the importance of Numeracy in all subjects across the curriculum.
- Identify similarities and differences in Mathematical teaching in different curriculum areas and develop a common approach.
- Encourage staff to take responsibility for the development of numeracy in each subject area.
- Raise staff and student awareness of key Numeracy strategies through whole school Inset time.
- Encourage students to transfer Mathematical skills and apply them in everyday and unknown contexts.

How will we ensure progress against the identified aims?

- All departments have a responsibility for identifying aspects of their schemes of work that contribute to raising standards of Numeracy and highlighting these aspects in their planning and making them explicit to students.
- All staff should encourage and promote the use of problem solving.
- Raise the profile of Mathematics throughout the school, promoting the use of numbers and measures whenever possible.

- Students identified as more able will be provided with opportunities to extend and develop their understanding.
- Students will be assessed in Year 7 to identify low levels of Numeracy. These students will then take part in an intervention programme to raise standards.
- Nominate a lead contact to communicate and support the delivery of numeracy across the curriculum.

Teachers of Mathematics should;

- Encourage the use of mental work in the classroom and frequently ask students to explain their answers. Provide opportunities for students to discuss so enabling them to share and compare ideas.
- Question students on strategies undertaken and promote the use of problem solving.
- Regularly ask students to consider 'rough' answers and invite them to estimate using these to provide a suitable check for their answers.
- Use diagrams and equipment to aid understanding when possible.
- Use Mathematical words often to familiarise students with their meanings and to develop their understanding.
- Support and encourage the Numeracy Strategy throughout.

Department leads should:

- Explicitly identify within the PoS the opportunities/need for numeracy to be developed.
- Ensure that the "Numeracy Toolkit" is referenced within schemes of work and used to plan the delivery of numeracy within the department.
- Seek guidance from the Numeracy lead contact where necessary to ensure the consistent approaches that have been agreed support success in their subject.
- Upload specific departmental resources for numeracy into the TeacherRes area.

All Staff should;

- Adopt a consistent approach to teaching numeracy skills.
- Be familiar with and use strategies to equip students with numeracy skills for life.
- Have the highest expectations of the students and ensure that the numerical content is of a high standard.
- Discourage students from writing down answers only and encourage students to show their numerical working out within the main body of their work.
- Encourage the use of estimation particularly for checking work.
- Help students 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.
- Encourage students to use non-calculator methods whenever possible.
- Encourage students to use the correct language e.g. use the word mean rather than average.

Use of Calculators

- The school expects each student to bring and use their own scientific calculator.
- Students should be encouraged to estimate the approximate answer first and then use the calculator to check the reasonableness of their answer.
- Students need to interpret calculator answers sensibly.
- In all areas of the curriculum the use of calculators can be encouraged where they enhance the learning taking place, however, it is important that students do not develop a reliance on the use of a calculator to solve problems where mental and/or written methods can be used.

Out of classroom learning

Opportunities for students' to transfer their learning across contexts and develop their ability to put learning into practice are incorporated into the PoS for each subject.

Monitoring and Evaluation

- Using the strategy to reflect on the implementation of Numeracy across Curriculum in the school.
- Lesson observations / Learning walks
- Book scrutiny
- Identification of mathematical elements in subject areas' schemes of work.

Conclusion

The role of the Mathematics Department is to ensure that the explicit teaching of basic numeracy and mental arithmetic skills, including those of number, calculations, measures and handling data are securely embedded in the Key stage 3 and 4 schemes of work. These skills are consolidated at whole class and individual student level by having the opportunity to apply these skills when solving real-life problems.

Each member of staff is responsible for promoting numeracy skills when they arise naturally within their subject. A whole-school commitment to numeracy will enhance the teaching and learning process in all curriculum areas. When mathematical work is completed in any subject there must be a consistent approach. The approaches used must be one of the selected methods identified in the "Numeracy Toolkit".

Cross-Curricular - Provision for developing numeracy skills through other subjects

There are opportunities for drawing mathematical experience out of a wide range of activities, in most if not all subject areas. Mathematics contributes to many subjects of the curriculum, both in practical and more theoretical ways. These examples are provided to help identify some of these mathematical experiences.

