Curriculum Improvement Cycle
Draft Technical Framework
Numeracy and Mathematics

November 2026

Version 1.0

These are draft materials. The content, format and style are subject to change. They are being shared as part of the co-design process and in advance of engagement and feedback time during the 2026/27 session. There is no expectation on educators, schools or settings to do anything now with these drafts. It would not be appropriate to change current planning or tracking and monitoring systems in establishments at this stage.

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Introduction

The Numeracy and Mathematics Know-Do-Understand framework is informed by three Big Ideas that provide the overarching rationale for learning in mathematics and numeracy. They help clarify the purpose of the curriculum, the significance of mathematical learning and the connections that support progression throughout the learner journey.

The framework is a reference document for planning learning, teaching and assessment. It should be viewed as a connected progression of learning rather than a checklist of individual statements. Feedback from practitioners and stakeholders highlighted a desire for greater clarity about progression in mathematics and for learning pathways to be more visible and coherent. This has informed the way progression is represented within the framework.

The curriculum co-design groups identified aspects of mathematical learning that benefit from a progressive sequence, illustrating how knowledge, skills and understanding develop over time. Within the Numeracy and Mathematics framework, Know and Do statements at Early to Third Level are presented in two or three sequenced steps beneath each Understand statement. Across the wider draft documentation, curriculum areas have adopted approaches to sequencing that best reflect the nature of the discipline.

To support engagement and gather meaningful feedback, two versions of the Numeracy and Mathematics framework are being shared. Both contain the same curriculum content but present progression in different ways. One version presents progression within individual sub-strands from Early to Fourth Level, while this one presents progression within complete strands from Early to Fourth Level. These alternative presentations are being tested to help determine which format practitioners and stakeholders find most helpful in understanding and navigating progression.

The length of the framework should not be interpreted as an expectation that all aspects of learning will be taught or assessed separately. Rather, it reflects an effort to make expectations and learning pathways more visible, supporting curriculum planning and professional understanding. While progression is presented in greater detail than before, this is intended to support professional understanding and curriculum planning rather than increase content coverage or assessment expectations. The key consideration is not the size of the document itself, but how effectively it supports high-quality learning, teaching and assessment in practice. Practitioners will continue to design rich learning experiences that bring together multiple aspects of learning in meaningful contexts.

Practitioner and stakeholder feedback has played an important role in shaping the framework and will continue to inform its refinement and development.

Numeracy and Mathematics purpose statement

Our purpose is to develop children and young people as mathematical thinkers and learners who can work both independently and collaboratively to reason, investigate and build connections. This will enable them to build fluency to make informed decisions, solve problems and appreciate the mathematical relationships that shape our world.

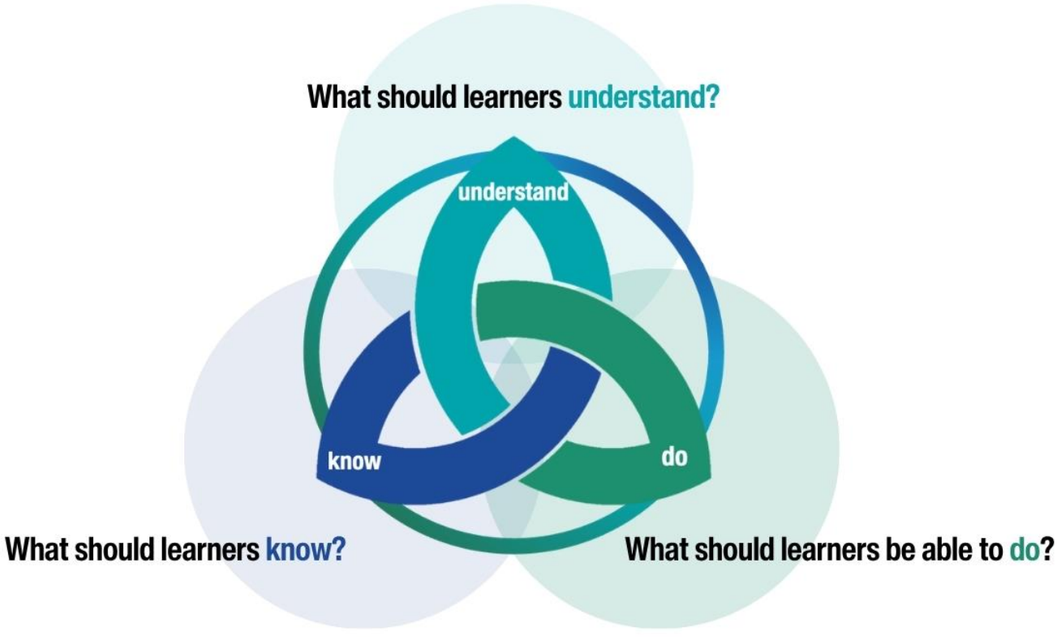
Big Ideas

Mathematics is a Language	Mathematics is Interconnected	Mathematics is Meaning
The language of mathematics supports the deepening of understanding. It allows us to model and communicate solutions to real-world problems. By using mathematical symbols, diagrams and accurate notation we can communicate effectively across disciplines and cultures. The use of precise notation and mathematical language is essential when conveying abstract concepts. As a collaborative practice, mathematics is about discourse, communicating ideas and posing purposeful questions that promote curiosity and creativity. Precise mathematical language underpins clear and visible thinking, informed decision-making and justification.	Mathematics is a structure of connected ideas, relationships and concepts which depend on one another. Noticing and making sense of these connections is central to mathematical thinking. Mathematics underlies and makes sense of the world beyond its own boundaries. Seeing mathematics as interconnected changes how learners think, moving them from following procedures to building understanding, where grasping one idea helps develop others. Once learners see mathematics this way, they begin to see the world differently.	Mathematics is more than a collection of facts, rules and procedures. It uncovers truths about the world and enables us to think critically and make evidence-based decisions. Mathematics makes sense of uncertainty and creates beauty from logic. Finding solutions is important, but value also lies in developing the skills of reasoning and problem solving. Being mathematical requires curiosity and asking questions, it invites us to wonder, investigate and challenge assumptions. Mathematics is a human endeavour spanning centuries and cultures. At its core it is about meaning, not just understanding what is true, but why it is true.

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The Know-Do-Understand (KDU) framework



How the KDU knots are written

Understand:
Statements that decribe the relationship between concepts.

Know:
Facts, definitions or **case studies** that learners need to know to develop the understanding above.

Do:
Skills, **processes** and **procedures** learners need to know to develop the understanding above.

Notes:
Information that helps practitioners in their planning for this KDU knot.

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Strand: Quantity, Numbers and the Algebraic Properties of Number

The focus on quantity is to understand value and size. Determining quantities in the world around us often involves solving problems that draw on a range of mathematical concepts. Numbers help us count, order, compare and express values. Number sense contributes to mathematical fluency, building accuracy, flexibility and efficiency. The algebraic properties of number provide a lens through which learners can generalise how numbers and operations on numbers interact.

Number systems and structures - Conceptual Understanding(s)

Level	Early Level	First Level	Second Level	Third Level	Fourth Level
	• Numbers, including zero, can be represented as spoken number names, written numerals and quantities, while retaining the same value. • Numbers have a fixed order which can be used to describe or compare position. • Sets of objects and numbers can be partitioned and their parts can be recombined to restore the original whole.	• Whole numbers extend without limit, so quantities can be counted indefinitely. • The base ten system uses symbols (digits) to express quantities in an organised way, with each place representing a value ten times greater than the one on its right. • Numbers can be partitioned flexibly to reveal their structure and support efficient calculation.	• Integers extend the number system to include values less than zero, enabling the representation of negative quantities. • Rational numbers allow quantities between integers to be represented and compared. • The base ten system extends to represent and partition increasingly large numbers and decimal fractions of increasing precision through a repeating place value pattern. • Whole numbers greater than one have a multiplicative structure that can be described through factors, enabling flexible and efficient multiplication and division strategies.	• The base ten number system extends infinitely in both directions, allowing increasingly large quantities and increasingly precise values to be represented, interpreted and communicated. • For whole numbers greater than one, the number of factors a number has determines whether it is prime or composite. • Index notation provides a compact way to express repeated multiplication, enabling the efficient calculation and generalisation of powers.	• Scientific notation uses powers of ten to represent numbers, enabling very large and very small numbers to be written and compared efficiently.

Number relationships and operations- Conceptual Understanding(s)

Level	Early Level	First Level	Second Level	Third Level	Fourth Level
	• Small quantities of objects can be identified immediately without counting. • Objects, sounds and movements can be counted to determine how many there are. • Comparing quantities reveals whether one collection has more, less, or the same number of items. • Addition describes combining collections of items into a single quantity. • Subtraction describes finding the quantity left when some items are removed, or the difference between quantities of items. • Addition and subtraction are connected, so one can undo the effect of the other.	• Additive relationships explain how quantities are increased, decreased, combined or compared. • Multiplicative relationships involve organising quantities into equal groups and equal parts. • Fractions represent equal parts of a whole and can be used for counting, comparing, measuring and partitioning quantities.	• Scaling by 10, 100 and 1000 is enabled by the multiplicative relationship between places in the base ten number system. • Place value and operation properties allow whole-number calculations to be decomposed, transformed and checked across different magnitudes. • Fractions represent proportions and can be used to describe, determine and compare relationships between quantities. • Decimal calculations extend place-value relationships and operation properties from whole numbers to include smaller units.	• Place-value relationships and operation properties allow numbers of any magnitude to be scaled, approximated and justified, supporting problem solving in a range of contexts. • Number relationships extend across zero to include positive and negative values, while equivalence, inverse relationships and operation properties remain consistent. • Fraction operations depend on equivalence and unit size, with common units supporting addition and subtraction and multiplicative relationships underpinning multiplication and division.	• Equivalence and multiplicative relationships underpin operations with fractions and mixed numbers, supporting the combination, scaling and comparison of quantities.

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	• Equal sharing results in a quantity being split into a given number of equal parts. • Equal grouping results in arranging a quantity into equal parts of a given size.				
Proportional Reasoning – Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
			• Percentages represent proportions on a common base of 100, allowing direct comparison between quantities.	• Proportional relationships involve quantities that are connected in a consistent way, so if one quantity is multiplied or divided by a given factor, the other quantity changes by the same factor.	• Ratios can be used to describe, partition and scale quantities while maintaining proportional relationships between parts and wholes.
Patterns and sequences – Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• Number sequences follow a predictable order, helping to identify what comes next.	• Additive patterns involve sequences where the same number is added or subtracted each time, so the difference between terms remains constant.	• Some patterns in shapes and nature follow numerical rules that determine how they grow and change.	• Sequences of numbers that follow multiplicative rules can lead to patterns of rapid growth or decay. • Rules describing sequences enable the efficient identification of the next term or any particular term based on its position.	• Sequences that follow additive and multiplicative patterns can model real-life situations to make predictions and solve problems.
Expressions, Equations and Relationships – Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
		• Symbols and pictorial representations model unknown quantities and make mathematical relationships explicit.	• Expressions, equations and functions represent relationships between quantities using symbols and variables, forming part of the language of mathematics.	• Like terms combine to simplify expressions because each variable represents the same quantity. • Equations and inequations can be solved using inverse operations and algebraic properties to determine values that satisfy equality or ranges of values that satisfy inequality. • The construction of expressions and formulae describe unambiguously the operations involved and in what order they are carried out.	• The use of brackets enables expressions to be written in equivalent forms according to the distributive law. • Algebra represents relationships between quantities, allowing patterns to be generalised, situations to be modelled and unknown values to be determined.

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Finance – Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• Money takes different forms and can be used to represent the price of items and activities.	• Money indicates value and can be stored, calculated, exchanged and managed to meet people's needs.	• People can obtain, manage and spend money in different ways based on their circumstances, needs and wants.	• Effective financial planning involves balancing income and expenditure, making informed choices about products and services and considering risks, costs and implications over time.	• Financial systems support individuals, communities and governments and involve risks, responsibilities and opportunities.

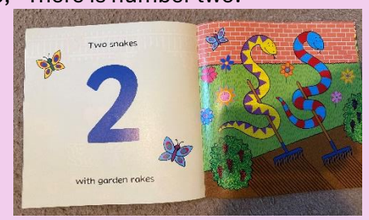
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Early Level

Number systems and structures

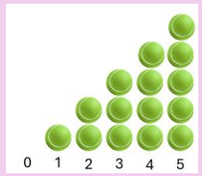
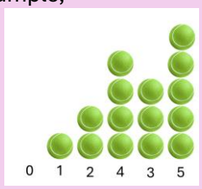
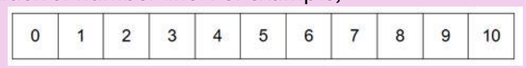
Quantity, Numbers and the Algebraic Properties of Number - Number systems and structures			
Beginning of Early level ⟷			**End of Early level**
Understand: Numbers, including zero, can be represented as spoken number names, written numerals and quantities, while retaining the same value.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Whole numbers can be said in words and symbolised using written numerals. Number words, numerals and quantities are connected. Zero is represented by the numeral 0.	Find examples of numerals in outdoor and indoor spaces. Recognise and select numerals which have been randomly arranged. For example, 'Can you point to 4?', 'Where is 1?'  Identify *(name)* numerals when randomly arranged. For example, 'What numeral is this?', 'What numeral have you found?' Explore making marks which represent numerals and quantities in different ways. Describe pictures, drawings and objects in the outdoor and indoor spaces in a numerical way. For example, 'I have painted three cats', 'I have two hands.' Match numerals, spoken number words and associated quantities that represent the same amount.	Digits are the symbols (0 to 9) used in the decimal number system. Digits are combined to represent numbers beyond 9.	Connect numbers to familiar quantities and contexts. For example, ten fingers, four Seasons, six eggs in a box, five people in my family. Recognise and select numerals which have been randomly arranged. For example, 'Can you point to 11?', 'Where is 17?' Identify *(name)* numerals when randomly arranged. For example, 'What numeral is this?', 'What numeral have you found?' Identify numerals from other written symbols. For example, 'There is number two!'  Match numerals, spoken number words and quantities to represent the same amount. Create mathematical marks during role play and everyday routines. For example, making price tags, receipts or shopping lists.
Notes Whole numbers are the set of numbers 0, 1, 2, 3, 4, 5, ... A numeral is a single-digit/symbol or group of digits/symbols used to represent a number. When connecting numbers to familiar quantities and contexts, this is called developing a number referent. A number referent is a known benchmark used to estimate unknown quantities or sizes. For example, if you know what ten fingers looks like, you could use that referent to estimate if a quantity shown is more or less than ten. In English, Western Arabic numerals are used. Some learners may have experience of, or interest in, different number systems, such as Chinese, Eastern Arabic, Roman and this can be explored where appropriate. Using familiar and engaging contexts such as songs, stories and rhymes helps to connect number words to quantities and notice how numbers change over time. Mathematical mark-making is how young learners use their own lines, dots, marks and symbols to represent real objects, visualise quantities and numbers and make sense of mathematics (symbolic representation). Some digits look like other digits or symbols. For example, 2 and 5, 6 and 9, 2 and z, 5 and s, 0 and o. Digits will have a range of appearances depending on font, handwriting, or display (such as on a digital clock). **Includes but is not limited to** Working within the range 1 to 5, progressing to 0 to 10 and then extending to 20. **New key mathematical language (Learners)**			

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numbers, zero

Numeracy and Mathematics Milestones
Number and number processes
Recognises some familiar numbers within the environment.
Recognises and identifies some numerals.

Understand: Numbers have a fixed order which can be used to describe or compare position.

Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
The order of the number words always stays the same (stable order). The whole number which comes directly after another whole number is one more. The whole number which comes directly before another whole number is one less. Ordinal numbers describe the position of people, numbers, objects or events in a list, for example first, second, third… (ordinal numbers).	Listen to, copy and say the number words in the correct forwards and backwards order through number songs, stories and rhymes. Represent numbers laid out in order, using concrete materials of the same size. For example,  Recognise and correct errors made in ordered numbers. For example,  Identify the numbers before and after within the range. For example, I am 3 and will be 4 on my next birthday. 0 1 2 3 4 5 Describe the position of an object or person using ordinal numbers. For example, ‘Amina is second in the race’, ‘The red car went through the tunnel first’, ‘The picture of the cat is on the third page.’	Ordinal number words can be written symbolically (1st, 2nd, 3rd…).	Listen to, copy and say the number words in the correct forwards and backwards order, through number songs, stories and rhymes. Count forwards and backwards in ones starting at any number within the range. Recognise when the numerals to 10 have been placed in the correct or incorrect order on a number track or number line. For example,   Identify the numbers before, after, between, one more and one less than a given number(s). Identify which number is the largest and which is the smallest. For example, Which is larger 13 or 16? Order a set of numerals from the largest or from the smallest. For example, 5, 12, 9, 2. Recognise and say ordinal numbers used in real and relevant contexts. For example, at sports events or in dates. Compare and describe the position of people or objects using ordinal numbers. For example, ‘The fourth counter from the start is blue.’ 

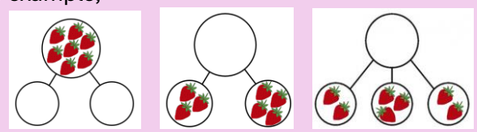
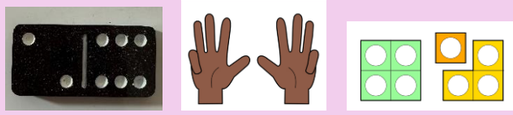
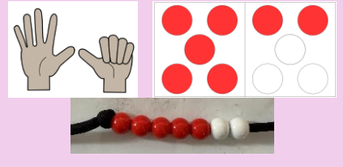
Notes
Model counting forwards and backwards as part of everyday interactions. Backwards counting is often overlooked or not given as much emphasis as counting forwards. Adults should ensure both are given equal emphasis.
When counting backwards some learners may say ‘3, 2, 1, … blast off’ instead of ‘zero’. Whilst some number songs and rhymes might end in this way, when counting aloud, it is important that adults model and reinforce ‘zero’ in the number sequence.
Number tracks are useful when introducing the sequential order of numbers. Using a number track, where each space is discrete, equally sized and spaced prevents skipping or double-counting numbers.
Number lines are more useful when moving beyond counting by ones and needing to understand the spaces between numbers, measuring distances, or performing jumps.
Includes but is not limited to
Working within the range 1 to 5, progressing to 0 to 10 and then extending to 20.

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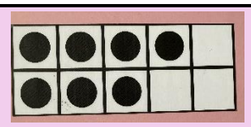
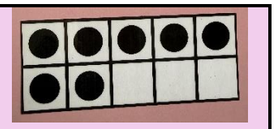
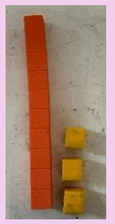
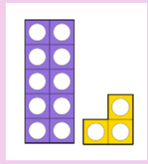
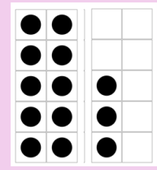
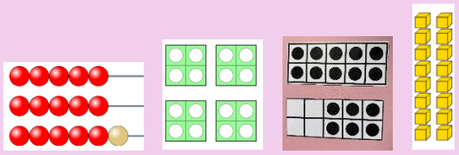
Excludes
Use of language such as stable order, in brackets, as this is intended for practitioner awareness.
New key mathematical language (Learners)
one more, one less, before, after, between, forwards, backwards, order

Numeracy and Mathematics Milestones
Number and number processes
Says or signs the number words in order.

Understand: Sets of objects and numbers can be partitioned and their parts can be recombined to restore the original whole.

Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
The same quantity (whole) can be partitioned into parts in different ways (part/part/whole, part/part/part/whole). Whole number partitions can be recombined to make the original quantity.	Share out sets of objects when playing and recognise that the total remains the same. For example, five dolls shared between two learners is still five dolls. Partition sets of objects in different ways and recognise that the total remains unchanged. For example, four could be shown split into two parts (two and two or three and one) or three parts (two and one and one).  Partition collections of objects (up to five) into two smaller groups without counting. Recombine partitioned amounts to five and recognise that this remakes the whole.	The numbers one to ten can be partitioned using a *pair-wise* pattern. The numbers 6 to 10 can be partitioned using a *five-wise* structure.	Recognise that when a set of objects is partitioned into smaller sized sets the total remains the same. For example,  Partition given amounts into two or more parts and represent this in different ways and recognise that the total remains unchanged. For example, eight could be shown as:  Recombine partitioned amounts to ten and recognise that this remakes the whole. Partition sets of objects using the pair-wise structure. For example, using ten frames, counters or other objects.  Partition sets of objects using the five-wise structure. For example, using finger patterns, Hungarian Ten Frames, bead strings.  Recognise and identify numbers 1 to 10 which have been partitioned in pair-wise and five-wise structures.

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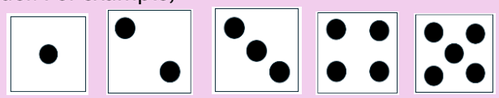
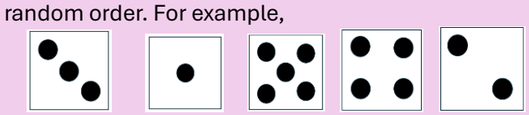
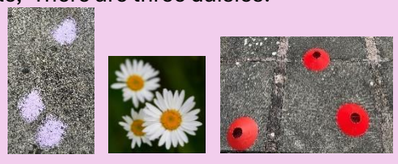
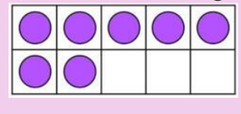
		The numbers 11 to 20 can be partitioned using a *ten and ones* structure. The numbers 11 to 20 can be partitioned into two or more parts.	  Partition the numbers to 20 into tens and ones using concrete materials. For example, 13 is one ten and three one, 20 is two tens and zero ones.    Demonstrate different ways that numbers to 20 can be partitioned into two or more parts using concrete materials and pictorial representations. For example, sixteen could be shown as:  Recombine partitioned amounts to 20 and recognise that this remakes the whole.

Notes
Five-wise is sometimes referred to as ‘five and a bit’.
Numbers shown in a ‘five-wise pattern’ on a ten frame build on knowledge of five as a unit, for example, seven can be seen as five and two more.
Numbers shown in a ‘pair-wise pattern’ on a ten frame builds up the amounts in pairs.
Use ten frames with quantities shown in both a pair-wise and five-wise way.
A Hungarian Tens Frame shows quantities arranged in a 5 and 5 structure and is a practical way to demonstrate the five-wise structure.
Make connections to knowledge of doubles (making equal groups).
Includes but is not limited to
Working within the range 1 to 5, progressing to 0 to 10, extending to 20.
New key mathematical language (Learners)
parts, partition, recombine, tens, ones

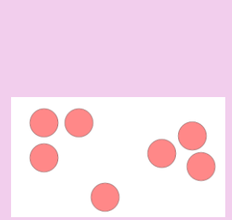
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Number relationships and operations

Quantity, Numbers and Algebraic Properties of Number - Number relationships and operations			
Beginning of Early level ←		→ **End of Early level**	
Understand: Small quantities of objects can be identified immediately without counting.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Objects up to five can be recognised as a single unit without counting (perceptual subitising).	Recognise and say, without counting, how many in regular patterns one to five, when shown them in order. For example,  Recognise and say, without counting, how many in regular patterns one to five, when shown them in a random order. For example,  Recreate regular patterns by pointing to imaginary dots in the air in the same arrangement. For example, pointing to four imaginary dots arranged in a square. Demonstrate how many using sounds and movements, when shown regular patterns to five. For example, clapping two times when shown two dots. Notice and say, without counting, how many in regular patterns to five in everyday contexts. For example, 'There are three!' 	The total number of objects in a group can be broken up into smaller quantities and then combined to work out the total (conceptual subitising).	Recognise and say, without counting, how many in irregular patterns one to five when shown them in order. For example,  Recognise and say, without counting, how many in irregular patterns 1 to 5 when shown them in a random order. For example,  Recreate irregular pattern by pointing to imaginary dots in the air in the same arrangement. For example, recreating a pattern of five with three imaginary dots higher up and two below. Demonstrate how many using sounds and movements, when shown an irregular pattern. For example, jumping four times when shown four randomly arranged dots. Notice and say, without counting, how many in irregular patterns to five in everyday contexts. For example, 'There are three daisies!"  Recognise and say, without counting, how many dots there are on each side of a regular 1 to 6 dice. Recognise and say, without counting how many in regular patterns. For example, 'I see four and three', 'I see five and two', 'That is seven altogether'. 

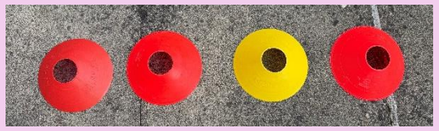
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	Make quantities to 5 by raising fingers one at a time (sequentially). For example, 'Show me three' is demonstrated by raising 1…2…**3** fingers. Make quantities to 5 by raising fingers one at a time (sequentially) without looking at them. For example, 'Show me three' is demonstrated by raising 1…2…**3** fingers with their head turned away from their fingers.	Estimation is making a rough guess about a quantity. The quantity within a collection can be estimated without counting.	Recognise and say, without counting how many in irregular patterns. For example, 'I see three, three and one', 'I see four and three', 'I know that is seven'.   Show quantities to 5 without counting out individual fingers (simultaneously). For example, 'Show me five' is demonstrated by raising 5 fingers at the same time, without counting. Show quantities to 5 without counting out individual fingers (simultaneously) and without looking at them. For example, 'Show me five' is demonstrated by raising 5 fingers at the same time, without counting and with their head turned away from their fingers. Estimate which collection has more than/less than, when shown two or more collections. Estimate how many there are in individual collections, then count to check.

