NUMERACY AT HOLY TRINITY CATHOLIC SCHOOL

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 understanding of the ways in which data are gathered by counting and measuring, and presented in graphs, diagrams, charts and tables. Poor numeracy skills hold back learners' progress and can lower their self-esteem.

We must, as a whole school, be involved in improving these skills in order to develop each learner as a whole person.

By the end of KS3 learners should:

- Have a sense of the size of a number and where it fits into the number system;
- Recall mathematical facts confidently;
- Calculate accurately and efficiently, both mentally and with pencil and paper, drawing on a range of calculation strategies;
- Use proportional reasoning to simplify and solve problems;
- Use calculators and other ICT resources appropriately and effectively to solve mathematical problems, and select from the display the number of figures appropriate to the context of a calculation;
- Use simple formulae and substitute numbers in them;
- Measure and estimate measurements, choosing suitable units, and reading numbers correctly from a range of meters, dials and scales;
- Calculate simple perimeters, areas and volumes, recognising the degree of accuracy that can be achieved;
- Understand and use measures of time and speed, and rates such as £ per hour or miles per litre;
- Draw plane figures to given specifications and appreciate the concept of scale in geometrical drawings and maps;
- Understand the difference between the mean, median and mode and the purpose for which each is used;
- Collect data, discrete and continuous, and draw, interpret and predict from graphs, diagrams, charts and tables;
- Have some understanding of the measurement of probability and risk;
- Explain methods and justify reasoning and conclusions, using correct mathematical terms;
- Judge the reasonableness of solutions and check them when necessary;
- Give results to a degree of accuracy appropriate to the context.

Mathematics contributes to and draws from many subjects and aspects of the curriculum. Learners can be helped to appreciate the importance of Mathematics in their lives by making these links explicit. For example, if the Maths teachers know how Mathematics is applied in other subjects, and ask colleagues to provide examples of applications to use in mathematics lessons, they will be able to provide examples and contexts which learners know and understand.

At Holy Trinity Catholic School each department completed a numeracy audit to help map numeracy across the curriculum. Please see attached. From the outcomes of this we have developed an agreed numeracy document, which explains the methods used to teach some of the most common numeracy topics. There was also the opportunity to raise queries or issues relating to the teaching of subject specific numeracy. Many heads of department did this and these issues will be dealt with on a 1:1 basis.

For example, the approach to calculation should be the same in Science as in Mathematics. Staff need to understand:

- the use of mental and informal written methods, especially with lower attaining learners;
- the expectation that learners should add and subtract pairs of two-digit numbers mentally;
- how and when calculators should be used

Besides the approach to calculation, we have agreed across subject departments:

- The use of units;
- The Mathematical notation and terms to be used;
- Algebraic and other Mathematical techniques, such as how algebraic expressions are to be simplified or how equations are to be solved;
- How graphs are to be represented;
- How and when ICT resources such as graph plotters or graphical calculators will be used to support Mathematics.

Mathematical skills can be consolidated and enhanced when learners have opportunities to apply them across the curriculum. Some opportunities to link Mathematics to work in other subjects are as follows:

English and literacy

The National Curriculum statement on language suggests three areas to include in all subject teaching:

- General accuracy in using language – spoken, written and read;
- Technical terms and concepts appropriate to the subject;
- Awareness of patterns of language.

In Mathematics, general accuracy in using language can be promoted through:

Interpreting questions posed orally or in writing; clarifying the precise meaning of words or Mathematical terms; discussing the essential ideas identified in the questions and interpreting them to identify the Mathematical content. Awareness of patterns of language can be developed by asking learners to explain, argue and present their conclusions to others, and by drawing their attention to the statements involved in mathematical reasoning and proof, such as *if…then, because, therefore, implies…* The technical terms and concepts used in mathematics will include the ideas of an *inverse,* of *equivalence, equality, proportionality, congruence, similarity, linearity,* and so on.

