

St Richard's Catholic College

Numeracy Policy



The Policy was approved by the Governing Body: March 2019

Chair of Governors: _____

The Governing Body will review the policy in March 2021

Numeracy is a life skill. Having confidence in numeracy gives us the ability to make informed choices and decisions in a variety of everyday life. Being numerate is more than completing calculations, it involves an awareness of number relationships and interpreting answers.

“Numeracy is a proficiency which involves confidence and competence with numbers and measures. It requires an understanding of the numbers 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.”

National Framework for teaching Mathematics

“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

Mission Statement

At St Richard’s Catholic College we are committed to raising the numeracy standards of our pupils across all year groups. We want all our pupils to use transferable numeracy skills across the curriculum.

Furthermore, we want to empower our pupils beyond school; we want them to have the confidence to apply and develop numeracy skills in further education, their career path and everyday life.

Numeracy at St Richard’s aims to go beyond mathematical knowledge and computational skills; it will develop the pupil’s ability to be systematic through problems involving numbers, shapes, space and measures, interpret information and make informed choices. However, mathematical facts and computational skills are the foundations on which a large proportion of GCSE questions are based and our primary aim is to ensure that our pupils can recall this knowledge and have reliable mental and written strategies for a selection of computational skills.

We encourage staff at St Richard’s to:

- i. Support the pupils’ understanding of the size of a number and where it fits into a number system.
- ii. Develop shared language and methods in areas where it is necessary to use established mathematical conventions.
- iii. Encourage pupils, when calculating, to use the most appropriate and efficient methods to solve problems; using a calculator only when appropriate.
- iv. Encourage pupils who are trying to solve a problem in a particular context to be logical and systematic, ready to persevere with their method but also flexible when required.
- v. Develop awareness of possible difficulties and common misconceptions pupils experience when solving problems.
- vi. Develop the pupils’ skills in estimation and approximation and have strategies for checking the reasonableness of their answers.
- vii. Empower pupils to explain their methods and reasoning using consistent language.
- viii. Communicate regularly with the mathematics department and other departments regarding difficulties and successes in developing pupils’ numeracy skills.

- ix. Support the development of interpretation skills among pupils encouraging them to explain how and why certain predictions are made from information given in graphs, charts and tables.
- x. Identify and share key numeracy skills and applications that occur in different curriculum areas within the school.
- xi. Have a positive attitude to solving numerical problems. Unfortunately for millions of adults and children in the UK, “I can’t do maths” has become a self-fulfilling prophecy.
- xii. With the support of the mathematics department, develop and build on a range of strategies to support the development of numeracy across the curriculum, and to determine intervention strategies for pupils encountering problems.

“The acquisition of at least basic mathematical skills is vital to the life opportunities and achievements of individual citizens. Research shows that problems with basic skills have a continuing adverse effect on people’s lives and that problems with numeracy lead to the greatest disadvantage for the individual in the labour market.”

Smith, 2004 Making Mathematics Count

Pupils at St Richard’s will be expected to:

- i. Put their full effort into any numeracy challenge given to them by members of staff
- ii. Show full workings to support their strategies when solving a numeracy problem
- iii. Attempt to use key words learnt in mathematics lessons to support their learning in other subjects.
- iv. Encourage parental involvement by sharing the work done daily in school and emphasising where numerical skills have been used.
- v. Use the inside cover of their mathematics books to maintain a list of important numeracy vocabulary that they can use to explain their work and methods in subjects across the curriculum.

Vocabulary and Literacy

Pupils are encouraged to keep and update a list of key numerical words in the inside cover of their Maths books. Pupils 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. 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.

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

Word	Possible interpretation	Mathematical interpretation
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 2
Power	Mechanical or electrical energy as opposed to manual labour	This is a way of indicating how a number (symbol) must be operated on by using another number written as a subscript to the first
Prime	Chief or most important	A whole number greater than one has exactly two factors, itself and 1
Product	A thing or substance produced by a natural process or manufacture	The result of multiplying one number by another
Root	Part of a plant below the earth's surface, which attaches it to the earth and carries nourishment from the soil to the plant	A value, which satisfies the equation which has been formed by putting an expression, containing one variable, equal to zero
Sign	Write one's name, a signature, important information displayed on a board	A quantity added or subtracted from others in an arithmetic or algebraic expression

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	Quotient
Plus	Minus	Times	
Sum	Subtract		
total	Take away		

Monitoring and Evaluating

To ensure that the policy is being successful the mathematics department will:

- i. Monitor the scores that pupils achieve from Year 7 through to Year 11.
- ii. Maintain and regularly update the numeracy box, which will form a central resource bank for all teachers to share good numeracy across the curriculum.
- iii. Carry out pupil interviews to ensure that pupils are making links between different curriculum areas.
- iv. Ensure that selected pupils are asked to keep a diary for a week documenting when they have used mathematics in other subjects
- v. At the end of each academic year, the numeracy policy will be discussed within the maths department and other departments, to action areas for development.

