The Sutton Academy

Numeracy Policy

Status	**Non-Statutory**
Responsible Trustees' Committee	**ALT**
Date last approved by TB	**Not Applicable**
Responsible Person	**Mr D Courtney**
To Review Date	**January 2025**
Last Amended Date	**January 2023**

Policy Statement

The Sutton Academy regards Numeracy as an integral skill for all students to be confident and fluent in using. All students that attend The Sutton Academy are entitled to quality experiences across the entire curriculum of Numeracy.

Numeracy is the proficiency of numerical manipulation and interpretation within a classroom. To be completely fluent in numeracy, students must be confident using numerical methods to solve problems as well as being able to apply these skills practical numeracy.

To be numerate is to be confident applying numeracy into the world outside of school and being able to transfer skills to everyday life and solve problems that arise. Being able to organise financial maths is essential to be successful in Numeracy.

Problem solving is a necessity in life, where new problems surface every day and it is vital that students are prepared to tackle these problems and not run away or ignore it. Being confident in approaching a problem from different angles is paramount in being a confident successful person in society and the community.

Scope

This policy should be used by all staff regardless of the age or ability of students. Students' progress in numeracy will be monitored and appropriate intervention will be put in place for students.

Responsibility

The Assistant Faculty Leader of Maths is responsible for:

- keeping the policy updated
- monitoring numeracy progress of students in the academy
- working with departments to improve numeracy within their curriculum areas through lessons
- providing and assessing numeracy interventions

Guidance

This policy has been created to provide information and guidelines to improve consistency across the curriculum – it is not been created to be a prescription to teaching, however advice is given.

Teachers should consider students' ability to cope with the numerical tasks of everyday life and provide opportunities to:

- Handle number and measurement competently, mentally. Orally and in writing;
- Use calculators accurately and appropriately;
- Interpret and use numerical and statistical data represented in a variety of forms.

Approaches

In classes across the curriculum, students will have varying competence with numeracy, if members of staff are unsure or would like more information, please see the Assistant Faculty Leader of Maths and use the appendices attached to this policy.

To ensure a consistent delivery of numeracy across the curriculum, all staff should:

- Encourage students to write down all the numerical working out and not accept just the answers only.
- Encourage students to use estimation when checking their work.
- When possible, allow students to verbalise their maths which is a necessity when developing full understanding of maths.
- Discourage students from using calculators for every calculation they have to do, encourage students to use non-calculator methods when appropriate.
- Encourage students to use correct terminology when talking about maths such as 'Addition, Subtracting, Multiplication and Division'. Staff should also encourage students to say express -4 as 'negative 4' instead of 'minus 4'.
- Teach students how to calculate the averages (Mean, Median and Mode) in a consistent way, please see Appendix 1 for guidance.
- Be aware of rough conversions between metric and imperial units, please see Appendix 2 for rough conversions.
- Encourage students write the units they are using when answering mathematical questions.
- Ensure students apply the Academy guidelines for constructing graphs and using charts.

Misconceptions within Numeracy

Misconceptions in numeracy need to be tackled at the earliest point and the opportunity for conceptual learning of numeracy must always be at the forefront of the teaching of any numerical based content. These misconceptions can be tackled across the curriculum and therefore a consistent approach to these topics is a necessity for the successful teaching of numeracy across the academy. Through the CPD programme staff are made aware of common misconceptions in numeracy and are provided with guidance of how to tackle them. Please see Appendix 4 for further details.

Appendices:

Appendix 1 – How to Teach Averages:

When teaching averages staff should encourage students to always start off by ordering the numbers from smallest to largest regardless of the question. It is then important for the students to understand how to work out the averages.

Mean - Total value of samples divided by the sample size.
The mean of 4, 6, 7, 8, 11, and 12 is 8 because 4 + 6 + 7 + 8 + 11 + 12 = 48 and there are 6 numbers in the sample so 48 divided by 6 = 8.

