NUMERACY POLICY

HOWARD HOUSE SCHOOL

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Date:	01.09.2022

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Date:	01.09.2022

Next review date:	01.09.2023

Numeracy in Context
The vision of the Department of Education (DE) as stated in **Count, Read: Succeed (DENI 2010),** is:

"To ensure that every learner fulfils his or her potential at each stage of his or her development."

In March 2011 the Department for Education published **'Count, Read: Succeed – A Strategy to Improve Outcomes in Numeracy'.** This strategy states that, *'A solid foundation in Numeracy is essential to ensure they (young people) can contribute effectively to the economy and society and live fulfilling lives'* It specifically outlines:

- Numeracy as core to the revised curriculum;
- A central element of school's delivery must be the development of Numeracy and on the revised curriculum. Further to this, the professional development of teachers should be considered in implementing the curriculum.

Central to the developments of Numeracy in light of revision, the core aim is to raise the levels of attainment for all young people and to close the gap between the highest and lowest achieving pupils. To achieve this, each child should have access to high quality teaching along with early intervention and increased additional support for those children who show difficulty in Numeracy.

Schools should have a Numeracy Policy that is linked to the School Development Plan and annual targets (2022-2023).

1. Purpose
In line with statutory guidance, Howard House aims to:

- To improve, monitor and continuously develop standards in numeracy across the school;
- To ensure consistency of practice including methods, vocabulary, notation, etc;
- To indicate areas for collaboration between subjects;
- To assist the transfer of pupil's knowledge, skills and understanding between subjects;
- To explicitly identify areas for stretch and challenge and clearly identify SEN links for all pupils between the numeracy coordinator and school SENCO;
- Planning, developing and implementing strategic assessment methods in support of accelerating learner progress.

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2. Aims of the Numeracy Policy

Howard House School is committed to raising the standards of numeracy for all of its students in order for them to develop their ability to use numeracy skills effectively in all areas of the curriculum and to develop the skills necessary to cope confidently with the demands of further education, employment and adult life. All teachers are teachers of numeracy. At Howard House School, we believe that numeracy is a key factor in the effective teaching of all subjects and is essential to the improvement of learning and student development. Numeracy is a core element of all good teaching. Teachers at Howard House School have a responsibility to develop students' competence in numeracy in their own subjects and to ensure that students can access the curriculum effectively and utilise such to reach their full potential. The policy will develop a shared understanding between all staff. By working together, teachers can provide consistency to students, across the teaching team, between professionals within school and promote high standards of numeracy that surpass the Math classroom.

3. Definition of Numeracy

Numeracy is the ability to understand and work with numbers. Numeracy is a proficiency which is developed mainly in mathematics, however, transcends across subjects. Numeracy surpasses the ability to compete basic arithmetic. Numeracy involves developing the confidence and competence with numbers and measures. It requires understanding of the number system, a rich 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 is gathered by counting and measuring, and presented in graphs, diagrams, charts and tables. Fluency across and between domains is implicit to numerical , outside of the classroom and in the real world.

I. Raising Standards

The National Curriculum for Mathematics aims to ensure that all pupils:

- Become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately;
- **Reason** mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language;
- Can **solve** problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The pupils learning of concepts is distinct in domain, however, pupils should become fluent in making rich connections across mathematical ideas and between concepts. Pupils should also apply their knowledge to other subjects.

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4. High Quality Learning and Teaching in Numeracy

Numeracy is promoted through high quality teaching and learning which focuses on mathematical knowledge and concepts, problem solving, decision-making, the development of financial capability and the exploration of mathematical ideas.