Notes
When introducing subitising, start by modelling noticing small groups of objects within play, stories and everyday experiences.
Gradually reduce the amount of time the dots are shown for, until they can be recognised from a quick flash.
A range of materials can support the understanding of subitising. For example, using natural materials such as sticks, stones.
Regular patterns are the dot formations on a 1 to 6 dice, five frame or ten frame. Irregular patterns are dots or objects that have been randomly arranged.
Excludes
Use of language such as perceptual, conceptual subitising, sequentially and simultaneously, in brackets, as this is intended for practitioner awareness.
New key mathematical language (Learners)
estimate, how many, altogether

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Understand: Objects, sounds and movements can be counted to determine how many there are.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Counting is a way to keep track of how many there are. An individual object (one) can be taken out of a larger collection. Zero means there is none of a particular quantity. When counting, one number name is assigned to each object and each object is counted only once (one-to-one correspondence). When counting, the last number word said refers to how many objects have been counted (cardinality). Anything can be counted, regardless of whether it is physical or abstract (abstraction).	Count forwards and backwards through play, everyday routines, games, songs, stories and rhymes. Respond with a number when asked 'how many?'. Separate an individual object (one) from a larger group and refer to this object as a one. For example, 'Take **one** ball from the basket', 'Take **one** banana from the bowl.' Recognise where there is zero of a particular quantity. For example, 'There are no oranges in a bowl, so the number of oranges is zero.' Recognise and identify if there is zero, one or more in a small collection of everyday objects. Count a range of physical objects that are the same size, colour and shape. Count items in and out of a container. For example, pens out of a pot, balls into a bag, toys out of a box. Organise objects to support counting. For example, line them up and then move one at a time, keeping track of what has been counted. Assign and match one number word to each object when counting aloud. Identify the total number of objects in a group by counting in a variety of ways and in different contexts. Accurately count objects and give the answer to how many with the last number counted. Count out a given amount. For example, 'Can you find four acorns?', 'We need five cups for snack.' Count out objects from a larger collection. For example, 'Give me five cars from the box.' Count anything, including, sounds, actions and items that cannot be touched or moved. For example, claps, shadows, bounces of a ball, number of people in a family.	Objects can be counted from any starting position in an arrangement or order (order-irrelevance). The number of objects in a set remains the same even if they are rearranged, covered, grouped or spread out, if none are added or taken away (conservation of number).	Match counted quantities with their corresponding numeral. Count forwards from any starting point. For example, 'How many cones are there? Start counting from the yellow one.'  Recognise that the total is not affected if only the arrangement or position changes. For example, ten balls put into a box remains ten balls. Recognise that the total is not affected by the size of object or their layout. For example, seven leaves spread apart, seven leaves lying close together, seven small leaves, seven large leaves all have the same total quantity of seven.  Count a range of random objects explaining that the count stays the same regardless of attributes (colour, size, shape). For example, a ball, a train and a pebble is three and three crayons is also three. In both examples there are three altogether. Keep track of how many sounds and movements within the expanding number range. For example, how many bounces of the ball, how many beats of the drum. Count out objects from a larger collection within the extended number range. For example, 'Give me 12 pencils from the pot.' Count a collection of objects within a larger collection. For example, 'How many pencils?', 'How many yellow counters?', 'How many blue objects?'

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	Keep track of how many movements or sounds using fingers. For example, 'Watch me as I clap, use your fingers to keep track of how many times I clap.'		 Represent and record how many have been counted in different ways. For example, holding up fingers, pointing to the numeral on a number track or making a mark to represent the total counted.

Notes

Not all number songs support counting in the same way. Some focus on rehearsing the number sequence (*1, 2, 3, 4, 5, Once I Caught a Fish Alive*), while others require learners to keep track of a changing quantity (*Five Little Ducks*, *Five Little Monkeys*). Both have value, but they support different aspects of early mathematical development.

Conservation of number is important because it is a foundational cognitive milestone where a quantity remains the same, despite changes in appearance or spatial arrangement. It supports the development of mathematical skills such as fluency, problem-solving and reasoning.

Counting in a steady, paced rhythm can help to keep track of the oral count.

Initially, a learner may think that zero is always the first counting word and will point to the first object being counted and call this 'zero', then count 'one, two, three…' Adults should model and reinforce that one is the first object being counted.

When counting sounds and movements using fingers to keep track… initially use a steady, paced rhythm, before moving on to using rhythmic sequences such as two claps-two claps and then rhythmical sequences such as one clap-three claps-one clap.

Having a variety of objects readily available encourages independence in choosing *what* to count and planning *how* these could be counted.

Make connections to the Stable Order principle

Make connections to Data Management to reinforce counting skills.

Make connections to counting out pound coins in Finance.

Includes but is not limited to

Working within the range 1 to 5, progressing to 0 to 10, extending to 20.

Excludes

Use of language such as cardinality, one-to-one correspondence, abstraction, order irrelevance and conservation of number, in brackets, as this is intended for practitioner awareness.

New key mathematical language (Learners)

count forwards/backwards, zero

Numeracy and Mathematics Milestones

Number and number processes

When asked 'how many?', recognises that they should respond with a number.

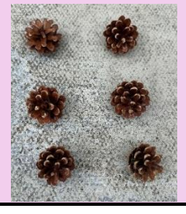
Uses counting to accurately identify 'how many?' there are in a small group of items.

Gives a requested number of items in a practical setting.

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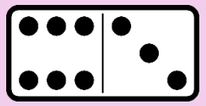
Understand: Comparing quantities reveals whether one collection has more, less, or the same number of items.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
More than, less than and the same can be used to compare and describe the number of objects in two collections.	Compare collections where the objects are the same shape, colour and size and where the amounts are obviously different. Describe these using the terms more than, less than or the same as. For example, 'There are more in this pile.'  Compare collections where the amount is closer in value. For example, 'There are fewer purple pom-poms', 'There are more pink pom-poms.'  Compare and describe collections where the objects are different in shape, size or colour. For example, 'There are more sticks.'  Recognise when the amount within two collections is the same. For example, 'There are the same number of pine cones on each side.' 	Most and least can be used to compare and describe the number of objects in three or more collections. Equal means being exactly the same in amount, number or size. Not equal means being different in amount, number or size.	Estimate, then determine the sizes of three or more collections and explain which one has the most, the least, or if they are the same size. Explain which collection has more than, less than or the same number of items using objects, drawings or marks to represent the items. Compare collections of objects indicating if these are equal or not equal in amount. For example, 'There are five in this group and two in that group, so this group is the larger collection because five is more than two.' Compare equal collections where the objects are different in size or colour and recognise that the total is the same. For example, three small pom-poms and three large pom-poms are both three. 

Notes
Initially the emphasis is on simply recognising if the amounts are more, less or the same rather than counting to compare.
As the collections being compared become closer in amount, encourage estimating which is more, most, less, least, the same and then encourage them to check by counting.
Grammatically, *fewer* is used to describe items that can be counted individually, such as balls and apples. *Less* is used to describe measured items such as water, sand and time. At this stage these terms may be used interchangeably as could other informal terms. For example, there *are not as many* balls, there *are less* toys.
When comparing equal collections, for example, three *large* basketballs and three *small* tennis balls, learners may initially think there are more basketballs because the objects are bigger.
New key mathematical language (Learners)

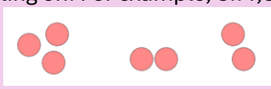
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compare, more than, less than, the same, equal

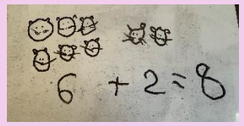
Understand: Addition describes combining collections of items into a single quantity.

Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Addition is combining two or more collections of objects or increasing the number of objects in a single collection. When counting the number of objects in more than one collection the last number word said refers to how many objects have been counted (cardinality).	Add one more to a collection of items, on request. Count the number of objects in more than one collection and say the total amount. For example, 'There are five strawberries.' 	Addition is finding the total by combining two or more amounts. When adding zero the total within the collection does not change. Addition is finding the total by adding something to an original amount.	Combine two collections to calculate the total. For example, 'There are four children building towers and three children painting. How many children are there altogether?' Count two collections where one cannot be seen (screened). For example, 'I have four in here and three under here, how many do I have in total?'  Discuss the impact that adding zero has on the total. Calculate the total by adding more to an original collection. For example, 'There are four children building towers, then three more arrive. How many children are there now?' Calculate the total of two collections by counting on. For example, counting **6**, 7, 8, 9 rather than 1, 2 ,3, 4, 5, 6, 7, 8, 9.  Calculate the total of two collections when the first collection is screened. For example, 'I have five under here and four here. How many are there altogether?'  Calculate the total by counting on when a collection has been increased by an amount. For example,

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			adding three more cubes to a jar of 7 can be counted **7**, 8, 9, 10.  Count on, using displays to keep track. For example, 'My counter is on 4, I have rolled a 3, now it will be on 5...6...**7**.'  Calculate the total, by counting on, when the starting number of objects cannot be seen or counted individually. For example, when 6 counters are in the tub (screened) and 3 are added.  Combine three or more collections to calculate the total by counting on. For example, 3..4,5..6,**7** 
		Pairs of numbers that add to a given number are called number bonds. The mathematical symbol for addition is +. The mathematical symbol used to show that something has the same value as something else (equality) is = and it is said as 'equals'.	Identify, show and say number bonds to 10. For example, using objects to show that 7 is 7 and 0, 6 and 1, ... Recognise and read number sentences where the addition and equality symbols have been used. For example, Saying 'seven plus two equals nine' when shown 7 + 2 = 9. Represent a given addition story using numerals and mathematical symbols. For example, 'I had seven stickers, mum gave me no more' can be recorded as 7 + 0 = 7, 'There are seven people on the bus and two more get on, there are now nine passengers altogether' can be recorded as 7 + 2 = 9.

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		A mathematical symbol used to show that something does not have the same value as something else (inequality) is ≠ and it is said as 'not equal to'.	Create, model and tell a number story that matches a given addition calculation. For example, 'Six cats plus two cats equal eight cats altogether' when shown 6 + 2 = 8.  Recognise, read and model number stories where the mathematical symbol for inequality has been used. For example, saying 'three plus two does not equal ten' when shown 3+2 ≠ 10.

Notes

Concrete materials and pictorial representations (such as illustrations and number tracks) should be used to model and carry out addition calculations.
Mathematical symbols should be modelled alongside the use of concrete and pictorial methods before learners are expected to independently demonstrate the use of symbols.
The equals sign is a symbol of balance, each side of the symbol should have the same quantity.
A number sentence is a calculation represented with symbols (for example, 7 + 2 = 9).
A number story is a calculation represented in a context (for example, seven strawberries plus two strawberries equal nine strawberries altogether).
When telling number stories, a range of words for addition should be modelled. For example, six *plus* two, six and two *more*, start with six and *add* two.
Provide opportunities to *read* number sentences aloud, *tell* number stories from given calculations and *record* number sentences when listening to a number story and not to have an over emphasis on solving written calculations.
A screened collection is when the objects are covered up with something like a hand, piece of card, cloth or put into something like a box or tub. This prevents counting from one as items cannot be counted and touched individually and encourages counting on from the collection that is covered up.

Includes but is not limited to

Working within the range 1 to 5, progressing to 0 to 10.

Excludes

Using the language, 'equality', 'inequality' and 'screened collections'. These have been included in brackets for practitioner awareness.

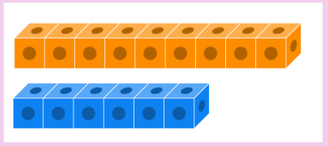
New key mathematical language (Learners)

addition, add, plus, combine, original amount, number bonds, total, equal to, not equal to, calculate, symbol

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Understand: Subtraction describes finding the quantity left when some items are removed, or the difference between quantities of items.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Subtraction is reducing the number of objects in a collection.	Removes one item from a collection, on request. Reduces the total within groups using a range of physical objects. For example, when eating snack or removing toys from a collection. Identifies when there are none left.	When subtracting zero the total within the collection does not change. Subtraction is reducing the number of objects in a collection, but it is also finding the difference between number of objects in two collections. The mathematical symbol for subtraction is –.	Discuss the impact that subtracting zero has on the total. Calculate the number of objects which are left when some are removed. For example, finding how many are left when six strawberries have been eaten out of a collection of nine. Count back, using a display to keep track. For example, 'I am standing on number 7 and jumping back by two, I am on 6…**5.'**  Find the difference between the total and one of its parts. For example, There are five pieces of fruit. Three are bananas and the rest are apples. How many apples are there?  Find the difference between two collections of objects. For example, Find the difference between 6 and 9.  Recognise and read number sentences where the subtraction and equality symbols have been used. For example, Saying 'seven minus four equals three' when shown 7 - 4 = 3. Represent a given subtraction story using numerals and mathematical symbols**.** For example, 'There were seven people on the bus and nobody got off', can be recorded as 7 – 0 = 7 or 'There were nine apples in a basket and five were eaten. Four apples were left' can be recorded as 9 – 5 = 4.

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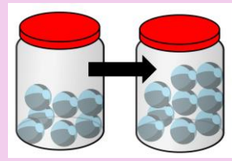
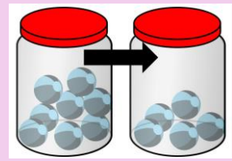
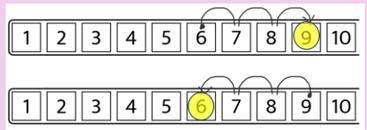
			Create, model and tell a number story that matches a given subtraction calculation. For example, 'I had nine stickers and gave five away, now I have four left' when shown 9 – 5 = 4. 

Notes
Concrete materials and pictorial representations (such as illustrations and number tracks) should be used to model and carry out subtraction calculations.
Mathematical symbols should be modelled alongside the use of concrete and pictorial methods before learners are expected to independently demonstrate the use of symbols.
A number sentence is a calculation represented with symbols (for example, 7 - 2 = 5).
A number story is a calculation represented in a context (for example, if you start with seven strawberries and take away two strawberries there would be five strawberries left).
When telling number stories, a range of words for subtraction should be modelled. For example, six *minus* two, six *take away* two, start with six and *subtract* two, six *remove* two, two *less than* six. Find *the difference between* six and two.
Provide opportunities to *read* number sentences aloud, *tell* number stories from given calculations and *record* number sentences when listening to a number story and not to have an over emphasis on solving written calculations.
Includes but is not limited to
Working within the range 0 to 5, progressing to 0 to 10.
New key mathematical language (Learners)
subtraction, subtract, reduce/remove, difference

Numeracy and Mathematics Milestones – (Scored through text indicates where the expectation or curriculum organisation has changed and this is covered in another section).
Estimation and rounding
Shows recognition of ~~more or~~ less in a range of practical contexts.

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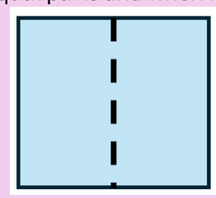
Understand: Addition and subtraction are connected, so one can undo the effect of the other.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
		Addition and subtraction are related and can be used to find a missing quantity when some quantities are known. Addition and subtraction are connected because they can undo each other.	Identify when quantities are being combined, increased, reduced or compared in a real situation and represent this using concrete materials. Calculate the total when the amount being added is unknown, using concrete materials to support. For example, calculating how many counters have been added to give a total of 9 when we started with 7.  Calculate how many objects have been taken away when given the starting number of objects and the remaining number. For example, calculate how many have been taken away from eight counters when five are left.  Recognise that when objects are removed the total of a collection becomes less but if these are added back in the collection returns to the original total. Recognise that when objects are added the total of a collection becomes more but if these are then removed the collection returns to the original total. Notice the connection between addition and subtraction using a number track. For example, six plus three is nine and nine minus three is six. 

Notes
Encourage noticing and discussing the connection between addition and subtraction when using concrete materials and pictorial representations. At this stage they are not expected to mathematically explain inverse operations.
In an *addition* calculation augend + addend = sum.
When the amount being added is unknown, this is called a missing addend (for example, calculating how many counters have been added to give a total of 9 when we started with 7).
In a *subtraction* calculation minuend – subtrahend = difference.
When the amount being subtracted is unknown, this is called a missing subtrahend (for example, calculate how many have been taken away from eight counters when five are left).

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Includes but is not limited to
Working within the range 0 to 10.
Excludes
Use of the language sum, addend, augend, minuend and subtrahend as this has been included for practitioner awareness only.

Understand: Equal sharing results in a quantity being split into a given number of equal parts.

Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
One whole (object) can be split and shared.	Split one whole (object) into smaller parts. For example, break a ball of dough into pieces or cut an apple into slices.	When one whole (object) is split into two equal parts, each part is one half of the original whole. They can be re-combined to make one whole.	Recognise when a whole (object) has been split into two equal parts and when it has not.   Recombine the two halves of shapes and objects in different orientations and layouts and recognise that this remakes a whole.  
A collection of objects can be shared into smaller collections.	Share out objects one at a time. For example, sharing out pieces of fruit at snack time.	When a collection of objects is shared out the shares can be equal or not equal.	Share out objects into smaller collections and use the language of shared equally and not shared equally to describe this. For example, 'These pinecones have not been shared equally.'  Model sharing out objects equally. For example, sharing out the oranges equally between the teddies. 

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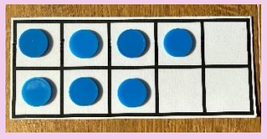
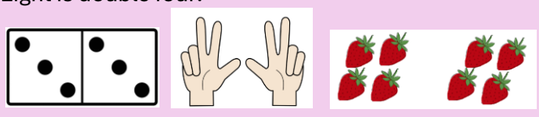
		If a number is even, the total can be shared into two equal, whole number parts. If a number is odd, it cannot be shared into two equal, whole number parts. When an even number of objects is shared equally between two, each part is one half of the original quantity.	Share a set of given objects equally and identify how many each person gets. For example, 'When 8 teddies are shared between 4 people, each person gets two teddies.'  Share a collection of whole objects between two and recognise if the total amount shared is odd or even. For example, 8 is even because it can be shared equally between 2 with none left over, 7 is odd because it can't be shared equally between two, there is one left over. Share out objects equally between two and recognise that each share is one half of the objects. For example, six counters shared equally between two is three each. One half of six is three. Share out objects equally between two and recognise that each share is one half of the objects even when the objects are arranged in different ways. For example, each penguin has three counters so they each have one half of the objects.  Share out objects equally between two and recognise that each share is one half of the objects, even when the objects in each group look different. For example, each penguin has three items so they each have one half of the objects. 

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Notes
When sharing out a collection of whole objects, ones which cannot be broken into smaller pieces should be used (for example, buttons, pebbles, beanbags).
Excludes
Learners halving whole objects through cutting and folding.
Learners may suggest halving items (for example sharing 7 strawberries between two people could result in three and a half each), this can be a useful aspect to explore together, however, independently sharing into fractional parts is not required.
New key mathematical language (Learners)
share, equal, not equal, equal parts, half, halves, one half, whole, odd, even

Numeracy and Mathematics Milestones
Fractions, decimal fractions and percentages
Splits an item into smaller pieces.
Puts smaller pieces back together to make the whole.
Takes part in distributing a collection of items between a group.

Understand: Equal grouping results in arranging a quantity into equal parts of a given size.

Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
		Equal groups have the same number of objects in them.	Arrange collections of objects into equal groups. For example, four sheep in each pen, three buttons for each snowman. Arrange a collection of objects into equal groups and identify how many groups there are. For example, 'Put three pencils into each pot, how many pots will we need?'
		A pair is a group of two objects.	Arrange themselves and objects into pairs. For example, gloves, wellies, socks.
		If a number is even, the total can be grouped into whole number pairs. If a number is odd, it cannot be grouped into whole number pairs.	Identify and explain if a number to 10 is odd or even by grouping concrete materials into pairs. For example, 'Seven is odd because when I grouped my counters in pairs there was one left over.'  Identify the next odd/even number to 10 using a number track or number line for reference. Sort odd and even numbers from 0 to 10.
		When two groups have exactly the same amount and are combined, this is called double.	Describe two equal groups using the language of doubles. For example, 'Double three equals six', 'Eight is double four.' 

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		When making equal groups of objects from a collection, there may be some left over.	Arrange themselves and objects into groups of different amounts and begin to recognise that there might be some left over. For example, putting ten strawberries into groups of four to make two groups of four with two left over. 
Notes At this stage, whole objects which cannot be broken into smaller pieces should be used. Make connections to partitioning into halves and pair-wise structures. **New key mathematical language (Learners)** group, pair, double, left over			

Patterns and sequences

Quantity, Numbers and Algebraic Properties of Number - Patterns and sequences			
Beginning of Early Level ⟷			**End of Early Level**
Understand: Number sequences follow a predictable order, helping to identify what comes next.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
In the world around us many numbers often follow a predictable pattern; this is called a number sequence.	Notice and describe number patterns in everyday situations and use these to predict what comes next. For example, house numbers, page numbers, clocks and calendars. Copy and continue number sequences through a range of songs, stories, rhymes and counting games. Identify missing numerals when shown sequences which ascend or descend in ones. For example, 'What numeral is Granny hiding?'  Notice errors when shown sequences modelled using concrete materials, which ascend or descend in ones. For example, 1, 2, 3, **5**, 4. 		Identify which number(s) comes next in ascending and descending aural and written sequences, when counting in ones. For example, 13, 14, 15, **?** Identify missing numbers from ascending and descending aural and written sequences, when counting in ones. For example, what numeral is covered up?  Recognise and explain errors made in ascending and descending aural, oral and written sequences, when counting in ones. For example, 14, 15, 16, 18, 19, …

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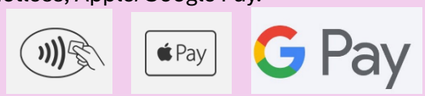
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Notes
A number pattern is a rule which can be used to generate an ordered list of numbers, which is called a sequence.
Provide experiences of working with aural (listened to), oral (spoken) and written or visual number sequences (for example, a number track with numerals covered).
Make connections to numbers having a fixed order.
Make connections to patterns within Shape, Space and Measurement.
Includes but is not limited to
Working within the range 1 to 5, progressing to 0 to 10, extending to 20.
New key mathematical language (Learners)
pattern, sequence

Finance

Quantity, Numbers and the Algebraic Properties of Number - Finance			
Beginning of Early Level ←		→	**End of Early Level**
	Understand: Money takes different forms and can be used to represent the price of items and activities.		
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Money is needed to pay for items and some activities. Some people use money as part of their job. Cash is money in the form of coins or notes. Coins and notes have different values. This is indicated by their size, shape, colour and what is written on them. There are different ways of paying for items and activities such as cash, cards or mobile devices.	Discuss examples of money being used. For example, 'We bought ice creams from the shop', 'You can tap your card to get into the swimming pool', 'You put coins in the vending machine to get a drink.' Notice and discuss different ways that money is being used when listening to stories and looking at books. Role play and discuss jobs that use money. For example, shop keepers, bank workers, serving staff, bus drivers. Represent situations involving spending, saving and paying for items using role play and real-life contexts. Notice and discuss similarities and differences in the shape, colour and size of a range of coins. For example, 'This is a silver coin and this is brown coin. This coin is round and this one is not.'  Role play and discuss different ways to pay for items. For example, using coins and notes, cards, vouchers or digital devices. Participate in real and relevant opportunities to spend money and pay for items. For example, a visit to a local shop, selecting items for an online shopping order.	The symbol £ is used to record amounts of money in pounds. Items and activities cost different amounts. Money can be spent, saved or gifted. Saving money is when money is put aside for the future.	Discuss examples of money being used in real and relevant situations and in books. For example, 'My ticket was £2', 'Granny was paying for her shopping.' Begin to use the language of money and finance when engaging in role play. For example, 'You have spent…', 'Here is your change', 'That will be ten pounds', 'You can tap your card here', 'Do you have a voucher?' Identify £1 coins from mixed collections of coins. Recognise the written symbol for pounds £ when reading and saying whole pound amounts, through real and relevant opportunities. For example, 'This book cost five pounds.' In role play, count out the number of pound coins required to pay for items and compare costs of items (whole pounds only). For example, 'There are 7 children in the café and each child needs a snack costing £1, do we have enough money?'  Discuss examples of money being saved, spent or gifted. For example, saving up for a treat by putting coins in a money box, taking part in a sponsored bounce for charity, buying items by taking coins out of a purse.

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	Recognise symbols used in digital payments, e.g. contactless, Apple/Google Pay. 		

Notes
Experiences of money will vary, so ensure that examples discussed are relevant to the context and sensitive to individual circumstances.
Adults should model the language of money and finance as part of their interactions such as when they are invited into role play scenarios.
Role play can provide opportunities to engage with the mathematical modelling process of understanding, planning, doing, considering and communicating (this proposed modelling cycle is informed by The Australian Curriculum, Assessment and Reporting Authority (ACARA)).
Make connections to counting and comparing in Number relationships and operations when working within the range of whole pound amounts to £20.
Suitable story books could include, Milo's Money, Ed and Bunny, The Money Bunnies.
Spending, saving and gifting is associated with a range of thoughts, feelings and emotions.
Includes but is not limited to
As appropriate, model the use of comparative language. For example, that costs more, that costs less, that is cheaper.
Excludes
Detailed awareness of coins under one pound and quantities of money less than one pound. Working with pence to one pound is introduced at First Level.
New key mathematical language (Learners)
money, cash, coins, notes, pay, cards, pound, save, spend, gift

Numeracy and Mathematics Milestones (Scored through text indicates where the expectation or curriculum organisation has changed and this is covered in another section).
Money
Matches coins ~~or notes~~ that are the same.
Uses language of money in a real life situation. For example, pay, coin, change, buy, pounds, pence.

