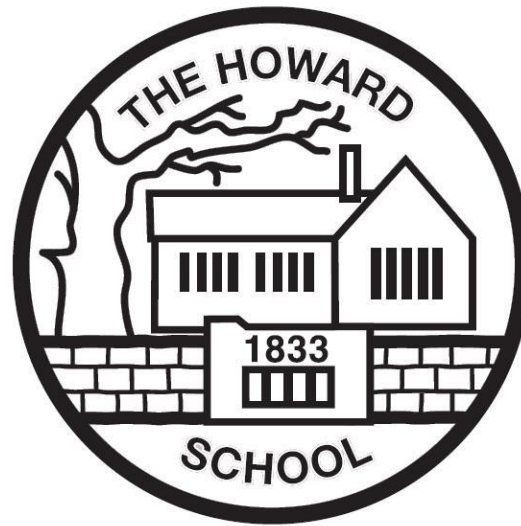


Ackworth Howard C of E School

Educating for 'life in all its fullness.'



Mathematics Curriculum – Essential Knowledge

Rationale

Why we teach Maths in the way we do...

- Embedding the Mastery Maths approach and utilising White Rose Maths – it is a cumulative scheme so that once a topic is covered it is met many times again, in a range of contexts.
- Covers the national curriculum in detail and secures understanding of concepts through pictorial, concrete and abstract activities.
- Structure – Review, Fluency, Modelling / Instruction, Reasoning / Problem solving
- Flashback 4 allows for regular review of previous learning in current and previous year groups (Rosenshine's principles of instruction – regular review)
- Promotes a culture of deep understanding, confidence and competence in mathematics – that produces strong, secure learning and real progress.
- Shaping assured, happy and resilient mathematicians who relish the challenge of maths. They become independent, reflective thinkers, whose skills not only liberate them in maths but also support them across the curriculum.

Intent

At Ackworth Howard J&I School, we believe that our Mathematics curriculum should develop: the mind (creative and critical thinkers, continuous improvement, foundations for understanding the world and curiosity of it); body (emotional intelligence and the ability to persevere with a resilient nature to any problems); and spirit (understanding how to thrive in the community of their class, working with each other to embrace change and challenge) of each child.



Mind

Mathematics at Ackworth Howard school is carefully designed to inter-connect, coherently progress and provide solutions to intriguing problems. Children develop critical thinking skills throughout their time in school, through becoming fluent in the fundamentals; having regular opportunities to reason and solve problems. This leads to a better understanding of the world around them; an enduring curiosity and ambition to improve continuously. The carefully mapped opportunities for learning across other subjects, ensures a deep-rooted understanding of Mathematics within real contexts.



Body

The Mathematics curriculum is designed to enable learners to build a resilient nature and persevere with challenging problem-solving and reasoning skills that can be applied to all aspects of their learning and life. It will enable children to develop their emotional intelligence as well as their logical capability, to equip them with the tools for life-long learning.



Spirit

Through a challenging and engaging Mathematics curriculum, learners will thrive in the community of their class, demonstrating how to work with others to achieve the best possible outcomes through supporting themselves and others. They will be confident to embrace change and welcome challenges as a result of their resilient natures.

How we create Mathematicians...

- Children will become fluent in the basics of mathematics through a range of activities including 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.
- Every child has regular opportunity to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language appropriately challenging for their age.
- All children have the opportunity to solve problems by applying their mathematics to a variety of problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.
- By the end of each Key Stage, pupils will know, apply and understand the matters, skills and processes specified in the relevant programme of study for Mathematics.
- Regular opportunities are given to each child to make their thinking clear to themselves and others.
- All children build secure foundations in Mathematics through using a wide range of mathematical vocabulary, experiencing quality discussion that develops their ability to present mathematical justification, argument and proof.
- Using correct mathematical language is crucial for thinking, learning and communicating mathematically.

Early Years Mathematics

Area of Learning

Mathematics

Early years outcomes are prerequisite skills for Mathematics within the National Curriculum. The table outlines the most relevant Early Years outcomes from 3 and 4 year olds to Early Learning Goal, brought together from different areas of the Early Years Foundation Stage, to match the programme of study for Mathematics.

This involves providing children with opportunities to:

- Develop their mathematical vocabulary
- Explore number and place value through counting; identifying, representing and estimating numbers; reading and writing numbers; comparing and ordering numbers and problem solving.
- Explore addition and subtraction including mental calculations and problem solving.
- Encounter measurement, including the opportunity to describe, measure, compare and solve problems relating to size, length, weight and capacity.
- Begin to explore the concept of time.
- Explore the properties of shapes including recognising 2D and 3D shapes and their properties; comparing and classifying shapes.
- Develop understanding of position, direction, movement and patterns.
- Explore statistics through opportunities to record, present and interpret data.

Ackworth Howard's Knowledge Essentials

Mathematical Vocabulary:

3 and 4 Year olds

- Use a wider range of vocabulary.
- Understand 'why' questions, like: "why do you think the caterpillar is so fat?"

Reception

- Learn new vocabulary.
- Use new vocabulary throughout the day.

Early Learning Goal

- Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary.

Number and Place Value - Counting:

3 and 4 Year olds

- Recite numbers past 5.
- Say one number name for each item in order: 1, 2, 3, 4, 5.
- Know that the last number reached when counting a small set of objects tells you how many there are in total ('cardinal principle').

Reception

- Count objects, actions and sounds.
- Count beyond ten.

Early Learning Goal

- Verbally count beyond 20, recognising the pattern of the counting system.

Number and Place Value – Identifying, Representing and Estimating Numbers:

3 and 4 Year olds

- Fast recognition of up to 3 objects, without having to count them individually ('subitising').
- Show 'finger numbers' up to 5.
- Link numerals and amounts: for example, showing the right number of objects to match the numeral, up to 5.
- Experiment with their own symbols and marks as well as numerals.

Reception

- Subitise.
- Link the number symbol (numeral) with its cardinal number value..

Early Learning Goal

- Subitise (recognising quantities without counting) up to 5.

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Ackworth Howard's Knowledge Essentials

Number and Place Value – Reading and Writing Numbers

3 and 4 Year olds

- Link numerals and amounts: for example, showing the right number of objects to match the numeral, up to 5.
- Experiment with their own symbols and marks as well as numerals.

Reception

- Link the number symbol (numeral) with its cardinal number value.

Number and Place Value – Compare and Order Numbers

3 and 4 Year olds

- Compare quantities using language: 'more than', 'fewer than'.

Reception

- Compare numbers.

Early Learning Goal

- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity.

Number and Place Value – Understanding Place Value

Reception

- Understand the 'one more than/one less than' relationship between consecutive numbers.
- Explore the composition of numbers to 10.

Early Learning Goal

- Have a deep understanding of numbers to 10, including the composition of each number.

Number and Place Value – Solve Problems

3 and 4 Year olds

- Solve real world mathematical problems with numbers up to 5.

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Ackworth Howard's Knowledge Essentials

Addition and Subtraction – Mental Calculations

Reception

- Automatically recall number bonds for numbers 0-10.

Early Learning Goal

- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.

Addition and Subtraction – Solve Problems

Reception

- Subitise.
- Link the number symbol (numeral) with its cardinal number value.

Early Learning Goal

- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed evenly.

Measurement – Describe, Measure, Compare and Solve (All Strands)

3 and 4 Year olds

- Make comparisons between objects relating to size, length, weight and capacity.

Reception

- Compare length, weight and capacity.

Measurement – Telling the time

3 and 4 Year olds

- Begin to describe a sequence of events, real or fictional, using words, such as 'first', 'then...'

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Ackworth Howard's Knowledge Essentials

Properties of Shapes – Recognise 2D and 3D shapes and their properties

3 and 4 Year olds

- Talk about and explore 2D and 3D shapes (for example, circles, rectangles, triangles and cuboids) using informal and mathematical language: 'sides', 'corners', 'straight', 'flat', 'round'.
- Select shapes appropriately: flat surfaces for a building, a triangular pattern for a roof, etc.
- Combine shapes to make new ones – an arch, a bigger triangle, etc.

Reception

- Select, rotate and manipulate shapes in order to develop spatial reasoning skills.

Properties of Shapes – Compare and Classify Shapes

Reception

- Compose and decompose shapes so that children can recognise a shape can have other shapes within it, just as numbers can.

Position and Direction – Position, Direction and Movement

3 and 4 Year olds

- Understand position through words alone – for example, "The bag is under the table," – with no pointing.
- Describe a familiar route.
- Discuss routes and locations, using words like 'in front of' and 'behind'.

Reception

- Draw information from a simple map.

Position and Direction - Patterns

3 and 4 Year olds

- Talk about and identify the patterns around them. For example, stripes on clothes, designs on rugs and wallpaper. Use informal language like 'pointy', 'spotty', 'blobs', etc.
- Extend and create ABAB patterns – stick, leaf, stick, leaf.
- Notice and correct an error in a repeating pattern.

Reception

- Continue, copy and create repeating patterns.

Statistics – Record, Present and Interpret Data

3 and 4 Year olds

- Experiment with their own symbols and marks, as well as numerals.

Early Years Mathematics Vocabulary

Essential Vocabulary

NUMBER

Number	Place value	Estimating	Addition and subtraction	Multiplication and division	Fractions
zero number one, two, three ... to twenty and beyond teens numbers, eleven, twelve ... twenty none how many ...? count, count (up) to, count on (from, to), count back (from, to) count in ones, twos, fives, tens is the same as more, less few pattern pair	ones tens digit the same number as, as many as more, larger, bigger, greater fewer, smaller, less fewest, smallest, most, biggest, largest, one more, ten more one less, ten less compare order size first, second, third... twentieth last, last but one before, after next between	guess how many ...? nearly close to about the same as just over, just under too many, too few, enough, not enough	add, more, and make, sum, total altogether double one more, two more ... ten more how many more to make...? how many more is...than...? how much more is...? take away how many are left/left over? how many have gone? one less, two less, ten less ... how many fewer is ... than ...? how much less is ...?	sharing doubling halving number patterns	parts of a whole half quarter

Early Years Mathematics Vocabulary

Essential Vocabulary

MEASUREMENT

Measuring measure size compare guess, estimate enough, not enough too much, too little too many, too few nearly, close to, about the same as just over, just under	Length metre length, height, width, depth long, short, tall high, low wide, narrow thick, thin longer, shorter, taller, higher ... and so on longest, shortest, tallest, highest ... and so on far, near, close	Weight weigh, weighs, balances heavy, light heavier than, lighter than heaviest, lightest scales	Capacity and volume full empty half full holds container	Time time days of the week, Monday, Tuesday ... day, week birthday, holiday morning, afternoon, evening, night bedtime, dinner time, playtime today, yesterday, tomorrow before, after next, last now, soon, early, late quick, quicker, quickest, quickly slow, slower, slowest, slowly old, older, oldest new, newer, newest takes longer, takes less time hour, o'clock clock, watch, hands	Money money coin penny, pence, pound price, cost buy, sell spend, spent pay
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Early Years Mathematics Vocabulary

Essential Vocabulary				
<u>GEOMETRY</u>			<u>STATISTICS</u>	<u>GENERAL</u>
Properties of shape shape, pattern flat curved, straight round hollow, solid sort make, build, draw size bigger, larger, smaller symmetrical pattern, repeating pattern match	2-D shape corner, side rectangle (including square) circle triangle 3-D shape face, edge, vertex, vertices cube pyramid sphere cone	Position and direction position over, under above, below top, bottom, side on, in outside, inside around in front, behind front, back beside, next to opposite apart between middle, edge corner direction left, right up, down forwards, backwards, sideways across next to, close, near, far along through to, from, towards, away from movement slide roll turn stretch, bend whole turn, half turn	Statistics count, sort group, set list	General pattern puzzle what could we try next? how did you work it out? recognise describe draw compare sort

Early Years Mathematics Vocabulary

Essential Vocabulary

Intended Learning Outcomes

- Rote count and count a variety of different objects.
- Make collections of things which are of interest to them.
- Sort, match and classify.
- See and make use of written numerals.
- Compare, estimate and measure.
- Make marks in play situations which communicate mathematical meaning.
- Investigate and solve practical problems.
- Test theories and ideas.

Key Vocabulary and Questions

- Number names and number songs.
- Number, numeral, count, add, more, less, take away, fewer, same.
- 2D shape names e.g. circle, triangle, square, rectangle, and terms sides/corners to describe.
- 3D shape names e.g. sphere, cube, cuboid, cylinder, cone and terms faces and corners to describe.
- Names of other equipment available.
- Measuring vocabulary – tall(er) short(er), heavy/ heavier, light/lighter, long(er), thin, wide.
- Positional language – in front, behind, next to, under, above, on top etc.
- Pattern. Can you count...? Do you know / can you sing...? What could you do with these shapes? Tell me about these shapes...? Where shall we put...? How did you...? How could you make it longer/ shorter/taller? How can you find the total...? What comes next in the pattern...? How did you do that/work that out...?

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Place Value:

Pupils should be taught to:

- 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
- 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.

Pupils practise counting (1, 2, 3...), ordering (for example, first, second, third...), and to indicate a quantity (for example, 3 apples, 2 centimetres), including solving simple concrete problems, until they are fluent.

Pupils begin to recognise place value in numbers beyond 20 by reading, writing, counting and comparing numbers up to 100, supported by objects and pictorial representations.

They practise counting as reciting numbers and counting as enumerating objects, and counting in twos, fives and tens from different multiples to develop their recognition of patterns in the number system (for example, odd and even numbers), including varied and frequent practice through increasingly complex questions.

They recognise and create repeating patterns with objects and with shapes.

In Year 1, children will be taught to understand the place value of numbers through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

Numbers to 10

- sort objects by characteristics as a precursor to counting (colour, shape, pattern, use)
- count objects reliably to 10
- understand that one object can represent another (1 elephant = 1 counter)
- count, read and write forwards from any number 0 to 10
- count, read and write backwards from any number 0 to 10
- count one more and count one less
- one to one correspondence to start to compare groups
- compare groups using the language such as equal, more/greater, less/fewer
- introduce < > and = symbols
- compare numbers using previous learning and range of concrete / pictorial resources
- order groups of objects through comparing quantities
- use concrete and pictorial representations to order numbers, using vocabulary 'smallest' 'greatest'
- explore the positional aspect of numbers - ordinal numbers (1st, 2nd, 3rd...)
- use a number line to practise and consolidating counting so far and develop counting from zero

Numbers to 20

- count forwards and backwards and write numbers to 20 in numerals and words
- use a range of representations (concrete and pictorial) to explore numbers from 11 to 20
- to explore the concept of tens and ones
- count one more and one less through application of counting skills
- compare groups of objects using 'less than' 'greater than' and 'equal to'
- compare numbers up to 20
- order groups of objects up to 20
- order abstract digits 0 – 20 (can use concrete materials or order pictorially)

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

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Pupils practise counting (1, 2, 3...), ordering (for example, first, second, third...), and to indicate a quantity (for example, 3 apples, 2 centimetres), including solving simple concrete problems, until they are fluent.