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. Learners will, for example, order numbers, including decimals, calculate 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 form graphs. They will explore rates of change in cooling curves and distance-time graphs, apply formulae and solve equations, for example, in problems on moments.

Art, design and technology

Measurements are often needed in Art and in Design and Technology. Many patterns and constructions in our own and other cultures are based on spatial ideas and properties of shapes, including symmetry. Designs may need enlarging or reducing, introducing ideas of multiplication, scale and ratio. The preparation of food involves measurement, working out times and calculating cost, frequently extending into calculations involving ratio and proportion.

Information and communication technology

In ICT lessons, learners will collect and classify data, enter them into data-handling software, produce graphs and tables, and interpret and explain their results. Their work in control will include the measurement of distance and angle. Spreadsheet skills, used in modelling and simulations, rely on the numeric, algebraic and graphical skills involved in constructing formulae and generating sequences, functions and graphs.

History and Geography

Discussing evidence in History or Geography may involve measurement, estimation and approximation skills, and making inferences. Learners will make statistical enquiries, for example, in analysing population data to explore and compare lifestyles; they will also use a wide range of measurements and rates of change. The study of maps includes the use of co-ordinates and ideas of angle, direction, position, scale and ratio.

Physical Education and Music

Athletic activities use measurement of height, distance and time, and data-logging devices to quantify, explore, and improve performance. Ideas of counting, time, symmetry, movement, position and direction are used extensively in music, dance, gymnastics, athletics and competitive games.

Religious Education, PSHE and Citizenship

Belief and likelihood in religious education, or risk assessment in PSHE, relate well to work in Mathematics. 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, helping learners to make reasoned and informed decisions and to recognise biased data and misleading representations. By applying Mathematics to problems set in financial and other real-life contexts learners will develop their financial capability and awareness of the applications of Mathematics in the workplace

Holy Trinity Catholic School Numeracy Policy follows:

Numeracy Policy

If we wish to ensure that our learners are able to use number throughout the curriculum, we need to ensure that we are using similar methods of construction and calculation.
The ten topics below were covered in at least 6 curriculum areas throughout an academic year.

Where relevant, a preferred method is given which most learners will identify with.

The top ten numeracy topics across the curriculum

1) Recognise odd and even numbers
2) Use decimal notation – money
3) Recognise and use simple percentages
4) Interpret bar graphs
5) Draw bar graphs
6) Interpret simple tables and lists
7) Interpret graphs that model real life situations
8) Knowing when to add or subtract in an order to solve a problem
9) Read and write numbers up to 1 million
10) Record results in simple lists, tables and block graphs

1) Odd and even numbers:

Even numbers are numbers that appear in the two times table (end in a 0, 2, 4, 6, 8). Odd numbers are numbers that are not in the two times table (ie they end in 1, 3, 5, 7, 9)

2) Money:

When dealing with decimal notation and money in particular, we reiterate that there is 100 pence in £1. To convert pence to pounds we ÷ 100 and to convert pounds to pence we x 100. A quick way of doing this is moving the decimal point two places (to the right when converting pounds to pence and the left when converting pence to pounds).

Example: 234 pence can be written as 234.0. When we divide by 100 we get £2.34.

If required to add or subtract money, please see below

Addition of whole numbers:

- Single digits – learners encouraged to do these in their heads.
- Two or more digits – less able learners are encouraged to write down the sum.

Eg: 16+24+37=

16
24
37 +
77

(All carrying figures below line in appropriate place)

Subtraction of whole numbers:

- Two or more digits – learners are encouraged to write down sum.

Eg: 314-187=

2 10 1
~~3 1~~ 4
1 8 7 -
1 2 7

(Decomposition method used)

Addition and subtraction of decimals:

Learners should know:

- any number can be written as a decimal, eg 4 is the same as 4.0.
- for addition and subtraction, line numbers up with decimal points vertically aligned. Carry out method as in previous section.