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First Level

Number systems and structures

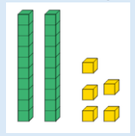
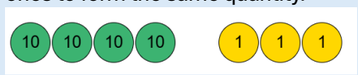
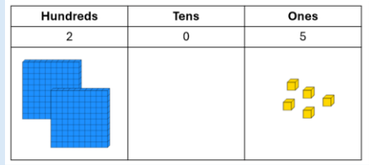
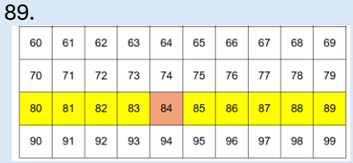
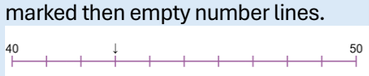
Quantity, Numbers and the Algebraic Properties of Number - Number systems and structures					
Beginning of First Level ◄———					———► **End of First Level**
Understand: Whole numbers extend without limit, so quantities can be counted indefinitely.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The language of less than, greater than, equal to can be used to estimate and compare quantities of items.	Compare (without counting) and describe quantities when the amounts are obviously different. Compare and describe quantities of items when their amounts are less obviously different, counting to check description is accurate. Make links to (conceptual) subitising when estimating quantities. For example, 'I see five, four and some more, so it must be greater than nine.' Count on and back, in ones, from any starting number. Skip count in tens off the decade (14, 24, 34…). For example, 'When counting off the decade, Hamza counts 14, 24, 34, 40. Is he correct? Why (or why not)?'		Count forwards and backwards, in ones, from any starting number. Skip count in hundreds on the hundred. For example, 400, 300, 200, …		Skip count in hundreds off the decade. For example, 676, 576, 476, …

Notes
Whole numbers are the set of numbers 0, 1, 2, 3, 4, 5 …
Encourage estimation, making links to subitising, before counting and then checking estimates for accuracy.
Subitising is introduced at Early Level.
Model skip counting backwards at the same time as skip counting forwards.
The origin of numbers and different ways of counting could be investigated, appreciating the influence of diverse cultures. They could compare different number systems and how they have evolved over time (for example, zero emerged in India around the 7th century and the numbers used globally today are a Hindu-Arabic numeral system).
Make connections to Society within Social Studies when investigating historical number systems.
Includes but is not limited to
Working within the range 0 to 100, progressing to 200, 300 before extending to 1000.
New key mathematical language (Learners)
skip count

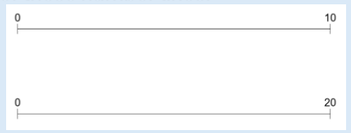
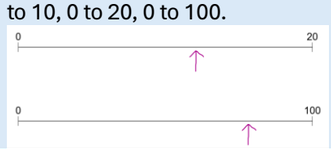
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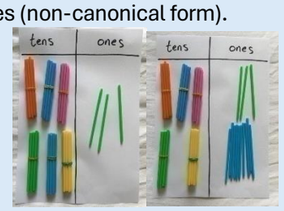
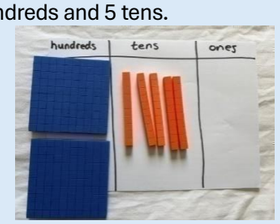
Understand: The base ten system uses symbols (digits) to express quantities in an organised way, with each place representing a value ten times greater than the one on its right.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Ten ones are equal to one ten and vice versa. The base ten system (decimal number system) uses exactly ten digits (0 to 9) to build any number.	Represent whole numbers as combinations of units of different sizes (ones, or tens and ones), showing how quantities can be composed and decomposed. 	One hundred is equal to ten groups of ten or one hundred ones.	Represent whole numbers to one hundred in different ways, showing how they are composed of tens and ones to form the same quantity. 	One thousand is equal to ten groups of one hundred or one hundred groups of ten or one thousand ones.	Represent whole numbers to one thousand in different ways, showing how place value units combine to form the same quantity.
Two-digit whole numbers have two place values, the ones place and the tens place. Zero is used as a placeholder.	Interpret the value of each digit in a number by analysing its position and the unit it represents within the place value system (two-digit whole numbers). Form written digits 0 to 9 correctly.	Three-digit whole numbers have three place values, the ones place, the tens place and the hundreds place.	Interpret the value of each digit in a number by analysing its position and the unit it represents within the place value system (three-digit whole numbers). For example, in the number 205, the 2 represents two hundreds and has a value of 200, the 0 represents zero tens (and holds the tens place) and the 5 represents five ones and has a value of five. 		
Decades of whole numbers are sets of ten numbers which have the same digit in the tens place.	Identify which decade whole numbers 10 to 99 belong to. For example, 84 lies in the decade 80 to 89. 	Numbers can be placed on a number line between their neighbouring decades. Numbers can be rounded to the nearest ten as an approximation.	Place two-digit whole numbers on marked then empty number lines.  Round two-digit whole numbers to the nearest ten using a number line.	Numbers can be rounded to the nearest hundred as an approximation.	Round three-digit numbers to the nearest hundred. Round three-digit numbers to the nearest ten.
The language less than, greater than, equal to can be used to compare whole numbers. Magnitude refers to the size or value of a number. The position of a number on the number line indicates its size	Identify whether whole numbers are greater than, less than or equal based on their relative position. Order whole numbers in ascending or descending order by comparing their magnitude. Estimate where the same number lies on number lines with different		Order whole numbers in ascending or descending order, gradually increasing the range towards 1000.	Numbers can be compared using the mathematical symbols. The mathematical symbol used to show less than is <. The mathematical symbol used to show more than is >.	Represent the relationship between whole numbers using appropriate symbols. For example, 67 is less than 98 is written as 67 < 98. Order whole numbers to 1000 in ascending or descending order.

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(magnitude) in relation to the numbers to either side of it.	scales by considering how far it is between the endpoints. For example, estimating where 8 would be on each of these number lines.  Estimate the number that is being indicated on empty number lines with different scales. For example, 0 to 10, 0 to 20, 0 to 100. 				

Notes
Some digits look similar to other digits or symbols. For example, 2 and 5, 6 and 9, 2 and z, 5 and s, 0 and o.
Using a number line/hundred square provides a strong visual and spatial representation of number order, magnitude and relationships.
The use of base ten material supports the understanding of how numbers are composed.
When discussing the use of the greater than and less than symbols the meaning of the equals sign should be reinforced.
Includes but is not limited to
Working within the range 0 to 100, progressing to 200 and 300 before extending to 1000.
New key mathematical language (Learners)
place value, base ten, ones, tens, hundreds, thousands, decades
round, approximation

Understand: Numbers can be partitioned flexibly to reveal their structure and support efficient calculation.

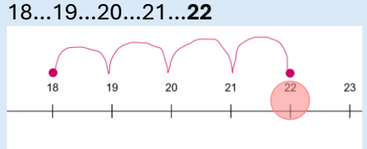
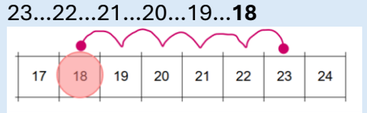
Know	Do	Know	Do	Know	Do
Two-digit whole numbers can be partitioned into tens and ones in canonical and non-canonical form.	Represent whole numbers as tens and ones and partition them in different ways, explaining how each representation shows the same quantity. For example, 63 is 6 tens and 3 ones (canonical) but 63 is also 5 tens and 13 ones, 4 tens and 23 ones (non-canonical form). 	Three-digit whole numbers can be partitioned into hundreds, tens and ones, in canonical form.	Represent three-digit whole numbers partitioned into hundreds, tens and ones. For example, the number 250 can be partitioned into 2 hundreds and 5 tens.  Represent numbers, initially within 300, in different ways by applying known number facts to generate and explain equivalent forms. For example, 220 is double 110, 100 + 120, 55 + 55 + 55 + 55 …	Three-digit whole numbers can be partitioned into hundreds, tens and ones, in canonical and non-canonical form.	Represent three-digit whole numbers partitioned into hundreds, tens and ones in canonical and non-canonical ways using appropriate materials. For example, the number 684 can be partitioned into 6 hundreds, 8 tens and 4 ones (canonical) or 5 hundreds, 18 tens and 4 ones… (non-canonical). Represent numbers in different ways by applying known number facts to generate and explain equivalent forms. For example, 484 is double 242, 400 + 80 + 4, 200 + 284…

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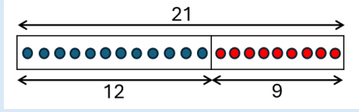
Whole numbers can be partitioned into two or more parts. This is the part-whole relationship.	Create and describe part-whole relationships by composing and decomposing numbers into parts that combine to form the same whole. For example, 'Maria thinks the number 64 can only be partitioned into two parts including 60 and 4, 50 and 14. Is she correct? Could the number also be partitioned in other ways?'				

Notes
Efficient calculation involves drawing on an understanding of number structure to select strategies that make calculations easier.
Flexible partitioning supports calculation strategies at this level and later levels. For example, when calculating 18 + 23 it can become 23 + 7 +11, when dividing 84 by 6 it can become 60 and 24 each divided by 6.
Make connections to additive and multiplicative relationships when representing numbers in different ways.
Make connections to making monetary amounts in different ways in Finance.
Includes but is not limited to
Working within the range 0 to 100, progressing to 200, 300 before extending to 1000.
New key mathematical language (Learners)
canonical, non-canonical, part-whole

Number relationships and operations

Understand: Additive relationships explain how quantities are increased, decreased, combined or compared.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The equals sign is used to demonstrate that both sides of a mathematical sentence have the	Solve addition calculations by counting on, using a number track or line to keep count. For example, 18 + 4 is counted as 18…19…20…21…**22**  Solve subtraction calculations by counting back using a number track or line to keep count. For example, 23 – 5 is counted as 23…22…21…20…19…**18**  Notice and investigate the meaning of the equals sign by comparing the values on each side of a mathematical sentence.				

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same value, like the two sides of balanced scale. Mathematical symbols, +, -, =, ≠ can be used to record mathematical sentences horizontally. Addition is commutative. This means that changing the order of the numbers in an addition calculation does not affect the total (sum). Subtraction is the inverse operation of addition. An additive fact family is a group of related maths facts that shows the connections between addition and subtraction and the commutative law.	Represent and explain the equivalence of different calculations by proving that they produce the same value. For example, 10 + 2 = 8 + 4. Construct mathematical sentences showing equalities symbols appearing in different positions. For example, 15 = 12 + 3 10 + 6 = 16, 11 – 2 = 4 + 5 14 ≠ 10 + 3. Explain and represent the commutative property of addition by showing that the order of quantities does not affect the result. For example, showing that 2 + 5 = 5 + 2.  Explain how addition and subtraction are inverses by showing how a quantity can be changed and then restored. For example, starting with 12 and adding 8 to get 20, then subtracting 8 from 20 to get back to 12. Represent spatially and explain relationships between related number facts, including how operations can be used to generate equivalent and inverse results. For example,  21 = 12 + 9 9 +12 = 21 21 – 9 = 12 21 – 12 = 9.	When three or more numbers are added together, the way they are grouped has no effect on the sum/total (associative law). Numbers can be rearranged and reordered to make addition calculations easier. Efficient strategies help to solve calculations quickly and accurately without completing unnecessary steps.	Add multiple numbers (three or more) efficiently by rearranging and reordering them while maintaining the same total.		Efficiently perform addition calculations of three or more numbers. Estimate the result of addition and subtraction calculations by

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There are a range of strategies for carrying out addition and subtraction calculations.	Apply known number facts when solving addition and subtraction calculations within 20, using doubles, near doubles, teen facts and number bonds. For example, 8 + 8 = 16 10 + 6 = 16 16 = 20 – 4. Interpret and solve problems by identifying when to use addition or subtraction and using (appropriate) representations to support and record the calculation process.		Check the accuracy of addition calculations using subtraction and vice versa. Apply known number facts when solving addition and subtraction calculations within 100 using doubles and halves, number bonds to 100. For example, 30 + 30 = 60, half of 50 = 25, 100 = 90 + 10. Select and use efficient strategies based on known number relationships to solve addition and subtraction problems. For example, when calculating 54 – 52 it would be more efficient to find the difference between the numbers rather than counting back. Solve contextual and non-contextual problems which involve two addition or two subtraction calculations.	The written algorithms for addition and subtraction can provide an alternative way to record calculations as they become more complex.	rounding numbers to nearby convenient values. Apply known number facts when solving addition and subtraction calculations within 1000 using doubles, halves and different ways to make 1000. For example, 200+200 = 400, half of 900 = 450, 400 + 600 = 1000. Apply and justify the efficiency of using different addition and subtraction strategies when calculating within 100. Solve two-step contextual and non-contextual problems which involve both addition and subtraction. Connect different representations of (two-digit) addition and subtraction to formal written algorithm, explaining how each shows the same calculation. Solve addition or subtraction calculations of two-digit whole numbers using the written algorithm.

Notes
Includes but is not limited to
Working within the number range 0 to 30, progressing to 0 to 100, extending to 1000.
Model and encourage the equals symbol being used in different places in written calculations, for example 20 = 14 + 6, 14 + 6 = 13 + 7.
A range of words for addition and subtraction should be modelled and encouraged. For example, plus, add, find the difference between, minus, subtract.
Provide a balance between *reading* number sentences aloud, *telling* number stories from given calculations, *recording* number sentences when listening to a number story, to avoid an over emphasis on only *solving* written calculations.
Make connections to finding missing values in Expressions, equations and relationships.
Encourage estimating before calculating and checking the reasonableness of solutions across all number ranges.
As the number range increases, use rounding to estimate.
Efficiency refers to selecting and using strategies that take advantage of number relationships and number structure to simplify calculations. Initially, efficiency will focus on counting on from the largest value, counting back by the smallest value and using known number facts such as, number bonds, teen facts, fact families, doubles and near doubles when calculating.

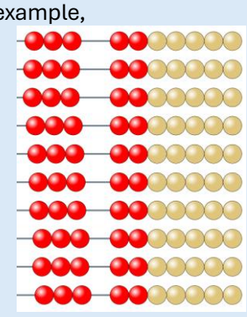
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As the number range increases efficient strategies also include partitioning, rounding or compensating. For example, when calculating 58 + 23, this could be:

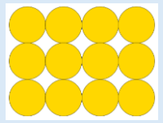
- Partitioned into tens and ones by calculating 50 + 20 + 8 + 3
- Rounded to 60 first by calculating 58 + 2 + 21
- Compensated to 60+21.

Mathematical tools such as empty number lines, place value materials, bar models or jottings can be used to keep track of the calculations.
Initially learners should fluently:
Find one more and one less to 100, 10 more and 10 less on the decade to 100, add and subtract within 20 and find doubles and halves within 10 (whole numbers only).
Then move on to:
Finding fluently 10 more and 10 less off the decade to 100 (for example, 10 more than 84), adding and subtracting within 20 mentally and begin to extend towards 100.
Then move on to:
Adding and subtracting mentally within 100.
New key mathematical language (Learners)
balanced, commutative, sum, inverse, strategies, rounding, written algorithm

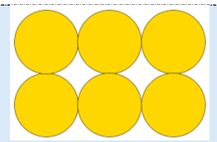
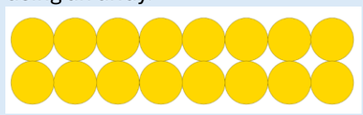
Understand: Multiplicative relationships involve organising quantities into equal groups and equal parts.

Know	Do	Know	Do	Know	Do
Objects can be equally grouped and counted (unitising). It is more efficient to skip count in equal jumps (unitise) rather than count in ones.	Group items into equal sets to count them more efficiently. For example, pairs of socks counted in twos, tally marks counted in fives. Skip count forwards and backwards in equal steps from and to zero in twos, fives and tens using appropriate mathematical tools to keep track. For example, 	Repeated addition is the same as skip counting forwards in equal groups.	Connect repeated addition and skip counting by showing how both represent equal steps that produce the same total. For example, 2 + 2 + 2 + 2 or 2, 4, 6, **8**. Skip count from zero in equal steps of twos, fives and tens and use the pattern to determine totals when some groups are not visible. For example, the value of notes and coins, the number of boots in total, 		Skip count forwards and backwards in equal steps from and to zero in threes, fours and sixes using appropriate mathematical tools to keep track. For example,  Skip count from zero in equal steps of threes, fours and sixes and use the pattern to determine totals when some groups are not visible. For example, eggs in boxes, wheels on cars. 
		An array shows objects grouped in an orderly way into rows and columns. For example, three rows of two or two columns of three.	Make arrays which represent given contextualised number stories. For example, building an array to represent three boxes of six cupcakes.	Multiplication and division by one results in an unchanged quantity. When any quantity is multiplied by zero, the result is zero.	Explain, using concrete materials, what it means to multiply and divide by one and why these leave a quantity unchanged. Explain why multiplication by zero results in zero.

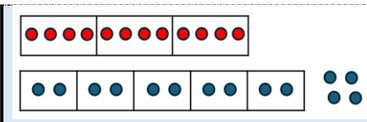
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		Rows go side to side (are horizontal). Columns go up and down (are vertical). Repeated addition can be represented in terms of multiplication and by using arrays. Multiplication is finding the total number in a set of equal groups. The mathematical symbol for multiplication is ×. Multiplication is commutative. This means that changing the order of the numbers in a multiplication calculation does not affect the total (product).	Describe physical or pictorial arrays using the language of repeated addition and multiplication. For example, this array represents 4 + 4 + 4, 3 rows of four and 3 × 4.  Skip count rows or columns to find totals within given arrays and connect to the related multiplication fact. For example, 4, 8, **12**, three rows of four is twelve**,** 3 × 4 = 12 (three multiplied by four equals twelve). Model the commutative nature of multiplication using arrays. For example, showing that two rows of eight and eight rows of two use the same number of counters. Make different arrays with set numbers of objects, connecting each to repeated addition and multiplication facts. For example, arranging eight counters in two by four, four by two, one by eight and eight by one array. Describe a given array using the language of division. For example, there are twenty pinecones arranged as four equal rows of five. This shows twenty divided into five equal groups of four or four equal groups of five. Describe a given array using the language of multiplication and division. For example, this array represents three groups of two, two groups of three, six shared two ways, six shared three ways, 3 × 2, 2 × 3, 6 ÷ 2 and 6 ÷ 3.		Model the repeated addition of two using arrays and other representations, identifying at least the first ten multiples, making connections between multiplication, skip counting and contextualised problems. Model the repeated addition of four using arrays and other representations, identifying at least the first ten multiples, making connections between multiplication, skip counting and contextualised problems.
				Multiples of two and four are connected through doubling and halving. Mathematical symbols, x, ÷ and = can be used to record calculations horizontally.	Recognise connections between the two and four times tables. For example, 4 × 5 is double 2 × 5 and 2 × 3 is half of 4 × 3. Recognise and read number sentences where mathematical symbols have been used to record multiplication and division by two or four. Record multiplication and division calculations from given contextualised number stories using mathematical symbols. For example, two baskets each have six apples in them can be recorded as 2 × 6 = 12 or 6 × 2 = 12. Tell number stories based on given multiplication and division facts from the two and four times tables. For example, 20 ÷ 4 could be twenty apples being placed into five packs of four. Apply the multiplication and division activities from the two and four times tables to the five and ten times tables.
Sharing out items does not always result in equal shares. Grouping problems do not always result in equal groups.	Select whether grouping or sharing is involved when listening to contextualised number stories and model this using concrete materials Model and explain how equal shares are, or are not, possible using collections of concrete materials. For example, eight counters can be equally shared four ways, but would be shared unequally three ways. Model and explain how equal groups are, or are not, possible using collections of concrete materials. For example, ten pebbles can be made into equal	Division is a way to share or group numbers equally. The mathematical symbol for division is ÷.		Multiples of five and ten are connected through doubling and halving. Multiples of three and six are connected through doubling and halving.	

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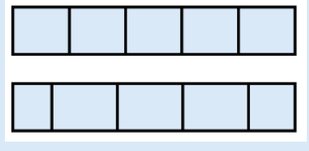
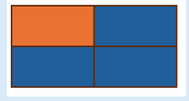
	groups of five but not equal groups of four.	Division problems do not always result in equal, whole number shares or groups. The remainder is the number left over when an amount cannot be grouped or shared equally in the required way.	 Explain and illustrate that when a quantity is arranged in equal shares, the more shares there are, the smaller each one will be. For example, 10 stickers shared between 2 learners, compared to 10 stickers shared between 5 learners. Explain that when a quantity is arranged in equal groups, the larger each group is, the fewer groups can be made. For example, twelve oranges arranged into groups of six, compared to twelve oranges arranged into groups of four. Solve, using concrete materials, contextual and non-contextual division problems which do not share or group equally. For example, twelve tennis balls cannot be shared equally five ways or grouped in fives. There are two tennis balls left over (there is a remainder of two).	Division reverses the effect of multiplication and vice versa (inverse operations). A multiplicative fact family is a group of related maths facts that shows the connection between division and multiplication, the commutative law and inverse operations. A multiple is the result of multiplying one whole number by another. Division is not commutative.	Apply the multiplication and division activities from the two and four times tables to the three and six times tables. Explain this inverse operation using concrete materials or pictorial representations. For example, start with four and multiply it by five to get twenty. Start with twenty and divide it by five to get back to four. Check the accuracy of multiplication calculations using division and vice versa. Explain and illustrate number facts and make connections between multiplication and division using concrete materials and pictorial representations. For example, facts linking 2, 8 and 16 using an array.  Identify multiples of two, five and ten progressing to three, four, six and 100, making connections to skip counting and the commutative law. For example, listing the multiples of five (5, 10, 15, 20, 25, ...) or identifying multiples of six from other known tables. Identify and model division problems which do, or do not share or group equally when dividing by 2, 3, 4, 5, 6 and 10. For example, 12 toys can be shared equally among 3 people because 12 is a multiple of 3, but 14 toys cannot be shared equally between 5 people because 14 is not a multiple of 5.

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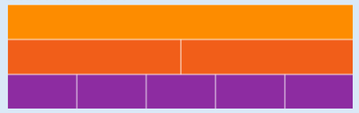
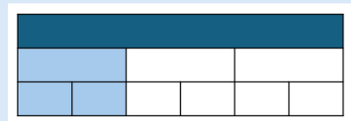
					 Illustrate and explain using concrete materials that the commutative law does not apply to division. For example, 6 ÷ 3 ≠ 3 ÷ 6

Notes
Unitising is the ability to see groups of the same number of items as equal units. For example, groups of 5, groups of 10, rather than counting individual items.
When introducing multiplication and division through arrays, use up to 30 objects as this will provide a good number of possible arrangements.
Make connections to place value and flexible partitioning.
Make connections between multiplicative relationships and finding a fraction of a quantity.
Make connections, when skip counting in fives to Tally Marks in Data Management.
Make connections to scales (when ascending in twos, fives or tens) in Data Management.
Appropriate mathematical tools to keep track when skip counting include multiple sets of dice patterns, hundred square and 100 bead two colour abacus.
When familiar with multiplication and division facts within the 2, 3, 4, 5, 6 and 10 times tables, a variety of contextualised problems should be presented where the need to identify which of the four operations is required.
Work on both sharing *and grouping*. Sharing is knowing the total number of objects to be shared out and how many equal shares you want to make with the goal of working out how many objects are in each share. Grouping is knowing the total number of objects and the size each equal group should be with the goal of working out how many groups can be made.
New key mathematical language (Learners)
multiplication, multiply, multiple, commutative, repeated addition, skip counting, array, row, column, half, division, divide, sharing, grouping, remainder

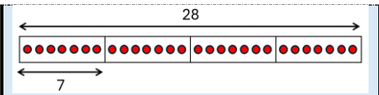
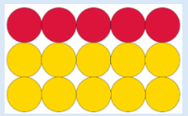
Understand: Fractions represent equal parts of a whole and can be used for counting, comparing, measuring and partitioning quantities.

Know	Do	Know	Do	Know	Do
A fraction is a number which represents part of a whole or a measure. Fractions can be greater than one. For example, one and a half. One half can be represented symbolically as $\frac{1}{2}$. One quarter is one of four equal parts of one whole object, shape or measure. One quarter can be represented symbolically as $\frac{1}{4}$.	Discuss and describe real and relevant contexts where halves and quarters are used as part of a whole and as measure. For example, I have eaten one half of my sandwich (part of a whole), the jug is one half full (measure). Discuss and describe real and relevant contexts where fractions greater than one are used. For example, I drank one and a half glasses of water. Read fractional notation of halves and quarters correctly. For example, one quarter ($\frac{1}{4}$) and not one over four. Connect concrete, spatial, oral and symbolic representations of halves and quarters of shapes, objects and measures.	A unit fraction represents one of a number of equal parts of a whole and has one as the numerator. For a given whole, the greater the number of equal parts, the smaller the size of each part.	Identify and represent unit fractions to tenths using concrete materials and pictorial representations. For example, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{10}$. Read fractional notation correctly. For example, one fifth ($\frac{1}{5}$) and not one over five. Connect concrete, pictorial, oral and symbolic representations of unit fractions of shapes, objects and measures. Recognise when objects, shapes and measures have been partitioned equally and when they have not. 	A non-unit fraction represents more than one of the same unit fractions. It has a numerator which is not equal to 1. Fractions are equivalent to each other if they represent the same value.	Identify and represent unit and non-unit fractions to tenths using concrete materials and pictorial representations. For example, $\frac{2}{3}$, $\frac{3}{5}$, $\frac{7}{10}$. Connect concrete, pictorial, oral and symbolic representations of unit and non-unit fractions of shapes, objects and measures. For example, three quarters of the rectangle are blue.  Represent equivalent fractions to tenths using concrete materials and spatial representations. For example, $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$.