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They recognise and create repeating patterns with objects and with shapes.

Numbers to 50

- count forwards and backwards with numbers to 50
- develop understanding of tens and ones, using practical equipment to represent numbers to 50
- continue to represent numbers to 50 using a variety of concrete materials
- apply previous learning to find one more one less of given numbers up to 50
- compare two sets of objects within 50, using the language 'more than' 'less than' and 'equal to'
- compare numbers within 50, using the inequality symbols
- order numbers within 50, using inequality symbols and in ascending/descending order
- count in 2s beyond 20 and up to 50
- count in 5s beyond 20 and up to 50

Numbers to 100

- count forwards and backwards with numbers to 100, including grouping tens to make counting more efficient
- partition numbers in to tens and ones with some use of place value charts
- use partitioning knowledge to begin to compare numbers to 100
- use the < > = symbols and comparison language to compare numbers to 100
- order sets of objects and numbers from smallest to largest and largest to smallest (use the language 'most', 'bigger', 'biggest', 'larger', 'largest', 'smaller', 'smallest' and 'least'.) Revisit and practise position and ordinal numbers (first, second, third etc.)
- find one more and one less than given numbers or amounts to 100

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Addition and Subtraction:

Pupils should be taught to:

- 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 $7 = \square - 9$.

Pupils memorise and reason with number bonds to 10 and 20 in several forms (for example, $9 + 7 = 16$; $16 - 7 = 9$; $7 = 16 - 9$). They should realise the effect of adding or subtracting zero. This establishes addition and subtraction as related operations.

Pupils combine and increase numbers, counting forwards and backwards.

They discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.

Addition and Subtraction

In Year 1, children will be taught to develop their understanding of addition and subtraction through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore addition by counting on from a given number. They begin to understand that addition is commutative and that it is more efficient to start from the largest number
- work systematically to find all the possible number bonds to 20 and use their knowledge of number bonds to 10 to find number bonds to 20
- add by making 10 (use knowledge of number bonds to add numbers within 20)
- build on the language of subtraction, recognising and using the subtraction symbol within 20 – not crossing 10
- subtraction – crossing 10, using the partitioning strategy.
- subtraction – crossing 10, begin to understand the different structures of subtraction (taking away, partitioning, difference)
- explore addition and subtraction fact families for numbers within 20, recognising that addition and subtraction are inverse operations
- compare number sentences using inequality symbols for numbers within 20

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Multiplication and Division:

Pupils should be taught to:

- solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Through grouping and sharing small quantities, pupils begin to understand: multiplication and division; doubling numbers and quantities; and finding simple fractions of objects, numbers and quantities. They make connections between arrays, number patterns, and counting in twos, fives and tens.

Fractions:

Pupils should be taught to:

- recognise, find and name a half as one of two equal parts of an object, shape or quantity
- recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.

Pupils are taught half and quarter as 'fractions of' discrete and continuous quantities by solving problems using shapes, objects and quantities. For example, they could recognise and find half a length, quantity, set of objects or shape. Pupils connect halves and quarters to the equal sharing and grouping of sets of objects and to measures, as well as recognising and combining halves and quarters as parts of a whole.

Multiplication and Division

In Year 1, children will be taught to develop their understanding of multiplication and division through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- count in groups of 10 (building on counting in 2s and 5s)
- explore making equal groups by using stories which link to pictures and concrete manipulatives to explore making equal groups and write statements such as 'there are ____ groups of ____.'
- use equal groups to find a total. They focus on counting equal groups of 2, 5 and 10 and explore this within 50.
- begin to make arrays by making equal groups and building them up in columns or rows
- explore doubling with numbers up to 20
- explore making equal groups (grouping) by starting with a given total and making groups of an equal amount. They record their understanding in sentences, not through formal division at this stage.
- make equal groups – sharing. Explore sharing as a model of division. They use 1 : 1 correspondence to share concrete objects into equal groups.

Fractions

In Year 1, children will be taught to develop their understanding of fractions through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- Explore finding a half for the first time using shapes and sets of objects and use the vocabulary 'half' and 'whole'.
- Use their understanding of finding half of an object or shape and apply this to finding half of a small quantity.
- Children explore quarters for the first time. They develop their understanding of equal parts and non-equal parts and relate this to a shape or object being split up into four equal parts.
- Children find a quarter of a small quantity through equal sharing.

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Pupils should be taught to:

- compare, describe and solve practical problems for:
 - lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]
 - mass/weight [for example, heavy/light, heavier than, lighter than]
 - capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]
 - time [for example, quicker, slower, earlier, later]
- measure and begin to record the following:
 - lengths and heights
 - mass/weight
 - capacity and volume
 - time (hours, minutes, seconds)
- recognise and know the value of different denominations of coins and notes
- sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]
- recognise and use language relating to dates, including days of the week, weeks, months and years
- tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.

The pairs of terms: mass and weight, volume and capacity, are used interchangeably at this stage. Pupils move from using and comparing different types of quantities and measures using non-standard units, including discrete (for example, counting) and continuous (for example, liquid) measurement, to using manageable common standard units. In order to become familiar with standard measures, pupils begin to use measuring tools such as a ruler, weighing scales and containers. Pupils use the language of time, including telling the time throughout the day, first using o'clock and then half past.

Length and Height

In Year 1, children will be taught to understand the length and height aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- compare lengths and heights, use and understand the language of length such as long, longer, short, shorter, tall, taller.
- use non-standard units, such as cubes, hands and straws to explore and measure length and height
- build on prior knowledge of measuring length and height using non-standard units and apply this to measuring using a ruler.

Weight and Volume

In Year 1, children will be taught to understand the weight and volume aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore weight and mass by holding objects and describing them using vocabulary such as heavy, light, heavier than, lighter than, before using the scales to check.
- begin using a variety of non-standard units (e.g. cubes, bricks) to measure the mass of an object.
- continue to use non-standard units to weigh objects and focus on comparing the mass of two objects – develop to use < > and = to compare mass.
- introduce concepts of volume and capacity and explore the concept in a practical way, using a variety of containers.
- compare the volume in a container by describing whether it is full, nearly full, empty or nearly empty.
- measure the capacity of different containers using non-standard units of measure (for example cup, spoon, pot, bucket).
- compare the capacity of different containers using non-standard units of measure. They use 'more', 'less' and 'equal to' to compare as well as the symbols < > and =

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Pupils should be taught to:

- compare, describe and solve practical problems for:
 - lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]
 - mass/weight [for example, heavy/light, heavier than, lighter than]
 - capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]
 - time [for example, quicker, slower, earlier, later]
- measure and begin to record the following:
 - lengths and heights
 - mass/weight
 - capacity and volume
 - time (hours, minutes, seconds)
- recognise and know the value of different denominations of coins and notes
- sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]
- recognise and use language relating to dates, including days of the week, weeks, months and years
- tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.

The pairs of terms: mass and weight, volume and capacity, are used interchangeably at this stage. Pupils move from using and comparing different types of quantities and measures using non-standard units, including discrete (for example, counting) and continuous (for example, liquid) measurement, to using manageable common standard units. In order to become familiar with standard measures, pupils begin to use measuring tools such as a ruler, weighing scales and containers. Pupils use the language of time, including telling the time throughout the day, first using o'clock and then half past.

Money

In Year 1, children will be taught to understand the money aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recognising coins – pupils will recognise and know the value of different denominations of coins. They will use their understanding of place value to match coins with equivalent values.
- recognising notes – pupils will use their understanding of place value to recognise that one note can represent many pounds.
- counting in coins – combine their knowledge of money with counting in 2s, 5s and 10s to count money more efficiently.

Time

In Year 1, children will be taught to understand the time aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use the terms 'before' and 'after' to describe, sort and order events (*moving on to first, next, morning, afternoon and evening*)
- dates – learn the days of the week and know there are 7.
- Talk about events using 'today' 'tomorrow' 'yesterday'
- Learn the months of the year and identify important dates (including their birthday)
- tell the time to the hour – introduced using analogue clocks. Explore language of 'o'clock' 'hour hand' (shorter) 'minute hand' (longer)
- tell the time to the half hour – understand that the minute hand has travelled halfway through the hour. Use the language 'half past'
- explore the difference between seconds, minutes and hours, deciding upon the most suitable measurement for a particular activity. Explore suitable equipment for recording the time (stopwatches)
- compare amounts of time using the language faster, slower, earlier and later

Year 1

National Curriculum

Ackworth Howard's Knowledge Essentials

GEOMETRY

Geometry – Properties of shapes:

Pupils should be taught to:

- recognise and name common 2-D and 3-D shapes, including:
 - 2-D shapes [for example, rectangles (including squares), circles and triangles]
 - 3-D shapes [for example, cuboids (including cubes), pyramids and spheres].

Pupils handle common 2-D and 3-D shapes, naming these and related everyday objects fluently. They recognise these shapes in different orientations and sizes, and know that rectangles, triangles, cuboids and pyramids are not always similar to each other.

Geometry – Position and Direction:

Pupils should be taught to:

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

Pupils use the language of position, direction and motion, including: left and right, top, middle and bottom, on top of, in front of, above, between, around, near, close and far, up and down, forwards and backwards, inside and outside. Pupils make whole, half, quarter and three-quarter turns in both directions and connect turning clockwise with movement on a clock face.

Properties of Shape

In Year 1, children will be taught to understand the Properties of Shape aspect of Geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- Recognise and name 3-D shapes (cuboid – including cubes, cylinders, pyramids, cones and spheres)
- sort and group 3-D shapes according to simple properties, including type, size and colour.
- recognise 2-D shapes as the faces of 3-D shapes.
- recognise and name 2-D shapes (triangles, squares, rectangles and circles) and understand they are flat.
- sort and group 2-D shapes according to simple properties, including type, size and colour.
- use 3-D and 2-D shapes to make patterns focusing on different shapes, sizes and colours.

Position and Direction

In Year 1, children will be taught to understand the Position and Direction aspect of Geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use the language 'full', 'half', 'quarter' and 'three quarter' to describe turns made by shapes/objects.
- use 'left', 'right', 'forwards' and 'backwards' to describe position and direction.
- describe the position of objects and shapes from different starting positions.
- build upon directional language 'left' and 'right' to assist with describing position. They will describe position using: 'top', 'in between', 'bottom', 'above' and 'below'.

Year 1 Mathematics Vocabulary

Year 1 - **New Essential Vocabulary** (In addition to Early Years Vocabulary)

NUMBER

Number	Place value	Estimating	Addition and subtraction	Multiplication and division	Fractions
zero number one, two, three ... to twenty and beyond teens numbers, eleven, twelve ... twenty none how many ...? count, count (up) to, count on (from, to), count back (from, to) count in ones, twos, fives, tens is the same as more, less few pattern pair	ones tens digit the same number as, as many as more, larger, bigger, greater fewer, smaller, less fewest, smallest, most, biggest, largest, one more, ten more one less, ten less compare order size first, second, third... twentieth last, last but one before, after next between	guess how many ...? nearly close to about the same as just over, just under too many, too few, enough, not enough	add, more, and make, sum, total altogether double one more, two more ... ten more how many more to make...? how many more is...than...? how much more is...? take away how many are left/left over? how many have gone? one less, two less, ten less ... how many fewer is ... than ...? how much less is ...?	sharing doubling halving number patterns	parts of a whole half quarter

Year 1 Mathematics Vocabulary

Year 1 - **New Essential Vocabulary** (In addition to Early Years Vocabulary)

MEASUREMENT

Measuring measurement roughly	Length centimetre ruler metre stick	Weight kilogram, half kilogram	Capacity and volume litre, half litre capacity volume more than less than quarter full	Time months of the year (January, February...) seasons: spring, summer, autumn, winter weekend moth year earlier, later first midnight date how long ago? how long will it be to...? how long will it take to...? how often? always, never, often, sometimes usually once, twice half past, quarter past, quarter to clock face hour hand, minute hand hours, minutes	Money change dear, costs more cheap, costs less, cheaper costs the same as how much...? how many...? total
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Year 1 Mathematics Vocabulary

Year 1 - **New Essential Vocabulary** (In addition to Early Years Vocabulary)

GEOMETRY

STATISTICS

GENERAL

Properties of shape
symmetry
symmetrical pattern

2-D shape
point, pointed

3-D shape
cuboid
cylinder

Position and direction
underneath
centre
journey
quarter turn
three-quarter turn

Statistics
vote
table

General
problem, problem solving
mental, mentally
explain your thinking

Year 2

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Place Value:

Pupils should be taught to:

- count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward
- recognise the place value of each digit in a two-digit number (tens, ones)
- identify, represent and estimate numbers using different representations, including the number line
- compare and order numbers from 0 up to 100; use $<$, $>$ and $=$ signs
- read and write numbers to at least 100 in numerals and in words
- use place value and number facts to solve problems.

Using materials and a range of representations, pupils practise counting, reading, writing and comparing numbers to at least 100 and solving a variety of related problems to develop fluency. They count in multiples of three to support their later understanding of a third. As they become more confident with numbers up to 100, pupils are introduced to larger numbers to develop further their recognition of patterns within the number system and represent them in different ways, including spatial representations. Pupils should partition numbers in different ways (for example, $23 = 20 + 3$ and $23 = 10 + 13$) to support subtraction. They become fluent and apply their knowledge of numbers to reason with, discuss and solve problems that emphasise the value of each digit in two-digit numbers. They begin to understand zero as a place holder.