3) Percentages:

Learners should know:

- A percentage is a value which has been given out of one hundred, for example 75% means 75 out of 100.
- 10% = $^{1}/_{10}$ = 0.1 25% = ¼ = 0.25
  50% = ½ = 0.5 75% = ¾ = 0.75

- how to calculate percentages of quantities, without a calculator,
  Eg: to calculate 15% of £250
  10% of £250 = £25
  5% of £25 = £25÷2 = £12.50
  so 15% of £250 = £25+£12.50=£37.50

- how to calculate percentages of quantities, using a calculator.
  First change the percentage into a decimal, then multiply the quantity by this decimal value
  Eg: to find 17% of 84m
  17% = 17÷100=0.17
  so 17% of 84m = 0.17x84m=14.28m

- how to express one number as a percentage of another (with a calculator).
  Divide the number by the total and theN multiply by 100
  Eg: to express a test mark of 45 out of 60 as a percentage
  45 ÷ 60 x100=75%

  Without a calcutor, consider what the denominator needs to be multiplied by to make 100.
  Eg. 17/25. 25 needs to be multiplied by 4 to make 100 so we do the same to the 17. 17 x 4 = 68 so 17/25 is 68%.

Graphs:

All graphs and diagrams to be completed in pencil

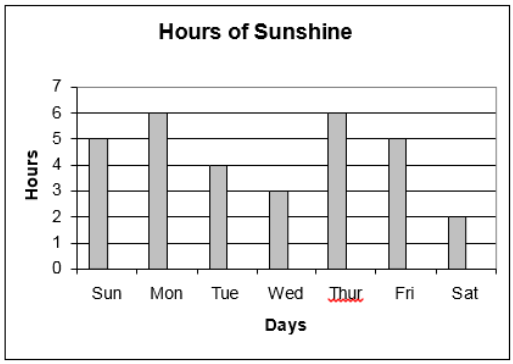
A ruler should be used for drawing straight lines

A title should accompany every diagram

In addition, the following should be observed.

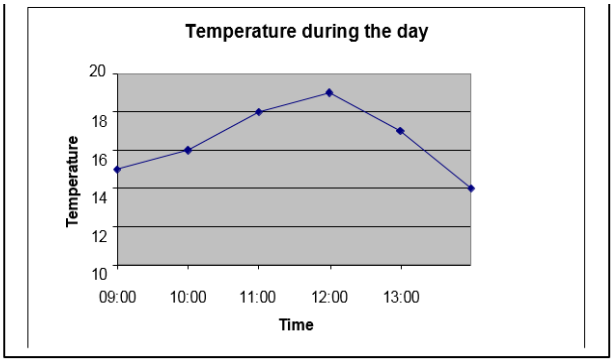
Bar Graph:

- Graphs can have vertical or horizontal columns
- Columns should be the same width
- The scale should begin at zero
- If it is appropriate use ⌇ to indicate a break in the scale
- Axes should be labelled
- Columns may have gaps between them



Line Graph:

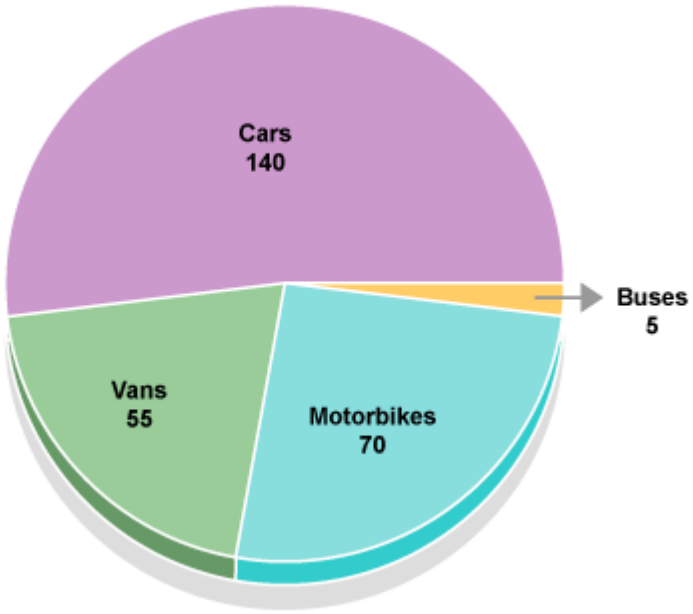
Horizontal axis will be labelled time



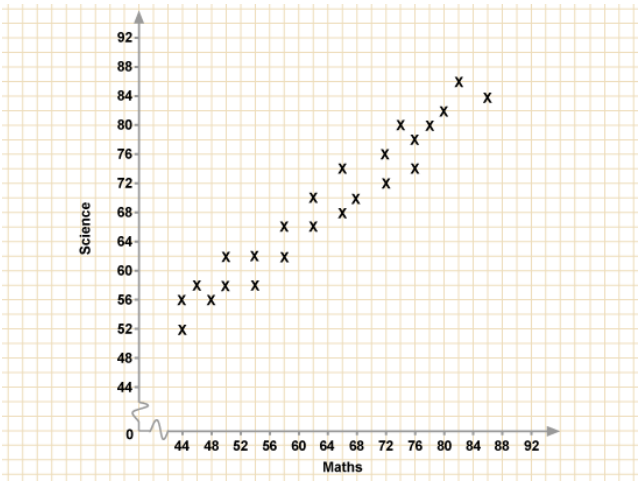
Pie chart:

Divide 360 by the total to work out how many degree each vehicle, person etc is worth first.

Type of vehicle	Number of vehicles	Calculation	Degrees of a circle
Cars	140	360 ÷ 270 x 140	= 187
Motorbikes	70	360 ÷ 270 x 70	= 93
Vans	55	360 ÷ 270 x 55	= 73
Buses	5	360 ÷ 270 x 5	= 7
Total	270		360



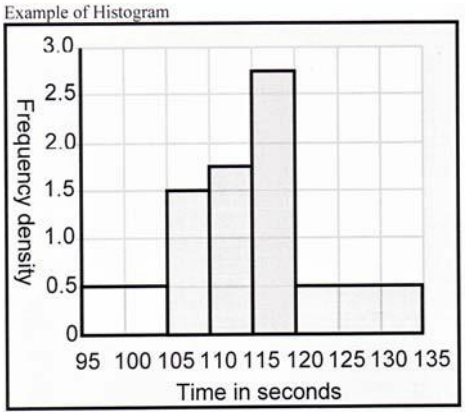
Scatter graphs:



Each axis should be clearly labelled. Points will be plotted with a small cross. A line of best-fit can be drawn by eye.
A more accurate line of best-fit can be drawn by calculating the mean of each variable and plotting that point. The line will go through that point.
The graph above shows positive correlation because as one variable increases, so does the other.

Histogram:

The horizontal axis must be labelled as for a frequency diagram using continuous data.
The vertical axis is labelled 'frequency density'
columns can be different widths – it is the area of the column which represents the frequency.



8)Deciding whether a problem involves addition or subtraction:

When deciding whether a problem requires addition or subtraction, we train the students to identify key words that may guide them.

Addition = Sum, total, altogether, in all, add, both

Subtraction = Take away, subtract, difference, minus, between, fewer, less, how many more, left, need to, remains, words ending in 'er' such as higher, longer, faster, shorter, slower

10)Writing numbers up to a million:

Writing numbers up to a million

Using the place value table can help you to write large numbers. Look at the following numbers:

Numbers in figures	Numbers in words
10	Ten
100	Hundred
1,000	Thousand
10,000	Ten thousand
100,000	Hundred thousand
1,000,000	Million

You will notice that the zeros become grouped in three figures between commas as the numbers increase. There is a comma between each group of three zeros (counting from right to left). You will sometimes see a space used to separate the three zeros. If there is no comma in a large number and you have problem saying it, try putting in the comma.

This grouping can help you to say the number **405,000**.
The first group of three figures is four hundred and five and show thousands (since there are three zeros in a thousand).

The number is **four hundred and five thousand**.

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