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Fractions are written in terms of a numerator and a denominator. Four quarters of a shape, object or measure can be recombined to make the whole. One half is equal to two quarters of the same whole. Quarters are smaller than halves of the same whole	Recognise when objects, shapes and measures have been quartered and when they have not. Explain the purpose of the numerator and denominator in fractions. For example, one quarter has the denominator 4 because there are four equal parts and a numerator 1 because we are describing one of those four equal parts. Recombine quarters of shapes, objects and measures and recognise that this remakes the whole. Represent halves and quarters using drawings of shapes split into two or four equal parts. Recognise and explain the connection between halves and quarters using concrete materials and spatial representations. Count forwards and backwards orally in halves and whole numbers using halves of items and shapes: one half, two halves/one whole, three halves/one and half, four halves/two…	Unit fractions of the same whole can be compared and put into order. Fractions can be made up of smaller fractions of the same whole.	Compare and order the size of unit fractions of the same whole using concrete materials and spatial representations. For example, for the same whole, fifths are smaller than halves.  Identify connections between larger and smaller fractions of the same whole using concrete materials and spatial representations. For example, one third is the same as two sixths of the same whole.  Count forwards and backwards orally in quarters and whole numbers, using mathematical tools such as fraction tiles, bar models, or a marked number line to keep track.	An improper fraction has a numerator which is greater than its denominator and has a value greater than one whole. A mixed number is a number greater than one, which has a whole number part and a fractional part. Improper fractions can be expressed as mixed numbers and vice versa.	 Explain and model the equivalence of mixed numbers and improper fractions using concrete materials and spatial representations. For example, $\frac{5}{3}$ is equivalent to one and two thirds.  Connect concrete, pictorial, oral and symbolic representations of improper fractions and mixed numbers of shapes, objects and measures. Place halves, thirds, quarters and fifths on a number line marked in whole numbers. For example, four thirds:  Count forwards and backwards orally in unit fractions to tenths and whole numbers, using mathematical tools such as fraction tiles, bar models or marked number lines to keep track.
				Halves and quarters can describe equal parts of a quantity. They can be found by splitting a collection of items into two and four equal shares.	Discuss and describe real and relevant contexts where halves and quarters of quantities are found. For example, a sale where items are half price, or in a class of 24 learners where one quarter of the people own a dog. Model and find halves and quarters of quantities using concrete materials and pictorial representations. For example, one quarter of 28 is seven.

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				A unit fraction of a quantity can be found using division.	 Describe the connection between finding halves and quarters of quantities. For example, half of 20 is 10, so a quarter of 20 is 5 (half of 10). Find the associated fractions of a quantity using the 2, 3, 4, 5, 6 and 10 times tables, (whole number answers only). Represent these calculations in an array. For example, $\frac{1}{3}$ of $15 = 15 \div 3 = 5$  Find the total in a quantity when shown one half or one quarter of that quantity. For example, show half of a collection as six counters with the other half unseen (screened).

Notes

Introduce fractions as a part-whole, where a whole is divided into equal parts and as a measure, where the fraction is relative to a unit and is often shown on a number line.
Calculate unit fractions of a quantity before introducing improper fractions and mixed numbers.
Appropriate concrete materials are folded strips of paper, fraction tiles or fraction circles.
As fractions become harder to compare, fraction strips are more appropriate than fraction circles, as circles are difficult to divide perfectly.
Rectangles and bars (Area Models) are much easier to physically fold, draw and partition equally.
When working with fractions, explore ideas such as, 'Is one half always bigger than one quarter?' to understand that this comparison can only be made if we are finding those fractions of the same whole.
Make connections to half hours and quarter hours in Measures.
Make connections to line symmetry in Properties of shapes and solids.
Make connections to half and quarter turns in Position and movement.
Make connections between finding a fraction of a quantity and multiplicative relationships.

Excludes

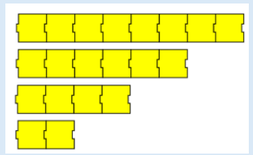
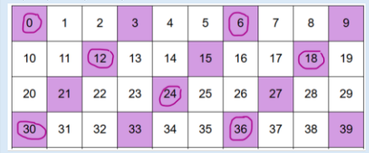
The use of abstract approaches when finding a whole, given a part. (Use screened concrete materials before moving on to pictorial approaches such as bar models).

New key mathematical language (Learners)

fraction, whole, equal parts, unit/non-unit fraction, equivalent, numerator, denominator, improper fraction, mixed number

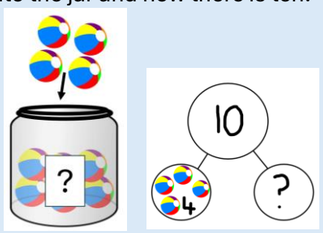
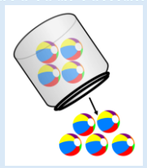
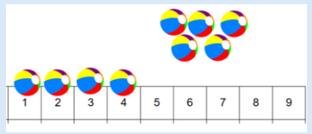
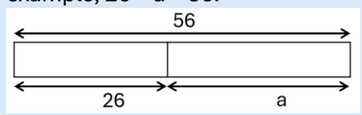
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Patterns and sequences

Quantity, Numbers and the Algebraic Properties of Number - Patterns and sequences					
Beginning of First Level ⟷					**End of First Level**
Understand: Additive patterns involve sequences where the same number is added or subtracted each time, so the difference between terms remains constant.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
A number pattern is a rule which can be used to generate an ordered list of numbers, which is called a sequence. The numbers in a sequence are called terms. The even numbers form an additive sequence that begins at zero and increases by two each time. The odd numbers form an additive sequence that begins at one and increases by two each time.	Identify next terms, missing terms and errors in number sequences that ascend and descend in ones. Notice, discuss and identify number patterns and describe the rule when choral counting and when making patterns using concrete materials. For example, the sequence of 8, 6, 4, 2 has the rule of decreasing by two each time.  Recognise and correct errors made in aural number sequences. For example, 10, 20, 30, **14**, 50. Identify odd and even numbers based on their ones digit.	Skip counting is based on a number pattern and generates a sequence.	Identify next terms, missing terms and errors in number sequences that ascend and descend in ones within the extending number range. Notice, discuss and identify the pattern within ordered lists and describe the rule. For example, the sequence of 100, 200, 300, 400 has the rule of skip counting forwards in hundreds. Extend sequences of numbers, based on skip counting, by applying the rule. For example, 35, 30, 25, … Identify odd and even numbers based on their ones digit within the extending number range.	Number sequences can be generated based on addition or subtraction number patterns. Skip counting to and from zero generates a sequence of multiples.	Notice, discuss and identify the pattern within sequences and explain the rule. For example, the sequence of 74, 70, 66, 62 has the rule of subtracting four each time. Identify next terms, missing terms and errors in ascending and descending number sequences based on addition and subtraction patterns. For example, 231, 236, ?, ?, 251,256, … Record the count and describe the connections and patterns when choral counting in multiples. For example, noticing the connections between the multiples of 3 and 6. **0**, 3, **6**, 9, **12**, 15, **18**, … 0, 6, 12, 18, … 
Notes Work on patterns and sequences provides an opportunity to build fluency in additive and multiplicative facts. Choral counting is a counting aloud routine where the count is recorded to enable pattern recognition. Appropriate concrete materials are counters, cubes or other objects of the same size. All even numbers have a ones digit of 0, 2, 4, 6 or 8. All odd numbers have a ones digit 1, 3, 5, 7 or 9. Make connections to patterns in Shape, Space and Measurement. **Includes but is not limited to** Working within the range 0 to 100, then gradually increasing the range towards 1000. **New key mathematical language (Learners)** terms, ascend, descend					

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Expressions, equations and relationships

Quantity, Numbers and the Algebraic Properties of Number - Expressions, equations and relationships					
Beginning of First Level ⟷					**End of First Level**
Understand: Symbols and pictorial representations model unknown quantities and make mathematical relationships explicit.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
An unknown initial quantity can be calculated using addition and subtraction as inverse operations. A picture or symbol can be used to represent an unknown number in a number statement. Fact families and known facts can be used to identify the missing value in addition and subtraction calculations.	Calculate an unknown starting quantity of objects (concrete materials), using addition and subtraction. For example, calculate how many objects we started with if we add four more into the jar and now there is ten.  For example, calculate how many balls we start with if we remove five and have four remaining.   Record addition and subtraction calculations with unknown numbers from given number stories. For example, giving some of my eight cookies away and being left with three could be recorded as 8 – ☐ = 3. Find missing values in addition and subtraction calculations, including those with a picture or symbol representing an unknown value. For example, 6 + ☐ = 8, 12 - ✸ = 4.	A range of addition and subtraction strategies (including using concrete materials and pictorial approaches) can be used to identify the missing value in calculations.	Record addition and subtraction calculations with unknown numbers from given number stories within the extending number range. For example, having some trading cards, getting 15 more and now having 24 could be recorded as ☐ + 15 = 24. Find missing values in addition and subtraction calculations, including those with a picture or symbol representing an unknown value, within the extending number range. For example, 20 + ☐ = 28 or ✸ - 7 = 7.	Letters of the alphabet can be used to represent an unknown number in a number statement.	Find missing values in addition and subtraction calculations, including those with letters of the alphabet representing an unknown value, using pictorial approaches when appropriate. For example, 26 + a = 56. 

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Notes
In an *addition* calculation augend + addend = sum.
When the amount being added is unknown, this is called a missing addend (for example, calculating how many counters have been added to give a total of 9 when we started with 7).
When the starting amount in an addition calculation is unknown, this is called a missing augend (for example, calculating how many counters we started with if we add four more and now have ten).
In a *subtraction* calculation minuend – subtrahend = difference.
When the amount being subtracted is unknown, this is called a missing subtrahend (for example, calculate how many have been taken away from eight counters when five are left).
When the starting amount in a subtraction calculation is unknown, this is called a missing minuend (for example, calculate how many we started with if we remove 5 and have 4 remaining).
Fact families use the same numbers to show how operations are related. For example, 6 + 2 = 8, 2 + 6 = 8, 8 – 6 = 2, 8 – 2 = 6.
Appropriate concrete materials and pictorial approaches include counters, base ten materials, number lines and bar models.
Make explicit connections to the understandings of addition and subtraction within Number relationships and operations.
Includes but is not limited to
Working within the number range 0 to 10, progressing to 0 to 30, extending to 100.
Excludes
Use of the language addend, augend, minuend and subtrahend as this has been included for practitioner awareness.
New key mathematical language (Learners)
symbol, unknown/missing value

Finance

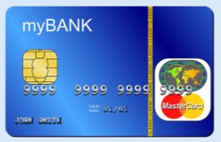
Quantity, Numbers and the Algebraic Properties of Number - Finance

Beginning of First Level ◄——————————————————————► **End of First Level**

Understand: Money indicates value and can be stored, calculated, exchanged and managed to meet people's needs.

Know	Do	Know	Do	Know	Do
Whole pound cash values can be made using combinations of the coins (£1 and £2) and notes (£5, £10 and £20) available.	Identify £1 and £2 coins from mixed collections of coins and from images or illustrations or coins. Identify £5, £10 and £20 notes from images or illustrations. Count amounts in £2, £5, £10, making links to skip counting. For example, £5, £10, £15, £20. Read and say a range of prices in whole pounds to £100.  Make cash amounts using combinations of coins and notes, whole pound amounts up to £20 only. For example, to pay £18, use £10, £5, £2 and £1; use £10 and eight pound coins; use a £20 note and expect change.	There are 100 pennies in £1. The symbol *p* is used to record amounts of money in pennies (pence). Cash values of less than £1 can be made using combinations of coins.	Identify all coins to £2 from mixed collections of coins and from images or illustrations or coins. Read and say a range of prices in pennies. For example, 'The bananas cost 78 pence each.' Make cash amounts of up to £1 using combinations of coins in different ways. For example, to make 63p, use 50p, 10p, 2p and 1p; use three 20p coins, 2p and 1p.  Record amounts in pounds or pence using the correct mathematical symbols. For example, 63p, £72.	Pennies split pounds into 100 equal parts (hundredths). A decimal point (·) can be used to separate whole pounds and fractions of pounds. Cash values of £5 or more can be made using combinations of notes and coins.	Count and make monetary amounts up to £20 using notes and coins. For example, £1·74 represents £1 and 74 pence and has the same value as 174 pence. It can be made using the coins £1, 50p, two 10p coins and two 2p coins. Read and say, using the language of pounds and pence and the correct mathematical symbols, a range of prices to £1000.  Make monetary amounts up to £20 efficiently given collections of coins and notes. 

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Change is the cash amount returned when paying with a note or coin worth more than an item costs.	Calculate correct change of whole pounds within £20. For example, if the shopping cost £14, the change from £15 would be £1.		Calculate correct change, in pence, from one pound using, making connections to number bonds to 100. For example, if the cost is 73p, how much change should you expect from one pound? How would you know the change is correct? Is there more than one way the change could be given?		Discuss and model how to pay for items using cash. For example, if a game costs £18, what different combinations of notes and coins could be used? Which is the most efficient way to pay? Select items from a price list within a given limit. For example, choosing items from a grocery price list to create a lunch with £5 to spend, calculating the total, checking there is enough money and justifying choices.
Cash is valuable and it is important that it is kept safe.	Discuss examples of ways to store physical cash safely. For example, wallets, money boxes, safes. Discuss examples of ways to store digital money safely. For example, pocket money apps and prepaid cards.	Banks are safe places where people can store and keep track of their money. This money is held in bank accounts. People can have more than one bank account.	Explain the main benefits of using a bank to store money.	Banks provide payment cards which electronically transfer payment from an individual's account to a seller or service provider or can be used to withdraw cash. Bank card details can be stored on digital devices which can then be used to make contactless payments.	Identify and discuss the key features of a bank card. For example, customer name, card number, expiry date, logo.  Describe scenarios where bank cards can be used instead of cash. Compare and discuss the advantages and disadvantages of making payments using bank cards versus using cash.

Notes

When first introduced to money, learners may find it difficult to distinguish between the value of a pile of coins and the number of coins in the pile.

Learners may revert to counting in ones rather than seeing £2, £5, £10 as a single unit. Pre-money counters can be a useful tool to help understand the value of money and develop counting and unitising skills before using real coins.

Take time to develop unitising by making links to skip counting.

A common misconception can be that the bigger the physical size of the coin, the bigger the value. For example, a 2p coin is physically larger than a 5p coin, but the value is less.

This is the first encounter with the decimal point. A more formal introduction to decimal fractions is included at Second Level, but it is recognised that seeing prices displayed as decimal fractions is a common everyday experience.

Read and say amounts to £100 then £1000.

Some learners may write 6£ instead of £6 because this mirrors the way amounts are spoken ("six pounds"). Model connecting the spoken form with the written notation.

Make connections to partitioning numbers in different ways in Number systems and structures.

Represent real-life purchasing situations by using contexts, such as a classroom shop, café or ticket office to support the understanding of money to make purchasing decisions, calculate totals and change and justify different payment strategies.

Make connections to careers in banking and finance, including a visit to a branch, mobile bank or from workers within the local community.

An awareness of where cash and banking services can be obtained locally may also be helpful. For example, Post Office, cash machines.

Excludes

A formal understanding of decimal fractions.

Calculating and making amount beyond £20.

Examples where zero is needed as placeholder, for example £3·05.

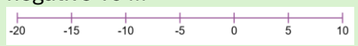
New key mathematical language (Learners)

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pound, pence, notes, change, valuable, price, secure, bank, account, bank card, electronic transfer, withdraw, digital
Numeracy and Mathematics Milestones **Money** Matches coins or notes that are the same. Sorts some coins from other coins. Identifies some coins.

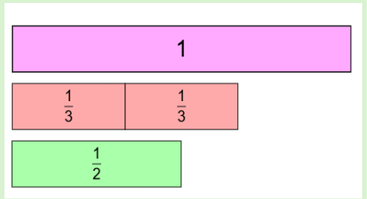
Second Level

Number systems and structures

Quantity, Numbers and the Algebraic Properties of Number - Number systems and structures					
Beginning of Second Level ←					→ **End of Second Level**
Understand: Integers extend the number system to include values less than zero, enabling the representation of negative quantities.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
		The number line can be extended below zero. Numbers greater than zero are positive. Numbers less than zero are negative. A negative symbol (−) is placed before a number to show that it is less than zero. Integers is the name given to the set of numbers ..., -3, -2, -1, 0, 1, 2, 3, ...	Recognise, say and write numbers below zero. For example, -5 is negative five and not minus five. Place positive and negative numbers accurately on number lines. Identify missing numbers on a number line which extends below zero.  Count in integers forwards and backwards, across zero, using appropriate tools. For example, negative two, negative one, zero, one, two, ... Compare and order integer values. For example, 1 > -3, 70 707 < 77 000.		Skip count forwards and backwards across and below zero. For example, 10, 5, 0, negative 5, negative 10 ...  Compare and order integer values to solve problems in context such as comparing temperatures. For example, -5°C is colder than -2°C because -5 < -2. Notice, discuss and identify the additive pattern within an ordered list of integers and describe the rule. For example, the sequence 23,11, -1, -13, ... has the rule of subtracting 12. Identify the next number(s), missing numbers and errors in ascending and descending integer sequences based on additive rules.
Notes When counting in integers, model counting backwards as well as forwards. Identify and discuss contexts where negative numbers occur. For example, temperature, finance or game scoring. Work with both horizontal and vertical number lines. Appropriate tools could include counting sticks and drawn or digital number lines. **New key mathematical language (Learners)** integer, positive, negative					

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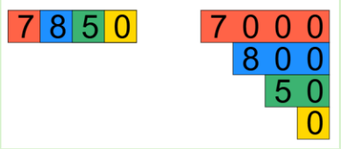
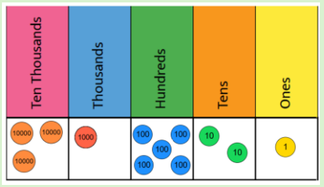
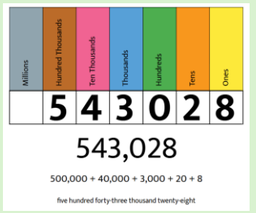
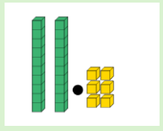
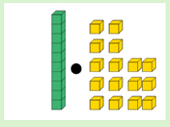
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Understand: Rational numbers allow quantities between integers to be represented and compared.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
				The set of rational numbers includes all the integers and the fractions that lie between them.	Express integers as fractions. For example, five could be written as $\frac{5}{1}, \frac{15}{3}, \ldots$ Identify and place positive and negative rational numbers on a number line. For example, place -3, 4, 0, $\frac{1}{2}$ and $-1\frac{1}{2}$ onto a marked number line.
Fractions are numbers which can be ordered and compared. An equivalent fraction can be found by multiplying or dividing the numerator and denominator by the same number.	Place fractions to tenths in order using spatial representations such as a fraction wall or a number line marked with whole numbers.  Compare the size of fractions using mathematical symbols. For example, $\frac{1}{2} < \frac{2}{3}$. Find equivalent fractions using multiplication and division, making connections to spatial representations. For example, $\frac{1}{2}$ is equivalent to $\frac{2}{4}, \frac{3}{6}, \frac{5}{10} \ldots$	Fractions can be compared and ordered by expressing them with the same (common) denominator or numerator.	Compare the size of pairs of fractions with related denominators by expressing them with a common denominator. For example, $\frac{4}{25}$ and $\frac{1}{5}$ can be written as $\frac{4}{25}$ and $\frac{5}{25}$ and so $\frac{4}{25} < \frac{1}{5}$. Compare the size of pairs of fractions with related numerators by expressing them with a common numerator. For example, $\frac{2}{5}$ and $\frac{4}{9}$ can be written as $\frac{4}{10}$ and $\frac{4}{9}$ and so $\frac{2}{5} < \frac{4}{9}$.		Compare the size of pairs of fractions with unrelated denominators by expressing them with a common denominator or numerator. For example, $\frac{5}{6}$ and $\frac{3}{4}$ can be written as $\frac{10}{12}$ and $\frac{9}{12}$ and so $\frac{5}{6} > \frac{3}{4}$.

Notes
Related denominators are denominators that are connected because one is a multiple of the other (they can easily be changed to match).
Fraction walls which allow learners to visualise, compare and understand relationships between different fractional values.
Represent equivalence spatially to avoid over reliance on procedural approaches.
Includes but is not limited to
Fractions to tenths.
New key mathematical language (Learners)
rational numbers
common denominator/numerator, pairs of fractions

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Understand: The base ten system extends to represent and partition increasingly large numbers and decimal fractions of increasing precision through a repeating place value pattern.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Four-digit whole numbers can be partitioned into thousands, hundreds, tens and ones. In a base ten number system each column, as we move left, has a place value ten times greater. These place values are 10, 100, 1000 and so on.	Represent whole numbers using concrete materials, within an extending number range. For example, 7850 could be shown as:  Skip count from any given whole number in thousands. For example, 2842, 3842, 4842, ...	Five-digit whole numbers can be partitioned into tens of thousands, thousands, hundreds, tens and ones.	Represent whole numbers using concrete materials, within an extending number range. For example, 31 521 could be shown as:  Counts forwards and backwards from any given number in steps of 10, 100, 1000, 10 000 crossing place value boundaries when necessary. For example, start at 4780 and count in 100s 4880, 4980, 5080, ... then count back in tens 5070, 5060, ...	Six-digit whole numbers can be partitioned into hundreds of thousands, tens of thousands, thousands, hundreds, tens and ones.	Represent whole numbers, within an extending number range. For example, 543 028 could be shown as:  Compare and order numbers to one million where the same digits are used in different place values. For example, ordering 108 808, 180 080, 118 000 and 108 880.
A decimal fraction has a denominator of 10, 100, 1000, ... and can be written using a decimal point. The decimal point (·) separates the whole number part from the fractional number part in a decimal fraction. Decimal place value refers to the value of a digit based on its position to the right of the decimal point. The first digit after the decimal point represents tenths. Decimal fractions to one decimal place can be placed on a number	Identify and describe the value of digits in decimal fractions based on their place. For example, in the number 3·6 (which is equal to $3\frac{6}{10}$), the 3 represents three ones and the 6 represents six tenths. Represent decimal fractions to one decimal place partitioned in different ways. For example, 2·6 is two ones and six tenths, but it is also 1 one and 16 tenths.   Place decimal fractions to one decimal place on marked then empty number lines.	The second digit after the decimal point represents hundredths. Decimal fractions to two decimal places can be placed on a number line between their neighbouring tenths.	Identify and describe the value of digits in decimal fractions based on their place. For example, in the number 4·65 (which is equal to $4\frac{65}{100}$), the 4 represents four ones, the 6 represents six tenths and the 5 represents five hundredths. Represent decimal fractions to two decimal places partitioned in different ways. For example, 2·63 is two ones and 63 hundredths but is also 1 one, 16 tenths and 3 hundredths. Place decimal fractions to one and two decimal places on empty number lines.	The third digit after the decimal point represents thousandths.	Identify and describe the value of digits in decimal fractions based on their place. For example, in the number 3·206 (which is equal to $3\frac{206}{1000}$), the 3 represents three ones, the 2 represents two tenths and the 6 represents six thousandths. Explain how decimal fractions can be partitioned in different ways up to three decimal places.

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line between their neighbouring whole numbers.	 Round decimal fractions to one decimal place to the nearest whole number, using a number line to support.	In some contexts, estimates and approximations must be more accurate than the nearest whole number.	Round decimal fractions to two decimal places to the nearest whole number or tenth, using a number line to support.		Round decimal fractions of up to three decimal places to the nearest whole number, tenth or hundredth.

Notes

Skip counting in multiples of ten can strengthen the understanding of place value.
Model skip counting backwards as well as skip counting forwards.
Choral counting supports development of number sense through the recognition of patterns and connections.
Appropriate resources and tools may initially include arrow cards and Gattegno charts before progressing to place value counters and place value charts, fraction bars split into tenths, hundred squares, base ten materials and decimal place value charts and counters.
Gattegno charts illustrate number structure and place value by organising numbers into rows representing ones, tens, hundreds and beyond, with columns for the digits 1 to 9. They support understanding of multiplying and dividing by ten, decimals and the role of zero as a placeholder.
Within the extending number range:

- identify and describe the value of a digit based on its place. For example, in the number 7850, the 8 represents eight hundreds and has a value of 800
- identify, say and write whole numbers
- compare and order numbers
- recognise, say and write decimal fractions within the extending number range (1 dp, 2 dp then 3 dp). For example, $\frac{7}{10}$ can be expressed as 0·7.

Investigate the use of decimal fractions in real and relevant contexts. For example, for one decimal place (dp) - measurements of length and body temperature, for 2 dp - money and measurements, for 3 dp - measurements of distance and mass.
Contexts which require more accuracy than the nearest whole number may include timings of runners in 100 metre races, ingredients in a recipe or doses of medicine.

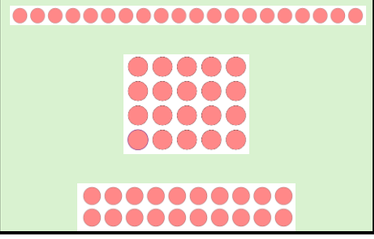
Includes but is not limited to

Working within the range 0 to 10 000, progressing to 0 to 100 000, extending to 1 000 000.

New key mathematical language (Learners)

column, tens of thousands, hundreds of thousands, powers of ten, decimal fraction, decimal point, digit, tenths, hundredths, thousandths, degree of precision

Understand: Whole numbers greater than one have a multiplicative structure that can be described through factors, enabling flexible and efficient multiplication and division strategies.

Know	Do	Know	Do	Know	Do
		A factor is a whole number that divides into another whole number with no remainder. A number divided by one of its factors will give another factor and these two numbers are called a factor pair.	Describe numbers using the language of factors. For example, the factors of 18 are 1, 2, 3, 6, 9, 18. Represent a number in terms of its factors by identifying pairs of numbers that multiply to produce it. For example, 20 could be represented as 1 × 20, 2 × 10 or 4 × 5. 		