Place Value

In Year 2, children will be taught to understand the place value of numbers through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- count objects to 100 and read and write numbers in numerals and words.
- represent numbers to 100 using a range of concrete materials (bead strings, straws, Base 10 etc.)
- partition tens and ones with a part-whole model.
- explore how tens and ones can be partitioned and recombined to make a total.
- use concrete, pictorial and abstract representations in a place value chart.
- compare objects using the vocabulary 'more than', 'less than' and 'equal to' and the symbols $<$ $>$ $=$
- compare numbers using the language greater than, less than, more than, fewer, most, least and equal to.
- order objects and numbers from smallest to greatest, and greatest to smallest.
- count forwards and backwards in 2s, 5s and 10s.
- count forwards and backwards in 3s from any multiple of 3.

Year 2

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Addition and Subtraction:

Pupils should be taught to:

- solve problems with addition and subtraction:
 - using concrete objects and pictorial representations, including those involving numbers, quantities and measures
 - applying their increasing knowledge of mental and written methods
- 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
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Pupils extend their understanding of the language of addition and subtraction to include sum and difference. Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using $3 + 7 = 10$; $10 - 7 = 3$ and $7 = 10 - 3$ to calculate $30 + 70 = 100$; $100 - 70 = 30$ and $70 = 100 - 30$. They check their calculations, including by adding to check subtraction and adding numbers in a different order to check addition (for example, $5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5$). This establishes commutativity and associativity of addition. Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.

Addition and Subtraction

In Year 2, children will be taught to understand the addition and subtraction aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- apply understanding of known addition and subtraction facts within 20 to identify all related facts (fact families).
- explore using concrete resources, number lines and estimating as part of a wide range of checking calculation strategies.
- compare number sentences using greater than, less than and equal to symbols.
- explore related facts relationships for similar numbers (e.g. $2 + 7 = 9$ so $20 + 70 = 90$)
- explore multiples of 10, up to 100, developing understanding of bonds to 100 (tens)
- explore what happens when we add and subtract 1s and comment on patterns they see.
- explore and then calculate 10 more and 10 less than a number, commenting on what happens to tens and ones.
- add a 2-digit and 1-digit number - crossing ten – using a range of concrete, pictorial materials.
- subtract a 1-digit number from a 2-digit number – crossing ten – using a range of concrete and pictorial materials.
- add two 2-digit numbers – not crossing ten – add ones and add tens – using a range of concrete and pictorial materials.
- add two 2-digit numbers – crossing ten – add ones and add tens – using a range of concrete, pictorial and some abstract materials.
- subtract a 2-digit number from a 2-digit number – not crossing ten - using a range of concrete, pictorial and some abstract materials.
- subtract a 2-digit number from a 2-digit number – crossing ten – subtract ones and tens - using a range of concrete, pictorial and some abstract materials.
- explore bonds to 100 (tens and ones), using understanding of exchange and a range of concrete, pictorial and abstract materials.
- add three 1-digit numbers using their understanding of number value to calculate efficiently.

Year 2

National Curriculum	Ackworth Howard's Knowledge Essentials
NUMBER	
<p><u>Multiplication and Division:</u> Pupils should be taught to:</p> <ul style="list-style-type: none"> recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) 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 <p><i>Pupils use a variety of language to describe multiplication and division. Pupils are introduced to the multiplication tables. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations. Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example, $40 \div 2 = 20$, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, $4 \times 5 = 20$ and $20 \div 5 = 4$).</i></p>	<p><u>Multiplication and Division</u> In Year 2, children will be taught to understand the multiplication and division aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:</p> <p><u>AUTUMN:</u></p> <ul style="list-style-type: none"> use stem sentences to talk about and recognise equal groups make equal groups to demonstrate understanding of the word 'equal' add equal groups and makes links to repeated addition introduction to multiplication sentences using the \times symbol use the multiplication symbol and work out answers of multiplication sentences from pictures explore arrays to see the commutativity of multiplication facts ($5 \times 2 = 2 \times 5$) explore and understand the 2 times-table explore and understand the 5 times-table explore and understand the 10 times-table <p><u>SPRING:</u></p> <ul style="list-style-type: none"> divide by sharing objects in to equal groups using one-to-one correspondence. divide by sharing equal groups and then count on to find total number of groups. use knowledge of grouping and sharing to divide by 2 use concrete manipulatives to explore odd and even numbers use efficient strategies (grouping or sharing) based on context of questions, to divide by 5 use efficient strategies (grouping or sharing) based on context of questions, to divide by 10

Year 2

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions:

Pupils should be taught to:

- 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 for example, $\frac{1}{2}$ of 6 = 3 and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$.

Pupils use fractions as 'fractions of' discrete and continuous quantities by solving problems using shapes, objects and quantities. They connect unit fractions to equal sharing and grouping, to numbers when they can be calculated, and to measures, finding fractions of lengths, quantities, sets of objects or shapes. They meet $4 \div 3$ as the first example of a non-unit fraction. Pupils should count in fractions up to 10, starting from any number and using the 2 1 and 4 2 equivalence on the number line (for example, $1\frac{1}{4}$, $1\frac{2}{4}$ (or $1\frac{1}{2}$), $1\frac{3}{4}$, 2). This reinforces the concept of fractions as numbers and that they can add up to more than one.

Fractions

In Year 2, children will be taught to understand the fractions aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- understand the concept of a whole being one object or one quantity.
- explore making and recognising equal and unequal parts using both real-life objects and pictorial representations of a variety of shapes and quantities.
- develop how to recognise a half and understand that halving is splitting a whole (explored through a variety of contexts) in to two equal parts.
- use the language denominator and numerator.
- find a half of a set of objects or a quantity.
- recognise quarters of shapes, objects and quantities.
- find a quarter of shapes, objects and quantities.
- recognise a third and understand that it is one out of three equal parts.
- find a third of different quantities using concrete and pictorial representations to support their understanding.
- understand the concept of a unit fraction by recognising it as one equal part of a whole.
- understand the concept of some non-unit fractions: $\frac{2}{3}$ and $\frac{3}{4}$
- explore the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$
- use their understanding of quarters to find three quarters of a quantity
- use their knowledge of halves, thirds and quarters to count in fractions from any number up to 10

Year 2

National Curriculum	Ackworth Howard's Knowledge Essentials
<u>STATISTICS</u>	
<p><u>Statistics:</u></p> <p>Pupils should be taught to:</p> <ul style="list-style-type: none">• interpret and construct simple pictograms, tally charts, block diagrams and simple tables• ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity• ask and answer questions about totalling and comparing categorical data. <p><i>Pupils record, interpret, collate, organise and compare information (for example, using many-to-one correspondence in pictograms with simple ratios 2, 5, 10).</i></p>	<p><u>Statistics</u></p> <p>In Year 2, children will be taught to understand statistics through the following small steps, including a range of fluency, reasoning and problem-solving experiences:</p> <ul style="list-style-type: none">• introduce tally charts as a systematic way of recording (reviewing counting in 5s).• use tally charts to draw pictograms (1 symbol-1 data value)• use their knowledge of one-to-one correspondence to answer questions and interpret data presented in pictograms (1 symbol-1 data value).• draw pictograms (2, 5 and 10 data values)• answer questions and interpret data presented in pictograms (2, 5 and 10 data values)• build block diagrams using cubes then move to drawing and interpreting block diagrams.

Year 2

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- compare and order lengths, mass, volume/capacity and record the results using >, < and =
- recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- find different combinations of coins that equal the same amounts of money
- solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change
- compare and sequence intervals of time
- 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
- know the number of minutes in an hour and the number of hours in a day.

Pupils use standard units of measurement with increasing accuracy, using their knowledge of the number system. They use the appropriate language and record using standard abbreviations. Comparing measures includes simple multiples such as 'half as high'; 'twice as wide'. They become fluent in telling the time on analogue clocks and recording it. Pupils become fluent in counting and recognising coins. They read and say amounts of money confidently and use the symbols £ and p accurately, recording pounds and pence separately.

Money

In Year 2, children will be taught to understand the money aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- count money in 1p, 2p, 5p and 10p coins and use related facts to count in 20p.
- count money in £1, £2, £5, £10 and £20s (working within 100) – pounds (notes and coins).
- build on counting money by bringing pounds and pence together.
- select coins to make an amount, drawing, using pictorial representations and writing in the abstract.
- explore different ways to make the same amount of money.
- compare two different values in money using either pounds or pence, using greater/less than and use the inequality symbols.
- build on their knowledge of addition to add money including:
 - 2-digit and 2-digit
 - 2-digit and ones
 - 2-digit and tens
 - 3 single digits
- expand knowledge of addition and subtraction strategies to find the difference between two amounts.
- build on subtraction skills by finding the change from a given amount.
- consolidate addition and subtraction skills to draw all money skills together and solve two-step problems.

Length and Height

In Year 2, children will be taught to understand the length and height aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- measure length to the nearest cm using rulers and tape measures.
- begin to measure larger objects' length in metres using metre sticks.
- compare lengths of objects using comparison language and symbols such as longer/shorter / taller than, longest, shortest, tallest.
- order more than two lengths from shortest to longest and vice versa, using the language of shorter, shortest, longer and longest to describe the order.
- apply understanding of the four operations with lengths and solve one and two step problems relating to length.

Year 2

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- compare and order lengths, mass, volume/capacity and record the results using >, < and =
- recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- find different combinations of coins that equal the same amounts of money
- solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change
- compare and sequence intervals of time
- 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
- know the number of minutes in an hour and the number of hours in a day.

Pupils use standard units of measurement with increasing accuracy, using their knowledge of the number system. They use the appropriate language and record using standard abbreviations. Comparing measures includes simple multiples such as 'half as high'; 'twice as wide'. They become fluent in telling the time on analogue clocks and recording it. Pupils become fluent in counting and recognising coins. They read and say amounts of money confidently and use the symbols £ and p accurately, recording pounds and pence separately.

Time

In Year 2, children will be taught to understand the time aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- revise O'clock and half past from previous year 1 learning.
- read and draw the times 'quarter to' and 'quarter past'.
- read and show analogue time to 5-minute intervals.
- understand there are 24 hours in a day and 60 minutes in an hour – using clocks to convert minutes in to hours and minutes.
- understand that duration is the time from the start to the end of an event and find durations of time.
- compare and order durations of time using longer, shorter, longest, shortest.

Mass, Capacity and Temperature

In Year 2, children will be taught to understand the mass, capacity and temperature aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- compare mass using balance scales and < > to order objects based on their masses.
- use standard units of mass to measure mass in grams, with balance scales and then weighing scales.
- apply measuring in grams to begin measuring mass in kilograms.
- compare volume of containers using the < > = symbols and using language 'quarter', 'half' and 'three-quarters full' to describe and compare volume.
- estimate and measure in millilitres, showing an understanding of capacity.
- estimate and measure in litres, knowing when to choose ml / l.
- explore temperature, using thermometers and language of unit 'degrees centigrade' °C.

Year 2

National Curriculum

Ackworth Howard's Knowledge Essentials

GEOMETRY

Geometry – Properties of shape:

Pupils should be taught to:

- identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line
- identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces
- identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid]
- compare and sort common 2-D and 3-D shapes and everyday objects.

Pupils handle and name a wide variety of common 2-D and 3-D shapes including: quadrilaterals and polygons, and cuboids, prisms and cones, and identify the properties of each shape (for example, number of sides, number of faces). Pupils identify, compare and sort shapes on the basis of their properties and use vocabulary precisely, such as sides, edges, vertices and faces. Pupils read and write names for shapes that are appropriate for their word reading and spelling. Pupils draw lines and shapes using a straight edge.

Geometry – Position and Direction:

Pupils should be taught to:

- order and arrange combinations of mathematical objects in patterns and sequences
- 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 anticlockwise).

Pupils should work with patterns of shapes, including those in different orientations. Pupils use the concept and language of angles to describe 'turn' by applying rotations, including in practical contexts (for example, pupils themselves moving in turns, giving instructions to other pupils to do so, and programming robots using instructions given in right angles).

Properties of Shape

In Year 2, children will be taught to understand the properties of shape aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recognise 2-D and 3-D shapes in different orientations and proportions.
- count sides on 2-D shapes and understand concept of irregular shapes.
- understand the terms vertex and vertices, count vertices on 2-D shapes.
- accurately draw 2-D shapes.
- explore vertical lines of symmetry using a range of practical resources.
- recognise and sort a range of 2-D shapes including circle, square, triangle, rectangle, pentagon, hexagon and octagon in a range of orientations.
- use their knowledge of the properties of 2-D shapes to make patterns.
- use their knowledge of 2-D shapes to count faces on 3-D shapes.
- use their knowledge of faces and curved surfaces to identify and count edges on 3-D shapes.
- use their knowledge of edges to identify and count vertices on 3-D shapes.
- use their knowledge of 3-D shape properties to sort 3-D shapes in different ways, e.g. faces, shapes of faces, edges, vertices, if they roll, if they stack...
- use their knowledge of the properties of 3-D shapes to make patterns with 3-D shapes.

Position and Direction

In Year 2, children will be taught to understand the position and direction aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use language 'forwards', 'backwards', 'up', 'down', 'left' and 'right' to describe movement in a straight line.
- describe turns using the language 'full turn', 'half turn', 'quarter turn', 'three-quarter turn', 'clockwise' and 'anti-clockwise'.
- use their knowledge of movement and turns to describe and record directions.
- describe and make patterns that involve direction and turns, using the language 'half turn', 'quarter turn', 'three-quarter turn', 'clockwise' and 'anti-clockwise'.

