Mathematics Curriculum Overview.

Introduction
Developed by early cultures, mathematics is one of the oldest forms of human knowledge. It is a cultural tool that can be used to measure, quantify, calculate, compute and express complex relationships and it is the basis of many sciences and most technology. Though terminology and some procedures vary culturally, the underlying principles in mathematics are universal. It is a way of thinking about the world that is innate in its elemental forms (e.g. unity, duality, parts of wholes and simple numbers) but as a cultural technique is only learned by most people through instruction. The link between the abstract symbols that are learned and the processes they represent require focused mental activity and reasoning, and because of its abstract nature, maths has to be carefully taught so that all children can grasp mathematical concepts and master mathematical processes.
Steiner Waldorf education always proceeds carefully, from the whole to the parts and from the tangible to the abstract so that all learners can follow the transitions. Mathematics is first experienced in concrete, practical ways through real-world activities. Then the relationships between quantities and their abstract numerical values and relationships (e.g. number bonds, time tables) are explored. Though maths is a way of thinking in itself, in the Waldorf curriculum it is always applied and practiced in relation to real questions of calculation in a wide range of fields from technology and crafts, dealing with money and economics as well as engineering and architecture. Maths is also a process that schools the imagination and flexibility of thinking through creative problem solving, but simultaneously exercises the will in seeing processes through their logical and necessary sequences.

Purpose of Study
Mathematics is a way of understanding the world. It is a creative and discipline with many applications, that has been developed over many centuries through exchange across many different cultures. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

The aim of Mathematics teaching is to ensure that all pupils:
● are skilled in the fundamentals of mathematics, applying their knowledge purposefully in a range of developmentally appropriate tasks
● develop conceptual understanding progressing from the concrete to the abstract, the simple to the complex, the whole to the parts and back again
● use their mathematical skills to solve increasingly complex problems over time through frequent and varied practice, and using a range of appropriate strategies
● reason mathematically by following a line of enquiry, discovering relationships and framing generalisations, developing an argument, justifying and proving using mathematical language.

Long Term Intent

Language and communication
- Using a wide mathematical vocabulary effectively, accurately and precisely
- Fluency in reading, writing and understanding mathematical symbols and formulae
- Representing and interpreting data in different forms and formats
- Representing, explaining and illustrating mathematical thinking and processes

Health and well-being
- Enjoyment of problem creation and solution

Senses
- Seeing the same thing in different ways, seeing from different perspectives

Imagination and play
- Having internal and mental models of numbers, shape, space and measure that support mathematical thinking
- Translating between abstract mathematical mental models and real life experiences or examples

Empathy
- Understanding the thinking, methods and routes to solutions of other people

Aesthetics
- Finding and appreciating elegant solutions to mathematical problems
- Appreciation of beauty in mathematical forms in the abstract, in nature and in man-made forms

Inquiry
- Explore patterns and not-patterns
- Explore mathematical ideas and experiment with different ways of finding solutions
- Being able to break down problems into small steps, and extract key information (decomposition and abstraction)
- Explore and experiment with shape, space and construction

Democratic participation and society
- Understanding the power of data and statistics in shaping and influencing political views
- Understanding how data and statistics can be used to manipulate people's political thinking

Lifelong learning
- Application of knowledge and skills in personal and professional life, e.g. mortages, economics, personal/business accounts etc
- An understanding of mathematics and binary code as the basis of computer coding and programming
- Understanding the mathematical processes that calculators and computers are applied to

Future thinking
- Use mathematical thinking and interpretation of data to better understand risks to people and the world, and to imagine mitigations and solutions to these issues

Holistic thinking / Spirituality
- Appreciating the role of maths in spiritual experience, e.g. sacred geometry
- Using maths as a powerful language which can create connections with others across time and space

Judgement
- Forming judgements based on own understanding of data and statistics
- Evaluating routes to a solution, premise or theory

Maths Age-related Learning Opportunities for KG	Relevant Learning Descriptors
Children should have the opportunity: • Children count reliably with numbers from one to 20, place them in order and say which	**Pre-Number** Children can count numbers to 20, forwards and backwards. Recognise the numbers that represent these. Count using one to one correspondence.