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Notes
Concrete materials and spatial representations support the understanding of factor pairs. These include counters or multi-link cubes arranged as arrays, multiplication grids.
When working with factor pairs, certain categories of numbers have special or unusual factor pair patterns including square numbers, which have a repeated factor pair. For example, 16 = 1 × 16, 2 × 8 and 4 × 4
Make connections, when discussing square numbers, to Patterns and Sequences.
New key mathematical language (Learners)
factor, whole number, divide, factor pair

Number relationships and operations

Quantity, Numbers and the Algebraic Properties of Number - Number relationships and operations

Beginning of Second Level → **End of Second Level**

Understand: Scaling by 10, 100 and 1000 is enabled by the multiplicative relationship between places in the base-ten number system.

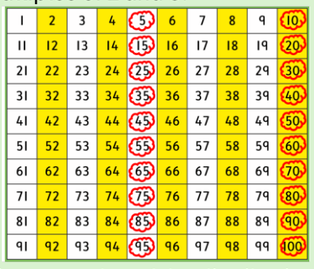
Know	Do	Know	Do	Know	Do
When numbers are multiplied by 10, their digits are moved one place to the left making the number 10 times larger. When numbers are multiplied by 100, their digits are moved two places to the left making the number 100 times larger. When numbers are divided by 10, their digits are moved one place to the right making the number 10 times smaller. When numbers are divided by 100, their digits are moved two places to the right making the number 100 times smaller. Strategies used when multiplying dividing whole numbers by 10 and 100 can be used when working with decimal fractions.	Multiply one-digit and two–digit whole numbers by 10. For example, 24 × 10 = 240. Multiply one-digit whole numbers by 100. For example, 5 × 100 = 500. Divide three-digit multiples of 10 or 100 by 10. For example, 410 ÷ 10 = 41. Divide three-digit multiples of 100 by 100. For example, 800 ÷ 100 = 8. Multiply decimal fractions to one decimal place by 10 using concrete materials and pictorial representations. For example, 3·2 × 10 = 32. Divide two and three-digit whole numbers by 10, using concrete materials and pictorial representations to find solutions which are decimal fractions. For example, 45 ÷ 10 = 4·5, 634 ÷ 10 = 63·4		Multiply one-digit and two-digit whole numbers by 10 or 100. Divide up to four-digit multiples of 100 by 10 or 100 (whole number answers only). For example, 9000 ÷ 100 = 90. Multiply decimal fractions to one and two decimal places by 10 and 100 using concrete materials and pictorial representations. For example, 58·26 × 10 = 582·6. Identify where zero is needed as a placeholder. For example, 1798·3 × 100 = 179 830. Divide whole numbers by 10 or 100, using concrete materials and pictorial representations to find solutions which are decimal fractions. For example, 256 ÷ 100 = 2·56.	When numbers are multiplied by 1000, their digits are moved three places to the left making the number 1000 times larger. When numbers are divided by 1000, their digits are moved three places to the right making the number 1000 times smaller. Strategies used when multiplying dividing whole numbers by 10, 100 and 1000 can be used when working with decimal fractions.	Multiply one-digit, two-digit and three-digit whole numbers by 10, 100 or 1000. Divide up to six-digit multiples of ten by 10, 100 or 1000 (whole number answers only). For example, 180 000 ÷ 1000 = 180. Multiply decimal fractions of up to three decimal places by 10, 100 or 1000, identifying where zero is needed as a placeholder. Divide whole numbers and decimal fractions by 10, 100 or 1000, to find solutions which are decimal fractions of up to three decimal places.

Notes
Scaling means changing the size, value, or amount of something by multiplying or dividing it by a numerical value.
When multiplying a whole number by a multiple of ten, zero is used as a placeholder in empty columns.

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Appropriate concrete materials or pictorial representations include place value counters and place value grids.
Make connections to metric conversions in Shape, Space and Measurement.
New key mathematical language (Learners)
scaling

Understand: Place value and operation properties allow whole-number calculations to be decomposed, transformed and checked across different magnitudes.

Know	Do	Know	Do	Know	Do
Addition and subtraction strategies used for whole numbers up to 1000 can also be applied to numbers greater than 1000. Numbers can be rounded as an approximation to a required degree of precision. Different degrees of precision are required depending on the context.	Solve contextual and non-contextual addition and subtraction problems justifying choice of strategy based on efficiency. Round whole numbers to the nearest 10, 100, 1000 or 10 000 to estimate the solution to a given problem. Discuss and describe real and relevant contexts where estimation and rounding are used.	Technology can support efficiency and accuracy of calculations.	Solve addition and subtraction problems using known strategies and verify solution with a calculator. Solve addition and subtraction problems using spreadsheet, including using a formula. For example, =SUM(..)	Subtraction is not commutative.	Solve contextual and non-contextual addition and subtraction problems justifying choice of strategy from a range, including calculators or spreadsheets where appropriate. Explain and represent that changing the order of numbers in subtraction changes the result. For example, $12 - 5 \neq 5 - 12$.
A product is the result of multiplying two or more numbers together.	Identify products in given calculations using the 2, 3, 4, 5, 6 and 10 times tables. For example, as $3 \times 2 = 6$, the product of 3 and 2 is 6. Recognise connections between the two, four and eight times tables. Model the repeated addition of eight using arrays and spatial representations, identifying at least the first ten multiples, making connections between multiplication, skip counting and contextualised problems. Recognise connections between the three, six and nine times tables and apply the multiplication activities from the eight times tables to the nine times tables. Build the seven times table using concrete materials, spatial representations and by making connections to other tables. Recognise and read number sentences where mathematical	A common multiple is one that appears in two or more times tables. Smaller multiples can be combined to find a larger product (the distributive law).	Carry out a range of multiplication and division calculations using known number facts and number patterns. For example, 5×13 could be calculated as 5×10 add 5×3. Find common multiples of two or more numbers by skip counting or listing the multiples. For example, 5, **10**, 15, **20** ... and 2, 4, 6, 8, **10**, 12, 16,18, **20**. Therefore 10 and 20 are the first two common multiples of 2 and 5.  Give examples of the distributive law within the times tables. For example, $7 \times 3 = 5 \times 3 + 2 \times 3$ Multiply two-digit multiples of 10 by a single-digit whole number using known number facts. For example, $50 \times 3 = 5 \times 3 \times 10 = 150$.		

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	symbols have been used to record multiplication or division by eight, nine or seven. Record multiplication or division calculations from given contextualised number stories using mathematical symbols. For example, six packs each containing nine individual toilet rolls can be recorded as 6 × 9 = 54. Tell a number story based on given multiplication or division facts from the eight, nine or seven times table. For example, 20 ÷ 4 could be twenty balls shared equally between four baskets would give five balls in each basket. Find the product of given calculations using all times tables to ten. Identify division problems which do, or do not share or group equally when dividing by 8, 9 or 7. For example, 14 toys can be shared equally among 7 people because 14 is a multiple of 7, but 14 toys cannot be shared equally between 8 people because 14 is not a multiple of 8.	The grid method is a way of representing a partitioning approach to multi-digit multiplication using the distributive law. In division calculations, dividend ÷ divisor = quotient. When sharing, the quotient represents the quantity of objects in each share. When grouping, the quotient represents the number equal of groups created.	Multiply two-digit whole numbers by single-digit whole numbers using the grid method. For example, to find 75 × 3 70 × 3 = 210 5 × 3 = 15 So, 75 × 3 = 210 + 15 = 225 Describe the solution to a division calculation using the term quotient. For example, when 12 toys are shared between 3 learners, the quotient (number in each share) is 4 as 12 ÷ 3 = 4. When 15 toys are put into groups of 5, the quotient (number of groups) is 3 as 15 ÷ 5 = 3. Solve division of two-digit numbers by single-digit whole numbers which require both grouping and sharing and use a range of representations, including concrete materials and/or pictorial representations to explain solutions. For example, 75 ÷ 5 could be calculated using tally marks or a Rekenrek to keep track. Divide two-digit numbers by single-digit whole numbers through non-canonical partitioning (whole number quotients only). For example, 84 ÷ 6 can be partitioned as 60 ÷ 6 and 24 ÷ 6. 60 ÷ 6 = 10	The extended written algorithm and the written algorithm for multiplication can provide a more efficient way of recording calculations as they become more complex. The grid method and the written algorithms can be extended to multiply any whole number by a single-digit whole number. When three or more numbers are multiplied together, the way they are grouped has no effect on their product (associative law). Numbers can be rearranged and reordered to make multiplication calculations easier. Round bracket symbols ( ) can be used in mathematics to indicate how numbers in a calculation are being grouped.	Multiply three-digit and four-digit whole numbers by single-digit whole numbers using the grid method. For example, to find 174 × 5 174 × 5 = 500 + 350 + 20 = 870 Make connections between the grid method and written representations of two-digit and three-digit multiplication by a single-digit whole number. For example, Using the extended written algorithm or the written algorithm Multiply larger whole numbers by single-digit whole numbers, using appropriate strategies. Perform multiplication calculations of three or more numbers efficiently by rearranging and reordering. For example, when multiplying 4, 7 and 25, it is more efficient to multiply the 4 and 25 first, then multiply by 7. Indicate the grouping of numbers in multiplication calculations using round brackets. For example, 2 × 3 × 5 = (2 × 3) × 5 = 2 × (3 × 5).

×	70	5
3	210	15

×	100	70	4
5	500	350	20

÷	10	4
6	60	24

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		A number is divisible by another if the quotient is a whole number. If the answer to a division problem is not a whole number, the answer could be given as a fraction, or as a whole number quotient with a remainder.	24 ÷ 6 = 4 So, 84 ÷ 6 = 10 + 4 = 14 Solve division problems which do not share or group equally and explain whether solutions should be expressed as a fraction or as a quotient and remainder. For example, sharing apples versus sharing toy cars.	The written algorithm for division can provide a more efficient way of recording calculations as they become more complex.	Choose from a range of approaches when multiplying whole numbers by a single-digit whole number, including a written algorithm and the use of a calculator, justifying choice based on efficiency. Solve division of three-digit whole numbers by single-digit whole numbers through partitioning (whole number quotients only). For example, 348 ÷ 3 could be partitioned as 300 ÷ 3, 30 ÷ 3 and 18 ÷ 3. **÷** | 100 | 10 | 6 **3** | **300** | **30** | **18** 300 ÷ 3 = 100 30 ÷ 3 = 10 18 ÷ 3 = 6 So, 348 ÷ 3 = 100 + 10 + 6 = 116 Make connections between the grid method and written representations of two-digit and three-digit division by a single-digit whole number and solve using the written algorithm. For example, to calculate 660 ÷ 5 **5** | 660 **5** | **100** 500 | 160 **5** | **100** 500 | **30** 150 | **2** 10 Interpret and explain if solutions to contextualised division problems should be given as a fraction, or as a quotient and a remainder. For example, 84 cupcakes shared equally among eight plates gives each plate exactly ten and a half cupcakes, however, 84 tennis balls shared equally into eight bags would give each bag ten balls with four remaining as the tennis ball would not be halved.

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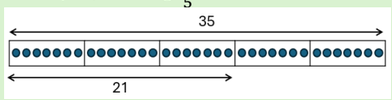
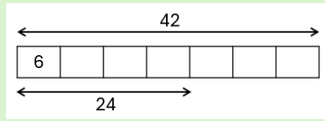
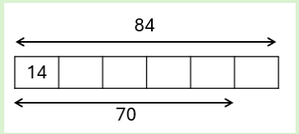
	Identify the operation(s) required when listening to or reading two-step contextualised problems.		Solve two-step problems involving two of the four operations within 100. For example, given that Alex has £13 and Nanette has £25. Calculate how much each person would receive if the money was shared equally.		Solve contextual and non-contextual problems using multiplication and division with whole number answers. Choose from a range of strategies, including the use of a calculator, justifying choice based on efficiency. Solve multi-step problems involving more than two of the four operations using concrete materials, pictorial representations and informal jottings to keep track.

Notes
Encourage estimating before calculating and checking the reasonableness of solutions across all number ranges. Draw on money and measurement to provide contexts for problems involving whole numbers.
Efficient calculation involves drawing on an understanding of number structure to select strategies that make calculations easier.
Appropriate strategies for addition and subtraction include partitioning, rounding, compensating and the written algorithm.
Appropriate strategies for multiplication and division include use of the commutative, associative and distributive properties, the grid method, the written algorithm and use of a calculator.
Arrays constructed using concrete materials can continue to support understanding of multiplicative relationships.
When calculators are first introduced, support will be required to ensure they are used effectively.
Revisit and make connections to work on multiplicative structures when working with fractions.
Revisit and make connections to work on multiplicative structures when introducing percentages.
Make connections to Expressions, equations and functions.
Excludes
Calculations that require consideration of the order of operations.
New key mathematical language (Learners)
bracket, product, common multiple, distributive law, partitioning, dividend, divisor, quotient

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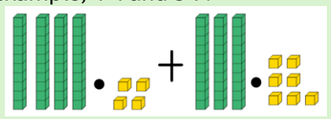
Understand: Fractions represent proportions and can be used to describe, determine and compare relationships between quantities.

Know	Do	Know	Do	Know	Do
A non-unit fraction can be found by first calculating the unit fraction and then combining equal parts.	Build fluency within multiplication facts to ten, by using division strategies to find unit fractions of whole numbers. For example, $\frac{1}{5}$ of 35 is the same as 35 ÷ 5. Find non-unit fractions of whole numbers using concrete materials and pictorial approaches. For example, finding $\frac{3}{5}$ of 35.  		Find unit fractions of any two-digit whole numbers by making connections to division by a single-digit whole number (whole number quotients only). For example, finding $\frac{1}{6}$ of 84. Build fluency by using known facts to find non-unit fractions of whole numbers. For example, finding $\frac{4}{7}$ of 42.  $\frac{1}{7}$ of 42 = 42 ÷ 7 = 6 $\frac{4}{7}$ of 42 = 6 × 4 = 24		Find unit fractions of three-digit whole numbers by making connections to division by a single-digit whole number. For example, finding $\frac{1}{3}$ of 348. Find non-unit fractions of two-digit whole numbers by using pictorial representations and making connections to division and multiplication. For example, finding $\frac{5}{6}$ of 84.  $\frac{1}{6}$ of 84 = 84 ÷6 = 14 $\frac{5}{6}$ of 84 = 14 × 5 = 70 Solve contextualised problems involving calculating and comparing proportions of quantities. For example, comparing $\frac{3}{4}$ of £120 and $\frac{2}{5}$ of £130.

Notes
Work within known times tables facts then move beyond times tables facts for unit fractions, but within times tables facts for non-unit fractions.
Appropriate concrete materials and pictorial representations include counters, base ten materials and bar models.
Make connections to known division and multiplication strategies.
Includes but is not limited to
Whole number solutions.
New key mathematical language (Learners)
non-unit fraction, proportional

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Understand: Decimal calculations extend place-value relationships and operation properties from whole numbers to include smaller units.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The number sequence can be expressed in fractions and decimal fractions.	Count in tenths using a number line or a counting stick to keep track. For example, $\frac{11}{10}, \frac{10}{10,}, \frac{9}{10}$, … Count in decimal fractions (tenths) using a number line or a counting stick to keep track. For example, 1·8, 1·9, 2, 2·1, 2·2, … Compare decimal fractions to one decimal place using the correct mathematical symbols. For example, 1·2 > 0·9. Order decimal fractions to one decimal place in ascending and descending order. For example, putting 0·2, 2·1, 1·2 in ascending order.		Count in decimal fractions (hundredths) using a number line or counting stick to keep track. For example, 0·97, 0·98, 0·99, 1, 1·01, 1·02, … Order decimal fractions to one and two decimal places in ascending and descending order and compare using the correct mathematical symbols. For example, putting 2·05, 0·25, 2·5 in descending order and stating that 2·05 < 2·5.		Order whole numbers and decimal fractions of up to three decimal places in ascending and descending order and compare using the correct mathematical symbols. For example, putting 1·375, 13, 1·37, 13·75, 1·075 in descending order and stating that 1·37 < 1·375.
		Strategies used when adding and subtracting whole numbers should be used when working with decimal fractions.	Add and subtract decimal fractions to one decimal place, progressing to two decimal places using concrete materials and pictorial representations. For example, 4·4 and 3·7.  Make connections between the concrete, pictorial and written forms of addition and subtraction calculations to two decimal places. Solve addition and subtraction problems to one or two decimal places in the contexts of money and measurement.		Solve addition and subtraction problems involving decimal fractions of up to three decimal places in the contexts of money and measurement.
				Strategies used when multiplying whole numbers by a single-digit whole number should be used when working with decimal fractions.	Multiply decimal fractions to one and two decimal places by a single-digit whole number using concrete materials and/or pictorial representations. For example, 69·35 × 6.

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				Division can result in decimal fractions when quantities do not divide into whole numbers.	Interpret and explain decimal fraction solutions to division problems in the context of money and measure. For example, when £47 is shared equally between two people, each person receives £23·50.

Notes
Model counting backwards as well as counting forwards.
Appropriate concrete materials pictorial representations to support addition and subtraction of decimal fractions include base 10 materials, place value counters, £1, 10p and 1p coins, place value charts and bar models.
Make connections to Shape, Space and Measurement and Finance.
Excludes
Decimal division at this stage should be restricted to problems in the context of money or measurement.
New key mathematical language (Learners)
operations

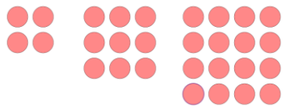
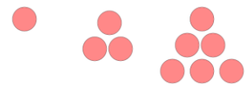
Proportional reasoning

Quantity, Numbers and the Algebraic Properties of Number - Proportional reasoning					
Beginning of Second Level ⟷					**End of Second Level**
Understand: Percentages represent proportions on a common base of 100, allowing direct comparison between quantities.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
		Percentages are fractions with a denominator of 100. The mathematical symbol used to represent percentage is %. Fractions, decimal fractions and percentages can be used as equivalent forms of an operator.	Convert and explain the equivalence of given percentages, fractions and decimal fractions. For example, 25% is 25 per 100, 0·25, $\frac{25}{100}$, $\frac{1}{4}$. Find 10%, 20%, 25% and 50% of two-digit numbers using knowledge of equivalence with unit fractions and spatial approaches such as bar models (whole number quotients only). For example, finding 20% of 85 is the same as one fifth of 85.	Fractions, decimal fractions and percentages can be expressed in equivalent forms to be compared and ordered. Known percentages can be scaled or combined to find other percentages of quantities.	Compare and order the size of fractions, decimal fractions and percentages of the same quantity by expressing them in equivalent forms. For example, ordering $\frac{1}{4}$, 0·2 and 30%. Solve contextualised problems by finding 10%, 20%, 25% and 50% of two-digit numbers (whole number quotients only). For example, finding the cost of a £55 rucksack after a 20% discount has been applied. Solve contextualised problems by scaling or combining known percentages. For example, using 10% to find 30%, using 50% and 25% to find 75%.

Notes
Make connections to multiplication, division and fractions in Number relationships and operations.
Discuss and describe real and relevant contexts where percentages are used. For example, sale prices, finance and advertising.
Explore ideas such as, 'Is 50% always more than 25%?' to understand that this comparison can only be made if we calculating percentages of the same quantity.
New key mathematical language (Learners)
percentage, operator, scale

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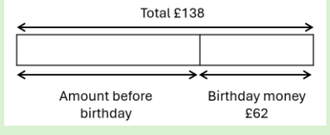
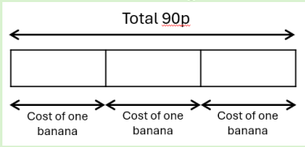
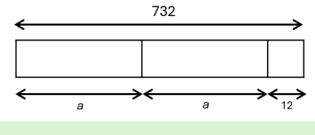
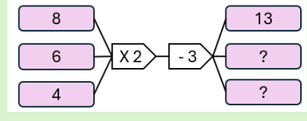
Patterns and sequences

Quantity, Numbers and the Algebraic Properties of Number - Patterns and sequences					
Beginning of Second Level ⟷					**End of Second Level**
Understand: Some patterns in shapes and nature follow numerical rules that determine how they grow and change.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
A square number of items can be arranged in an array with an equal number of rows and columns.  A square number is found by multiplying a whole number by itself. The mathematical symbol for squared is ^{2} (superscript two).	Explain and model pictorially or with concrete materials what a square number is. Find square numbers using arrays and known multiplication facts. Justify and explain pictorially or with concrete materials whether number is a square number. Calculate and record a range of square numbers. For example, $4 \times 4 = 4^2$ is read as four squared and is equal to 16.	A triangular number describes the number of items that can be arranged in a triangle. The first row contains one item, the second row has two items, the third row has three items and so on. 	Create triangular patterns with everyday items and recognise where they appear in real contexts. For example, stacked cans, snooker balls and bowling pin formations. Justify and explain pictorially or with concrete materials whether a number is triangular. Investigate triangular numbers by exploring classic mathematical problems. For example, Pascal's Triangle, the handshake problem.	A cubic number of items can be arranged in a three-dimensional array with equal numbers of rows, columns and layers.  A cubic number is found by multiplying a number by itself and then by itself again. The mathematical symbol for cubed is ^{3} (superscript three). The next number in a Fibonacci sequence is found by adding together the previous two numbers in that sequence.	Explain and model pictorially or with concrete materials what a cubic number is. Find cubic numbers using physical objects and multiplication facts. Justify and explain using number facts and concrete materials if a number is cubic. Calculate and record a range of cubic numbers. For example, $4 \times 4 \times 4 = 4^3$ is read as 'four cubed' and is equal to 64. Develop an awareness of the history and application of Fibonacci sequences in the context of the natural world. 
Notes Appropriate concrete materials to explore square and triangular numbers spatially are counters, cubes or other objects of the same size. Appropriate concrete materials to explore cubic numbers spatially are 3D stackable objects of the same size. Make connections to factor pairs when discussing square numbers. **New key mathematical language (Learners)** square/triangular/cubic number, Fibonacci					

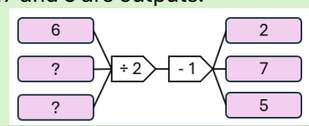
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Expressions, equations and relationships

Quantity, Numbers and the Algebraic Properties of Number - Expressions, equations and relationships					
Beginning of Second Level ⟷					**End of Second Level**
Understand: Expressions, equations and functions represent relationships between quantities using symbols and variables, forming part of the language of mathematics.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Fact families and known facts can be used to identify the missing value in multiplication and division calculations	Find whole number missing values up to three-digits in addition and subtraction calculations using pictorial approaches when appropriate. For example, $124 = 200 - t$ Find whole number missing values up to two-digits in multiplication and division calculations, using pictorial approaches when appropriate. For example, 40 = ☐ × 10 or 6 ÷ ✱ = 3 or $b \div 5 = 7$	A variable is a quantity that can take on different values and is represented by a dedicated symbol or a letter. A term is a single number, a variable or a product of numbers and variables. An algebraic expression is a term or group of terms separated by operators and may contain more than one variable. An equation states that two expressions are equal in value. Equations can be solved by finding the unknown value for which the equation is true. Expressions and equations can be used to model situations and solve problems in context.	Identify quantities that vary in real-world contexts and represent them using variables. For example, a person's height, the number of green blocks in a tub, the cost of a banana. Build and interpret algebraic expressions to model relationships and calculations in real-world contexts. For example, the total cost of 3 bananas could be represented by the expression $3b$, the difference between the number of green bricks and blue bricks could be represented by the expression $g - b$. Model and solve addition and subtraction problems with one unknown by translating between real-world situations, spatial representations and algebraic notation. For example, 'I got £62 in birthday money and I now have £138, how much money did I have before my birthday?' can be modelled by $a + 62 = 138$ and using a bar model. 		Model and solve multiplication and division problems with one unknown and one solution by interpreting the context, representing it using algebraic notation and visual models and explaining the solution in relation to the original context. For example, three bananas cost 90 pence. What is the cost of each banana? This could be modelled by $3b = 90$ and using a bar model.  Model and solve problems with one unknown and one solution (one-step and two-step examples only) by representing relationships using algebraic notation, making connections to visual models and interpreting solutions in context. For example, I double a number and add 12 and I get 732. What number did I start with? could be modelled by $732 = 2a + 12$ and by using a bar model. 
				A function is a relationship between two sets of numbers, describing how each element in the first set (input) is mapped on to exactly one element in the second set (output). Functions can be represented pictorially and these are often called function machines.	Calculate outputs for given inputs of single-step and two-step functions represented pictorially as function machines. For example, 8,6 and 4 are input. 

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					Calculate inputs for given outputs of single-step and two-step functions represented pictorially as function machines by using inverse operations. For example, 2,7 and 5 are outputs. 

Notes

Make explicit connections to addition, subtraction, multiplication and division within Number relationships and operations.

Use the mathematical modelling process when exploring algebraic situations: understand the context, plan a mathematical representation, do the mathematics, consider the reasonableness of solutions and communicate reasoning and conclusions.

Variables help create general rules and allow us to express relationships between quantities.

Focus on modelling and solving problems using equations rather than procedurally solving abstract equations.

The origin of algebra could be investigated, including how it developed across multiple cultures over time as a way of representing and solving problems involving unknown quantities and relationships. For example, Persian mathematician Al-Khwarizmi formalised systematic methods for solving equations and his work gave us the word *algebra*.

New key mathematical language (Learners)

variable, algebraic expression, equation, function, relationship, element

Finance

Quantity, Numbers and the Algebraic Properties of Number - Finance					
Beginning of Second Level ←					→ **End of Second Level**
Understand: People can obtain, manage and spend money in different ways based on their circumstances, needs and wants.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Different jobs and patterns of work attract different rates of pay.	Investigate and provide examples of different employment opportunities and current rates of pay. For example, compare the amount of money earned by working more hours, working shifts, having a more highly skilled job or by managing more people.	There are different types of bank accounts. Some accounts pay savers money, a percentage of the amount they have in their account (their bank balance). This is called interest. Borrowing money usually involves repayment over time and may include additional costs. Debt is a name given to money that has been borrowed and must be paid back. Loans from banks and other providers often require more money to be paid back than was borrowed. The extra is a percentage of what was borrowed. This is called interest.	Find current examples of savings products, comparing their interest rates and any incentives offered to customers when opening these accounts. Identify and discuss common reasons for borrowing money. Identify and discuss different sources of lending. Find current examples of loan products, identifying their interest rates and any other charges payable.	Benefits are payments, provided by the governments in the UK, which are designed to support living costs. These may be paid to individuals depending on their circumstances.	Identify and describe some of the different types of benefits which can offer financial support to individuals and families.