Year 2 Mathematics Vocabulary

Year 2 - **New Essential Vocabulary** (In addition to Early Years, Year 1 Vocabulary)

NUMBER

Number two hundred ... one thousand count in threes, fours and so on tally sequence continue predict rule > greater than < less than	Place value hundreds one-, two- or three-digit number place place value stands for represents exchange twenty-first, twenty-second	Estimating exact, exactly	Addition and subtraction one hundred more... one hundred less... number facts tens boundary	Multiplication and division groups of times once, twice, three times...ten times repeated addition divide, divided by, divided into share, share equally left, left over one each, two each, three each...ten each group in pairs, threes...tens equal groups of row, column multiplication table multiplication fact, division fact	Fractions equivalent fraction mixed number numerator, denominator (two) halves two quarters, three quarters one third, two thirds, one of three equal parts
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Year 2 Mathematics Vocabulary

Year 2 - **New Essential Vocabulary** (In addition to Early Years, Year 1 Vocabulary)

MEASUREMENT

Measuring

measuring scale

Length

further, furthest
tape measure

Weight

gram

Capacity and volume

millilitre
contains

Temperature

temperature
degree

Time

fortnight
5, 10, 15...minutes past
digital/analogue
clock/watch
timer
seconds

Money

bought
sold

Year 2 Mathematics Vocabulary

Year 2 - **New Essential Vocabulary** (In addition to Early Years, Year 1 Vocabulary)

<u>GEOMETRY</u>			<u>STATISTICS</u>	<u>GENERAL</u>
Properties of shape surface line symmetry	2-D shape rectangular circular triangular pentagon hexagon octagon 3-D shape (See previous year groups)	Position and direction route higher, lower clockwise, anticlockwise right angle straight line	Statistics tally graph, block graph, pictogram represent label title most popular, most common least popular, least common	General show how you... explain your method describe the pattern describe the rule investigate mental calculation written calculation

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Place Value:

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- recognise the place value of each digit in a three-digit number (hundreds, tens, ones)
- compare and order numbers up to 1000
- identify, represent and estimate numbers using different representations
- read and write numbers up to 1000 in numerals and in words
- solve number problems and practical problems involving these ideas.

Pupils now use multiples of 2, 3, 4, 5, 8, 10, 50 and 100. They use larger numbers to at least 1000, applying partitioning related to place value using varied and increasingly complex problems, building on work in year 2 (for example, $146 = 100 + 40$ and $6, 146 = 130 + 16$). Using a variety of representations, including those related to measure, pupils continue to count in ones, tens and hundreds, so that they become fluent in the order and place value of numbers to 1000.

Place Value

In Year 3, children will be taught to understand the place value aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- build on understanding of tens and link this to understanding hundreds
- using base 10 to explore and represent numbers to 1000
- read and write 3-digit numbers, developing understanding of the relationship between 100s, 10s and 1s.
- use place value counters to represent and explore 3-digit numbers.
- estimate, work out and draw numbers on a number line (with different starting and end points) up to 1000.
- use a range of concrete and pictorial resources to find 1, 10, 100 more / less than a given number.
- use objects to represent numbers to 1000 and comparative language and symbols to show which is smallest/greatest.
- use numerals and compare numbers to 1000.
- explore ordering a set of numbers from smallest to greatest and vice versa, introducing ascending and descending.
- use their knowledge of the patterns in the 5 times table to count in 50s.

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number – Addition and Subtraction:

Pupils should be taught to:

- add and subtract numbers mentally, including:
 - a three-digit number and ones
 - a three-digit number and tens
 - a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Addition and Subtraction

In Year 3, children will be taught to understand the addition and subtraction aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- apply prior knowledge of adding and subtracting 1s/10s to add and subtract multiples of 100.
- add and subtract 3-digit and 1-digit numbers – not crossing 10 – using mental arithmetic.
- add 3-digit and 1-digit numbers – crossing 10 – understanding exchange.
- subtract a 1-digit number from a 3-digit number – crossing 10
- explore what happens to a 3-digit number when a multiple of 10 is added, using a variety of representations, including Base 10, arrow cards and place value charts (not crossing 100)
- add a multiple of 10 to a 3-digit number, including crossing 100
- subtract multiples of 10 from a 3-digit number – crossing 100
- add and subtract 100s, including tens and ones.
- consolidate adding ones, tens and hundreds to 3-digit numbers by spotting patterns in calculations to enable prediction of answers – making explicit connections.
- add and subtract 2-digit and 3-digit numbers – not crossing 10 or 100 by focusing on the position and place value of numbers.
- add a 2-digit and 3-digit number – crossing 10 and 100 (deepening understanding of the previous step).
- subtract a 2-digit number from a 3-digit number – crossing 10 or 100, focusing on the position and place value of numbers and using column method.
- add 2 3-digit numbers – not crossing 10 or 100 – focusing on arranging calculations correctly.
- add 2 3-digit numbers – crossing 10 or 100, deepening understanding of the previous step with exchange involved.
- explore efficient strategies to subtract a 3-digit from a 3-digit number – no exchange (including counting on – number lines, near subtraction, number bonds and column subtraction).
- explore column subtraction using concrete manipulatives to subtract a 3-digit from a 3-digit number – exchange.
- check reasonability of their answers by using an estimate.
- explore different ways to check answers and reasonability, including using the inverse.

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number - Multiplication and Division:

Pupils should be taught to:

- recall and use multiplication and division facts for the 3, 4 and 8 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.

Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables. Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and multiplication and division facts (for example, using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts (for example, $30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$). Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division. Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

Multiplication and Division

In Year 3, children will be taught to understand the ... aspect of ... through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

AUTUMN:

- recap their understanding of recognising, making and adding equal groups.
- use knowledge of equal groups to use concrete and pictorial methods to solve problems multiplying by 3.
- use concrete and pictorial representations to explore dividing by 3 through sharing into three equal groups and grouping in threes.
- draw together knowledge of multiplying and dividing by 3 to become more fluent in the three times table.
- building on knowledge of 2 times table, children multiply by 4.
- use concrete and pictorial representations to explore dividing by 4 through sharing into four equal groups and grouping in fours.
- use knowledge of known multiplication tables (2, 3, 5 and 10 times) and understanding of key concepts of multiplication to understand the 4 times table.
- use understanding of the 4 times table and doubling to multiply by 8.
- divide by 8 using concrete and pictorial representations to explore dividing through sharing into eight equal groups and grouping in eights.
- use prior knowledge of multiplication facts for 2, 3, 4 and 5 times tables along with the distributive law to calculate unknown multiplication facts (the 8 times table).

SPRING:

- use their knowledge of multiplication and division facts to compare statements using inequality symbols.
- use known multiplication facts to solve other multiplication problems.
- use understanding of repeated addition to represent a 2-digit multiplied by a 1-digit number using concrete manipulatives and then formal method of column multiplication.
- move on to multiply 2-digits by 1-digit using formal methods and involving exchange.
- divide 2-digits by 1-digit number by partitioning into tens and ones and sharing into equal groups (no exchange).
- divide 2-digits by 1-digit number by partitioning into tens and ones and sharing into equal groups (with exchange).
- divide 2-digits by 1-digit with remainders and use formal notation for remainders.
- begin to explore scaling through questions with 'times as many.'
- list systematically the possible combinations resulting from two groups of objects (how many ways?).

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Fractions:

Pupils should be taught to:

- 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 [for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$]
- compare and order unit fractions, and fractions with the same denominators
- solve problems that involve all of the above.

Pupils connect tenths to place value, decimal measures and to division by 10.

They begin to understand unit and non-unit fractions as numbers on the number line, and deduce relations between them, such as size and equivalence. They should go beyond the [0, 1] interval, including relating this to measure. Pupils understand the relation between unit fractions as operators (fractions of), and division by integers. They continue to recognise fractions in the context of parts of a whole, numbers, measurements, a shape, and unit fractions as a division of a quantity. Pupils practise adding and subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.

Fractions

In Year 3, children will be taught to understand the fractions aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

SPRING:

- recap and build on understanding of unit and non-unit fractions, exploring denominators other than 2, 3, 4 (from Year 2).
- explore what makes the whole and understand when a fraction is equivalent to a whole, the numerator and denominator are the same.
- explore tenths and recognise they arise from dividing one whole in to ten equal parts.
- count up and down in tenths using different representations.
- begin to understand tenths as decimals, comparing fractions and decimals in words, fraction form and link to pictorial representations.
- use a number line to represent fractions beyond the whole and count forwards/backwards in fractions.
- find a unit fraction of an amount by dividing amounts in to equal groups.
- develop understanding that denominator shows number of parts the whole is split into and numerator is how many parts of the whole there are.
- apply knowledge and understanding of fractions to solve problems in various contexts.

SUMMER:

- use concrete manipulatives to investigate and record equivalent fractions.
- use Cuisenaire rods, paper strips and number lines to deepen understanding of equivalent fractions.
- use proportional reasoning to link pictorial images and abstract methods to find equivalent fractions, exploring links and patterns to support understanding.
- compare unit or fractions with the same denominator.
- order unit fractions or fractions with the same denominator.
- use practical equipment and pictorial representations to add two or more fractions with the same denominator where the total is less than 1.
- use practical equipment and pictorial representations to subtract fractions with the same denominator where the answer is within the whole.

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

STATISTICS

Statistics:

Pupils should be taught to:

- interpret and present data using bar charts, pictograms and tables
- solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables

Pupils understand and use simple scales (for example, 2, 5, 10 units per cm) in pictograms and bar charts with increasing accuracy. They continue to interpret data presented in many contexts.

Statistics

In Year 3, children will be taught to understand statistics through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- build on their understanding of pictograms by continuing to read and interpret information in order to answer questions about the data.
- show understanding of the value of symbols in pictograms (including what it means when a half symbol is used), construct pictograms – choosing an appropriate key and carrying out their own data collection.
- interpret information in pictograms and tally charts to construct bar charts, and interpret information from bar charts – answering questions relating to the data.
- read and interpret bar charts with scales of 1, 2, 5 and 10 – choosing appropriate scales for their own charts.
- interpret information from tables to answer one and two-step problems.

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- measure the perimeter of simple 2-D shapes
- add and subtract amounts of money to give change, using both £ and p in practical contexts
- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight
- 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].

Pupils continue to measure using the appropriate tools and units, progressing to using a wider range of measures, including comparing and using mixed units (for example, 1 kg and 200g) and simple equivalents of mixed units (for example, 5m = 500cm). The comparison of measures includes simple scaling by integers (for example, a given quantity or measure is twice as long or five times as high) and this connects to multiplication. Pupils continue to become fluent in recognising the value of coins, by adding and subtracting amounts, including mixed units, and giving change using manageable amounts. They record £ and p separately. The decimal recording of money is introduced formally in year 4. Pupils use both analogue and digital 12-hour clocks and record their times. In this way they become fluent in and prepared for using digital 24-hour clocks in year 4.

Money

In Year 3, children will be taught to understand the money aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- know the value of each coin and note and understand what these represent, understanding that money can be represented in different ways but retain the same value.
- convert between pounds and pence using the knowledge that £1 is equal to 100 pence.
- add two amounts of money using pictorial representations to support them.
- use different methods to subtract money.
- use a number line and part-whole models to subtract to find change.

Length and Perimeter:

In Year 3, children will be taught to understand the length and perimeter aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use different measuring equipment (including rulers, tape measures, metre sticks and trundle wheels) to explore millimetres and build on understanding of centimetres and metres to measure length.
- recognise that 100cm is equivalent to 1m and use this to convert other multiples of 100cm into metres and vice versa (equivalent lengths – m & cm).
- recognise that 10mm is equivalent to 1cm and use this to convert other multiples of 10mm into centimetres and vice versa (equivalent lengths – mm & cm).
- compare and order lengths based on measurements in mm, cm and m.
- add lengths given in different units of measurement and convert to same units to add efficiently.
- use take-away and finding the difference to subtract lengths.
- explore and measure perimeter of 2-D shapes.
- use their understanding of the properties of shape to calculate the perimeter of simple 2-D shapes.

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- measure the perimeter of simple 2-D shapes
- add and subtract amounts of money to give change, using both £ and p in practical contexts
- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight
- 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].

Pupils continue to measure using the appropriate tools and units, progressing to using a wider range of measures, including comparing and using mixed units (for example, 1 kg and 200g) and simple equivalents of mixed units (for example, 5m = 500cm). The comparison of measures includes simple scaling by integers (for example, a given quantity or measure is twice as long or five times as high) and this connects to multiplication. Pupils continue to become fluent in recognising the value of coins, by adding and subtracting amounts, including mixed units, and giving change using manageable amounts. They record £ and p separately. The decimal recording of money is introduced formally in year 4. Pupils use both analogue and digital 12-hour clocks and record their times. In this way they become fluent in and prepared for using digital 24-hour clocks in year 4.

Time

In Year 3, children will be taught to understand the time aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use calendars to explore months and years, and understand how a leap year is different.
- recap the number of hours in a day and use language such as 'noon', 'midday', 'midnight.' Review facts such as days in a week/month.
- tell the time to 5 minutes using analogue clocks, recognise roman numerals on a clock face and use language 'past' / 'to'.
- tell the time to the nearest minute using analogue clocks.
- use 'morning', 'afternoon', 'a.m.' and 'p.m.' to describe the time of the day.
- explore telling the time digitally, and understand the 24-hour clock.
- find the duration of events using both analogue and digital clocks.
- compare durations of time using analogue and digital clocks.
- find start and end times to the nearest minute using analogue and digital times.
- measure and compare durations of time in seconds.

Mass and Capacity:

In Year 3, children will be taught to understand the mass and capacity aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- read a range of scales (including missing intervals) to measure mass in grams/kilograms.
- measure mass of objects and record them as a mixed measurement in kilograms and grams.
- build on previous knowledge and compare mass using 'lighter', 'heavier' and inequality symbols.
- use a range of mental and written methods to add and subtract mass.
- use litres, millilitres and standard scales to explore and measure capacity.
- explore capacity using mixed measurements of litres and millilitres.
- continue to build understanding to compare capacity using language such as 'full', 'empty' and inequality symbols.
- add and subtract volumes and capacities.

Year 3

National Curriculum

Ackworth Howard's Knowledge Essentials

GEOMETRY

Geometry – Properties of shape:

Pupils should be taught to:

- draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them
- recognise angles as a property of shape or a description of a turn
- identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle
- identify horizontal and vertical lines and pairs of perpendicular and parallel lines.

Pupils' knowledge of the properties of shapes is extended at this stage to symmetrical and non-symmetrical polygons and polyhedra. Pupils extend their use of the properties of shapes. They should be able to describe the properties of 2-D and 3-D shapes using accurate language, including lengths of lines and acute and obtuse for angles greater or lesser than a right angle. Pupils connect decimals and rounding to drawing and measuring straight lines in centimetres, in a variety of contexts.