Median - The 'middle number'
The median of 4 5 6 7 8 is 6 because 6 is in the middle of the list. For this list 4 5 6 7 8 9 the median is 6.5 because 6 and 7 are in the middle of the list and halfway between 6 and 7 is 6.5. This can also be worked out by adding doing 6 + 7 = 13 and 13 divided by 2 = 6.5.

Mode - The most common
The mode is the number that appears most frequently in a set of numbers. So the mode of the list 2, 3, 4, 4, 4, 5, 6, 6, 7, 10 is 4, because 4 appear more frequently than any other number. If there are 2 numbers that appear equally more frequently than other for example. 3, 3, 4, 5, 6, 7, 7, 8 then the mode would be 3 and 7. If a list of numbers would have 3 or more numbers that as equally more frequently than the others, we would say there is no mode. The lists 2, 2, 3, 3, 4, 4, 5, 6, 7 and 1, 2, 3, 4, 5, 6, 7 are both examples of lists of numbers that would have no mode.

Appendix 2 - Rough conversions between metric and imperial

Here are some examples or **rough** conversions between metric and imperial units

1 inch ≈ 2.5cm	1 yard ≈ 90 cm	1 kg ≈ 2.2 lbs	1 pint ≈ 568ml (or 500ml)
1 mile ≈ 1.6 km	1 oz. ≈ 25g		

Appendix 3 - Guidelines for Constructing and/or Using Graphs and Charts

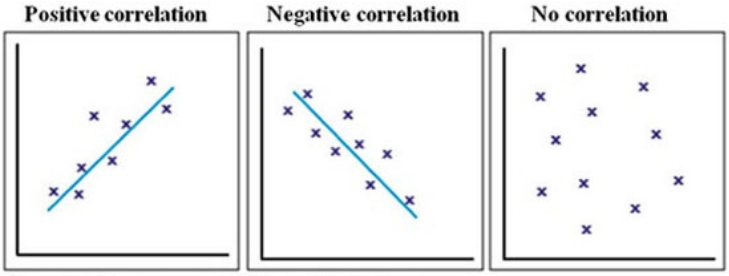
Student should:

- Use a sharp pencil
- Label the x and y axis including units
- Make sure the graph has a clear title
- Use independent variable on x-axis and the dependant variable on the y axis, for example, if measuring the cooling temperature of a liquid, time should go on the x axis and temperature should go on the y axis (the temperature of the liquid is dependent on the time of the reading)
- Label the lines and **not** the spaces
- Use equally spaced intervals
- Use appropriate scales
- Mark points with a small cross

- Draw graphs on squared or graph paper

Additional Guidance for specific graphs and charts:

- Bar Charts – Bars should be have equal width and equal spacing. Frequency should be on the y axis
- Pie Charts – Sectors should be labelled and if not, there should be a key. Angles will generally add up to 360^0 but sometimes they don't due to rounding.
- Scatter Graphs - Scatter graphs are used to represent and compare **two** sets of data. By looking at a scatter diagram, we can see whether there is any connection (**correlation or relationship**) between the two sets of data.
- Correlation shows whether there is a 'trend' in the data, for example, the longer you leave a cup of tea on the counter, the cooler it becomes. We can show correlation as negative, positive or neither. A positive correlation is seen as the value for x increase, the value for y increases, and a negative correlation is seen as the value of x increases, the value of y decreases. If there does not appear to be a trend in the data, we say it has no correlation. A line of best fit is used to show the trend of a graph and allows us to predict outcomes. These are normally straight lines; however lines of best fits can also be curved when looking at exponential graphs.