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Financial management tools such as bank statements, personal finance diaries, or digital spreadsheets can be used to track spending and saving. A bank statement is a record of transactions made to and from a bank account over a period of time. Financial records can be used to identify patterns and inform future decisions.	Complete a record of spending and/or saving using a digital budgeting tool or spreadsheet template. Interpret key information presented on bank statements and spending records. Explain how keeping records of spending and saving can support budgeting and financial decision making. Analyse spending records to identify patterns and suggest changes that could help achieve a financial goal.	A budget is a plan that outlines how an allocated amount of money will be spent or saved. Budgets can be adjusted when circumstances, priorities or costs change A receipt is a record of what was purchased, when and where it was purchased and how much it cost. Receipts can come in either paper or digital format.	Create a spending or saving plan using a digital budgeting tool or spreadsheet template. Create, test and revise a spending or savings plan to meet a specific goal or set of constraints. For example, planning an event, trip or enterprise activity within a given budget. Identify the key features and advantages/disadvantages of paper and digital receipts. Explain why businesses provide receipts and why a customer might need to check or keep a receipt.	Debit cards are bank cards which are used to withdraw cash or make payments instantly from a bank account. If there isn't enough money in the account to cover the transaction, the payment is likely to be declined. A credit card is a payment card that allows money to be borrowed from a bank or provider to make purchases or withdraw cash. This money needs to be paid back and interest may be charged. Insurance can protect valuables against unexpected loss or damage by providing financial support in certain circumstances.	Explain how debit cards work and give examples of how and when they can be used. Find information about debit cards currently available to learners and describe any associated costs or conditions, sharing personal experiences as appropriate. Explain how credit cards work and how and when they can be used. Identify and discuss the benefits and risks of using credit cards in different scenarios. Explain the differences between using debit and credit cards. Discuss examples of different types of insurance and explain the benefits and risks that this protection may bring.
The price of an identical item may differ depending on the provider. Currency is a standardised form of money used in a country, region or online platform.	Compare purchase prices for single items across multiple vendors. Identify examples of different currencies used in online platforms and across the world, sharing experiences as appropriate. For example, seeing online prices in dollars or Euros, buying items when on holiday, online gaming purchases.	There are many sources of influence when it comes to making financial decisions. Some celebrities and influencers are paid to promote products and services.	Identify examples of ways in which financial decisions can be influenced. For example, by current trends, family, friends, religious beliefs, advertising and by cost. Discuss the risks of being influenced to spend by celebrity marketing.	Value for money means getting the best possible benefit for money spent on items. Some items provide better value for money than others. Multibuy deals can sometimes offer better value for money. Some retailers provide discounted prices or offers for their members. Gambling means betting money or something valuable on an event with an uncertain outcome, hoping to win more money or prizes.	Compare prices of items and justify which offers provide best value for money in a given situation. Discuss how factors such as quantity, quality, sustainability and ethical trading can influence spending decisions. Compare discounts, loyalty rewards and promotional offers to determine potential savings and value for money. Give examples of real-life gambling situations and identify the risks involved.

Notes
The methods used to acquire goods and services and to manage money, have changed over time and will continue to evolve as technology develops. This could be explored to provide context to current uses of digital technology.
Connections could be made to local industries or employers to explore local job opportunities.
Common reasons for borrowing could include paying for expensive items such as a car, furniture, home improvements etc. Current examples of loan products could include bank loans, car finance deals and credit agreements for purchases such as sofas. Other sources of lending could include family or friends and credit cards. Borrowers will need to meet certain criteria to have applications accepted for loans, credit cards etc.

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Comparisons should be made between interest charged on borrowing and interest paid on savings.
Current examples of benefits include state pensions, sick pay, parental benefits, disability allowances, carers support payments, education maintenance allowance (EMA).
A detailed knowledge of current job opportunities, benefits and financial products is not required, rather the focus is on developing awareness and identifying reliable sources of up-to-date information which can be accessed as the need arises. Sensitivity towards individual circumstances should always be exercised.
Spreadsheet templates for managing finances are readily available online.
Examples of types of insurance could include phone, device, car, holiday and pet insurance.
A number of online games popular with children and young people have inbuilt currencies which could be discussed.
Connections could be made to the use of persuasion within How Texts Work within Literacy & English. Influence and persuasion will be revisited within ethical marketing in Business (Technologies) at third level.
Gambling examples for discussion could include raffles, mystery boxes, arcade and fairground games and tombolas. Discussions about gambling should be approached sensitively and respectfully, recognising that learners may hold diverse religious, cultural and personal views and experiences. Make connections to Probability when discussing gambling.

Excludes

Interest calculations and calculated comparisons at this stage.

New key mathematical language (Learners)

pay rates, borrowing, repayment, interest, benefits, living costs
record, budget, receipt, debit card, credit card, payment, insurance, risk
currency, influence, decision making, value, gambling

Third Level

Number systems and structures

Quantity, Numbers and the Algebraic Properties of Number - Number systems and structures			
Beginning of Third Level ←			→ **End of Third Level**
Understand: The base ten number system extends infinitely in both directions, allowing increasingly large quantities and increasingly precise values to be represented, interpreted and communicated.			
Know	**Do**	**Know**	**Do**
The sequence of place values beyond hundred thousands continues with millions, ten millions, hundred millions and billions.	Read, write and represent whole numbers beyond one million using numerals, words and expanded notation. Partition and recombine large numbers in multiple ways.		Compare and order whole numbers beyond one million and justify comparisons using place value reasoning. Round numbers beyond one million to an appropriate level of precision. Estimate and check the reasonableness of solutions to problems involving large numbers.
The sequence of place values beyond thousandths is ten-thousandths, hundred-thousandths and so on. Increasingly precise measurements require additional decimal places.	Read, write and represent decimal fractions beyond thousandths. Identify the value of digits in decimal fractions to at least four decimal places. For example, in 4·2065 the 2 represents two tenths, the 6 represents six thousandths and the 5 represents five ten-thousandths	Equivalent decimal fractions can be written with different numbers of decimal places. Adding or removing trailing zeros does not change the value of a decimal fraction.	Compare and order decimal fractions with different numbers of decimal places. Identify equivalent decimal fractions, for example, 3·2 = 3·20 = 3·200
Notes Large numbers and precise decimals are used in science, technology, finance and measurement. **New key mathematical language (Learners)** billion, ten-thousandth, hundred-thousandth			
Understand: For natural numbers greater than one, the number of factors a number has determines whether it is prime or composite.			

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Know	Do	Know	Do
Prime numbers are natural numbers which have exactly two factors, themselves and one. Composite numbers are the product of two or more prime numbers.	Identify prime numbers using knowledge of factors. Use the definition of prime numbers to reason about the classification of the number one. Express composite numbers as a product of prime factors and use these to perform calculations efficiently.		

Notes
Natural numbers are the set of numbers 1, 2, 3, 4, 5, ...
Work initially with prime numbers to one hundred.
Counters and arrays may support the initial understanding of primes and composites. For example, prime numbers cannot be arranged as arrays with multiple rows and columns.
Composite numbers may or may not have composite factors but will always be able to be expressed in terms of prime factors only.
Discuss and investigate the use of prime numbers in real-life and mathematical contexts.
Digital tools exist for prime factorisation that may be useful to experience.
New key mathematical language (Learners)
natural number, prime, factor, composite

Understand: Index notation provides a compact way to express repeated multiplication, enabling the efficient calculation and generalisation of powers.

Know	Do	Know	Do
		Index notation is an efficient way of expressing repeated multiplication. There is an inverse relationship between powers and roots.	Express repeated multiplications using index notation. For example, $5 \times 5 \times 5 \times 5 = 5^4$. Explain how squared numbers, cubed numbers and their corresponding roots, are connected through inverse operations. For example, as $4^3 = 64, \sqrt[3]{64} = 4$. Apply these connections to evaluate whole number roots.

Notes
Make connections between squared numbers, cubed numbers, square roots and cube roots and the area of squares, the volume of cubes and their dimensions in Shape, Space and Measurement.
Excludes
Negative roots are not required at this stage.
New key mathematical language (Learners)
index notation, power, root

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Number relationships and operations

<table>
<tr><th colspan="4">Quantity, Numbers and the Algebraic Properties of Number - Number relationships and operations</th></tr>
<tr><th colspan="2">Beginning of Third Level</th><th colspan="2">End of Third Level</th></tr>
<tr><td colspan="4">Understand: Place-value relationships and operation properties allow decimal calculations to be scaled, approximated and justified, supporting problem solving in a range of contexts.</td></tr>
<tr><th>Know</th><th>Do</th><th>Know</th><th>Do</th></tr>
<tr>
<td>Written and mental strategies, used to complete calculations with smaller numbers, generalise to larger numbers.

Two-digit multipliers can be decomposed into tens and ones.</td>
<td>Solve addition and subtraction problems involving numbers beyond one million.

Multiply whole numbers by a two-digit number using efficient written methods. For example,
$23 \times 35 = (23 \times 30) + (23 \times 5)$
$= 690 + 115$
$= 805$

<table><tr><th>×</th><th>20</th><th>3</th></tr><tr><td>30</td><td>600</td><td>90</td></tr><tr><td>5</td><td>100</td><td>15</td></tr></table></td>
<td>Digital technologies can improve efficiency and accuracy when working with whole numbers and decimal fractions with many digits.</td>
<td>Solve multiplication and division problems involving large whole numbers using appropriate written and mental methods.

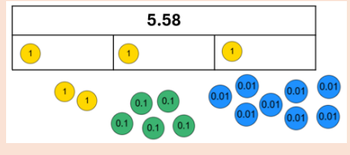
Calculate and verify solutions using calculators, spreadsheets and other digital tools.

Choose and justify the most appropriate method for calculations using mental, written or digital approaches.

Estimate solutions to check whether technology-generated answers are reasonable.</td>
</tr>
<tr>
<td>Strategies used when multiplying and dividing whole numbers can be used when working with decimal fractions.</td>
<td>Multiply one-digit, two-digit and three-digit whole numbers and decimal fractions by powers of 10 to 1 000 000.
For example, $7 \cdot 82 \times 10\,000 = 78\,200$

Multiply decimal fractions to one, two and three decimal places by a single-digit whole number, justifying solutions using manipulatives or pictorial approaches.
For example, $9 \cdot 352 \times 6 = 56 \cdot 112$.

Multiply one-digit, two-digit and three-digit numbers by any number which is a product of a single-digit whole number and any whole number power of ten.
For example, $3 \cdot 4 \times 400 = 3 \cdot 4 \times 4 \times 100$.

Divide decimal fractions to one and two decimal places by a single-digit whole number, initially using manipulatives and pictorial approaches. For example,
$5 \cdot 58 \div 3 = 1 \cdot 86$.


Divide two-digit and three-digit whole numbers by a single-digit whole number where solutions are decimal fractions to one or two decimal places,</td>
<td>Solutions to calculations resulting in decimal fractions may need to be rounded or truncated depending on the context.</td>
<td>Calculate, interpret and explain solutions to increasingly complex multi-step contextualised problems which use the four operations.

Round solutions which are decimal fractions to a given degree of precision.

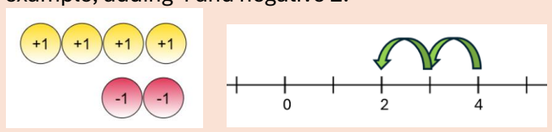
Justify solutions which have been rounded or truncated. For example, the number of full 230 ml cups that can be poured from a two-litre bottle is 8, even though
$2000 \div 230 = 8 \cdot 7$ (to one decimal place).</td>
</tr>
</table>

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	initially using manipulatives and pictorial representations. For example, $124 \div 8 = 15 \cdot 5$ Divide two-digit and three-digit numbers by any number which is a product of a single-digit whole number and 10, 100 or 1000 (whole number and exact decimal fraction answers only). For example, $240 \div 80 = 3$ $375 \div 50 = 7 \cdot 5$		

Notes
Appropriate manipulatives and pictorial representations include place value counters and bar models.
Make connections to money and measure across Shape, Space and Measurement and Finance.
New key mathematical language (Learners)
truncate

Understand: Number relationships extend across zero to include positive and negative values, while equivalence, inverse relationships and operation properties remain consistent.

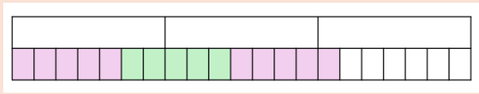
Know	Do	Know	Do
The additive inverse of a number is the number that is added to the original to give zero. A positive unit and a negative unit that combine to make zero together is known as a zero pair. Subtraction is addition of the additive inverse. The properties of multiplication and division remain when working with negative integers.	Identify the additive inverse of given integers. For example, the additive inverse of 2 is -2, the additive inverse of -5 is 5. Add and subtract integers using appropriate manipulatives, making use of zero pairs. Connect this to its spatial representation on a number line. For example, adding 4 and negative 2.  Multiply and divide integers by applying repeated addition, continuing patterns and applying the connections between multiplication and division (inverse operations).		Add and subtract integers using a number line to keep track as necessary. Build fluency by applying multiplication and division strategies when working with integers.

Notes
Appropriate manipulatives and pictorial representations include double sided counters and number lines.
New key mathematical language (Learners)
additive inverse, zero pair, positive/negative unit

Understand: Fraction operations depend on equivalence and unit size, with common units supporting addition and subtraction and multiplicative relationships underpinning multiplication and division.

Know	Do	Know	Do
	Add and subtract fractions, including improper fractions, with common denominators, initially using a number line to keep track. Add and subtract mixed numbers with common denominators, initially using pictorial approaches or a number line to keep track.	The highest number that is a factor of two or more numbers is called their highest common factor (HCF).	Identify the highest common factor of two or more numbers by listing their factors. For example, Factors of 32: 1, 2, 4, 8, **16**, 32 Factors of 48: 1, 2, 3, 4, 6, 8, 12, **16**, 24, 48. The HCF of 32 and 48 is 16. Express fractions in their simplest form efficiently by first finding the highest common factor of their numerator and denominator.

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The smallest multiple that is shared by two or more numbers is called their lowest common multiple (LCM). Expressing fractions with common denominators allows for efficient addition and subtraction. Proper and improper fractions can be simplified by dividing the numerator and denominator by a common factor. A fraction is in its simplest form if the only common factor of its numerator and denominator is one. Proportions of a whole can be expressed as equivalent fractions, decimal fractions and percentages.	Identify the lowest common multiple of two or more numbers by listing their first few multiples. For example, Multiples of 6: 6, **12**, 18, 24 ... Multiples of 4: 4, 8, **12**, 16 ... Therefore, the LCM of 6 and 4 is 12. Add and subtract fractions with related denominators by finding equivalent fractions with common denominators (including improper fractions), initially justifying choice of denominator and solutions using pictorial approaches. For example, $\frac{2}{3}+\frac{1}{6}=\frac{4}{6}+\frac{1}{6}=\frac{5}{6}$.  Add and subtract fractions with unrelated denominators by finding equivalent fractions with any common denominators (including improper fractions), initially justifying choice of denominator and solutions using pictorial approaches. For example, $\frac{2}{3}+\frac{1}{4}=\frac{8}{12}+\frac{3}{12}=\frac{11}{12}$. Express fractions in their simplest form. Solve contextualised problems by adding or subtracting fractions, expressing solutions in their simplest form. Calculate and compare proportions, in context, expressing them in an appropriate form. For example, comparing the frequencies of outcomes in probability experiments.	Finding a fraction of a quantity is the same as multiplying the quantity by that fraction.	Add and subtract mixed numbers with related and unrelated denominators, initially using manipulatives or pictorial approaches, expressing solutions in their simplest form. Multiply a whole number by a fraction, using pictorial approaches and the commutative law. For example, $\frac{5}{7}\times 3=\frac{15}{7}=2\frac{1}{7}$  Solve contextualised problems by multiplying a whole number by a fraction.
Notes Related denominators are denominators that are connected because one is a multiple of the other (they can easily be changed to match). When simplifying fractions, connections can be made to the prime factors of the numerator and denominator. **New key mathematical language (Learners)** lowest common multiple, highest common factor, common denominator, simplify			

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Proportional reasoning

Quantity, Numbers and the Algebraic Properties of Number - Proportional reasoning

Beginning of Third Level ⟷ **End of Third Level**

Understand: Proportional relationships involve quantities that are connected in a consistent way, so if one quantity is multiplied or divided by a given factor, the other quantity changes by the same factor.

Know

Percentages of a quantity can be found by multiplying that quantity by the equivalent decimal fraction.

Two variables are directly proportional if they have a constant quotient. This algebraic relationship can be used to model real-life situations.

Do

Find non-unit fractions of three-digit and four-digit whole numbers (whole number quotients only).

Find any percentage of any quantity, using a calculator or spreadsheet where appropriate.

Solve problems in real-life contexts by increasing or decreasing a quantity by a given percentage. For example, pay rises, interest or depreciation.

Recognise variables which are directly proportional to one another.

Model the multiplicative relationship between two variables which are directly proportional to one another to find the value of one variable given the other. For example,

Scones	Grams of flour
12	450
6	225
18	675

The constant quotient (rate) is 37·5 g per scone.

Interpret and use constant quotients as rates. For example, estimate, calculate and compare the cost of items in different currencies using current exchange rates.

Know

A ratio can be used to compare two or more quantities expressed in terms of their relative sizes.

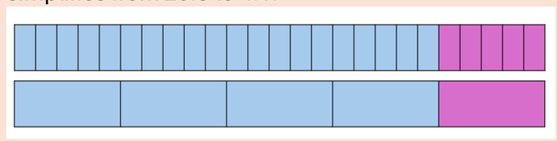
A ratio is in its simplest form if the only common factor of its terms is one.

Two variables are inversely proportional if they have a constant product. This algebraic relationship can be used to model real-life situations.

Do

Express the relationship connecting sets of two or three quantities as a ratio. For example, if there are three blue counters and five red counters, the ratio of blue to red is 3:5 (three to five).

Express ratios in their simplest (whole number) form, using spatial representations where appropriate. For example, in a lucky dip there are twenty losing tickets and five winning tickets, the ratio of losing to winning simplifies from 20:5 to 4:1.



Find related quantities by using equivalent ratios and given quantities. For example, if the safety ratio of learners to adults is 12:1 and there are three adults in the group, they can safely look after up to 36 learners.

Recognise variables which are inversely proportional to one another.

Model the multiplicative relationship between two variables which are inversely proportional to one another to find the value of one variable given the other. For example,

Number of workers	Hours taken
4	12
8	6
1	48

The constant product is 48 hours of work.

Notes

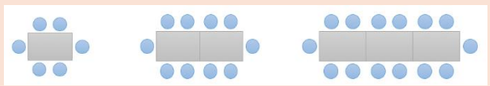
Real-life situations which demonstrate a directly proportional relationship include buying groceries, purchasing fuel, driving at constant speed, scaling up a recipe and hourly wages.
Proportion tables can be used to organise calculations.
When working with currency exchange, methods and locations for exchanging currencies could be explored, considering factors such as exchange rates available, convenience and any added fees. The effect of fluctuating exchange rates on real-life situations such as holidays and online purchases could also be explored.
Real-life situations which demonstrate an inversely proportional relationship include the length of time a fixed quantity of resource will last when used at a particular rate and how long a task will take given the number of workers assigned to it.

New key mathematical language (Learners)

direct/inverse proportion, quotient, ratio, exchange rate

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Patterns and sequences

Quantity, Numbers and the Algebraic Properties of Number - Patterns and sequences			
Beginning of Third Level ◄———			**End of Third Level**
Understand: Sequences of numbers that follow multiplicative rules can lead to patterns of rapid growth or decay.			
Know	**Do**	**Know**	**Do**
Number sequences can be generated by applying the same multiplicative rule between successive terms.	Identify and describe the multiplicative rule within given growing number sequences and where appropriate, explain what the sequences represent in context. For example, describing how the number of bacteria in a dish doubles each hour: 10, 20, 40, 80, 160, ... Continue sequences which have a multiplicative pattern. Identify missing numbers and errors in number sequences based on multiplicative rules.		Identify and describe the multiplicative rule within given growing or decaying number sequences and where appropriate, explain what the sequences represent in context. For example, describing how a medicine breaks down in the body over time, if it halves every two hours: 600, 300, 150, 75, ... Describe how the terms in multiplicative sequences change compared to additive ones.
Notes Examples of sequences which have multiplicative patterns include a sequence that starts with 2 and terms are multiplied by 3 each time or a sequence that starts with 13 and terms are divided by 10 each time. Compare additive and multiplicative sequences, such as one which adds two each time to one which multiplies by 2 each time. Explore the long-term behaviour of such sequences. **New key mathematical language (Learners)** multiplicative, rule, rapid growth/decay			
Understand: Rules describing sequences enable the efficient identification of the next term or any particular term based on its position.			
Know	**Do**	**Know**	**Do**
A sequence can be described by its first term and the rule for finding the next term. An arithmetic sequence is one where the difference between two consecutive terms is always the same (common difference).	Find the first few terms in number sequences given their first term and the rule for finding the next term. For example, starting with a first term 10, use the rule add 6 to find the next four terms in this sequence. Identify whether a sequence is arithmetic by looking for a common difference. In context, identify patterns that follow an arithmetic sequence. Describe these patterns in words and continue these sequences to solve related problems. For example, finding the number of blue dots in the 7th picture in this sequence. 	A rule can be described to find a particular term in a sequence by using its position in the sequence. This is called an n^{th} term formula.	Generate parts of sequences using their nth term formula (arithmetic sequences only). For example, T = 4n + 6 generates the sequence 10, 14, 18, ... Describe the relationship between the n^{th} term formula of arithmetic sequences and their common difference. For example, T = 4n + 6, the sequence has a common difference of four. Describe the relationship between the n^{th} term formula of arithmetic sequences and the sequence of multiples of their common difference. For example, for T = 4n + 6, all the terms in the sequence are six greater than a multiple of four.
Notes Geometric patterns such as mosaics from around the world could provide examples of geometric representations of numerical patterns. **New key mathematical language (Learners)** arithmetic, n^{th} term formula, common difference			

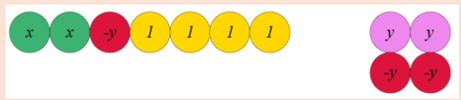
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Expressions, equations and relationships

Quantity, Numbers and the Algebraic Properties of Number Expressions, equations and relationships

Beginning of Third Level ⟷ **End of Third Level**

Understand: Like terms combine to simplify expressions because each variable represents the same quantity.

Know	Do	Know	Do
Terms in an expression which contain exactly the same variable(s) and exponents are called like terms. Like terms can be added and/or subtracted. This is known as collecting like terms. Expressions can be simplified by collecting like terms into a single term.	Identify like terms within expressions. For example, in the expression $2x - 3y + 4a + 2y$ there are two like terms, $-3y$ and $2y$. Simplify expressions by collecting like terms, initially using concrete or digital manipulatives. For example, $2x - 3y + 4 + 2y$ $= 2x - y + 4$   		Simplify expressions algebraically by collecting like terms. Simplify multi-variable expressions and justify why terms can or cannot be combined. For example, $2x - 3xy + 4 + 6x - 7$ $= 8x - 3xy - 7$

Notes
Constant terms, such as 4 and -7, are like terms that can be collected.
Appropriate manipulatives include algebra discs.
Online resources exist which provide digital manipulatives.
New key mathematical language (Learners)
like terms, collecting, simplify

Understand: Equations and inequations can be solved using inverse operations and algebraic properties to determine values that satisfy equality or ranges of values that satisfy inequality.

Know	Do	Know	Do
An equivalent equation can be created by applying the same operation to each of its sides.	Solve one and two-step equations of the form $ax \pm b = c$ where a, b and c are whole numbers. Record working steps and solutions algebraically.	An inequation compares the values of two expressions using the symbols <, >, ≤, or ≥. An inequation has a set of solutions for which the inequation is true. The subject of a formula is the variable that is expressed in terms of the others.	Solve, by applying inverse operations, one and two-step equations of the form $ax \pm b = c$ where a, b and c are integers. Model contextualised problems with one and two-step equations and solve them algebraically. Solve algebraically a variety of one and two-step inequations and explain what the solutions mean. For example, $3x - 5 < 16$ $3x < 21$ $x < 7$ so, the inequation is true for any value of x less than 7. Change the subject of linear formulae using the same algebraic strategies as for solving equations algebraically (single-step examples only).

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Notes
Appropriate algebraic strategies include balancing approaches and using inverse operations. However, manipulatives and/or pictorial approaches should still be used.
Relevant contexts which could be modelled include for example, using the information that 5 tickets and a booking fee of £2 comes to a cost of £127 to find the cost of each ticket.
Includes but is not limited to
Examples where the position of the variable is varied.
Excludes
Equations with negative solutions initially.
New key mathematical language (Learners)
inequation

Understand: The construction of expressions and formulae describe unambiguously the operations involved and what order they are carried out.