number is one more or one less than a given number.
- Join in with number rhymes and/or games involving addition/subtraction.
- Using quantities and objects, add and subtract two single-digit numbers and count on or back to find the answer using concrete materials.
- Solve problems, including doubling, halving and sharing in a practical manner through games and activities.
- Recognise, find and name 1/2 as one of two equal parts of an object, shape, or quantity
- Recognise, find and name 1/4 as one of four equal parts of an object, shape, or quantity.
- Children use everyday language to talk about size, and position, to compare quantities and objects, for example; more/fewer/less, long/short, longer/shorter, tall/shorter, heavy/light, heavier than, lighter than, full/empty, more than, less than.
- Recognise and use language related to time, hours, minutes.
- Recognise and name different shapes and use positional language, under/over/behind/round.
- Begin to use place value and number facts to solve problems.
- Solve mathematical problems or puzzles.
- Suggest extensions 'What if?' 'What could I try next?

All the above concepts will be explored through stories and using concrete materials in the form of play.

They can add and subtract using practical equipment verbally. All of these are experienced in activities such as laying the table, cooking and sewing, and joining in songs. Problem solving is included in every day activities such as building gardening, cooking and group work.

Pre - Shape Space and Measure
Children can use every day language during play to describe simple geometric shapes, they will draw them freehand if the game requires and find examples of them in their natural environment. They can continue repeating pattern when sewing and creating jewellery. Children are able to demonstrate their understanding of simple positional language, such as over, under, while playing games and during ring time. They can talk about quantities in terms of more, less and the same. Children indicate past, present or future using simple, everyday language, such as before, now and after.

Solve problems in different contexts and investigate to answer a question; How can I arrange these bricks in different ways?
What if....?

Maths Age-related Learning Opportunities for C1	Relevant Learning Descriptors
Children should have the opportunity: **Number - number and place value** - count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number - count, read and write numbers to 100 in numerals, count in multiples of twos, fives and tens (during rhythmic time in main lesson) - given a number, identify one more and one less - identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least - read and write numbers from 1 to 20 in numerals and words	**Beginning Number** Children can identify, reproduce and invent simple concrete patterns. They can differentiate between odd and event numbers. Children read, write and have an understanding of numbers to 20, counting accurately with correspondence and understanding cardinality. They count forwards and backwards to 100, order numbers and skip count in increments with regular patterns, knowing the most regular times-tables (e.g. 2s, 5s, 10s). Children can compare the magnitudes of different numbers, subitising smaller numbers, and having some fluency in composition, addition and subtraction of numbers to 20. They can exchange and unitise numbers to 20. Children group and share numbers, and

- recognise odd and even numbers using practical equipment, (Pebble maths is an excellent resource for this)

Number - addition and subtraction

- read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including zero
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ - 9. (practically through story)
- Introducing the four rules using numbers up to 20 and in written form (in notation, written whole to part: 7 is 3 + 4)
- solve problems with addition and subtraction:
- solve number problems and practical problems involving these ideas. (through number stories)
- using concrete objects and pictorial representations, including those involving numbers,
- applying their increasing knowledge of mental and written methods, calculations will come through story.

Number - multiplication and division

- Learn the 2-, 5- and 10-times table by heart and through rhythmical practice
- solve one-step problems involving multiplication and division, calculating the answer by using concrete objects, pictorial representations, and arrays with the support of the teacher and stories.

Measurement

- sequence events in chronological order using language (e.g. before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening).

Geometry - properties of shapes (form drawing)

- recognise and name common 2-D shapes, including:
- 2-D shapes [for example, rectangles (including squares), circles and triangles] draw this free hand.

Geometry - position and direction

- describe position, direction and movement, including whole, half, quarter and three-quarter turns

partition shapes into simple fractions. Children solve word problems involving a single step using all four operations.

Beginning Shape Space and Measure

Children can name simple geometric shapes, draw them freehand and find examples of them in the environment. They can reproduce shapes and forms, continuing and extending patterns. Children are able to demonstrate their understanding of simple positional and directional language and symmetry in their work. They accurately compare lengths, heights, weights and capacities in practical activities. Children can recognise some coins, and count pence using a single, small denomination (e.g. 5 x 5p coins = 25p). Children indicate past, present or future using simple, everyday language (e.g. yesterday, next week) and use the appropriate tense.