5. The Role of the Numeracy Coordinator

1. Meeting with staff and its leaders to share the vision for numeracy across the school & identify key aspects.
2. The Numeracy Co-ordinator is to train staff on the 7 strands of numeracy. a. Number;
   b. Ratio and Proportion;
   c. Algebra;
   d. Geometry and Measures;
   e. Rates of Change;
   f. Statistics;
   g. Probability;
3. Identify key aspects delivered or required within each strand for all years and in particular for KS3;
4. Ensure that the senior leadership team have a clear overview and are able to isolate and align key aspects with the vision to move numeracy forward;
5. To provide the Mathematics department with contextual examples of mathematics within their area and to ensure numeracy is made relevant;
6. Identify where numeracy is used in schemes of work and support teaching staff through observations and coaching where possible;
7. Deliver training to all staff in the methodologies for the key aspects;
8. Produce exemplar booklet on the strands for future reference and training;
9. Monitor and evaluate the impact of these steps to re inform planning for future academic terms.

6. The Role of the Teacher

'A deep understanding of mathematics and of subject-specific pedagogy is crucial for teachers of mathematics' (DfE. 2012)

Teachers of mathematics should:

- Be aware of the mathematical techniques used in other subject and provide assistance and advice to other departments, so that a correct and consistent approach is used in all subjects.
- Provide information when needed to other subject teachers and departments on appropriate expectations of students and difficulties likely to be experienced by various age and ability groups.
- Through liaison with other teachers, attempt to ensure that students have appropriate numeracy skills.
- Teachers will use a wide range of activities to take account of the different learning styles of pupils i.e.

  - Pupils who are mainly visual learners;
  - Pupils who are mainly auditory learners;
  - Pupils who are mainly reading learners;
  - Pupils who are kinaesthetic learners;
- Types of activity will include:
  - Exposition/ explanation – whole class;
  - Demonstration – whole class and group work;
  - Group work/ co-operative learning;
  - Pair work;
  - Individual work;
  - Investigation and problem solving work, allowing pupils to experience breadth and balance of approach.
  -

7. Whole school policy on the use of calculators

In deciding when pupils use a calculator in lessons, we should ensure that:

- Pupil's first resort should be mental methods;
- Pupils have sufficient understanding of the calculation to decide the most appropriate method: mental, pencil and paper or calculator;
- pupils understand the four arithmetical operations – The Four Rules of Number, and recognise which to use to solve a particular problem;
- pupils have the technical skills required to use the basic functions of a calculator constructively and efficiently, the order in which to use keys, how to enter numbers as money, measures, fractions, etc;
- When using a calculator, pupils are aware of the processes required and are able to say whether their answer is reasonable;
- pupils can interpret the calculator display in context (e.g 6.1 is £6.10 in money calculations);
- we help pupils, where necessary, to use the correct order of operations – especially in multi – step calculations.

8. Vocabulary

The following are all important aspects of helping pupils with the technical vocabulary of Mathematics; using a variety of words that have the same meaning e.g. add, plus, sum. Encouraging pupils to be less dependent on simple word e.g exposing them to the words that have different meanings in mathematics from everyday life e.g. take away, volume, product, etc. Highlighting word sources e.g. quad means 4, lateral means side etc. so that pupils can use such to help remember their meanings. This applies to both prefixes and suffixes of words.

9. Opportunities for maths to be encountered in other curriculum areas

Below are some ideas of ways in which Mathematics can be encountered in other curriculum areas, however, this list is not exclusive.

ART:	Symmetry; use of paint mixing as a ratio context;
ENGLISH:	Comparison of 2 data sets on word and sentence length;
FOOD TECHNOLOGY:	Recipes as a ratio context, reading scales;
GEOGRAPHY:	Representing data, use of Spreadsheets;
HISTORY:	Timelines, sequencing events;

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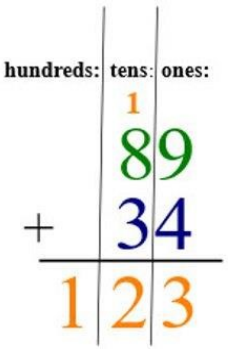
ICT:	representing data; considered use of graphs; bar charts for discrete data; histogram data;
MUSIC:	fractions;
PHYSICAL EDUCATION:	collection of real data for processing in Maths, estimation, time and measurement;
RELIGIOUS EDUCATION:	interpretation and comparison of data gathered from secondary analysis (internet) on e.g. developing and developed world;
SCIENCE:	calculating with formulae, graphing skills;
TECHNOLOGY:	measuring skills, units of area and volume, scale practical equipment, and proportion;
PD:	Alcohol awareness and unit measures; Statistics of crime; Statistics of abuse etc.