Do	Do	Know	Do
Substitution is the process of replacing variables with specific values and can be used to evaluate an algebraic expression. A formula is an equation that describes a relationship between two or more variables.	Substitute positive values to evaluate expressions and make use of known or given formulae.		Substitute positive and negative values to evaluate expressions, including those with brackets. Check solutions to equations using substitution.
Functions are often written as $f(x)$ where x is the input and $f(x)$ is the output.	Describe, using function notation, single-step and two-step functions represented pictorially as function machines. For example, $f(x) = 2x - 3$ Calculate outputs for given inputs of single-step and two-step functions represented in function notation. For example, if $f(x) = 3x + 5,$ $f(4) = 3 \times 4 + 5$ $= 17$		Calculate inputs for given outputs of single-step and two-step functions represented in function notation by establishing and solving an appropriate equation. For example, if $f(x) = 3x + 5$ and $f(x) = 23$ So, $3x + 5 = 23$ $3x = 18$ $x = 6$

Notes
Examples of appropriate known or given formulae could include evaluating $a - 4b$ given positive values for a and b, finding the area of a circle given its radius.
Encourage estimating to check the reasonableness of solutions.
New key mathematical language (Learners)
substitution, formula(e), function notation

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Finance

Quantity, Numbers and the Algebraic Properties of Number - Finance			
Beginning of Third Level ◄———			———► **End of Third Level**
Understand: Effective financial planning involves balancing income and expenditure, making informed choices about products and services and considering risks, costs and implications over time.			
Know	**Do**	**Know**	**Do**
Income is the money people receive from different sources. Expenditure is the money people spend on daily needs and personal choices. Personal budgeting involves estimating income and expenditure over a set period of time. Personal budgets are based on assumptions about income and expenditure and unexpected changes can create the need to adapt plans and to make informed decisions.	Identify and compare different sources of income. Identify and describe everyday costs that are likely to feature in personal expenditure. Create a monthly personal budget, real or imagined, using a budgeting tool such as a spreadsheet template, explaining the assumptions and decisions made. Identify examples of unforeseen changes and one-off expenses that can impact personal budgets. For example, rising energy prices, reduced income, unexpected repairs, increased travel costs. Model the impact of unforeseen changes or one-off expenses on a personal budget and identify possible responses.	The cost of living is a term used to describe how much is spent on everyday expenditure. Inflation is the sustained increase in prices of goods and services over time and is commonly expressed as a percentage. Some contracts (legal agreements) and services provide better value for money than others.	Explore the current prices of everyday items and how these have changed over recent years due to inflation. Compare and evaluate services from different providers, identifying which provide the best options, considering value for money, relevant evidence and personal circumstances.
Current accounts are for daily banking, allowing deposits, bill payments, cash withdrawals and debit card use. Savings accounts earn interest and are usually used to store and grow savings. A basic bank account offers only essential services, like payments and withdrawals, for customers who are unable to open a standard account. Online banking is a way of managing finances via secure apps and websites.	Discuss the factors that would influence the choice of bank account. Include, where appropriate, any personal experiences. Analyse given financial scenarios to compare available savings options. Justify recommendations based on relevant financial information. For example, advising person A, who has saved £500 and would like this amount to grow over a two-year period. Identify commonly used functions of banking apps. Explain, where appropriate, any personal experience of their use.	There are different types of savings accounts. These pay differing rates of return and access terms can vary. Annual Equivalent Rate (AER) shows the true interest earned on savings over a year, taking account of how often the interest is paid. A direct debit is an agreement that allows a company or organisation to take a varying amount of money directly from a person's bank account to pay for regular bills or services. A standing order is an instruction a person gives to their bank to pay a fixed amount of money to another person or organisation on a regular basis.	Identify and compare different types of savings options that are available to consumers, including their AER, the incentives they bring and any terms and conditions attached. Identify everyday situations where direct debits and standing orders are commonly used, including how they are set up and managed. Include, where appropriate, any personal experiences. Explain the benefits and any drawbacks of using these services.
Some current accounts include the offer of an overdraft which allows borrowing up to an agreed limit. Banks often charge a fee or interest on overdrafts. Loans can be used by individuals and businesses to borrow differing amounts of money, over a range of time periods. Regular payments are made, usually	Compare the rates of interest charged on a range of loan products, including overdrafts. Discuss the advantages and risks associated with using an overdraft option on a current account. Describe the factors which should be considered when making choices about taking out a loan.	Borrowing on credit or store cards usually incurs interest, fees and charges. Buy now pay later (BNPL) services, allow payments to be delayed or split over a short period of time.	Compare the actual costs associated with obtaining credit via credit cards, store cards and BNPL services. Discuss the advantages and risks associated with different credit options.

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monthly, to pay back the amount borrowed plus interest (debt).		Annual percentage rate (APR) is the total cost of borrowing money over a year, expressed as a percentage. Borrowing decisions involve balancing immediate needs against future costs.	Model and compare, using an online tool, the costs of different borrowing options over time using criteria such as affordability of monthly payments, repayment period and total cost. For example, exploring the effect of changing the repayment period on monthly payment and total cost.

Notes

Sources of income include money earned from working or running a business, royalties from creative industry, payments from the government like pensions or benefits.
Common types of expenditure could include, food, transport, entertainment, subscriptions, membership costs, housing (such as rent), bills, loan repayments.
Make connections to Proportional reasoning as inflation is a useful context for percentage increase calculations.
Considerations when choosing contracts and services could include overall and monthly costs, affordability, better terms and protections, customer service etc.
Comparisons could be made of mobile phone contracts on a price comparison website, considering monthly cost, data allowance, use overseas, length of contract.
A bank account is said to be in credit when it has a positive balance.
An account goes into overdraft (negative balance) when more money is spent or withdrawn from it than the funds which are available.
Factors for consideration when applying for a loan include the purpose of the borrowing, the terms and conditions of products available, the affordability of repayments, the duration of the loan agreement and the cost of borrowing.
Different types of savings accounts could include ISAs, instant access accounts, children's savings accounts etc.
Features of credit and store cards include minimum payments, charges for late payments and cash withdrawals and the benefit of paying off borrowed amounts in full.
Some BNPL schemes are interest-free for an agreed period.
A detailed knowledge of sources of income and financial products is not required, rather the focus is on developing awareness and identifying reliable sources of up-to-date information which can be accessed as the need arises. Sensitivity towards individual circumstances should always be exercised.

New key mathematical language (Learners)

income, expenditure, inflation, current/bank/savings account, withdrawals, overdraft, AER, direct debit, standing order, store card, APR

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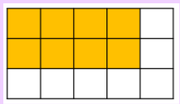
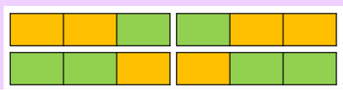
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Fourth Level

Number systems and structures

Quantity, Numbers and the Algebraic Properties of Number - Number systems and structures	
Beginning of Fourth Level ⟷ **End of Fourth Level**	
Understand: Scientific notation uses powers of ten to represent numbers, enabling very large and very small numbers to be written and compared efficiently.	
Know	**Do**
Any number can be written in scientific notation, $a \times 10^n$, where $1 \leq \mid a \mid < 10$ and n is an integer. The arithmetic operations on numbers can be applied to numbers expressed in scientific notation.	Convert numbers to and from scientific notation. Solve contextualised problems which involve numbers expressed in scientific notation, using a calculator as appropriate.
Notes Appropriate contexts could be taken from other curriculum areas including microscopic and large scale measurements from Science and processor speeds, data transfer speeds and memory access times in Technologies. **New key mathematical language (Learners)** scientific notation	

Number relationships and operations

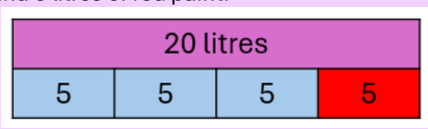
Understand: Equivalence and multiplicative relationships underpin operations with fractions and mixed numbers, supporting the combination, scaling and comparison of quantities.	
Know	**Do**
Finding a fraction of a fraction is the same as multiplying these fractions together. In grouping problems, the size of each group can be a fraction.	Solve contextualised problems by adding and subtracting mixed numbers, expressing solutions in their simplest form. Multiply fractions by fractions, including improper fractions, initially using a pictorial approach. For example, $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$  Solve contextualised problems by multiplying fractions, expressing solutions in their simplest form. Solve contextualised problems that involve division by a fraction (whole number answers only), using pictorial approaches. For example, working out how long four tins of cat food would last if a cat ate two thirds of a tin each day. 
Notes Using a pictorial approach to develop an understanding of multiplication and division of fractions avoids an over reliance on memorised procedures. The area model provides a useful pictorial approach to multiplication of fractions. Make connections to increasing a quantity by a fraction of that quantity and its equivalence to percentage increase. Possible contexts could be an overtime rate of time and a half, adding VAT of 20% or one fifth to a price. **New key mathematical language (Learners)** simplest form	

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Proportional reasoning

Quantity, Numbers and the Algebraic Properties of Number - Proportional reasoning	
Beginning of Fourth Level ⟷	**End of Fourth Level**
Understand: Ratios can be used to describe, partition and scale quantities while maintaining proportional relationships between parts and wholes.	
Know	**Do**
Ratios can be used to describe and find proportions of a whole and to compare the balance of constituent parts within different mixtures.	Partition quantities into a given ratio and solve associated contextualised problems. For example, 20 litres of purple paint is made by mixing blue and red paints in the ratio of 3:1. This means that there are 4 shares of 5 litres, with 15 litres of blue paint and 5 litres of red paint. 
Notes	

Patterns and sequences

Quantity, Numbers and the Algebraic Properties of Number - Patterns and sequences	
Beginning of Fourth Level ⟷	**End of Fourth Level**
Understand: Sequences that follow additive and multiplicative patterns can model real-life situations to make predictions and solve problems.	
Know	**Do**
A geometric sequence is one where the ratio of two consecutive terms is always the same. The next term of a geometric sequence is found by multiplying the previous term by this common ratio. The common difference in an arithmetic sequence appears in its n^{th} term formula. When terms in an arithmetic sequence are plotted against their position in that sequence, a straight line is formed with a gradient equal to the common difference. Arithmetic and geometric sequences can be used as mathematical models to represent and predict change in real-world situations.	Identify whether or not a sequence is geometric by looking for a common ratio. Investigate and model contextualised situations using geometric sequences. Interpret the meaning of the common ratio, make predictions and describe any limitations of the models devised. For example, the rice and chessboard legend, compound interest, depreciation and inflation, the r figure for spread of disease. Develop arithmetic sequences that model physical or pictorial patterns, or real-life situations. Determine and interpret its n^{th} term formula, use algebraic or graphical representations to make predictions and communicate conclusions within the context. Select and justify whether an arithmetic or geometric sequence is the most appropriate model for given situations. For example, modelling a saving scheme that increases by £5 each week with a arithmetic sequence and modelling a population that grows by 5% each year with a geometric sequence.
Notes Make explicit connections to the mathematical modelling process by using multiplicative sequences to represent, predict and interpret patterns of growth and decay in real-world contexts. Connections could be made to Science in how immunity and vaccinations reduce the spread of disease. Make connections between the terms in an arithmetic sequence with linear functions in Shape, Space and Measurement. Arithmetic and geometric sequences have a rich and ancient history across the world, such as in the construction of the pyramids in Egypt. **Excludes** Finding the nth term of Geometric sequences and finding the sum of terms in any sequence. **New key mathematical language (Learners)** geometric sequence, consecutive terms, gradient	

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Expressions, equations and relationships

<table>
<tr><th colspan="2">Quantity, Numbers and the Algebraic Properties of Number - Expressions, equations and relationships</th></tr>
<tr><td colspan="2">Beginning of Fourth Level ◄——————————————————————► End of Fourth Level</td></tr>
<tr><td colspan="2">Understand: The use of brackets enables expressions to be written in equivalent forms according to the distributive law.</td></tr>
<tr><td>Know</td><td>Do</td></tr>
<tr><td>The distributive law can be applied to find equivalent forms of expressions. This is known as expanding brackets and its inverse operation is known as factorising.</td><td>Find equivalent expressions by expanding brackets using the distributive law and simplifying where appropriate by using manipulatives and algebraic approaches.

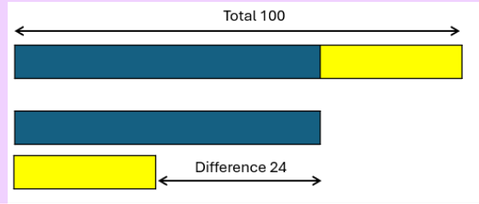
Factorise expressions by identifying the highest numerical common factor using manipulatives and algebraic approaches.

Model contextualised situations using expressions with and without brackets. For example, adding two to a number then multiplying by six has the same result as multiplying by six then adding twelve.</td></tr>
<tr><td colspan="2">Notes
Make connections to multiplication and the distributive law for numerical calculations in 2nd Level Number relationships and operations using manipulatives or pictorial approaches including algebra tiles and the grid method.
Area and perimeter problems provide opportunities for modelling situations using expressions.
Includes but is not limited to
Multiplication across brackets by a positive or negative number only.
New key mathematical language (Learners)
distributive law, expanding brackets, equivalent form, factorising</td></tr>
<tr><td colspan="2">Understand: Algebra represents relationships between quantities, allowing patterns to be generalised, situations to be modelled and unknown values to be determined.</td></tr>
<tr><td>Know</td><td>Do</td></tr>
<tr><td>Quadratic equations contain a term with a squared variable.</td><td>Solve, by applying inverse operations, linear equations of the form $ax \pm b = cx \pm d$ where a, b, c and d are integers.

Solve linear equations by expanding brackets.

Solve quadratic equations of the form $x^2 = a$ where $a > 0$ and explain why there are two solutions.
For example, if $x^2 = 9$, then $x = \pm 3$ as $3^2 = 9$ and $(-3)^2 = 9$.

Using the same strategies as for solving equations algebraically, change the subject of a formula (single-step or two-step examples only).

Model situations involving two unknown quantities with one solution by identifying relationships, representing them using manipulatives or spatial representations and interpret solutions within the context of the problem. For example, finding the number of blue and yellow counters given that the total number of counters is 100 and there are 24 more blue counters than yellow counters. This could be solved using bar models.

</td></tr>
<tr><td colspan="2">Notes
Algebra, although abstract at this stage of learning, is the language that forms the basis for further mathematical study.
Excludes
Equations with solutions that are not integers. However, it should be made clear that this is for simplicity at this stage and solutions to equations and inequations can be fractions.</td></tr>
</table>

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Use of an algebraic approach to find the solution to problems with two unknowns and one solution.
New key mathematical language (Learners)
quadratic equation, squared variable, inverse operations, linear equations

Finance

Quantity, Numbers and the Algebraic Properties of Number - Finance	
Beginning of Fourth Level ◄——► **End of Fourth Level**	
Understand: Financial systems support individuals, communities and governments and involve risks, responsibilities and opportunities.	
Know	**Do**
In the UK, tax is a compulsory contribution collected by governments to fund public services. For most employed people in the UK, Income Tax and National Insurance are automatically deducted before they receive their pay. By paying National Insurance contributions, individuals can build up their state pension, which is a benefit they will receive when they reach the state retirement age. A payslip provides a detailed summary of an employee's earnings (gross pay), deductions such as taxes and contributions toward a workplace pension and take home (net) pay. VAT is a tax charged at a percentage on most goods and services sold in the UK. Council Tax in Scotland is set and collected locally and used to fund council services. Insurance offers financial protection against the risk of events that would cause loss, damage or expense. The price of insurance policies depends on a wider range of factors. In many cases, insurance is not compulsory. Missing or making late payment(s) for borrowed money, products or services can have negative financial and legal repercussions. An investment is money spent on a valuable item, or put into a project, business or account with the aim of making a financial gain. Some investments carry higher risk, increasing the possibility of financial loss.	Describe some of the public services funded by taxes. For example, the NHS, education and transport. Interpret key information presented on payslips in a range of scenarios. Perform checks on related calculations and use the information provided to explain the connections between earnings, deductions and take-home pay. Identify the types of goods and services that are subject to VAT. Perform related calculations using the appropriate rate of VAT. Identify and discuss the local rates for council tax and the services it funds. Compare the benefits and costs of a variety of personal insurance products. For example, home insurance, car insurance, travel insurance, pet insurance. Discuss the roles played by risk and personal circumstances in choosing to purchase an insurance policy and in the pricing of policies. Discuss the costs and risks associated with missing or making late repayments. For example, additional penalty fees, account closures, reduced borrowing power, debt collection or creditors taking legal action. Investigate and discuss examples of real-life investment opportunities, identifying some of their associated risks and rewards.
Notes The way tax is used in the UK to fund public services and how taxes vary across the world, could be explored making connections to Equality and Society in Social Studies. Connections could be made to learning about the public sector within Systems in Technologies (Business). Examples of investments could include property, stocks and shares, high interest savings accounts. Examples of risk factors for investments could include fluctuating values in volatile markets and unforeseen events. Make connections between risk and probability in Information, Data and Uncertainty. For example, a consumer may choose to have personal accident insurance if they take part in a contact sport and they are self-employed, they may choose not to have life insurance if they have no dependents. **Excludes** Calculations involving rates of Income Tax and National Insurance are not required, however discussions might include that there are different rates of tax depending on how much is earned. **New key mathematical language (Learners)** income Tax, VAT, national insurance, council tax, payslip, deductions, pension, protection, late payments, investment, risk	

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Strand: Shape, Space and Measurement

Ideas of shape and space support the development of visualisation skills, spatial reasoning, understanding the effects of transformations, recognising symmetry and making sense of mathematical structures. Exploring position and movement provides a foundation for thinking spatially. Sorting, comparing and describing the properties of two-dimensional shapes and three-dimensional objects helps build geometric understanding. Coordinate geometry connects with algebra to provide meaning for critical ideas, such as linear models and proportional reasoning. Trigonometry builds on geometric principles by offering methods for calculating angles and distances.

Shape, Space and Measurement					
Position and Movement - Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• Position, direction and movement describe where objects are and how they move in relation to other objects, people and spaces.	• The language of location, movement and direction describes where objects are and how they move in relation to other objects, people or spaces. • Angles quantify rotation and enable changes in orientation to be described.	• Major and minor compass points describe where places are, enabling accurate interpretation of maps and navigation of routes. • The classification and measurement of angles enable the description of their properties and relationships. • Positions in two-dimensional space can be described and communicated using coordinates.	• Bearings determine direction relative to north using angles, supporting precise navigation. • Known angle relationships can be used to determine unknown angles, while labels and notation enable clear communication about geometric properties. • Positive and negative coordinates can be used to represent and locate positions in two-dimensional space.	• Relationships between angles formed by intersecting and parallel lines determine how angle measures are calculated from known values. • Transformations describe mathematically how shapes can be manipulated to change their position or orientation. • Linear models represent situations where the rate of change is constant, allowing the relationship between two variables to be described, interpreted and used to make predictions.
Properties of Shapes and Solids - Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• 2D shapes and 3D objects have properties that can be identified, described and compared.	• The defining properties of 2D shapes and 3D objects determine how they are recognised and classified.	• Relationships between geometric properties of 2D shapes and 3D solids allow them to be classified, compared, represented and applied in meaningful real-life contexts.	• Relationships between the properties of 2D shapes and 3D solids allow unknown measurements to be calculated and shapes to be represented, analysed and constructed.	• Relationships between the sides and angles of right-angled triangles determine how unknown measurements are calculated. • Relationships between angles formed by lines meeting or intersecting circles determine how angle measures are calculated from known values.
Proportional Reasoning - Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• Relative size shows how big or small things are compared to each other.	• Maps and plans represent spaces at a different scale, allowing the location and relationships of objects and places to be recreated.	• In proportional relationships, quantities scale together so that a change in one determines a corresponding change in another.	• Proportional relationships determine how quantities that scale together are modelled, represented and analysed.	• Proportional relationships, including the dimensions of similar shapes, determine how quantities that scale together are compared, analysed and generalised.

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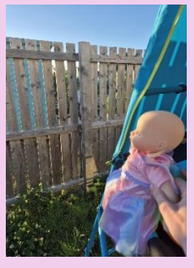
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Patterns and Sequences - Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• Patterns repeat in a regular way, allowing what comes next to be predicted.	• Sequences follow rules that determine how they repeat or grow, allowing what comes next to be predicted.			
Measures - Conceptual Understanding(s)					
Level	**Early Level**	**First Level**	**Second Level**	**Third Level**	**Fourth Level**
	• Measurement helps describe, compare and make sense of the features of objects and events in everyday life.	• Standard units of measure provide a commonly used and consistent way for measurable quantities to be estimated, measured, compared and described accurately.	• The choice of units and level of precision determine how measurements are represented, interpreted and communicated. • Measurement provides a common way to quantify attributes, supporting comparison, communication and decision-making.	• Relationships between dimensions determine how perimeter, area and volume are calculated and used to quantify spaces. • Irrational numbers are needed to describe exactly the relationships between the radius, circumference and area of a circle, enabling calculations to be carried out with appropriate precision.	• Relationships within and between shapes and solids can be used to derive and justify measures of area, surface area and volume.
	• Time helps describe when things happen, the sequence in which they happen and how events can repeat in predictable cycles.	• The passing of time can be noted, represented and standardised, allowing events to be ordered, planned and coordinated.	• Hours can be partitioned into smaller units of time and these can be represented in equivalent ways using fractions, number relationships and standard time formats.		
	• Different timing devices track the passing of time and help estimate and compare durations in everyday contexts.	• Time can be measured using standard units, allowing durations to be estimated, calculated and compared.	• Relationships between units of time allow durations to be measured, calculated, used to solve problems and make decisions.	• Relationships between units of time can be used to estimate, calculate and reason about duration.	• The Earth's rotation determines how time zones standardise time of day across regions of the world.

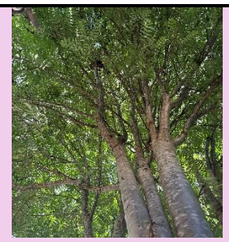
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Early Level

Position and movement

Shape, Space and Measurement - Position and movement			
Beginning of Early Level ← → **End of Early Level**			
Understand: Position, direction and movement describe where objects are and how they move in relation to other objects, people and spaces.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Spaces can be explored through physical experiences. Shapes and objects can fit together by being moved and/or rotated to fit a space. Smaller objects can fit inside larger containers. People, objects or programmable toys can move in different directions and be in different positions and can turn/be turned to face different directions. Directions are instructions that describe how to move or where to go. Directions can be followed. Gestures can be used to indicate position. On, off, over, in, under, in front of, behind, on top of, across, inside, outside, close(r), near(er), far away, high(er) and low(er) are words that can describe position. Up, down, forwards, backwards, sideways, across, along, around, through, towards and away from are words that can describe direction. Upside down, back to front, turning, flipping are words that can describe movement and rotation. Nearer, further away, higher and lower are words that can be used to compare the position of people and objects in relation to each other.	Manoeuvre themselves and toys around and through objects, in a range of outdoor and indoor spaces. For example, fitting inside, crawling through, moving between, pushing objects down. Investigate and describe how objects fit together. For example, jigsaw pieces, blocks and construction. Investigate and compare how objects fit inside others. For example, boxes, bags, tubs or nesting containers. Explore and use the language of movement, position and directions in a range of outdoor and indoor spaces through play, everyday routines, games, songs, stories, rhymes and using programmable toys. Follow a range of spoken instructions which use the language of position and direction. Which could include in games, play, stories and songs, for example, Simon says sit on the cushion, stand behind Samira, put the cars in the basket, push the car down the ramp. Respond with gestures to indicate position. For example, by pointing to the hooks when asked where the aprons are. Describe and compare the position of people and objects using the language of position and direction. For example, ‘I was behind the tree’, ‘The teddy is on the shelf’, ‘I was running across the grass’, ‘I am nearer the sandpit than you.’ Describe the movement and rotation of objects and people. For example, ‘I am upside down’, ‘The pancake flipped over.’	Direction is the position towards which a person or object moves or faces. Directions are instructions that are followed or given to find a particular place or object. Beside, above, below are words to describe position.	Predict, investigate and explain whether objects of increasing complexity fit together or inside each other. For example, ‘Which piece will fit? Show me how they will fit together.’  Follow and give a range of one and two-step instructions which use the language of direction. For example, go ten steps forward and then jump over the bench. Follow and give a range of directions when finding people and objects in games and movement activities. For example, ‘The person I am thinking of is sitting beside Fraser and in front of Amelia.’ Describe and predict what can or might be seen and how things look (or might look) from the perspective of different objects, heights and distances. For example, ‘If I turn around, I think I will see the slide because it is behind me’, ‘If I put the doll at the top of the climbing frame, I think it could see over the fence.’   Describe the height or position that objects have been photographed from. For example, ‘Those trees have been photographed from far away and that tree has been photographed from underneath the branches.’

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Instructions can be input into programmable toys to move them in different directions.	Navigate familiar outdoor and indoor spaces. For example, where to find a helmet, where to wash hands. Input instructions into programmable toys to explore the direction it moves in.	Maps can be used to locate people or objects.	  Describe a familiar route using the language of position and direction. For example, getting to the lunch area or outdoors. Input two or more instructions into programmable toys to move them in different directions. For example, forward, go, turn, go. Follow maps created as part of play and games. For example, a map which shows where objects have been hidden outside, a map that depicts an obstacle course to be followed.  Describe what has been represented on a map. For example, 'These are the tractor tyres and I drew them as black circles.'