- Draw straight lines, curves and simple linear shapes
- Give examples of straight lines, curves and basic geometric shapes in the natural environment
- Understand the different directions of straight lines and hears the names horizontal, vertical, diagonal

Maths Age-related Learning Opportunities for C2	Relevant Learning Descriptors

Children should have the opportunity:
Number - number and place value
● read and write numbers from 1 to 20 in numerals and words.
● identify, represent and estimate numbers using different representations, including the number line
● Understand the difference between odd and even numbers using practical equipment.
● use place value and number facts to solve problems.
● recognise the place value of each digit in a three-digit number (hundreds, tens, ones).
Number - addition and subtraction
● recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
● add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers; adding three one-digit numbers
● recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. add and subtract numbers mentally, including:
  • a three-digit number and ones
  • a three-digit number and tens
  • a three-digit number and hundreds
● show that addition of two numbers can be done in any order (commutative, this word would not be introduced at this stage) and subtraction of one number from another cannot,
● add and subtract numbers with up to three digits, using vertical method.
● estimate the answer to a calculation and use inverse operations to check answers
	Early Number
	Children can identify, describe, extend and invent patterns using concrete resources and numbers and can demonstrate their understanding of the difference between odd and even numbers. They count beyond 1000 in 1s, 10s, 100s and 1000s, reading and writing Arabic numerals to 100 and identifying the value of a numeral depending on its place, including understanding this value in terms of tens and ones. Children have fluency with number bonds to 20 and can recite several of the more regular times-tables (e.g. 2s, 3s, 5s, 10s). They can calculate missing digits in simple equations with numbers to 100, working across 10s boundaries and using all four operations. Children can group and share objects and quantities, representing their thinking with concrete resources, pictures and numerals. They can extract the essential mathematical information from simple word and picture problems, solving the problem, explaining the calculation in their own words and recording their thinking numerically. They can do simple calculations with money, including calculating change.
	Early Shape, Space and Measure
	Children can draw reflections of forms made of straight lines and/or curves in both the horizontal and vertical axes, and can transform forms made of straight lines into those made of curves, and vice versa. Given the beginning of a pattern or sequence of shapes, they can extend this accurately. Children can describe aspects of their work using positional and directional language. During practical and craft activities, they measure lengths, heights, weights and capacities in useful and relatively accurate ways, using informal and/or non-standard measures. Children can recognise all coins and notes, can exchange equivalent amounts in different denominations, can count out a total amount using a mixture of denominations. They can

● solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.	compare durations of time using appropriate everyday language, e.g. minutes vs hours vs days, and can recognise the hours, half past and quarter past.

Number - multiplication and division
- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number.
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.
- recall and use multiplication and division facts for the 2, 3, 4, 6, 5, 8 and 10 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Measurement
- recognise and use language relating to dates, including days of the week, weeks, months, and years

Geometry - properties of shapes (form drawing)
- Metamorphose straight to curved forms
- Metamorphose drawn ribbon forms

Geometry - position and direction
- Draw forms with vertical and horizontal symmetry

Maths Age-related Learning Opportunities for C3	Relevant Learning Descriptors
Children should have the opportunity: **Number - number and place value** ● compare and order numbers up to 1000	**Developing Number** Children can predict, continue and create sequential and numerical patterns. They count forwards and backwards from any number in 1s, 10s, 100s and

- identify, represent and estimate numbers using different representations
- read and write numbers up to 1000 in numerals and in words

Number - addition and subtraction
- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation

Number - multiplication and division
- count in multiples of 6, 7, 9, 25 and 1000
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.
- recall multiplication and division facts for multiplication tables up to 12 × 12
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout

Measurement
- convert between different units of metric measure (e.g. km and m; cm and m; cm and mm; g and kg; l and ml)
- understand and use equivalences between metric and common imperial units such as inches, pounds and pints
- recognise and use language relating to dates, including days of the week, weeks, months and years
- know the number of seconds in a minute and the number of days in each month, year and leap year
- compare durations of events [for example, to calculate the time taken by particular events or tasks]
- tell the time to the hour and half past the hour and draw the hands on a clock face to show these times
- tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times
- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- solve word problems using lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- solve word problems using amounts of money to give change, using both £ and p in practical contexts, including different combinations of coins that equal the same amounts of money.