Properties of shape:

In Year 3, children will be taught to understand the properties of shape aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recognise angles as a measure of a turn and practise making $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{4}$ turns from different starting points in both clockwise and anti-clockwise directions in practical contexts.
- recognise right angles in shapes in different orientations and recognise that a right angle is a quarter turn, 2 right angles make a half turn, 3 right angles make a three quarter turn and 4 right angles make a whole turn.
- identify whether an angle is greater or less than a right angle in shapes and turns, by measuring, comparing and reasoning practical contexts, and using the language 'acute' and 'obtuse'.
- measure and draw straight lines accurately in centimetres and millimetres, whilst practising rounding to the nearest centimetre.
- identify and find horizontal and vertical lines in a range of contexts – including lines of symmetry in shapes and symbols.
- identify and find parallel and perpendicular lines in a range of practical contexts, using arrow notation to represent parallel lines and right angle notation for perpendicular lines.
- recognise, describe (using properties including types of angles, lines, symmetry and lengths of sides) and draw 2-D shapes accurately.
- recognise, describe (including the number of faces, edges and vertices) and draw 3-D shapes in different orientations.
- make 3-D shapes (cubes, cuboids, prisms, cylinders, pyramids, cones, spheres) using construction materials.

Year 3 Mathematics Vocabulary

Year 3 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2 Vocabulary)

NUMBER

Number count in eights, fifties and so on to hundreds factor of relationship Roman numerals	Place value one hundred more one hundred less	Estimating approximate, approximately round nearest round to the nearest ten, hundred round up, stick (NOT Rounding down)	Addition and subtraction hundreds boundary	Multiplication and division factor product remainder	Fractions sixths, sevenths, eighths, tenths
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Year 3 Mathematics Vocabulary

Year 3 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2 Vocabulary)

MEASUREMENT

Measuring division approximately	Length millimetre, kilometre, mile distance apart...between...to...from perimeter	Weight (See previous year groups)	Capacity and volume (See previous year groups) Temperature centigrade	Time century calendar earliest, latest a.m, p.m Roman numerals 12-hour clock time 24-hour clock time	Money (See previous year groups)
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Year 3 Mathematics Vocabulary

Year 3 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2 Vocabulary)

<u>GEOMETRY</u>			<u>STATISTICS</u>	<u>GENERAL</u>
<i>Properties of shape</i> perimeter	<i>2-D shape</i> pentagonal hexagonal octagonal quadrilateral right-angled parallel perpendicular <i>3-D shape</i> hemisphere prism, triangular prism	<i>Position and direction</i> compass point north, south, east, west, N, S, E, W horizontal vertical diagonal angle....is a greater/smaller angle than acute angle obtuse angle	<i>Statistics</i> chart bar chart frequency table Carroll diagram Venn diagram axis, axes diagram	<i>General</i> greatest value least value statement

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Place Value:

Pupils should be taught to:

- count in multiples of 6, 7, 9, 25 and 1000
- find 1000 more or less than a given number
- count backwards through zero to include 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
- solve number and practical problems that involve all of the above and with increasingly large positive numbers
- read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.

Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1000, including counting in tens and hundreds, and maintaining fluency in other multiples through varied and frequent practice. They begin to extend their knowledge of the number system to include the decimal numbers and fractions that they have met so far. They connect estimation and rounding numbers to the use of measuring instruments. Roman numerals should be put in their historical context so pupils understand that there have been different ways to write whole numbers and that the important concepts of zero and place value were introduced over a period of time.

Place Value

In Year 4, children will be taught to understand the place value aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- build on knowledge of roman numerals to 12, on a clock face, to explore roman numerals to 100.
- look at the position of a 2 and 3-digit number on a number line, focusing on the number of ones and rounding up or not (round to the nearest 10).
- compare rounding to the nearest 10 (looking at the ones column) to rounding to the nearest 100 (looking at the tens column) – using knowledge of multiples of 100 to round 3-digit numbers.
- explore 4-digit numbers and count in 1,000s, representing numbers in numerals and words.
- represent numbers to 9,999, using concrete resources on a place value grid and understand a 4-digit number is made up of 1,000s, 100s, 10s and 1s.
- explore how numbers can be partitioned in more than one way.
- estimate, label and draw numbers on a number line to 10,000 – understanding it is possible to count forwards or backwards, in equal steps, from both sides.
- build on prior knowledge of 1, 10 and 100 more or less by finding 1,000 more or less than a given number.
- compare 4-digit numbers using comparison language and symbols to show which is greater and which is smaller, representing numbers using concrete, pictorial representations, and write them using numerals.
- explore ordering a set of numbers in ascending and descending order and finding the largest or smallest number from a set.
- build on knowledge of rounding to nearest 10 and 100, to round to the nearest 1,000 – understanding which multiples of 1,000 a number sits between.
- use knowledge of counting in 50s and 100s to count in 25s and spot patterns.
- recognise that there are numbers below zero, using correct mathematical language of 'negative' not 'minus'.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Addition and Subtraction:

Pupils should be taught to:

- 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
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.

(Refer to Mathematics Appendix 1)

Addition and Subtraction

In Year 4, children will be taught to understand the addition and subtraction aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- using concrete representations, abstract and mental methods, add and subtract 1s, 10s, 100s and 1,000s.
- use concrete equipment and a place value grid to support understanding alongside column addition to add two 4-digit numbers – no exchange.
- use place value grid, alongside column addition to add two 4-digit numbers – exploring exchanges as they occur in different columns (one exchange).
- add two 4-digit numbers – more than one exchange.
- subtract two 4-digit numbers using the formal column method, concentrating on the value of each digit – no exchange.
- explore subtractions with one exchange using place value counters to model the exchange and match with formal column method to subtract two 4-digit numbers.
- subtract two 4-digit numbers – more than one exchange.
- find the most efficient subtraction method (partition, take away or find the difference).
- use their knowledge of rounding to make sensible estimate answers for calculations and word problems.
- explore ways of checking an answer using inverse operations.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Multiplication and Division:

Pupils should be taught to:

- recall multiplication and division facts for multiplication tables up to 12×12
- 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
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency. Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$).

Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (see Mathematics Appendix 1). Pupils write statements about the equality of expressions (for example, use the distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$ and associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5 = 10 \times 6 = 60$. Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.

Multiplication and Division:

In Year 4, children will be taught to understand the multiplication and division aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

AUTUMN:

- visualise and understand making a number 'ten times bigger' (multiply by 10) using language of 'ten lots of'.
- build on multiplying by 10 to understand multiplying by 100 and make links.
- explore dividing by 10 with whole number answers, using concrete manipulatives to see the link between dividing and the position of the digits before/after calculations.
- divide by 100 with whole number answers, using concrete manipulatives to see the link between dividing and the position of the digits before/after calculations.
- multiply by 1 using concrete equipment link to multiplying by 0 – using concrete equipment and pictorial representations.
- understand what happens to a number when it is divided by 1 and itself.
- draw on knowledge of times tables facts to multiply and divide by 6, using knowledge of equal groups to solve multiplication and division problems.
- use known facts to become fluent in the 6 times table, and understand related division facts.
- draw on knowledge of times tables facts to multiply and divide by 9, using knowledge of equal groups to solve multiplication and division problems.
- use known facts to become fluent in the 9 times table, and understand related division facts.
- draw on knowledge of times tables facts to multiply and divide by 7, using knowledge of equal groups to solve multiplication and division problems.
- use known facts to become fluent in the 7 times table, and understand related division facts.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Multiplication and Division:

Pupils should be taught to:

- recall multiplication and division facts for multiplication tables up to 12×12
- 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
- recognise and use factor pairs and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency. Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$).

Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (see Mathematics Appendix 1). Pupils write statements about the equality of expressions (for example, use the distributive law $39 \times 7 = 30 \times 7 + 9 \times 7$ and associative law $(2 \times 3) \times 4 = 2 \times (3 \times 4)$). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, $2 \times 6 \times 5 = 10 \times 6 = 60$. Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.

Multiplication and Division:

In Year 4, children will be taught to understand the multiplication and division aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

SPRING:

- build on knowledge of 1, 2 and 10 times-tables and explore the 11 and 12 times-table through partitioning.
- use associative law (doesn't matter how we group numbers when we multiply) to multiply 3 numbers and link to commutativity (different order) to group numbers more efficiently.
- understand that a factor is a number that multiplies by another number to make a product and develop understanding of factor pairs, using concrete resources to work systematically.
- develop mental multiplication by exploring different ways to calculate – leading to flexibility and efficiency in multiplication.
- use a variety of informal written methods to multiply a 2-digit and 1-digit number.
- use the formal short multiplication method to multiply 2-digits by 1 digit.
- multiply 3-digits by 1 digit using concrete manipulatives and written methods.
- divide 2-digits by 1 digit by sharing into equal groups, including exchange between tens and ones.
- explore dividing 2-digits by 1 digit where there are remainders, using place value counters.
- using place value counters and part-whole models to aid understanding, divide 3-digits by 1 digit with and without remainders.
- build on previous understanding of correspondence problems to solve more complex problems when n objects relate to m objects.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions (including decimals):

Pupils should be taught to:

- recognise and show, using diagrams, families of common equivalent fractions
- count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.
- 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 $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$
- 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
- round decimals with one decimal place to the nearest whole number
- compare numbers with the same number of decimal places up to two decimal places
- solve simple measure and money problems involving fractions and decimals to two decimal places.

Pupils should connect hundredths to tenths and place value and decimal measure. They extend the use of the number line to connect fractions, numbers and measures.

Pupils understand the relation between non-unit fractions and multiplication and division of quantities, with particular emphasis on tenths and hundredths...

Fractions:

In Year 4, children will be taught to understand the fractions aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore fractions in different representations including fractions of shapes, quantities and on a number line. Recap and review meaning of numerator, denominator, non-unit and unit fractions.
- use strip diagrams to investigate and record equivalent fractions.
- continue to understand equivalent fractions through diagrams and onto using proportional reasoning to find equivalent fractions.
- use manipulatives and diagrams to show that a fraction can be split into wholes and parts, developing understanding of fractions greater than 1.
- explore fractions greater than one on a number line to count in fractions and begin connections between improper and fractions and mixed numbers.
- use practical equipment and pictorial representations to add 2 or more fractions.
- use practical equipment and pictorial representations to subtract fractions with the same denominator.
- continue to use practical equipment and pictorial representations to subtract fractions, including from whole amounts.
- use knowledge of finding unit fractions of a quantity to calculate non-unit fractions of a quantity.
- solve more complex problems involving calculating quantities.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions (including decimals):

... Pupils make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities. Pupils use factors and multiples to recognise equivalent fractions and simplify where appropriate (for example, $\frac{6}{9} = \frac{2}{3}$ or $\frac{1}{4} = \frac{2}{8}$).

Pupils continue to practise adding and subtracting fractions with the same denominator, to become fluent through a variety of increasingly complex problems beyond one whole.

Pupils are taught throughout that decimals and fractions are different ways of expressing numbers and proportions.

Pupils' understanding of the number system and decimal place value is extended at this stage to tenths and then hundredths. This includes relating the decimal notation to division of whole number by 10 and later 100.

They practise counting using simple fractions and decimals, both forwards and backwards.

Pupils learn decimal notation and the language associated with it, including in the context of measurements. They make comparisons and order decimal amounts and quantities that are expressed to the same number of decimal places. They should be able to represent numbers with one or two decimal places in several ways, such as on number lines.

Decimals:

In Year 4, children will be taught to understand the decimals aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

SPRING

- recognise and explore tenths and hundredths using a hundred square, Base 10 and other concrete manipulatives.
- recognise the relationship between 0.1 and $\frac{1}{10}$, write tenths as decimals and fractions and represent them using concrete and pictorial representations.
- read and represent tenths on a place value grid.
- read and represent tenths on a number line, linking the number line to measurement (measuring in millimetres and centimetres).
- understand dividing 1-digit by 10 as a number being split into 10 equal parts and is 10 times smaller.
- understand dividing 2-digits by 10 using a place value chart to see how the numbers move when dividing by 10.
- explore hundredths and recognise they arise from dividing one whole into one hundred equal parts.
- using the hundred square and Base 10, recognise the relationship between 0.01 and $\frac{1}{100}$, writing hundredths as decimals and fractions.
- read and represent hundredths on a place value grid.
- divide 1 or 2-digits by 100, understanding that when dividing by 100, the number is being split into 100 equal parts and is 100 times smaller.

SUMMER

- make a whole from any number of tenths and hundredths, using number bonds to 10 and 100 to support calculations.
- use place value counters and place value grids to make numbers with up to two decimal places leading to reading and writing numbers with up to 2 decimal places.
- apply understanding of place value to compare numbers with up to two decimal places.
- apply understanding of place value to order numbers with decimals with up to two decimal places.
- round numbers with 1 decimal place to the nearest whole number, understanding the need to look at tenths to decide whether to round up or not.
- use concrete and pictorial representations to read and record $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{4}$ as decimals.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- Convert between different units of measure [for example, kilometre to metre; hour to minute]
- measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
- find the area of rectilinear shapes by counting squares
- estimate, compare and calculate different measures, including money in pounds and pence
- 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; years to months; weeks to days.

Pupils build on their understanding of place value and decimal notation to record metric measures, including money.

They use multiplication to convert from larger to smaller units.

Perimeter can be expressed algebraically as $2(a + b)$ where a and b are the dimensions in the same unit.

They relate area to arrays and multiplication.

Length and Perimeter:

In Year 4, children will be taught to understand the length and perimeter aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore kilometres including:
 - multiplying and dividing by 1,000 to convert between kilometres and metres.
 - apply understanding of adding and subtracting with 4-digit numbers to find two lengths that add up to a whole number of kilometres.
 - find fractions of kilometres, using knowledge of fraction of amounts from Year 3 and bar models to aid understanding.
- calculate the perimeter of rectilinear shapes by counting squares on a grid.
- explore and calculate the perimeter of rectangles (including squares) that are not on a squared grid.
- begin to calculate the perimeter of rectilinear shapes without using squared paper, using addition and subtraction to calculate missing sides.

Area

In Year 4, children will be taught to understand the area aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore area for the first time:
 - understand that area is the amount of space that is taken up by a 2D shape or surface.
 - investigate shapes that can be made with the same area.
- understand that area is measured in squares and use counting squares as a strategy for calculating area.
- make rectilinear shapes using a given number of squares.
- compare the area of rectilinear shapes, using $<$ and $>$, and putting shapes in order of size by comparing their area.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- Convert between different units of measure [for example, kilometre to metre; hour to minute]
- measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
- find the area of rectilinear shapes by counting squares
- estimate, compare and calculate different measures, including money in pounds and pence
- 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; years to months; weeks to days.

Pupils build on their understanding of place value and decimal notation to record metric measures, including money.