- **English** - English lessons can help to develop and support students' numeracy skills, for example, by use of 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.
- **Science** - Almost every scientific investigation or experiment is likely to require one or more of the mathematical skills of measuring, classifying, counting, calculating, estimating, and recording in tables and graphs. In science, students will, for example, order numbers, including decimals, calculate simple means and percentages, use negative numbers when taking temperatures, decide whether it is more appropriate to use a line graph or bar chart, and plot, interpret and predict from graphs.
- **Design & Technology** - Measurements are often needed in Design and technology. Many patterns and constructions are based on spatial ideas and properties of shapes, including symmetry. A lot of work is also undertaken using estimation of measurements and quantities. Designs may need enlarging or reducing, introducing ideas of multiplication and ratio. When dealing with recipes and cooking, students will carry out a great deal of measurement calculations, which include working out times and calculating cost.
- **Art & Design** - Composition – simple geometry, looking for simple geometric shapes such as triangles and squares help in the overall form of the figure and achieve a cohesive composition; use of triangles, squares and circles. Golden Section: the application of a mathematical proportion of approximately 5:8 to the composition of a drawing to ensure the focal point / dominant feature of the drawing is developed.

- **ICT** - Students 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 angles, using uniform nonstandard then standard measures. When they use computer models and simulations they will draw on their abilities to manipulate numbers and identify patterns and relationships.
- **History, Geography and PCE** - In History and Geography students will collect data by counting and measuring and make use of measurements of many kinds. The study of maps includes the use of coordinates and ideas of angle, direction, position, scale and ratio. Graphical and data analysis is common at KS4. The pattern of the days of the week, the calendar and recurring annual festivals all have a mathematical basis. For older students, historical ideas require understanding of the passage of time, which can be illustrated on a time line, similar to the number line that they already know. KS5 students need to deal with complex statistical calculations. In PCE, an understanding of data is fundamental and the use of statistics in relation to our society and its make-up. Exploring the special significance of numbers in religion is also important.
- **Physical Education and Performing Arts** - Athletic activities require measurement of height, distance and time, while ideas of counting, time, symmetry, movement, position and direction are used extensively in Music, Dance, Drama Gymnastics and ball games.
- **PSHE** - Numeracy can be directly related to everyday life. Budgeting, paying bills, running a home and other money management issues can be undertaken.
- **Business Studies** - Within this subject there is wide scope for numeracy in relation to real life situations. Also there is scope for handling data with meaningful figures. This can augment work carried out in other departments.
- **Modern Foreign Languages** - Looking at a currency within a country; Calculations in a foreign language; Time in MFL; data within passages; use of surveys and graphs; quantities; prices; statistics; number series

and sequences. A great deal of work that is already undertaken in the mathematics classes can be applied here to learn about different countries. Numeracy related concepts feature frequently in AFL in lessons.

- **Social Science** - Psychology – complex statistical methods are used to analyse data as part of the research methods and data analysis. Sociology / Health and Social – interpretation of social data and demographic data showing social changes over time; use of percentile charts regarding children’s development in-line with their intellectual and physical development.

The key to making the most of all these opportunities is to identify the mathematical possibilities across the curriculum at the planning stage. Teachers of all subjects should make the links between subjects and numeracy explicit by talking about links frequently in their classes, also drawing students' attention to the links between subjects by discussing both in mathematics and in other lessons.

Vocabulary and Literacy to support numeracy

A list of vocabulary with ambiguous meanings is detailed below and will be made available to other departments to allow for better cross-curricular coherency. Students will be made aware of the use of the words in a mathematical context but will also be reminded that the same words might be used differently outside that context.

Word	Possible interpretation	Mathematical interpretation
Average	Estimate a general standard	Used synonymously with arithmetic mean; for a set of discrete data this is the sum of quantities divided by the number of quantities
Difference	Being dissimilar, non-identical	The result of subtraction
Even	Level or smooth	A positive integer that is divisible by two
Expression	Intonation of voice or aspect of face indicating emotion	A mathematical form expressed symbolically
Face	Front of head from forehead to chin	One of the flat surfaces of a solid shape
Mean	Small minded, malicious, ill-tempered	The arithmetic mean of a set of discrete data is the sum of quantities divided by the number of quantities
Negative	Image on developed film	A number less than zero
Odd	Extraordinary, strange, remarkable	A positive integer that has a remainder of 1 when divided by
Power	Mechanical or electrical energy as opposed to manual labour	This is a way of indicating how a number (symbol) must be operated on
Prime	Chief or most important	A whole number greater than one has exactly two factors, itself and
Product	A thing or substance produced by a natural process or	The result of multiplying one number by another
Root	Part of a plant below the earth's surface, which attaches it to	A value, which satisfies the equation which has been formed by
Sign	Write one's name, a signature, important information displayed on a	A quantity added or subtracted from others in an arithmetic or

Secondary Maths ITE, 2003 Literacy in Mathematics

Language of Operations

Some pupils may experience difficulty in associating terms with symbols.

+	-	x	÷
Add	Decrease	Multiply	Divide
Increase	Difference	Of	Share
More	Less	Product	
Plus	Minus	Times	
Sum	Reduce		
total	Subtract		
	Take		