Geometry - properties of shapes (form drawing)

1000s to beyond 10 000, reading, writing and ordering any numbers and describing the value of any digit in terms of 1s, 10s, 100s and 1000s. Children can perform mental addition and subtraction to 3 digits, using known number facts and their understanding of place value to support their working out. They can recite times-tables and answer multiplication and division questions to 12 x 12, recognising and recalling square numbers to 144. Children can use simple written methods to solve equations for all 4 operations with numbers to 100, explaining their reasoning verbally. They can represent multiplication in arrays. Children can use the language of halves, thirds and quarters accurately in different contexts, including o'clock, quarter past and half past on an analogue clock, grouping and sharing objects and quantities. They can solve word and picture problems by extracting the essential mathematical information, recording this in the form of an equation, and then solving it, explaining the calculation in their own words.

Developing Shape, Space and Measure
Children can extend complex forms with overlapping, coiling and/or intertwined elements, identifying and naming common geometric shapes. They can draw symmetrical reflections of forms on the horizontal, vertical and/or diagonal axes, and use simple positional, directional and geometrical language to describe their work. Children can use appropriate tools to measure lengths, heights, weights and capacities of differing scales, using a range of non-standard and standard measures, understanding the history and conventions of the metric measuring system in the UK. They can use their mathematical knowledge and understanding to solve problems of measurement with all four operations. Children can use coins and notes to make totals and give change. They can tell the time to 5 minutes on an analogue clock.

Developing Data Handling
Children can add data in numbers, words and pictures to tables and charts.

- Draw increasingly accurate freehand geometric forms such as circle, square, rectangle as preparation for building layout

Geometry - position and direction
- Draw mirrored forms on diagonal axis
- Draw forms with four-fold symmetry

Maths Age-related Learning Opportunities for C4	Relevant Learning Descriptors
Children should have the opportunity: **Number - number and place value** - find 1000 more or less than a given number - count backwards through zero to introduce negative numbers - recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) - order and compare numbers beyond 1000 - identify, represent and estimate numbers using different representations - round any number to the nearest 10, 100 or 1000 **Number - addition and subtraction** - add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) - add and subtract numbers mentally with increasingly large numbers **Number - multiplication and division** - multiply two-digit and three-digit numbers by a one-digit number using formal written layout - divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context - use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy - solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why, including weights and measures. - identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers - establish whether a number up to 100 is prime and recall prime numbers up to 19 - know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers	**Progressing Number** Children can identify and extend number patterns which use one of the four operations. They count forwards and backwards from any number in 1s, 10s, 100s and 1000s to beyond 100 000, reading, writing and ordering any numbers and describing the value of any digit in terms of 1s, 10s, 100s and 1000s. Children know number bonds of 100, and can fluently count in and add and subtract 100s and 50s. They know their multiplication tables and corresponding division facts to 12 x 12 both in and out of sequence, can find the factors of a given number, and identify common multipliers and factors for numbers. Children can use formal written methods to carry out calculations for all four operations with larger numbers. Children can read, write, order and manipulate simple fractions, adding and subtracting where the denominator is the same. They can identify equivalent fractions, simplify fractions and convert simple improper fractions to mixed numbers. Children can solve word problems involving multiple steps, identifying the essential mathematical information, and the steps needed, and explaining the calculation in their own words. **Progressing Shape, Space and Measure** Children can draw complex forms involving intertwining and plaiting. They draw regular shapes freehand, and can divide them into a given number of equal parts with relative accuracy. Children can use simple tools for measurement of length, height, weight and capacity with relative accuracy, and record their measurements appropriately. They read and write the time using minutes past and minutes to and an analogue clock, and can record amounts of money using appropriate symbols, including a decimal point. Children can solve mathematical problems using units of measurement with all four operations. **Progressing Data Handling** Children can record data with relative accuracy in a table, bar chart and pie chart.

- solve number and practical problems that involve all of the above and with increasingly large positive numbers

Number – fractions

- recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity
- write simple fractions e.g. $\frac{1}{2}$ of 6 = 3 and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$.
- count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
- recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- recognise and show, using diagrams, equivalent fractions with small denominators
- add and subtract fractions with the same denominator within one whole [e.g. $^5/7 + {}^1/7 = {}^6/7$]
- recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements >1 as a mixed number (e.g. $^2/5 + {}^4/5 = {}^6/5 = 1^1/5$)
- add and subtract fractions with the same denominator and denominators that are multiples of the same number
- multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.
- solve problems that involve all of the above.