They use multiplication to convert from larger to smaller units.

Perimeter can be expressed algebraically as $2(a + b)$ where a and b are the dimensions in the same unit.

They relate area to arrays and multiplication.

Money

In Year 4, children will be taught to understand the money aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- develop understanding of pounds and pence and use decimal notation for money.
- use knowledge of £1 = 100 p to compare and order amounts of money.
- round amounts of money written in decimal notation to the nearest pound and estimate the total of two or more amounts of money.
- solve simple problems with money, involving all four operations.

Time

In Year 4, children will be taught to understand the time aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recap number of minutes in an hour and seconds in a minute and use this (along with knowledge of multiplication and division) to convert between different units of time.
- recap concepts of years, months, weeks and days from Year 3 and use this, along with knowledge of addition, subtraction, multiplication and division to convert between the different units of time.
- convert between analogue and digital times using the format up to 12 hours, using a.m. and p.m. to distinguish between morning and afternoon.
- convert between analogue and digital times using a 24 hour clock.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

STATISTICS

Statistics:

Pupils should be taught to:

- interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.
- solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

Pupils understand and use a greater range of scales in their representations.

Pupils begin to relate the graphical representation of data to recording change over time.

Statistics

In Year 4, children will be taught to understand statistics through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- develop ability to interpret charts by:
 - revisiting how to use bar charts, pictograms and tables,
 - interpret and present discrete data,
 - decide upon scale, gather data using tally charts and present/draw own bar charts,
 - answer questions about their own data.
- solve comparison, sum and difference problems using discrete data with a range of scales.
- introduction of line graphs in the context of time – use knowledge of scales to read a time graph accurately and create their own graphs to represent continuous data.
- continue to develop understanding of line graphs through solving comparison, sum and difference problems using continuous data with a range of scales.

Year 4

National Curriculum

Ackworth Howard's Knowledge Essentials

GEOMETRY

Geometry – Properties of shape:

Pupils should be taught to:

- compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes
- identify acute and obtuse angles and compare and order angles up to two right angles by size
- identify lines of symmetry in 2-D shapes presented in different orientations
- complete a simple symmetric figure with respect to a specific line of symmetry.

Pupils continue to classify shapes using geometrical properties, extending to classifying different triangles (for example, isosceles, equilateral, scalene) and quadrilaterals (for example, parallelogram, rhombus, trapezium). Pupils compare and order angles in preparation for using a protractor and compare lengths and angles to decide if a polygon is regular or irregular. Pupils draw symmetric patterns using a variety of media to become familiar with different orientations of lines of symmetry; and recognise line symmetry in a variety of diagrams, including where the line of symmetry does not dissect the original shape.

Geometry – Position and Direction:

Pupils should be taught to:

- describe positions on a 2-D grid as coordinates in the first quadrant
- describe movements between positions as translations of a given unit to the left/right and up/down
- plot specified points and draw sides to complete a given polygon

Pupils draw a pair of axes in one quadrant, with equal scales and integer labels. They read, write and use pairs of coordinates, for example (2, 5), including using coordinate plotting ICT tools.

Properties of shape:

In Year 4, children will be taught to understand the properties of shape aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- develop understanding of acute and obtuse angles by comparing with a right angle and learn the degree measurement facts associated with acute, obtuse and right angles.
- compare and order angles (in different representations) in ascending and descending order, using an angle tester to decide if an angle is acute or obtuse.
- classify triangles using the names 'isosceles', 'scalene' and 'equilateral', Use rulers to measure sides and compare similarities/differences of triangles to identify, sort and draw them.
- name quadrilaterals including a square, rectangle, rhombus, parallelogram and trapezium – describing properties to identify similarities and differences between different quadrilaterals.
- find and identify lines of symmetry within 2-D shapes of different sizes and orientations.
- use knowledge of symmetry to complete 2-D shapes and patterns.

Position and Direction:

In Year 4, children will be taught to understand the position and direction aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- read, write and use pairs of coordinates and describe positions in the first quadrant.
- develop understanding of coordinates by plotting given points on a 2-D grid.
- move shapes and points on a coordinate grid following specific directions using language such as: left/right and up/down.
- describe the movement of shapes and points on a coordinate grid using language such as: left/right and up/down.

Year 4 Mathematics Vocabulary

Year 4 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3 Vocabulary)

NUMBER

Number ten thousand hundred thousand million count in sixes, sevens, nines, twenty-fives and so on to hundreds, thousands next, consecutive integer positive negative above/below zero minus negative numbers	Place value one thousand more one thousand less	Estimating thousand	Addition and subtraction inverse	Multiplication and division inverse square, squared cube, cubed	Fractions hundredths decimal decimal fraction decimal point decimal place decimal equivalent proportion
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Year 4 Mathematics Vocabulary

Year 4 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3 Vocabulary)

MEASUREMENT

Measuring

unit
standard unit
metric unit

Length

breadth
edge
area, covers
square centimetre (cm²)

Weight

in terms of mass:
big, bigger
small, smaller

in terms of weight:
heavy/light
heavier/lighter
heaviest/lightest

Capacity and volume

measuring cylinder

Temperature

(See previous year group's
vocabulary)

Time

leap year
millennium
noon
date of birth
timetable
arrive
depart

Money

(See previous year groups)

Year 4 Mathematics Vocabulary

Year 1 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3 Vocabulary)

<u>GEOMETRY</u>			<u>STATISTICS</u>	<u>GENERAL</u>
<i>Properties of shape</i> angle right-angled base square-based reflect reflection regular irregular	<i>2-D shape</i> 2-D, two-dimensional oblong rectilinear equilateral triangle isosceles triangle scalene triangle heptagon parallelogram rhombus trapezium polygon <i>3-D shape</i> 3-D, three dimensional spherical cylindrical tetrahedron polyhedron	<i>Position and direction</i> north-east NE north-west NW south-east SE south-west SW translate translation rotate rotation degree reflection ruler set square angle measurer compass	<i>Statistics</i> survey questionnaire data	<i>General</i> justify make a statement

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Place Value:

Pupils should be taught to:

- 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
- interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero
- round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000
- solve number problems and practical problems that involve all of the above
- read Roman numerals to 1000 (M) and recognise years written in Roman numerals

Pupils identify the place value in large whole numbers. They continue to use number in context, including measurement. Pupils extend and apply their understanding of the number system to the decimal numbers and fractions that they have met so far. They should recognise and describe linear number sequences, including those involving fractions and decimals, and find the term-to-term rule. They should recognise and describe linear number sequences (for example, $3, 3\frac{1}{2}, 4, 4\frac{1}{2}, \dots$), including those involving fractions and decimals, and find the term-to-term rule in words (for example, add $\frac{1}{2}$).

Place Value

In Year 5, children will be taught to understand the place value aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use concrete manipulatives and pictorial representations to recap representing numbers to 10,000 – and revise adding / subtracting 10, 100 and 1,000.
- build on Year 4 knowledge of Roman numerals to 100 to explore Roman numerals to 1,000.
- build on previous knowledge to round to nearest 10, 100 and 1,000 up to and within 10,000 – understanding the column used when deciding how to round.
- represent numbers on a place value grid, read and write numbers and place them (including estimating) on a number line to 100, 000.
- compare and order numbers to 100,000 presented in a variety of ways (place value counters, part-whole models, Roman numerals etc.)
- round numbers within 100,000, using knowledge of multiples of 10, 100, 1,000 and 10,000 to work out which two numbers the number they are rounding is between.
- read, write and represent (in a variety of ways) numbers to a million.
- counting forwards and backwards in 10s, 100s, 1,000s, 10,000s and 100,000s – completing number sequences and describing term-to-term rules.
- compare and order numbers to one million using comparison vocabulary and symbols.
- use numbers with up to 6-digits to recap previous rounding, and learn the new skill of rounding to the nearest 100,000 – within context and for a purpose.
- continue to explore negative numbers and their position on a number line in contexts, such as temperature. (reiterate 'negative four' not 'minus four').

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Addition and Subtraction:

Pupils should be taught to:

- 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
- 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.

Pupils practise using the formal written methods of columnar addition and subtraction with increasingly large numbers to aid fluency (see Mathematics Appendix 1).

They practise mental calculations with increasingly large numbers to aid fluency (for example, $12\,462 - 2300 = 10\,162$).

Addition and Subtraction

In Year 5, children will be taught to understand the addition and subtraction aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- build on previous knowledge to add whole numbers with more than 4 digits using column method, using place value knowledge to line the numbers up accurately.
- using column method, subtract whole numbers with more than 4 digits, including exchange and experience '0' as a place holder.
- round to estimate and approximate answers for calculations and problems.
- use knowledge of addition and subtraction to carry out inverse operations and check accuracy of their work, showing understanding of the commutative law to see that addition can be done in any order but subtraction cannot.
- solve a range of multi-step addition and subtraction problems in different contexts and in different forms (bar models / word problems).

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Multiplication and Division:

Pupils should be taught to:

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- 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
- 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
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Pupils practise and extend their use of the formal written methods of short multiplication and short division (see Mathematics Appendix 1). They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations...

Multiplication and Division

In Year 5, children will be taught to understand the multiplication and division aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

AUTUMN:

- building on times tables knowledge, find multiples of whole numbers using concrete and pictorial representations – understanding that a multiple of a number is the product of the number and another whole number.
- understand the relationship between multiplication and division and learn that factors of a number multiply together to give that number – they come in pairs.
- using knowledge of factors, find the common factors of two numbers.
- understand that numbers that have only two factors are prime numbers and non-primes are composite numbers. Recall primes up to 19 and establish primes up to 100.
- explore square numbers, the fact they have an odd number of factors and are the result of multiplying a number by itself – and use notation for squared (2)
- understand a cube number is the result of multiplying a whole number by itself three times – and use notation for cubed (3)
- recap multiplying by 10, 100 then move to multiplying by 1,000 – understanding how the digits move on a place value grid.
- divide by 10, 100 and 1,000 using a place value chart and understanding that the digits move to the right when dividing by powers of ten.
- use knowledge of other multiples of 10, 100 and 1,000 to answer related questions.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Multiplication and Division:

...

They use and understand the terms factor, multiple and prime, square and cube numbers.

Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, $98 \div 4 = \frac{98}{4} = 24 \text{ r } 2 = 24\frac{1}{2} = 24.5 \approx 25$).

Pupils use multiplication and division as inverses to support the introduction of ratio in year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying and dividing by powers of a 1000 in converting between units such as kilometres and metres.

Distributivity can be expressed as $a(b + c) = ab + ac$.

They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalence statements (for example, $4 \times 35 = 2 \times 2 \times 35$; $3 \times 270 = 3 \times 3 \times 9 \times 10 = 9^2 \times 10$).

Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, $13 + 24 = 12 + 25$; $33 = 5 \times \square$).

Multiplication and Division

In Year 5, children will be taught to understand the multiplication and division aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

SPRING:

- use concrete manipulatives to multiply 4-digits by 1-digit, including exchange in more than one column and using 0 as a place holder correctly.
- use Base 10 to represent the area model of multiplication, in order to see the size and scale linked to multiplying.
- use and understand more formal methods used to multiply 2-digits by 2-digits and explore the role of the zero in the column method and its importance.
- extend multiplication skills to multiply 3-digits by 2-digits, including to find area and solve multi-step problems.
- extend previous understanding to multiply 4-digits by 2-digits and understand the steps taken when using this method of multiplication.
- build on Year 4 knowledge to divide 4-digits by 1-digit, using place value counters to partition number then group to develop understanding of the short division method.
- build prior knowledge to continue to divide with remainders in context.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions (including Decimals and Percentages):

Pupils should be taught to:

- compare and order fractions whose denominators are all multiples of the same number
- identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]
- 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
- read and write decimal numbers as fractions [for example, $0.71 = \frac{71}{100}$]
- recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- round decimals with two decimal places to the nearest whole number and to one decimal place
- read, write, order and compare numbers with up to three decimal places
- solve problems involving number up to three decimal places
- recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal
- solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25.

Pupils should be taught throughout that percentages, decimals and fractions are different ways of expressing proportions.

They extend their knowledge of fractions to thousandths and connect to decimals and measures...

Fractions

In Year 5, children will be taught to understand the fractions aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore equivalent fractions using models and concrete representations, making links to multiplication and division, then applying abstract method to find equivalent fractions.
- convert improper fractions to mixed numbers and understand the meaning of the terms, aided by visual representations of the process.
- convert mixed numbers to improper fractions using concrete and pictorial methods to understand the abstract method.
- explore number sequences through visual representations and count up/down in a given fraction.
- compare and order fractions less than 1 where the denominators are multiples of the same number, through finding common denominators.
- use previous knowledge to compare and order fractions greater than 1, using common denominators to help them.
- recap adding and subtracting fractions with the same denominator, using bar models.
- use understanding of common denominators to add fractions within 1, where one denominator is a multiple of the other.
- continue to use understanding of common denominators to add 3 or more fractions, where two denominators are a multiple of the other.
- continue to represent fractions using pictorial methods to explore adding two or more proper fractions where the total is greater than 1.
- add mixed numbers using the method of adding the wholes and then the parts.
- subtract fractions with different denominators, where one denominator is a multiple of the other.
- apply understanding of subtracting fractions to subtract proper fractions from mixed numbers.
- use method of flexible partitioning to subtract two fractions where one is a mixed number, and one you need to break one of the wholes up.
- use different strategies to subtract 2 mixed numbers.
- begin to multiply unit fractions by an integer, linking to repeated addition and understanding that the denominator stays the same, whilst the numerator is multiplied by the integer.
- build on prior learning to multiply non-unit fractions by an integer.
- use knowledge of fractions to multiply a mixed numbers by a whole number – using repeated addition and exploring visual representations.
- recap finding unit and non-unit fractions of amounts, quantities and measures.
- link understanding of fractions of amounts and multiplying fractions to use fractions as operators.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions (including Decimals and Percentages):

... Pupils connect equivalent fractions > 1 that simplify to integers with division and other fractions > 1 to division with remainders, using the number line and other models, and hence move from these to improper and mixed fractions. Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division, building on work from previous years. This relates to scaling by simple fractions, including fractions > 1 . Pupils practise adding and subtracting fractions to become fluent through a variety of increasingly complex problems. They extend their understanding of adding and subtracting fractions to calculations that exceed 1 as a mixed number. Pupils continue to practise counting forwards and backwards in simple fractions. Pupils continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities. Pupils extend counting from year 4, using decimals and fractions including bridging zero, for example on a number line. Pupils say, read and write decimal fractions and related tenths, hundredths and thousandths accurately and are confident in checking the reasonableness of their answers to problems. They mentally add and subtract tenths, and one-digit whole numbers and tenths. They practise adding and subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, $0.83 + 0.17 = 1$). Pupils should go beyond the measurement and money models of decimals, for example, by solving puzzles involving decimals. Pupils should make connections between percentages, fractions and decimals (for example, 100% represents a whole quantity and 1% is $\frac{1}{100}$, 50% is $\frac{50}{100}$, 25% is $\frac{25}{100}$) and relate this to finding 'fractions of'.