Appendix 4 – Common Misconceptions in Numeracy

1. Multiplying numbers by power of 10

Multiplying numbers by power of 10 – '*Just add a 0*' must never be heard in any classroom when teaching students to multiply by powers of 10, not just because it doesn't allow for conceptual learning, it also isn't accurate all of the time. For example; 12.4 x 10 = 124, however if we were to '*just add a 0*' we would have 12.4 x 10 = 12.40, and 12.4 is the same as 12.40 so we have not actually multiplied by 10. Likewise, where '*just add a 0*'should not be used, '*just take away a 0*' should also not be used. Nor should we teach students to '*move a decimal point*' that isn't how numeracy works, we manipulate the numbers. When we multiply a number by 10, all of the digits move 1 column to the left, we can explain why this is by setting up 'Hundreds, Tens and Ones' like so 24.56 x 10:

Th	H	T	O	.	Te	Hu
	2	4	.	5	6	

Because we are multiplying by '10' they all move 1 place to the left as such:

Th	H	T	O	.	Te
2	4	5	.	6	

So we have shown that 24.56 x 10 = 245.6.

2. Measuring with a Ruler

This is more common than we would like to admit, however students are to be reminded that when measuring with a ruler they must **always** measure from 0, and **not** from the end of the ruler. Not only is this important within mathematically topics, it is just as important in practical subjects such as Design where inaccuracy can be the difference between a door fitting into a cupboard or leaving large gaps.

3. Recording Time

It should be reinforced with students where possible that when recording time it is vital that they do not represent 2 hours and 30 minutes as 2.30 hours, when it should be recorded as 2.5 hours. Students should be encouraged to understand that minutes are a fraction of hours. An example of how to convert more difficult numbers would be:

Record 3 hours and 48 minutes as hours. Student should understand 48 minutes into an hour should be represented as $\frac{48}{60}$ as there are 60 minutes in an hour. Students should also understand the horizontal of a fraction (called a vinculum) means divide. So students would be expected to calculate 48 divided by 60 = 0.6. Therefore 3 hours and 48 minutes is 3 hours + 0.6 hours which equals 3.6 hours.

4. Multiplying Numbers

Using the column method to multiply numbers – When using the column method to multiply numbers It is important to explain to students the conceptual understanding of what is happening, for example;

21 x 17 =

$$\begin{array}{r} 21 \\ \times 17 \\ \hline 147 \\ 210 \\ \hline 357 \end{array}$$

The '0' has been highlighted in bold as this the opportunity to teach conceptual understanding. We do not tell students to '*just add a 0'* we must explain to them why – we put a '0' there because we are not just multiplying by '1', we are actually multiplying by '10' and we know that 21 x 10 = 210.

5. Subtracting Numbers

Subtracting using the column method – Like using the column method of multiplying, it is important to explain conceptual understanding when subtracting numbers using the column method. To explain the conceptual understanding here is an example of 746 – 84.

$$\begin{array}{r} \not{7}^{6}\,{}^{1}46 \\ - \quad 84 \\ \hline 662 \end{array}$$

This method is correct however, it is the explanation of why it works that should be taken into account to encourage conceptual understanding. In the working out the '7' has been crossed out and replaced with a '6', this because after we have done 6 – 4 = 2, we are asked to work out 4 – 8, which we can't do as it would give us a negative value. It is at this point of the working out that we cannot say the following instruction: '*borrow a 1 from next door and add it to the 4'*. The concept of 'borrowing' numbers in this is wrong; borrowing implies that we are going to put it back at some point. We must

also recognise that even we only write a ‘1’ it is not a ‘1’ that we are using, look at the value of the 7 in the question. The 7 is in the ‘Hundreds’ column, so the 7 has a real value of 700 and what we are doing is taking 100 of that (which leaves us with 600) and we are adding it to 40 (because the 4 in the ‘tenths’ column) and we are doing 140 – 80 = 60 so we put a ‘6’ in the ‘tenths’ column of our answer, we than do 600 – 0 which is 600 and place a ‘6’ in the ‘hundredths’ column of out answer.

The numeracy policy will be updated when appropriate to fit the needs of the curriculum of The Sutton Academy.