Howard House School has standardised the cross curriculum, whole school approach to method regarding 'The Four Rules of Number'; This is to ensure that all learners are able to consolidate their method in order to move forward onto more complex calculations.

Students will work through the standard algorithm approach for addition. The rationale behind this is that it is an existing method that functions, students are taught this approach in the main across secondary provisions and, the students parents/carers and/or guardians may have existing knowledge of this approach.

The standard algorithm approach requires the knowledge of place value by all learners and the ability to carry over.

The layout of the sum is as follows in the example below.



II Subtraction using the standard algorithm approach

Again, the standard algorithm approach will be applied to subtraction. Learners will be required to use place value and borrow from a number, as well as carry over amounts. The rationale for this is again that most parents and or respective carers/guardians should have pre-existing knowledge of this method in order to reduce the amount of confusion or resistance they may have in supporting their young person with homework. The layout of the sum is as follows in the example below.

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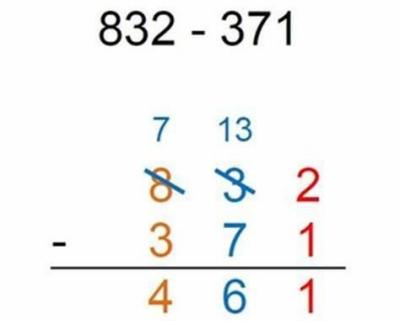


III Multiplication using the standard algorithm approach for long multiplication

Students will use the standard algorithm approach for long multiplication. This will require learner knowledge of place value and carrying over amounts. As a rationale, this is broadly the most specific method across generations and in support of home/school learning, this is deemed as the best fit. Learners will follow the below stops in solving a long multiplication sum:-

Step 1. Multiply the top number by the digit in the ones place.
Step 2. Put a zero as a place holder.
Step 3. Multiply the top number by the digit in the tens place and so on.
Step 4. Once all numbers have been multiplied, create an addition sum with the values.

Long multiplication

24 × 16 becomes

	2	
	2	4
×	1	6
2	4	0
1	4	4
3	8	4

Answer: 384

124 × 26 becomes

	1	2	
	1	2	4
×		2	6
2	4	8	0
	7	4	4
3	2	2	4
1	1		

Answer: 3224

124 × 26 becomes

	1	2	
	1	2	4
×		2	6
	7	4	4
2	4	8	0
3	2	2	4
1	1		

Answer: 3224

IV Division using the bus stop approach for both short and long division

The layout of the sum is as follows in the example below

Division will be completed using the bustop method

Learners will start with short division and use a remainder.

98 ÷ 7 becomes

$$7\overline{)98} = 14$$

Answer: 14

432 ÷ 5 becomes

$$5\overline{)432} = 86 \text{ r } 2$$

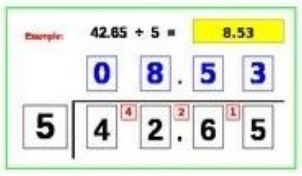
Answer: 86 remainder 2

496 ÷ 11 becomes

$$11\overline{)496} = 45\tfrac{1}{11}$$

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

Learners will then move to long division, introducing the decimal point to their calculation.