Decimals and Percentages

In Year 5, children will be taught to understand the decimals and percentages aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

SPRING:

- read and write decimals up to 2 d.p. and understand the value of each digit, through use of place value grids and partitioning numbers in different ways.
- explore the relationship between decimals as fractions and convert between the two.
- explore and represent (in a variety of ways) more complex decimals as fractions and numbers greater than 1.
- develop knowledge of tenths and hundredths to understand thousandths, considering decimal and mixed number equivalences.
- explore the link between tenths, hundredths and thousandths, representing decimals in different ways.
- round to the nearest whole numbers and to the nearest tenth.
- order and compare numbers with up to three decimal places, using place value counters and number lines.
- explore and understand percentages and that 'per cent' relates to 'number of parts per hundred.'
- represent percentages as fractions using the denominator 100 and make the connection to decimals and hundredths – understanding percentages, decimals and fractions are different ways of expressing proportions.
- explore a range of equivalent fractions decimals and percentages, using bar models and hundred squares to support understanding and show equivalence.

SUMMER:

- add decimals within one whole, using place value counters and charts to support adding and understanding what happens when exchange occurs between columns.
- subtracting decimals within 1 using a variety of methods (place value counters, difference, formal methods).
- explore complements to 1, making links with number bonds to 10, 100 and 1,000.
- use skills from finding complements to support adding decimals – crossing the whole.
- add numbers greater than one with the same number of decimal places, using place value counters and charts alongside formal column method.
- subtract decimals with the same number of decimal places.
- add decimals with a different number of decimal places, focusing on lining up the decimal point to ensure correct place value.
- subtract decimals with a different number of decimal places, focusing on lining up the decimal point to ensure correct place value.
- add and subtract numbers with decimals from whole numbers.
- explore decimal sequences and create simple rules.
- multiply decimals by 10, 100 and 1,000 using place value charts to reinforce how digits move to the left.
- divide decimals by 10, 100 and 1,000, using place value charts to reinforce how digits move to the right.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

STATISTICS

Statistics:

Pupils should be taught to:

- solve comparison, sum and difference problems using information presented in a line graph
- complete, read and interpret information in tables, including timetables

Pupils connect their work on coordinates and scales to their interpretation of time graphs.

They begin to decide which representations of data are most appropriate and why.

Statistics

In Year 5, children will be taught to understand statistics through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- read and interpret line graphs, making links to using number lines when reading the horizontal and vertical axes – and drawing vertical/horizontal lines, within a graph, to read the points accurately.
- use their knowledge of scales and coordinates to represent data in a line graph, drawing axes with different scales depending on the data. (Drawing line graphs directly links to Year 5 Science).
- use line graphs to solve comparison, sum and difference problems in a range of contexts, making links to other subject areas (particularly Science).
- read tables to extract and interpret information, and answer questions – including generating their own questions. (application of addition and subtraction skills is abundant within this step).
- read a range of two-way tables and answer questions by interpreting the information – including completing and creating tables of their own.
- read timetables to extract and interpret information, in relevant contexts for children's experiences.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)
- understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints
- measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm²) and square metres (m²) and estimate the area of irregular shapes
- estimate volume [for example, using 1 cm³ blocks to build cuboids (including cubes)] and capacity [for example, using water]
- solve problems involving converting between units of time
- use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

Pupils use their knowledge of place value and multiplication and division to convert between standard units. Pupils calculate the perimeter of rectangles and related composite shapes, including using the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example $4 + 2b = 20$ for a rectangle of sides 2 cm and b cm and perimeter of 20cm. Pupils calculate the area from scale drawings using given measurements. Pupils use all four operations in problems involving time and money, including conversions (for example, days to weeks, expressing the answer as weeks and days).

Perimeter and Area:

In Year 5, children will be taught to understand the perimeter and area aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use rulers accurately to measure the perimeter of rectilinear shapes from diagrams without grids.
- apply their knowledge of measuring and finding perimeter to find the unknown side lengths, calculating perimeter (with and without grids).
- build on previous learning in Year4 by counting squares to find the area and moving on to using a formula to find the area of rectangles.
- calculate the area of compound shapes, understanding the lengths that correspond to the whole shape and which to the smaller shapes created.
- use their knowledge of counting squares and fractions to estimate the area of irregular (not rectilinear) shapes.

Converting Units

In Year 5, children will be taught to understand the converting units aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- understand the prefix 'kilo' in units of length and mass, meaning a thousand. They convert from metres to kilometres (km), grams to kilograms (kg) and vice versa.
- understand the use of 'milli' in units of length and mass – knowing it means $\frac{1}{1000}$, converting from metres to millimetres (mm), litres to millilitres (ml) and vice versa.
- convert between different units of length and choose the appropriate unit for measurement (metric units – mm, m, km, cm)
- explore imperial units, understanding and using approximate equivalences between metric and common imperial units such as inches, pounds (lbs) and pints.
- convert between different units of time including years, months, weeks, days, hours, minutes and seconds using bar models to aid understanding, alongside time lines, calendars and clocks to enhance understanding.
- use timetables to retrieve information and convert between different units of time in order to solve problems using the timetables.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)
- understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints
- measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm²) and square metres (m²) and estimate the area of irregular shapes
- estimate volume [for example, using 1 cm³ blocks to build cuboids (including cubes)] and capacity [for example, using water]
- solve problems involving converting between units of time
- use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

Pupils use their knowledge of place value and multiplication and division to convert between standard units. Pupils calculate the perimeter of rectangles and related composite shapes, including using the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example $4 + 2b = 20$ for a rectangle of sides 2 cm and b cm and perimeter of 20cm. Pupils calculate the area from scale drawings using given measurements. Pupils use all four operations in problems involving time and money, including conversions (for example, days to weeks, expressing the answer as weeks and days).

Volume

In Year 5, children will be taught to understand the volume aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- understand that volume is the amount of solid space something takes up and how it is different to capacity (the amount a container can hold).
- use their previous understanding of volume to compare and order different solids that are made of cubes.
- estimate volume and capacity of different solids and objects, building cubes and cuboids to aid their estimates and choosing the most suitable unit of measure for an object.
- estimate capacity using practical equipment such as water and rice – exploring how containers can be different shapes but still hold the same capacity.

Year 5

National Curriculum

Ackworth Howard's Knowledge Essentials

GEOMETRY

Geometry – Properties of Shape:

Pupils should be taught to:

- identify 3-D shapes, including cubes and other cuboids, from 2-D representations
- know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
- draw given angles, and measure them in degrees ($^{\circ}$)
- identify:
 - angles at a point and one whole turn (total 360°)
 - angles at a point on a straight line and half a turn (total 180°)
 - other multiples of 90°
- use the properties of rectangles to deduce related facts and find missing lengths and angles
- distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

Pupils become accurate in drawing lines with a ruler to the nearest millimetre, and measuring with a protractor. They use conventional markings for parallel lines and right angles. Pupils use the term diagonal and make conjectures about the angles formed between sides, and between diagonals and parallel sides, and other properties of quadrilaterals, for example using dynamic geometry ICT tools. Pupils use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems.

Geometry – Position and Direction:

- identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed

Pupils recognise and use reflection and translation in a variety of diagrams, including continuing to use a 2-D grid and coordinates in the first quadrant. Reflection should be in lines that are parallel to the axes.

Geometry – Properties of Shape

In Year 5, children will be taught to understand the properties of shape aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recap acute and obtuse angles, recognise a full turn as 360 degrees, a half-turn as 180 degrees and a quarter-turn (or right angle) as 90 degrees, and from this deduce angles such as 45 degrees, 135 degrees and 270 degrees. Reflex angles are explored for the first time.
- use a protractor for the first time, beginning with measuring angles less than 90° (acute angles), using understanding of right angles to estimate.
- continue measuring with a protractor, focussing on obtuse angles, still using knowledge of right angles to estimate and check if answers are sensible.
- draw lines correctly to the nearest millimetre and draw angles of a given size.
- use understanding of right angles, and the fact that two right angles are equivalent to a straight line, to calculate angles on a straight line.
- use their understanding that a full turn is 360 degrees to calculate angles around a point, understanding when they should measure an angle and when they should calculate from given facts.
- explore calculating lengths and angles in shapes through looking at squares and rectangles on a grid to identify right angles – reasoning about length and angles.
- distinguish between regular (all sides and angles in a shape are equal) and irregular polygons and work out the sizes of missing angles and sides.
- identify and reason about 3-D shapes – using nets to identify 3-D shapes and looking at properties of 3-D shapes from 2-D projections, including plans and elevations.

Geometry – Position and Direction

In Year 5, children will be taught to understand the position and direction aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore position in the first quadrant – understanding that the first number represents the x-coordinate and the second the y-coordinate.
- reflect objects using lines that are parallel to the axes, in the first quadrant and on a grid. Recognise the term object (name of shape before reflection) and image (name of shape after reflection).
- explore what happens to coordinate points when they are reflected in lines parallel to the axes.
- understand how to translate shapes on a grid, focusing on each vertex.
- translate coordinates and describe translations of coordinates.

Year 5 Mathematics Vocabulary

Year 5 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3, 4 Vocabulary)

NUMBER

Number factor pair prime factor composite number linear sequence \geq greater than or equal to \leq less than or equal to formula divisibility square number prime number ascending/descending order	Place value millions	Estimating ten thousand	Addition and subtraction ones boundary tenths boundary complement	Multiplication and division	Fractions proper fraction improper fraction equivalent, reduced to, cancel thousandths in every, for every percentage, per cent %
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Year 5 Mathematics Vocabulary

Year 5 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3, 4 Vocabulary)

MEASUREMENT

Measuring

imperial unit

Length

square meter (m²)
square millimetre (mm²)

Weight

(See previous year group's
vocabulary)

Capacity and volume

pint
gallon

Temperature

(See previous year group's
vocabulary)

Time

(See previous year group's
vocabulary)

Money

discount
currency

Year 5 Mathematics Vocabulary

Year 5 - New Essential Vocabulary (In addition to Early Years, Year 1, 2, 3, 4 Vocabulary)				
<u>GEOMETRY</u>			<u>STATISTICS</u>	<u>GENERAL</u>
Properties of shape radius diameter congruent axis of symmetry reflective symmetry orientation	2-D shape x-axis y-axis quadrant 3-D shape octahedron	Position and direction coordinate protractor	Statistics database bar line chart line graph maximum/minimum value outcome	General explain your reasoning

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Number and Place Value:

Pupils should be taught to:

- read, write, order and compare numbers up to 10 000 000 and determine the value of each digit
- round any whole number to a required degree of accuracy
- use negative numbers in context, and calculate intervals across zero
- solve number and practical problems that involve all of the above.

Pupils use the whole number system, including saying, reading and writing numbers accurately.

Place Value

In Year 6, children will be taught to understand the place value aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- read, write and represent numbers to ten million, in different ways.
- compare and order whole numbers up to ten million, using numbers presented in different ways – using correct mathematical vocabulary (greater than / less than) alongside inequality symbols.
- round any number within ten million, using their knowledge of multiples and place value columns to work out which two numbers the number they are rounding sits between.
- build on previous understanding of negative numbers by counting forwards and backwards through zero.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Addition, Subtraction, Multiplication and Division:

Pupils should be taught to:

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the four operations
- 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
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1). They undertake mental calculations with increasingly large numbers and more complex calculations. Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency. Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures. Pupils explore the order of operations using brackets; for example, $2 + 1 \times 3 = 5$ and $(2 + 1) \times 3 = 9$. Common factors can be related to finding equivalent fractions.

Addition, Subtraction, Multiplication and Division:

In Year 6, children will be taught to understand the addition, subtraction, multiplication and division aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- consolidate knowledge of column addition and subtraction to add and subtract integers within multi-digit calculations.
- consolidate knowledge of column multiplication to multiply up to a 4-digit number by a 2-digit number.
- build on understanding of dividing up to 4-digits by 1-digit to divide by up to 2-digits, using short division.
- use their number sense (specifically factors) to see relationships between the dividend (number being divided) and the divisor (number the dividend is being divided by).
- introduction to long division as a different method for dividing by a 2-digit number – dividing a 3-digit number by a 2-digit number without remainders, showing expanded method of multiples shown, before moving to more formal method.
- build on previous long division understanding to divide 4-digit numbers by 2-digit numbers.
- use the long division method to calculate where answers have remainders.
- divide 4-digit numbers using long division, with remainders and interpreting remainders for the context (whether to round up or not).
- find the common factors of two numbers and present their findings in different diagrams and tables.
- use visual representations to build on knowledge of multiples and find common multiples of numbers.
- use their knowledge of prime numbers, factors and composite numbers to work out primes to 100.
- explore the relationship between square and cube numbers, including solving problems.
- explore how the order of operations affects the answer within a mixed operation calculation question.
- explore efficient mental calculations and sensible estimations to ensure this skill is practised.
- reason from known facts to determine the answer of similar calculations to ensure efficiency in calculating.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions (including Decimals and Percentages)

Pupils should be taught to:

- 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 [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]
- divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$]
- associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$]
- identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places
- 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
- solve problems which require answers to be rounded to specified degrees of accuracy
- recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Pupils should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example, $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$) and progress to varied and increasingly complex problems.