Measurement

- solve problems involving measurement learnt in class 3

Geometry - properties of shapes (form drawing)
Celtic Knots

- Produce freehand geometry with reasonable accuracy

Geometry - position and direction

- use mathematical vocabulary to describe position, direction, and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise)

Maths Age-related Learning Opportunities for C5	Relevant Learning Descriptors
Children should have the opportunity: **Number - number and place value** ● read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit ● count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 ● use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1; dividing by 1; multiplying together three numbers **Number - addition and subtraction** ● solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why ● solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign **Number - multiplication and division** ● perform mental calculations, including with mixed operations and large numbers ● use their knowledge of the order of operations to carry out calculations involving the four operations ● solve problems involving addition, subtraction, multiplication and division, including "rule of three' problems (e.g. if it costs £2.50 to buy 10 pencils, how much would it cost for 8?) ● use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. ● multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers ● multiply and divide numbers mentally drawing upon known facts ● multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 ● solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. **Number – fractions (including decimals)** ● count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten	**Competent Number** Children can find and express the rule governing the creation of a pattern. They can generate a pattern using a rule of their choosing. Children can count forwards and backwards from any number in tenths, hundredths and thousandths, reading, writing and ordering any numbers and describing the value of any digit. They know the number bonds of 1 within tenths and hundredths. Children know their multiplication tables and corresponding division facts to 12 x 12 both in and out of sequence, can solve these equations quickly and confidently, including missing number problems, can find all the factors of a given number, and identify common multipliers and factors for numbers. They can round numbers to the nearest ten, hundred, tenth and hundredth. Children confidently, fluently and accurately use formal written methods to carry out calculations for all four operations with large numbers, and across the decimal point. They can find a fraction or a decimal of a whole number, translating between decimals and fractions. Children can perform all four operations with fractions, mixed numbers and improper fractions. They can apply all of their arithmetic skills to multi-step word problems, abstracting the key information and breaking the problem down into logical, solvable steps, and explaining the calculation in their own words. **Competent Shape, Space and Measure** Children can use a pair of compasses to draw accurate circles and divide them into a given number of parts. They can use perpendicular and angle bisection to construct a range of geometrical shapes, and also draw these freehand. Children can describe geometric shapes using accurate vocabulary, including for different types of triangle and angle. They can calculate the perimeter and area of a given shape, and draw freehand nets of 3D shapes. Children can demonstrate their understanding of Pythagoras' theorem in practical ways, using manipulatives and/or pictures. Children can first estimate, then weigh and measure accurately to decimal places, converting between units (e.g. cm to m; g to kg). They can read and write the time in both analogue and digital formats, and using both 12 and 24 hour conventions. Children can solve multi-step word problems in

- solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number - add and subtract fractions with the same denominator. - recognise and write decimal equivalents of any number of tenths or hundredths - recognise and write decimal equivalents to ¼ , ½, ¾ - find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths - add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions **Measurement** - read, write and convert time between analogue and digital 12- and 24-hour clocks - solve problems involving converting from hours to minutes; minutes to seconds; - measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres - find the area of rectilinear shapes by counting squares **Geometry - properties of shapes (form drawing)** - Use ruler and compass accurately - Draw, recognise and name different common geometrical shapes - Draw polygons using freehand, or approximate divisions of the circle - measure the perimeter of simple 2-D shapes	measurement of time, length, weight, capacity and volume using all four operations. **Competent Data Handling** Children can use simple coordinates to plot points on a grid and extract data from a grid. They can find information from a table or chart and use this information to solve a given problem, for example solving a word problem using a timetable.