Numeracy Folder

The numeracy folder will be owned and updated by the Numeracy Coordinator (currently TK) and will be a source for inter-curricular resources to be shared. Staff may wish to add resources to their respective section and also browse other sections to find relevant materials. The resources will be reviewed regularly.

It is the responsibility of each teacher to explicitly demonstrate connections to numeracy through their subject **where appropriate**.

Early Numeracy Intervention:

All pupils in years 7 and 8 complete Numeracy Ninja exercises during tutor time. This is an intervention to provide extra practice and fill gaps in pupils' basic mental calculation strategies; improving numeracy skills and fluency.

Identified pupils in years 7, 8 and 9 are asked to carry out an additional independent numeracy intervention programme. This follows a scheme of work using maths watch videos and worksheets which target specific skills and gaps. Parents are asked to check and sign pupils' work to acknowledge completion of these tasks.

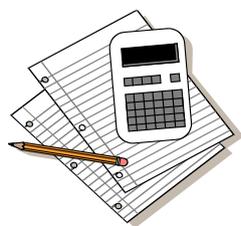
Cross-curricular guidance:

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 pupils 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 pupils from writing down answers only and encourage pupils to show their numerical working out within the main body of their work.
- Teachers will encourage the use of estimation for checking work.
- Teachers will encourage pupils to write mathematically correct statements.
- It is recognised that there is never only one correct method and pupils will be encouraged to develop their own correct methods where appropriate rather than be taught 'set' ways.
- Wherever possible pupils will be allowed and encouraged to 'vocalise' their maths - a necessary step towards full understanding for many pupils.
- All pupils should be helped to understand the methods they are using or being taught - pupils 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 pupils should be encouraged to use non-calculator methods whenever possible. However departments should ensure pupils 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.

Presentation of 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: $\text{£}3.50 \times 0.85 = 2.975 + 3.50 = 6.475 = \text{£}6.48$

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

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, ie. mean, median or mode.

Mean The sum of the numbers ÷ how many numbers there are
 [This the average that most people mean when they use the word 'average']

Median The middle value when all numbers have been ordered from smallest to largest. If there are two numbers in the middle, find the mean of these two numbers to get your median.

Mode The value that occurs most frequently.

Checking:

Encourage pupils 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.

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

$$\begin{array}{c}
 \swarrow \quad \swarrow \quad \swarrow \\
 = 36.4
 \end{array}$$

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
 For example, to solve: $3x - 7 = 5$

Balance Method:

$$\begin{array}{l}
 3x - 7 = 5 \qquad \qquad \qquad \text{(add 7 to both sides)} \\
 3x - 7 + 7 = 5 + 7 \\
 3x = 12 \qquad \qquad \qquad \text{(divide both sides by 3)} \\
 3x \div 3 = 12 \div 3 \\
 \underline{x = 4}
 \end{array}$$

Flow Chart Method:

START: $x \rightarrow \boxed{\times 3} \rightarrow \boxed{-7} \rightarrow 3x - 7$ (you now UNDO)
END: $4 \leftarrow \boxed{\div 3} \leftarrow \boxed{+7} \leftarrow 5$
 $\underline{X = 4}$

Guidelines for Constructing/Using Graphs and Charts



Pupils 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 dependent 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
- 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, cumulative frequency graphs and histograms.

Pupils need to be taught when each type of graph is appropriate and not just how to create each graph.

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 or there should be a key.

Do not be surprised if the total of all the angles is not exactly 360 degrees. This can happen if pupils have been asked to round their answers to a certain degree of accuracy (e.g. one decimal place). If the total of the calculated angles is more than 2 degrees away from 360 degrees then pupils should check through their answers.

Scaling

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

Early Intervention

Pupils identified as requiring support with their numeracy skills will be placed on our early intervention programme. Full details of this are available from the Numeracy Coordinator.