Appendix 3 MATHS TERMINOLOGY

Mathematical Term	Meaning
Acute angle	An angle which measures below 90°.
Acute triangle	A triangle containing only acute angles.
Additive inverse	The opposite of a number or its negative. A number plus its additive and inverse equals 0.
Adjacent angles	Angles with a common side and vertex.
Angle	Created by two rays and containing an endpoint in common.
Arc	A set of points that lie on a circle and that are positioned within a central angle.
Area	The space contained within a shape.
Average	The numerical result of dividing the sum of two or more quantities by the number of quantities.
Binominal	An expression of algebra that consists of two terms.
Bisect	To divide into two equal sections.
Cancelling	In multiplication of fractions, when one number is divided into both a numerator and a denominator.

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Cartesian Coordinates	Ordered number pairs that are assigned to points on a plane.
Chord	A line segment that connects two points on a circle.
Circle	A set of points that are all the same distance from a given point.
Circumference	The distance measured around a circle.
Coefficient	A number that is placed in front of a variable. For example in 6x, 6 is the coefficient.
Common denominator	A number that can be divided evenly by all denominators in the problem.
Complementary angles	Two angles in which the sum of their measurement equals 90°.
Complex fraction	A fraction that contains a fraction or fractions in the numerator and/or denominator.
Congruent	Exactly the same. Identical in regard to size and shape.
Coordinate graph	Two perpendicular number lines, the x axis and the y axis, which make a plane upon which each point is assigned in a number of pairs.

Cube	A solid with six sides, with the sides being equal squares and the edges being equal. Also, the resulting number when a number is multiplied by itself twice.
Cube root	A number that when multiplied by itself twice gives the original number. For example, 4 is the cube root of 64.
Decimal fraction	Fraction with a denominator of 10, 100, 1000, etc., written using a decimal point.
Degree	The measurement unit of an angle.
Denominator	The bottom symbol of a number or a fraction.
Diameter	A line segment that contains the centre and has its endpoints on the circle. Also, the length of this segment.
Difference	That which results from subtraction.
Equation	A relationship between symbols and/or numbers that is balanced.

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Equilateral Triangle	A triangle that has three equal angles and three sides the same length.
Even number	An integer which can be divided by 2, with no remainder.
Expanded notation	To point out the place value of a digit by writing the number as the digit times its place value.
Exponent	A positive or negative number that expresses the power to which the quantity is to be raised or lowered. It is placed above and to the right of the number.
Exterior angle	In a triangle, an exterior angle is equal to the measures of the two interior angles added together.
Factor	As a noun, it is a number or symbol which divides evenly into a larger number. As a verb, it means to find two or more values whose product equals the original value.
F.O.I.L Method	A method used for multiplying binominals in which the first terms, the outside terms, the inside terms, and then the last terms are multiplied.
Fraction	A symbol which expresses part of a whole. It contains a numerator and denominator.
Greatest Common Factor	The largest factor that is common to two or more numbers.
Hypotenuse	In a right angle triangle, it is the side opposite from the 90° angle.
Imaginary Number	The square root of a negative number.
Improper Fraction	A fraction in which the numerator is larger than the denominator.

Integer	A whole number. It may be positive, negative, or zero.
Interior angles	Angles formed inside the shape or inside two parallel lines.
Intersecting lines	Lines that come together at a point.
Interval	The numbers that are contained within two specific boundaries.
Irrational number	A number that is not rational (cannot be written as a fraction x/y, with x a natural number and y an integer.
Least common multiple	The smaller multiple that is common to two or more numbers.

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Linear equation	An equation where the solution set forms a straight line when it is plotted on a coordinate graph.
Lowest common multiple	The smallest number that can be divided evenly by all denominators in the problem.
Mean	The average of a number of items in a group (total the items and divide by the number of terms).
Median	The middle item in an ordered group. If the group has an even number of items, the median is the average of the two middle terms.
Mixed number	A number containing both a whole number and a fraction.
Monomial	An expression in algebra that consists of only one term.
Natural number	A counting number.
Negative number	A number less than zero.
Nonlinear equation	An equation where the solution set does not form a straight line when it is plotted on a coordinate graph.
Number line	A visual representation of the positive and negative numbers and zero.
Numerator	The top symbol or number of a fraction.
Obtuse angle	An angle which is larger than 90° but less than 180°.
Odd number	An integer (whole number) that is not divisible evenly by 2.
Ordered pair	Any pair of elements (x,y) where the first element is x and the second element is y. These are used to identify or plot points on coordinate graphs.
Origin	The intersection point of the two number lines of a coordinate graph. The intersection point is represented by the coordinates (0,0).
Parallel lines	Two or more lines which are always the same distance apart. They never meet.