Maths Age-related Learning Opportunities for C6	Relevant Learning Descriptors
Children should have the opportunity: **Number - number and place value** - read, write, order and compare numbers up to 10 000 000 and determine the value of each digit - Rounds any whole number to a required degree of accuracy - Uses negative numbers in context and calculates intervals across zero - Count forwards and backwards in steps of powers of 10 for any number up to 10,000,000 - Multiply and divide any number by 10,100 and 1000. **Number - addition and subtraction**	**Secure Number** Pupils have a sound understanding of the number system, including indices/powers and place value. They can order any whole numbers and decimals to four places as well as common fractions, and compare decimals, fractions and percentages, using the appropriate mathematical symbols to denote relationships (= ≠ < > ≤ ≥). Pupils can also express the relationship of two numbers with ratio notation, reducing to the simplest form. Pupils can use a range of strategies to perform both mental and written calculations with integers, decimals, proper and improper fractions and mixed numbers, using all four operations. This is supported by a fluent

- Solves addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why perform mental calculations, including with mixed operations and large numbers
- Uses estimation to check answers to calculations and determines, in the context of a problem, an appropriate degree of accuracy

Number - multiplication and division
- Multiplies multi-digit numbers up to four digits by a two-digit whole number using the formal written method of long multiplication
- Divides numbers up to four digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.
- identify common factors, common multiples, and prime numbers

Number – fractions (including decimals)
- use common factors to simplify fractions; use common multiples to express fractions in the same denomination
- compare and order fractions, including fractions > 1
- add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions
- multiply simple pairs of proper fractions, writing the answer in its simplest form
- divide proper fractions by whole numbers
- Uses written division methods in cases where the answer has up to two decimal places
- Solves problems which require answers to be rounded to specified degrees of accuracy
- Recalls and uses equivalences between simple fractions, decimals, and percentages, including in different contexts
- multiply one-digit numbers with up to two decimal places by whole numbers
- use written division methods in cases where the answer has up to two decimal places

Measurement
- Measurement Uses, reads, writes, and converts between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places

Geometry
- Compares and classifies geometric shapes based on their properties and sizes and finds unknown

knowledge of number facts and times tables. Pupils can apply all of their arithmetic skills to multi-step word problems, including those involving time, length, weight, capacity and volume, abstracting the key information and breaking the problem down into logical, solvable steps, and explaining the calculation in their own words. Pupils can use their arithmetic knowledge and understanding in relation to simple business maths, calculating simple and compound interest, applying formulae such as VAT, price rises/decreases and discounts, and calculating profit and loss.

Secure Shape, Space and Measure
Pupils can construct shapes and forms with clean lines, using precise measurements and accurate angles. They can describe angles using appropriate terminology (obtuse, acute, reflex, right-angle, perpendicular, parallel, similar, complementary, supplementary etc). Pupils can use their understanding of formulae such as the sum of the angles of a triangle or the principal cases for the congruency of triangles to solve problems such as finding a missing angle and prove their answer. They can plot points and shapes onto coordinate axes, accurately rotating, translating and reflecting triangles and quadrilaterals. Pupils can find the perimeter and area of more complex shapes, and the volume of cuboids.

Secure Data Handling
Pupils can ask questions to generate data, and record answers in tables or charts. They can represent and display data using block graphs, line graphs or pictograms. Pupils can read, interpret and draw line graphs, extracting information to solve problems or draw conclusions. They can find the three types of average and the range of a set of integers. Pupils can identify and talk about relationships and patterns within sets of data, using tables, graphs and/or diagrams.

- angles in any triangles, quadrilaterals and regular polygons
- Draw 2-D shapes using given dimensions and angles
- Draw 2-D shapes using given dimensions and angles
- Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.
- recognise when it is possible to use formulae for area and volume of shapes
- calculate the area of parallelograms and triangles

Statistics
- Calculates and interprets the mean as an average interpret and construct pie charts and line graphs and use these to solve problems.

Algebra
- Uses simple formulae
- Understand that 2e represents 2 x e or 2 lots of e - Solve a simple algebraic formula.

Ratio and Proportion*
- Solves problems involving the calculation of percentages eg of measures and calculations such as 15 per cent of 360, and the use of percentages for comparison
- Solves problems involving unequal sharing and grouping using knowledge of fractions and multiples