Fractions:

In Year 6, children will be taught to understand the fractions aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use their knowledge of the highest common factor and pictorial representations to simplify fractions.
- count forward and backwards in fractions and revise comparing/ordering fractions with the same denominator or denominators that are multiples of the same number and place these fractions on a number line.
- use understanding of equivalent fractions to compare and order fractions where the denominators are not multiples of the same number, using the method of finding the lowest common multiple.
- build on prior knowledge of comparing unit fractions to compare and order fractions by finding a common numerator (focusing on the idea that when the numerators are the same, the larger the denominator, the smaller the fraction).
- add and subtract fractions within 1 where the denominators are multiples of the same number.
- add and subtract fractions where the denominators are not multiples of the same number – finding the lowest common multiple and finding equivalent fractions.
- explore adding mixed number fractions through different methods depending on whether the fractions total more than one.
- subtract mixed number fractions, exploring different methods, including exchanging wholes for fractions, subtracting wholes/fractions separately, converting the mixed number to an improper fraction.
- solve problems that involve mixed addition and subtraction of fractions and mixed numbers.
- multiply fractions and mixed numbers by integers, using diagrams to make the link between multiplication and repeated addition.
- use concrete and pictorial representations to multiply fractions by fractions.
- begin to divide fractions by integers, where the numerator is a multiple of the integer they are dividing by.
- divide fractions where the numerator is not a multiple of the integer they are dividing by.
- combine the four operations when calculating with fractions, recapping the order of operations.
- calculate fractions of an amount, recognising the denominator as the number of parts the amount is being divided into, and numerator is the amount of parts we need to know about.
- find the whole amount from the known value of a fraction, using bar models to aid understanding.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Fractions (including Decimals and Percentages) cont...

Pupils should use a variety of images to support their understanding of multiplication with fractions. This follows earlier work about fractions as operators (fractions of), as numbers, and as equal parts of objects, for example as parts of a rectangle.

Pupils use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if $\frac{1}{4}$ of a length is 36cm, then the whole length is $36 \times 4 = 144\text{cm}$).

They practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators.

Pupils can explore and make conjectures about converting a simple fraction to a decimal fraction (for example, $3 \div 8 = 0.375$). For simple fractions with recurring decimal equivalents, pupils learn about rounding the decimal to three decimal places, or other appropriate approximations depending on the context. Pupils multiply and divide numbers with up to two decimal places by one-digit and two-digit whole numbers. Pupils multiply decimals by whole numbers, starting with the simplest cases, such as $0.4 \times 2 = 0.8$, and in practical contexts, such as measures and money.

Pupils are introduced to the division of decimal numbers by one-digit whole number, initially, in practical contexts involving measures and money. They recognise division calculations as the inverse of multiplication.

Pupils also develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations. This includes rounding answers to a specified degree of accuracy and checking the reasonableness of their answers.

Decimals:

In Year 6, children will be taught to understand the decimals aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recap understanding of numbers with up to three decimal places, looking at the value of each place value column and describing its value in words and digits.
- multiply numbers with up to three decimal places by 10, 100 and 1,000, understanding that digits move to the left and the decimal point does not move.
- divide numbers with up to three decimal places by 10, 100 and 1,000, understanding that digits move to the right and the decimal point does not move, applying this to converting units of measure.
- use concrete resources to multiply decimals by integers and explore what happens when you exchange with decimals.
- use concrete resources to divide decimals by integers and explore what happens when exchange occurs.
- apply understanding of division to solve problems where the answer has up to 2 decimal places.
- explore the relationship between decimals and fractions, using place value knowledge to convert decimals to fractions.
- explore converting fractions to decimals, using prior knowledge of common fractions and finding equivalent fractions with denominators of 10, 100, 1000 to convert.
- convert fractions to decimals using the understanding that the numerator can be divided by the denominator.

Percentages:

In Year 6, children will be taught to understand the percentages aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- convert fractions to percentages using finding equivalent fractions where the denominator is 100.
- use knowledge of common equivalent fractions and decimals to find the equivalent percentage.
- convert between fractions, decimals and percentages to enable them to order and compare them.
- use known fractional equivalences to find the percentage of an amount.
- build on previous learning to find multiples of 10% and other known percentages of an amount.
- use their understanding of percentages to find the missing whole or a missing percentage when the other values are given.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

NUMBER

Algebra

Pupils should be taught to:

- use simple formulae
- generate and describe linear number sequences
- express missing number problems algebraically
- find pairs of numbers that satisfy an equation with two unknowns
- enumerate possibilities of combinations of two variables.

Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as:

- *missing numbers, lengths, coordinates and angles*
- *formulae in mathematics and science*
- *equivalent expressions (for example, $a + b = b + a$)*
- *generalisations of number patterns*
- *number puzzles (for example, what two numbers can add up to).*

Ratio and Proportion

Pupils should be taught to:

- solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts
- solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison
- solve problems involving similar shapes where the scale factor is known or can be found
- solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio (for example, similar shapes and recipes). Pupils link percentages or 360° to calculating angles of pie charts. Pupils should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation $a:b$ to record their work. Pupils solve problems involving unequal quantities, for example, 'for every egg you need three spoonful of flour', '3 fifths of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion.

Algebra:

In Year 6, children will be taught to understand the algebra aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- explore simple one-step function machines to find a rule, including working backwards to find the input when given the output.
- build on previous learning to explore two step function machines and find a rule to satisfy the function.
- use simple algebraic inputs with function machines to understand forming expressions.
- substitute into simple expressions to find a particular value.
- substitute into familiar formulae such as those for area and volume.
- building on forming expressions, develop how to use algebraic notation to form one-step equations, distinguishing between different types of expression.
- explore how to solve simple one-step equations involving the four operations, using concrete materials and the balancing method using inverse operations.
- develop previous step to solve two-step equations with the aid of concrete and pictorial representations to secure understanding.
- use their understanding of substitution to consider what possible values a pair of variables can take.
- develop previous step to find possible solutions to equations which involve multiples of one or more unknown, working systematically to test the possible solutions that meet given criteria.

Ratio:

In Year 6, children will be taught to understand the algebra aspect of number through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- understand that ratio shows the relationship between two values and describe how one is related to another using ratio language.
- use objects and diagrams to compare ratios and fractions.
- explore the ratio symbol – colon notation – and continue to link with the language 'for every..., there are...'
- calculate ratio and find both a part and a whole, using bar models to represent problems.
- understand scale factors by enlarging shapes to make them 2 or 3 times as big etc.
- calculate scale factors when given similar shapes and understand the meaning of 'similar.'
- apply the skills they have learnt to solve a range of ratio and proportion problems in different contexts.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

MEASUREMENT

Measurement:

Pupils should be taught to:

- solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate
- use, read, write and convert 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
- convert between miles and kilometres
- recognise that shapes with the same areas can have different perimeters and vice versa
- recognise when it is possible to use formulae for area and volume of shapes
- calculate the area of parallelograms and triangles
- calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3].

Pupils connect conversion (for example, from kilometres to miles) to a graphical representation as preparation for understanding linear/proportional graphs.

They know approximate conversions and are able to tell if an answer is sensible.

Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature.

They relate the area of rectangles to parallelograms and triangles, for example, by dissection, and calculate their areas, understanding and using the formulae (in words or symbols) to do this.

Pupils could be introduced to compound units for speed, such as miles per hour, and apply their knowledge in science or other subjects as appropriate.

Converting Units

In Year 6, children will be taught to understand the converting units aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- read, write and recognise all metric measures for length, mass and capacity, understanding clearly the difference between capacity and volume.
- use their skills of multiplying and dividing by 10, 100 and 1,000 to convert between units of length, mass and capacity.
- use and apply conversion skills to calculate and solve problems with metric measures in context.
- know that 5 miles is approximately 8 kilometres and use this fact to find approximate conversions from miles to kilometres and vice versa, understanding that ' \approx ' means 'is approximately equal to.'
- know and use the following facts for imperial measures: 1 foot = 12 inches; 1 pound = 16 ounces; 1 stone = 14 pounds; 1 gallon = 8 pints; 1 inch \approx 2.5cm. Use these to perform related conversions both within imperial measures and between imperial and metric.

Perimeter, Area and Volume

In Year 6, children will be taught to understand the perimeter, area and volume aspect of measurement through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- find and draw rectilinear shapes that have the same area, using knowledge of factors.
- calculate area and perimeter of rectilinear shapes, exploring that shapes with the same area can have the same or different perimeters.
- use previous knowledge of approximating and estimating to work out the area of different triangles by counting.
- use knowledge of finding the area of a rectangle to find the area of a right-angled triangle.
- work out the area of any triangle using the formula, $\text{base} \times \text{height} \div 2$ for a variety of triangles where different side lengths are given.
- use their knowledge of finding the area of a rectangle to find the area of a parallelogram.
- understand that volume is the space occupied by a 3-D object and count cubic units (1cm^3) to find the volume of 3-D shapes.
- make the link between counting cubes and the formula ($l \times w \times h$) to calculate the volume of a cuboid.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

GEOMETRY

Geometry – Position and Direction:

Pupils should be taught to:

- describe positions on the full coordinate grid (all four quadrants)
- draw and translate simple shapes on the coordinate plane, and reflect them in the axes.

Pupils draw and label a pair of axes in all four quadrants with equal scaling. This extends their knowledge of one quadrant to all four quadrants, including the use of negative numbers. Pupils draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes. These might be expressed algebraically for example, translating vertex (a, b) to $(a - 2, b + 3)$; (a, b) and $(a + d, b + d)$ being opposite vertices of a square of side d .

Geometry – Properties of Shape:

Pupils should be taught to:

- draw 2-D shapes using given dimensions and angles
- recognise, describe and build simple 3-D shapes, including making nets
- compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons
- illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius
- recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

Pupils draw shapes and nets accurately, using measuring tools and conventional markings and labels for lines and angles. Pupils describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements. These relationships might be expressed algebraically for example, $d = 2 \times r$; $a = 180 - (b + c)$.

Geometry – Position and Direction

In Year 6, children will be taught to understand the position and direction aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recap learning with the first quadrant by reading and plotting coordinates.
- build on previous learning to read and plot coordinates in all four quadrants and draw shapes from coordinates given.
- use knowledge of coordinates and positional language to translate and draw shapes in all four quadrants.
- extend knowledge of reflections to reflect shapes in all four quadrants, in both the x and y axis.

Geometry – Properties of Shape

In Year 6, children will be taught to understand the properties of shape aspect of geometry through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- recap using a protractor and practise measuring angles given in different orientations.
- explore understanding of degrees through right angles and understanding of fractions of a turn in different contexts such as time and on a compass.
- apply their understanding of angles in a right angle, angles on a straight line and angles around a point to calculate missing angles.
- recognise that vertically opposite angles share a vertex and realise they are equal, using practical examples to show this.
- explore, practically, interior angles of a triangle and understand that the angles add up to 180 degrees.
- identify hatch marks for equal lengths and concentrate on angles in right-angled and isosceles triangle.
- build on prior learning to make links and recognise key features of specific types of triangle to solve missing angle problems.
- use their knowledge of properties of shape to explore interior angles in special quadrilaterals such as a parallelogram, rhombus, trapezium etc. and understand angles in any quadrilateral add up to 360° .
- explore interior angles in regular polygons, considering partitioning shapes into triangles from a single vertex to work out the sum of the angles.
- use knowledge of properties of shape and angles, as well as converting between different units of measure, to draw shapes accurately on different grids before using a protractor on plain paper.
- use their knowledge of 2-D and 3-D shapes to identify 3-D shapes from their nets and draw nets of 3-D shapes.

Year 6

National Curriculum

Ackworth Howard's Knowledge Essentials

STATISTICS

Statistics:

Pupils should be taught to:

- interpret and construct pie charts and line graphs and use these to solve problems
- calculate and interpret the mean as an average

Pupils connect their work on angles, fractions and percentages to the interpretation of pie charts.

Pupils both encounter and draw graphs relating two variables, arising from their own enquiry and in other subjects.

They should connect conversion from kilometres to miles in measurement to its graphical representation.

Pupils know when it is appropriate to find the mean of a data set

Statistics

In Year 6, children will be taught to understand statistics through the following small steps, including a range of fluency, reasoning and problem-solving experiences:

- use previous experience of interpreting data to read and interpret line graphs, using knowledge of scales to read information accurately and showing a secure understanding of the terms x and y axis, frequency and data.
- build on experience of reading and interpreting data to draw their own line graphs.
- use line graphs to solve problems, including graphs that show more than one set of data.
- illustrate and name parts of circles, using the words radius, diameter, centre and circumference confidently.
- read and interpret pie charts, understanding how to calculate fractions of amounts to interpret simple pie charts.
- apply understanding of calculating percentages of amounts to interpret pie charts and know the whole pie chart represents 100%.
- build on angles around a point totalling 360 ° to know that this represents 100% of the data within a pie chart and use this understanding to draw pie charts.
- apply addition and division skills to calculate the mean (using sharing equally or formula – mean = total ÷ number of items) average in a variety of contexts.

Year 6 Mathematics Vocabulary

Year 6 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3, 4, 5 Vocabulary)

NUMBER

Number factorise digit total	Place value (See previous year group's vocabulary)	Estimating (See previous year group's vocabulary)	Addition and subtraction interval	Multiplication and division long division	Fractions (including decimals, percentages, ratio and proportion) ratio Algebra formula, formulae equation unknown variable symbol letter sequence algebraic algebraically constant generalise
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Year 6 Mathematics Vocabulary

Year 6 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3, 4, 5 Vocabulary)

MEASUREMENT

Measuring

(See previous year group's vocabulary)

Length

yard
foot
feet
inch
inches
circumference

Speed

miles per hour
metres per second
kilometres per hour

Weight

tonne
pound
ounce

Capacity and volume

centilitre
cubic centimetres (cm³)
cubic metres (m³)
cubic millimetres (mm³)
cubic kilometres (km³)

Temperature

(See previous year group's vocabulary)

Time

Greenwich Mean Time (GMT)
British Summer Time (BST)
International Date Line (IDL)

Money

profit
loss

Year 6 Mathematics Vocabulary

Year 6 - **New Essential Vocabulary** (In addition to Early Years, Year 1, 2, 3, 4, 5 Vocabulary)

GEOMETRY

Properties of shape

circumference
concentric
arc
net
open
closed
intersecting
intersection
plane
bisect

2-D shape

kite

3-D Shape

dodecahedron
net
open
closed

Position and direction

reflex angle

STATISTICS

Statistics

pie chart
mean (mode, median, range
as estimates for this)
statistics
distribution
data set

GENERAL

General

hypothesis
hypothesise