Percentage	A common fraction with 100 as its denominator.
Perpendicular lines	Two lines which intersect at right angles.
Pi (π)	A constant that is used for determining the circumference or area of a circle. It is equal to approximately 3.14.

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Polynomial	An expression in algebra that consists of two or more terms.
Positive number	A number greater than zero.
Power	A product of equal factors. 3 x 3 x 3 = 3^3, read as "three to the third power" or the "third power of three". Power and exponent can be used interchangeably.
Prime number	A number that can be divided by only itself and one.
Proper fraction	A fraction in which the numerator is less than the denominator.
Proportion	Written as two equal ratios. For example, 5 is to 4 as 10 is to 8, or 5/4 = 10/8.
Pythagorean theorem	A theorem concerning right triangles. It states that the sum of the squares of a right triangle's two legs is equal to the square of the hypotenuse ($a^2 + b^2 = c^2$).
Quadrants	The four divisions on a coordinate graph.
Quadratic equation	An equation that may be expressed as $Ax^2 + Bx + C = 0$.
Radical sign	A symbol that designates as a square root.
Radius	A line segment where the endpoints lie one at the centre of a circle and one on the circle. The term also refers to the length of its segment.
Ratio	A comparison between two numbers or symbols. May be written x:y, x/y, or x is to y.
Rational number	An integer or fraction such as 7/7 or 9/4 or 5/1. Any number that can be written as a fraction x/y with x a natural number and y an integer.
Reciprocal	The multiplicative inverse of a number. For example, 2/3 is the reciprocal of 3/2.
Reducing	Changing a fraction into its lowest terms. For example, 3/6 is reduced to ½.
Right angle	An angle which measures 90°
Right triangle	A triangle which contains a 90° angle.
Scalene triangle	A triangle in which none of the sides or angles are equal.
Scientific notation	A number between 1 and 10 and multiplied by a power of 10. Used for writing very large or very small numbers.

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Set	A group of objects, numbers etc.
Simplify	To combine terms into fewer terms.
Solution, or Solution set	The entirety of answers that may satisfy the equation.
Square	The resulting number when a number is multiplied by itself. Also, a four-sided figure with equal sides and four right angles. The opposite sides are parallel.
Square root	The number which when multiplied by itself gives you the original number. For example, 6 is the square root of 36.
Straight angle	An angle which is equal to 180°.
Supplementary angles	Two angles that when combined the sum equals 180°.
Term	A literal or numerical expression that has its own sign.
Transversal	A line which crosses two or more parallel or nonparallel lines on a plane.
Triangle	A three-sided closed figure. It contains three angles that when combined the sum equals 180°.
Trinomial	An expression in algebra which consists of three terms.
Unknown	A symbol or letter whole value is unknown.
Variable	A symbol that stands for a number.
Vertical angles	The opposite angles that are formed by the intersection of two lines. Vertical angles are equal.
Volume	The amount which can be held, as measured in cubic units. The volume of a rectangular prism = length times width times height.
Whole number	0,1,2,3,4,5,6,7,8, etc.
X-axis	The horizontal axis on a coordinate graph.
X-coordinate	The first number in an ordered pair. It refers to the distance on the x-axis.
Y-axis	The vertical axis on a coordinate graph.
Y-coordinate	The second number in an ordered pair. It refers to the distance on the y-axis.