Maths Age-related Learning Opportunities for C7	Relevant Learning Descriptors
Children should have the opportunity:	**Proficient Number**
Number - number and place value	Pupils have a sound understanding of the number system, including place value. They can order any whole numbers, decimals and fractions, convert between decimals, fractions and percentages, express the relationship between two numbers as a ratio, identify prime numbers, calculate the square and estimate the square root of a number. Pupils can use a range of strategies to perform both mental and written calculations with integers, decimals, proper and improper fractions and mixed numbers, using all four operations and applying the rules for the correct order of operations. They can round numbers, including recurring decimals, to a given number of decimal places or significant figures. Pupils can calculate with negative numbers, and can describe numbers using mathematical vocabulary. They can apply all of their arithmetic skills to multi-step word problems, including
• Order, sort and interpret any number (including decimals and negatives).	
• Use and apply BIDMAS to the number system, ensuring the calculations are carried out in order.	
Number - addition and subtraction	
• Explore and understand rules for adding and subtracting positive and negative integers.	
Number - multiplication and division	
• Understand and apply the concept of multiples, factors and primes individual, pairs or groups of numbers. For example, finding the Lowest Common Multiples of a pair of numbers.	
• Use place value to multiply and divide any number by powers of 10.	
• Multiply and divide negative numbers.	
Number – fractions (including decimals)	

- Round any number to any specified degree of accuracy, including decimals and measures.
- Understand the concept of percentages and use this to find percentages of a quantity.
- Compare the result of two percentage calculations. For example, 15% of 40 and 10% of 50.
- Understand the interrelated nature of fractions, decimals, and percentages, converting between them and ordering with increasing fluency.
- Add, subtract, and multiply fractions fluently.
- Use formal methods for addition, subtraction, multiplication, and division fluently including increasingly complex decimals.

Geometry
- Use the properties and vocabulary of 3D shapes and their nets to solve problems.
- Calculate the area and perimeter of a variety of 2D and compound shapes, including triangles using a formula.
- Represent 3D shapes in 2D.
- Work with shapes on a 4-quadrant grid to translate, reflect and rotate in any direction or plane.
- Use a ruler and a protractor to draw accurately.
- Recognise, describe, and name all common 2D shapes and apply angle facts to solve a variety of problems.

Measurement
- Understand and use place value when using different measures of length, mass, time and volume changing freely between different units of metric measures.

Statistics
- Create, use and interpret a variety of different tables and graphs to observe and analyse statistical information including; stem and leaf diagrams, vertical line charts and pie charts.
- Use the mode, median, mean and range fluently to compare, describe and analyse groups of data.

Algebra
- Use and interpret algebraic notation including ab (a x b) 3y (3 x y), substituting numerical values into formula to find the value of an equation.
- Combine variables within an equation or expression and simplify by collecting like terms.
- Recognise and use the relationships between operations and use inverse to change the subject of a formula.

those involving time, length, weight, capacity and volume, abstracting the key information and breaking the problem down into logical, solvable steps, and explaining the calculation in their own words.They can apply their knowledge and understanding of negative numbers to a simple balance sheet.

Proficient Algebra
Pupils can use and interpret algebraic notation, simplifying and manipulating algebraic expressions to maintain equivalence, and solving simple and linear equations.

Proficient Shape, Space and Measure
Pupils can calculate the perimeter and area of any shape. They can plot points and shapes onto coordinate axes, accurately rotating, translating and reflecting given figures. Pupils can use Pythagoras' theorem to solve problems involving right-angled triangles, and use known results to obtain simple proofs. They understand that a tangent forms a right angle with the radius at the point of intersection. Pupils can use the principles of perspective drawing to realistically depict three-dimensional objects in a two-dimensional plane.

Proficient Data Handling
Pupils can design useful questions and effective collection methods to generate, gather and record both qualitative and quantitative data. They can represent and display collected information in a range of appropriate ways, demonstrating their understanding of the conventions of tables, graphs and diagrams, e.g. axis, row and column labels, legends etc. Pupils can read, interpret and draw line graphs, extracting information to solve problems or draw conclusions. They can find the mean, median and mode of a set of numbers. Pupils can identify and talk about relationships and patterns within sets of data, using tables, graphs and/or diagrams.

● Use and interpret bracket notation with algebraic equations, multiplying out a single bracket. ● Plot a linear function on a graph from an equation and interpret mathematically. ● Understand linear sequences and finding a formula to solve the next and nth terms.

Maths Age-related Learning Opportunities for C8	Relevant Learning Descriptors
Children should have the opportunity: **Number - number and place value** ● Order, sort and interpret any number (including decimals and negatives). ● Understand the interrelated nature of fractions, decimals, and percentages, converting between them and ordering with increasing fluency. **Number - addition and subtraction** ● Explore and understand rules for calculating with negative numbers. **Number - multiplication and division** ● Understand and apply the concept of multiples, factors and primes individual, pairs, or groups of numbers. ● Use and apply BIDMAS to the number system, ensuring the calculations are carried out in order including using powers and roots. **Number – fractions (including decimals)** ● Round any number to any specified degree of accuracy, including decimals and measures. ● Understand how to round to any given number of significant figures and use approximation to check and verify answers. ● Work with percentages below and above 100% solving problems that involve percentage increase, percentage change over time and reverse percentages. For example 120% = 40 what was 100%? ● Add, subtract, and multiply fractions fluently including working with mixed and improper fractions ● Divide fractions by multiplying by the reciprocal with proper and improper fractions. **Measurement and Geometry** ● Derive Pythagoras theorem by modelling it and use the formula to work out the length of a side in a simple right angled triangle. ● Know and apply corresponding, alternate and allied rules for angles and use them to problem solve.	**Mature, Independent Number** Pupils have a sound understanding of the number system, including place value. They can order any whole numbers, decimals and fractions, convert between decimals, fractions and percentages, express the relationship between two numbers as a ratio, identify prime numbers, calculate the square and estimate the square root of a number. Pupils can use a range of strategies to perform both mental and written calculations with integers, decimals, negative numbers, proper and improper fractions and mixed numbers, using all four operations. They can round any number to a given number of decimal places or significant figures. Pupils can use mathematical vocabulary appropriately. They can apply all of their arithmetic skills to multi-step word problems, including those involving time, length, weight, capacity and volume, abstracting the key information and breaking the problem down into logical, solvable steps, and explaining the calculation in their own words. Pupils can complete a simple balance sheet and solve problems involving the calculation of interest on mortgages. **Mature, Independent Algebra** Pupils can use and interpret algebraic notation, simplifying and manipulating algebraic expressions to maintain equivalence, and solving linear equations. Pupils can draw the graph of a linear equation. They can calculate the gradient and work out the y-intercept of a line from a graph and use these to build the equation of the line. **Mature, Independent Shape, Space and Measure** Pupils can calculate the volume and surface area of a range of shapes, and compare their densities. They can construct different types of conic section and plot the loci of lines and planes. Pupils can use coordinate axes to enlarge given figures. They can identify and apply circle definitions and properties, including centre, radius, diameter, circumference, tangent, arc, sector and segment, and can construct

- Use a ruler, protractor and compass to draw accurately including constructing triangles, perpendicular bisectors and scale drawings.
- Use the properties and vocabulary of 3D shapes and their nets to solve problems.
- Calculate the area of a parallelogram and trapezium using a formula.
- Represent 3D shapes in 2D
- Use a formula to calculate the volume of a prism (derived from the area of a surface multiplied by the length).
- Work with shapes on a 4 quadrant grid to translate, reflect and rotate in any direction or plane.
- Enlarge a shape by a given scale factor and identify congruent shapes
- Work with and apply circle geometry to find the circumference and area of a circle using Pi.

Statistics
- Create, use and interpret a variety of different tables and graphs to observe and analyse statistical information including stem and leaf diagrams, vertical line charts, pie charts and scatter graphs; including information that has been grouped.
- Use the mode, median, mean and range fluently to compare, describe and analyse groups of data.
- Use and interpret grouped frequency tables.

Algebra
- Understand a relationship between two quantities and use this information to solve problems involving direct and inverse proportion; including algebraic representations.
- Work with, rearrange and solve increasing complex algebraic equations involving brackets and variables and constants and both sides of the equals sign.
- Use and interpret bracket notation with algebraic equations, multiplying out double brackets and factorising a single bracket.
- Plot a linear function on a graph from an equation and interpret mathematically in relation to the equation of a straight line $y = mx + c$.
- Understand linear sequences and finding a formula to solve the next and nth terms.

orthogonal curves. Pupils can use Pythagoras' theorem to solve problems, including finding the altitude of a given triangle. They can find the internal and external angles of polygons. Pupils can use the principles of perspective drawing to realistically depict three-dimensional objects in a two-dimensional plane.

Mature, Independent Data Handling
Pupils can find the mean, median, mode and range of a set of numbers. They can record, describe and analyse the frequency of outcomes of simple probability experiments, enumerating these using tables, grids and/or Venn diagrams. Pupils can identify and describe simple mathematical relationships between two variables in observational and experimental contexts, illustrating this using, for example, a scatter graph.