Notes
Model, gesture and use the language of position and movement during everyday routines as this helps to demonstrate the purpose of the language.
Some learners may need additional opportunities to move their own bodies in, around and through different spaces before they can move objects.
Gross and fine motor skills are being developed across the curriculum and connections should be made to Early Writing within Literacy & English.
New key mathematical language (Learners)
on, off, over, in, under, in front of, behind, on top of, inside, outside, close, far, high, low, beside, above, below
up, down, forwards, backwards, sideways, across, along, around, through, towards, away
nearer, further away, higher and lower, upside down, back to front, turning, flipping, directions

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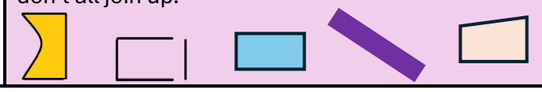
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Properties of shapes and solids

Shape, Space and Measurement - Properties of shapes and solids			
Beginning of Early Level ←		→	**End of Early Level**
Understand: 2D Shapes and 3D objects have properties that can be identified, described and compared.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
The shape of some objects can be changed. (3D) Objects can be held, moved and have a solid form. Informal words can be used to describe objects. These may include pointy, slanted, ball shaped, spiky and flat. (3D) Objects can be combined to make constructions and representations of real-life and imaginary items. Circle, triangle, square and rectangle are names of common (2D) shapes. (2D) Shapes can be drawn, created digitally or printed.	Investigate and describe how the shape of objects can change. For example, stretching and flattening moulding dough and explaining what actions caused the change and how the object is different. Investigate and describe the movements of objects through play and everyday experiences. For example, by stacking, balancing, building. Discuss and predict what might happen when different objects are used. For example, 'The ball might roll off.' Describe different objects using informal language. For example, 'The tabletop is flat', 'The orange is ball shaped.' Create structures, selecting from a range of objects and describe these using the language of shape. For example, 'This is tall and pointy.' Create circles, triangles, squares and rectangles using a range of media and digital technology. For example, drawing with a template, using sticker, digital drawing tools or printing with paints. Describe designs and drawings using the language of shape. For example, 'My robot has a rectangle head.'  Recognise and match circles, triangles, squares and rectangles regardless of orientation or size. For example, these are both rectangles: 	Objects are three-dimensional, this is commonly known as 3D. Shapes are two-dimensional, this is commonly known as 2D. 2D shapes have straight and/or curved sides. Two straight sides of a 2D shape meet at a corner.	Investigate and describe features of 3D objects. For example, predict, check and describe if objects can stack, slide and roll. Create 3D models for a self-selected or given purpose. For example, building a tower that is taller than teddy. Explain why particular 3D objects have been chosen when making structures. For example, 'These blocks have a flat part which make them easier to stack.' Create 3D models from 2D plans or photographs. For example,  Identify and describe circles, triangles, squares and rectangles using the language of shape. For example, 'This is a circle and it is curved all the way around', 'This is a square and it has four equal, straight sides.' Create and identify circles, triangles, squares and rectangles in different orientations and sizes, discussing what they have in common. For example, 'All triangles have three straight sides and three corners.'  Sort mixed collections of circles, triangles, squares and rectangles (of different sizes and orientations) into categories. For example, triangles and not triangles. Recognise examples and non-examples of circles, triangles, squares and rectangles and use mathematical language to justify these. For example,

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			‘The second one is not a rectangle, the four sides don’t all join up.’ 

Notes

Make connections to the Stages of Block Play and focus interactions on ‘how’ structures have been built rather than ‘what’ has been built.

Show shapes and objects in a range of orientations and sizes so that they can be recognised consistently. For example, recognising triangles in any orientation.

Posters, books and matching games may refer to informal names such as ‘heart’, ‘diamond’ and ‘star’, whilst these can be acknowledged, the focus of learning should remain on circles, triangles, squares and rectangles.

Referring to thin 3D objects (see image) as 2D shapes can be confusing. A 2D shape cannot be picked up or held.



Some block-play resources use names such as *square*, *triangle* or *semi-circle* block. These labels often describe the shape of a face rather than the 3D object itself.

Initially, the language of two-dimensional/2D or three-dimensional/3D is not required. Where this term has been included in brackets in the first column, this is to support practitioner knowledge.

A square can also be classified as a rectangle as it has the same properties. This is explored in more detail in First Level once right angles are introduced.

Excludes

Expectation to describe 2D shapes on the surface of 3D objects.

Naming 3D objects (cube, cuboid, sphere, …).

New key mathematical language (Learners)

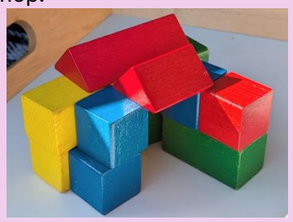
object, shape, circle, triangle, square, rectangle, two-dimensional (2D), straight, curved, corner, sides

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Proportional reasoning

<table>
<tr><th colspan="4">Shape, Space and Measurement - (The foundations of) proportional reasoning</th></tr>
<tr><td colspan="2">Beginning of Early Level ←</td><td colspan="2">→ End of Early Level</td></tr>
<tr><td colspan="4">Understand: Relative size shows how big or small things are compared to each other.</td></tr>
<tr><th>Know</th><th>Do (through play, everyday routines, games, songs, stories and rhymes)</th><th>Know</th><th>Do (through play, everyday routines, games, songs, stories and rhymes)</th></tr>
<tr>
<td>Objects can be used to represent smaller versions of familiar settings and everyday items.

Photographs, objects and drawings can be used to represent a smaller version of people and objects.</td>
<td>Recreate smaller versions of familiar settings using objects. For example, using blocks to represent a house or a shop.

Recreate everyday items using smaller versions of the same shape. For example, using buttons or milk bottle tops to represent wheels.

Respond to stories, songs and situations using smaller versions of the characters and objects. For example, using puppets, photographs or small world figures.</td>
<td></td>
<td>Recreate smaller versions of familiar settings using objects of relative sizes, in relative distances and positions. For example, using small world toys to represent the park which has swings beside the slide.

Retell familiar stories, songs and situations using smaller versions of the characters and objects, choosing objects of relative sizes. For example, three different sized bowls for the Three Bears.

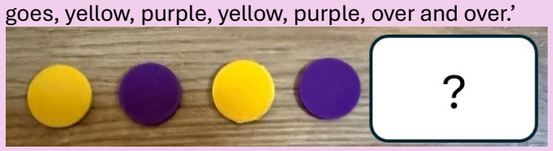
Consider relative size and proportion when matching. For example, ‘Uma thinks all the penguins are matched correctly. Do you agree?’

Consider relative size and proportion when drawing. For example ‘I have drawn my dog Benji smaller than me and me smaller than my dad.’
</td>
</tr>
<tr><td colspan="4">Notes
When responding to and retelling stories, connections should be made to Enjoying, Engaging With and Creating Texts within Literacy & English.
Excludes
Representations do not need to be accurately scaled.
New key mathematical language (Learners)
size</td></tr>
</table>

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Patterns and sequences

Shape, Space and Measurement - Patterns and sequences			
Beginning of Early Level ⟷			**End of Early Level**
Understand: Patterns repeat in a regular way, allowing what comes next to be predicted.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Patterns can be seen and heard in the world around us. Stripy, spotty, zig-zag, polka-dot, checked and tartan are informal words that can be used to describe pattern designs. Shapes, objects, colours, sounds and movements can be arranged in a repeating pattern.	Explore and identify patterns in everyday situations and experiences. For example, on clothing, home furnishings, in songs, rhymes and in nature. Recognise and describe patterns using informal language. For example, 'My top has red and white stripes' or 'The rug has blue and yellow spots.' Notice when objects have created a repeating ABAB… sequences, where one element, such as colour, shape, type or size alternates. For example, 'Look! I have made pinecone and leaf again and again.'  Recognise and copy repeating ABAB…sequences as part of action songs and movement games. For example, clap(A), jump(B), clap(A), jump(B), clap(A), jump(B)… Extend sequences which have a repeating AB pattern unit using the next objects, movements or sounds, justifying what has been picked. For example, 'I knew the next ones were yellow then purple because it goes, yellow, purple, yellow, purple, over and over.' 		Recognise when an error has been made in visual sequences with a repeating AB pattern unit. For example, 'Square, triangle is wrong, it should be a circle, triangle.'  Notice more complex visual sequences which have repeating pattern units such as ABC, AAB. For example, items arranged by type as counter (A), teddy (B), pom-pom (C), counter (A), teddy (B), pom-pom (C).  Create repeating sequences by laying out the individual sections, such as red, yellow, blue blocks and then combining these to make the repeating sequence.   Decide how the sequence should continue, justifying which objects should be used. For example, 'I pointed to the cubes and said red, yellow, blue, red, yellow, blue over and over so I am going to lay out red, yellow, blue for the next cubes.'

Notes
A pattern is a rule which can be used to generate an ordered arrangement of objects, sounds, movement, which is called a sequence.
A pattern unit is the part of the sequence that keeps repeating. For example, in counters arranged blue, red, blue, red, blue, red the pattern unit is blue, red.
Start with physical objects arranged in repeated patterns before moving onto using pictures or images.
Make connections to patterns in number in Quantity, Number and the Algebraic Properties of Number and cyclical patterns within the passing of time.
Make connections to patterns in other areas of the curriculum such as patterns in music and movements within Expressive Arts. Connections can also be made to the use of rhythm and rhyme within Oral Language and Interaction and the skill of distinguishing between images, shapes, letters and symbols in Language Foundation within Literacy & English.
Excludes

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Describing patterns as ABAB, ABCABC, … this has been included to support practitioners to see the repeating element(s) of the pattern.
New key mathematical language (Learners)
pattern, sequence, repeating

Measures

Shape, Space and Measurement - Measures			
Beginning of Early Level ←		→	**End of Early Level**
Understand: Measurement helps describe, compare and make sense of the features of objects and events in everyday life.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Measuring is needed in everyday activities. Informal words used to describe, gesture and compare size include giant, big, bigger, tiny, wee, muckle, small, smaller, huge, teeny and little. Estimation is making a rough guess about a measure.	Explore measurement through everyday routines and experiences. For example, baking, snack preparation, woodwork, construction. Compare and describe different objects using informal language. For example, 'This ball is huge, but this one is tiny', 'The red tub is smaller than the yellow one.' Make estimates through play, games and everyday experiences. For example, estimating how many pinecones will fit into the basket, how many scoops of sand will fill the bucket, which bottle will empty first.	Measuring is important in many jobs. Different devices can be used for measuring.	Discuss examples of measurement being used. For example, 'We put the apples on the scales', 'We use the height chart to see if we have grown taller', 'Mum's suitcase was too heavy at the airport.' Explore a range of jobs that use measurement through role play and opportunities to visit or engage with workers from local shops and businesses. For example, a baker, a shop assistant, a joiner. Explore the purposes of measuring devices through role play and everyday experiences. For example, rulers, tape measures, kitchen scales, jugs, spoons, cups, luggage scales.
Long and short are words that can describe length. Tall and short are words that can describe height.	Describe the length and height of everyday objects using the language of measure. For example, 'This stick is long', 'The bookcase is tall.'	Longer and shorter are words that can compare length. Taller and shorter are words that can compare height.	Compare and describe two objects that are obviously different in length or height. For example, 'The teddy is shorter than the door.' Compare and describe two objects which are closer in length and height. For example, 'The red scarf is longer than the blue one.' Recognise when two objects have the same height or length. For example, 'My tower is the same height as yours.' Explore the length and height of everyday items using informal measurements. For example, 'Our room is ten strides long', 'This table is six hands tall.'
Heavy, heavier, light and lighter are words that can describe and compare mass.	Explore and describe the mass of various everyday items through hands-on activities. For example, 'My bag is heavy', 'This crayon is light.'	*Weighing* is used as an informal word to describe measuring the mass.	Identify real-life contexts where the term 'weighing' is used to describe measuring mass. For example, weighing the baby, weighing the ingredients. Predict, compare and describe two objects that are obviously different in mass through handling activities. For example, 'I think the bag of oranges will be heavier than the tissue.'

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			Compare and describe two objects, which are closer in mass through handling activities. For example, ‘My bag feels lighter than yours.’ Notice that size and mass are not always related when handling everyday objects. For example, ‘The big balloon is light **and** the small stone is heavy.’ Explain that containers which look the same can have a different mass. For example, two tubs might look the same but one is heavier as it is filled with stones and the other is lighter as it is filled with pompoms. Compare and describe the mass of two objects using a pan balance. For example, ‘The teddy is lighter than the roll of tape.’  Explore and describe equality using a two-pan balance and recognise items as having the same mass as each other. For example, ‘Allan thinks the apple has about the same mass as five pebbles. Do you agree?’ 
Full and empty are words that can describe how much space inside a container has been used up.	Fill and empty containers of different sizes using different sized spoons, ladles, funnels, jugs and cups. Describe the contents of containers. For example, ‘The basket is empty’, ‘The jug is full of water.’	Holds most, holds least and holds the same as can be used to describe and compare how much is needed to fill a container.	Predict which container will hold the most/least then test these ideas and compare the results. For example, ‘I think the bucket will hold the most sand’, ‘This bottle holds the least water.’ Recognise when two containers hold the same amount when pouring from one to the other. Select and explain which container would be best for a specific purpose. For example, ‘Which bucket would be best for carrying water to the sandpit?’

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			Contribute to measuring ingredients when following recipes which use whole and half quantities. For example, one cup of ..., two tablespoons of ..., half a jug of ...

Notes

Model and use the language of measurement during everyday routines as this helps to demonstrate the language through meaningful contexts.

Length

Height and its associated language refer to length measured vertically. This can be explored through practical examples such as noticing being the same height lying down and standing up.

Informal measurements may include hand-spans, steps, blocks, paperclips or loose parts.

These aren't an accurate way to measure as hand-spans, steps, loose parts, ... can be different and might not be lined up correctly. This lays the foundations for understanding the importance of using a standard unit as they progress through First Level.

Mass

Reinforce conservation through practical activities such as noticing the dough has the same mass if it is in one large piece or several smaller pieces.

Make connections to counting in Quantity, Numbers and the Algebraic Properties of Number.

The term weight is commonly used in everyday language; however the mathematically correct term is mass.

Learners may confuse 'light' in colour with 'light' in mass. It is important to explore the mass of a range of different coloured items. For example, a black feather is dark in colour but light in mass, a white piece of paper is light in colour and light in mass, a pink plant pot is light in colour but heavy in mass.

Volume

When pouring amounts from one container to another there can be a misconception that if the second container overflows it holds more.

When filling and emptying containers, use both continuous pourable materials (such as dry sand, rice and water)

Make connections to counting in Quantity, Numbers and the Algebraic Properties of Number.

New key mathematical language (Learners)

measuring, estimating

long, longer, short, shorter, tall, taller, length, height

heavy, heavier, light, lighter, mass

full, empty, holds most, holds least, almost full, almost empty

Numeracy and Mathematics Milestones – (Scored through text indicates where the expectation or curriculum organisation has changed and this is covered in another section).

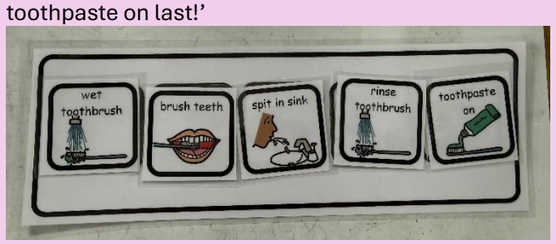
Measurement

Sorts items by size and/or amount, for example, ~~big and small~~, heavy and light, full and empty.

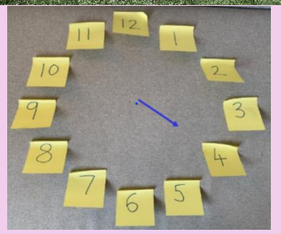
Matches items by size and length.

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Understand: Time helps describe when things happen, the sequence in which they happen and how events can repeat in predictable cycles.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Before, now, then, next, after, first and last can be used to describe and sequence daily routines and personal events.	Describe when daily routines and personal events take place using the language of time. For example, 'I listen to a story before bed', 'It's my turn next.' Sequence routines and respond to stories using the language of time. For example, 'First the hungry caterpillar ate an apple then he ate two pears.' Answer questions about the sequence of a story or event. For example, 'What happened first?', 'Who was the last person they met?' Follow instructions in the correct sequence, as part of everyday routines. For example, putting on an apron before painting, washing hands after playing in the mud kitchen.	Today, yesterday, tomorrow, in the morning, in the afternoon, in the evening and at night can be used to describe and sequence daily routines and events. A visual timetable can be used to sequence and track the order of routines. There are 7 days in a week, 12 months in a year and 4 seasons in a year. The seasons, days of the week and months of the year are cyclical. Calendars and diaries can be used to track what day of the week and month of the year it is and used to mark when important dates and celebrations are happening.	Describe when daily routines and events take place using the language of time. For example, 'Today we are going to the gym hall', 'This afternoon we will go outside.' Sequence routines and retell stories using the expanding language of time. For example, 'Yesterday we practised our songs and we will sing them to our visitors this afternoon.' Describe the sequence of events by following a visual timetable. For example, 'This morning we will have a snack then we are going to the woods', 'We are going to the hall after lunch.' Identify when an error has been made in a familiar routine shown visually. For example, 'I don't put toothpaste on last!'  Decide when activities should happen, using a visual timetable to support. For example, 'I think we could listen to a story after lunch and then have time to do some art.' Name the days of the week, months of the year and seasons in their correct sequence through songs, stories and rhymes. Describe routines and events using the names of the days of the week and months of the year. For example, 'My birthday is in May', 'I am going swimming on Saturday', 'Our trip is on Friday morning.' Describe that the passage of time in days, months and seasons is cyclical. For example, 'January comes after December', 'Spring comes after winter.' Contribute to the tracking of important events and celebrations using a monthly overview and describe when these are taking place using the language of

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			time. For example, 'This month we are going on a trip', 'The vet is coming to visit us.' Count how many days (or *sleeps*) until an event, using a calendar to keep track. For example, how many sleeps there are until the end of term disco.
Clocks tell us what time it is and can be found in different outdoor and indoor places.	Notice different types of clocks in the wider environment and discuss what time it is.	An analogue clock has a long hand called the minute hand and a shorter hand called the hour hand. The position of the hands, on analogue clocks, display what time it is. Most analogue clocks have the numerals 1 – 12 around the edge. The minute hand points directly at 12 when it is an o'clock time. The hour hand points directly at the numeral when it is an o'clock time. The hours of the day run in a repeating sequence of twelve hours (..., eleven o'clock, twelve o'clock, one o'clock, ...) The hours and minutes on a digital display are shown as hh:mm. O'clock times are written and displayed digitally as hh:00.	Describe and identify the hands-on analogue clocks using the correct mathematical language. Read o'clock times from a range of analogue clock faces. Describe daily routines using 12-hour o'clock times. For example, 'We have lunch at one o'clock', 'We are going to the music room at eleven o'clock', 'I go to bed before eight o'clock.' Mark the passing of time spatially by moving along a 1 to 12 number track. Make connections to the movement of the hour hand around a clock face. For example, 'After four o'clock it is five o'clock.'   Describe daily routines using the repeating sequence of time. For example, 'At seven o'clock in the morning I am having my breakfast', 'At seven o'clock at night I am getting ready for bed.' Read 12-hour o'clock times from a range of digital devices. Display 12-hour o'clock times using the correct digital time notation. For example, setting the digits on a digital clock when shown an analogue time, as part of an online game.

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		The same time can be expressed in different ways.	 Match analogue and digital o'clock times. For example, when shown 03:00 set the hands (of an analogue clock) to the correct position and vice versa.  Link and match oral, aural, written and visual times. For example, when shown six o'clock on an analogue clock, know this is the same as 06:00 on a digital clock or saying, 'six o'clock.'

Notes

Daily routines and personal events will vary across contexts. Examples used should be relevant to the learners. Make connections learning about diverse cultures, customs and traditions (Religious, Moral and Philosophical Studies and Languages).

Model and encourage the language of time, as emphasised in bold through everyday interactions.

When responding to and retelling stories, connections should be made to Enjoying, Engaging With and Creating Texts within Literacy & English.

Displaying the days of the week, months of the year, the seasons in a cyclical way can help to emphasise the repeating sequence.

Make connections between learning the names of the seasons and learning about the weather, the environment and the solar system (which develop through Early, First and Second Level Science).

Assumptions such as Summer is always warm and sunny and Winter is always cold and snowy are often made. However, this can be different around the world.

Analogue clocks may be less familiar, but they provide a vital, visual model of the continuous passage and sequence of time, helping build understanding that digital displays present only as abstract numbers.

It is important to use geared clocks (see image of yellow clock above) as they demonstrate how the minute hand moves in conjunction with the hour hand.

Clocks (analogue and digital) should be displayed within learning spaces; the language of time should be reinforced through everyday interactions. For example, at one o'clock we will have lunch.

A range of free time games and interactive teaching tools can be found at teachingtime.co.uk.

Thanks to the National Autism Implementation Team (NAIT) and their work on visual support resources for the toothbrushing sequence strip included above.

Excludes

Memorising the sequences of days and months.

Using the language of analogue and am/pm time.

New key mathematical language (Learners)

before, now, then, next, after, first, last

today, yesterday, tomorrow, in the morning, in the afternoon, in the evening, at night

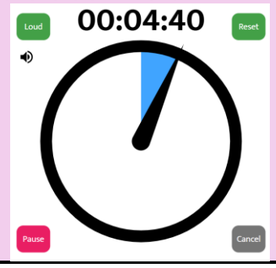
days, weeks, months, year, calendar

time, clocks, digital, hour hand, minute hand, o'clock

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Understand: Different timing devices track the passing of time and help estimate and compare durations in everyday contexts.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Watches, clocks, calendars and timers track how much time has passed.	Explore timing devices through role play and real-life contexts. For example, using a timer when taking part in baking activities, using an alarm clock or a calendar in the home corner. Make and test estimations during 'beat the clock' games. For example, how many star jumps can be done before the timer runs out, who will pick up the most balls if one person uses their hands and another uses tongs?	There are different types of timing devices. Countdown timers and sand timers help to visualise the passing of time.	Play and tinker with a range of timing device. For example, stopwatches, digital timers, voice activated timers, sand timers, countdown timers. Recognise the passing of time spatially using different types of sand and countdown timers. For example, the countdown timer has only turned a little, so we have lots of time left. 
Notes Reinforce the use of timing devices as part of everyday routines. **Excludes** Reading times on timing devices such as stop watches. **New key mathematical language (Learners)** watches, clocks, calendars and timers			

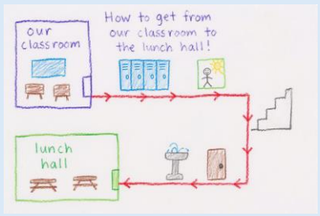
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First Level

Position and movement

Shape, Space and Measurement - Position and movement					
Beginning of First Level ⟷ **End of First Level**					
Understand: The language of location, movement and direction describes where objects are and how they move in relation to other objects, people or spaces.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
On the left and on the right are phrases that can be used to describe position. To the left and to the right are phrases that can be used to describe turns and movements.	Explore left and right through real-life contexts and games. For example, copying actions in songs and movements in games. Describe the position of objects in relation to another object using left and right. For example, 'The door is on the left of the sink.' Follow instructions in movement games and practical activities which use the language of full turn, half turn, to the left and to the right.	Clockwise and anticlockwise are words that can be used to describe the direction of turn. Four quarter turns in the same direction make a full turn.	Plan, record and follow routes using half, quarter, left, right, full, clockwise and anticlockwise turns. Follow instructions in movement games and practical activities which use the language of full, half and quarter turns. Visualise then rotate objects full, half and quarter turns, to the left (anticlockwise) and to the right (clockwise), describing these	The four compass points (north, south, east and west) can be used to describe direction.	Locate examples of places and areas, locally and nationally, on a map using the language of north, south, east and west. For example, the fire station is to the west of our school, Shetland is in the north of Scotland. Plan, record and follow directions and routes on maps which include the four compass points. For example, 'Start at the gate. Walk 5 steps north. Walk 3 steps east. Walk 4 steps south. Walk 2 steps east. Where do you end up?'

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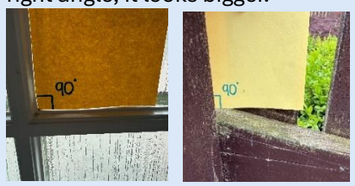
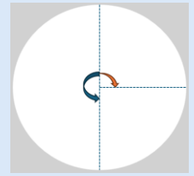
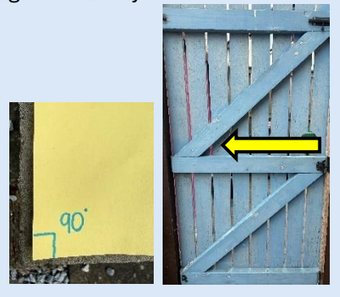
Maps can be used to describe routes. A full turn is a rotation all the way around to face the original direction. Two half turns in the same direction make a full turn.	Input instructions into programmable toys using the language of left and right. For example, forward, left, forward, forward, go. Create maps that show familiar routes and use these to describe location and position. For example, 'To get to the lunch hall we go along the corridor and turn right. Once we pass the stairs to the library turn right. Go past the book cupboard and the water fountain and then you are at the lunch hall.'  Rotate objects full turns, half turns, to the left and to the right.		rotations using appropriate language.		

Notes
Position and movement learning should include physical movement and practical experiences both outdoors and indoors.
Language should be explicitly modelled and emphasised.
Encourage predicting the location that directions will lead to. Use questioning approaches to encourage justification. For example, Sarah predicts that we will end up at the gate at the end of the playground, do you agree and why?
Reinforcement of halves and quarters may be required.
Make connections to using maps within Enquiry in Social Studies.
Excludes
Maps do not need to be drawn to scale.
New key mathematical language (Learners)
left, right, rotation, full turn, half turn, quarter turn
clockwise, anticlockwise
compass points, north, south, east, west

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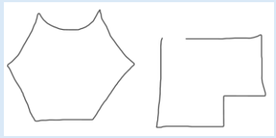
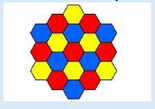
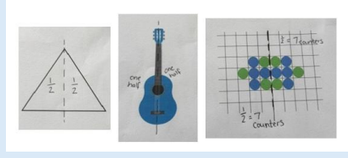
Understand: Angles quantify rotation and enable changes in orientation to be described.

Know	Do	Know	Do	Know	Do
		The orientation of an object describes the direction it is pointing or facing. When an object is rotated, its orientation is changed. The orientation of lines and surfaces can be described using the words horizontal, vertical, diagonal or sloping. Angles are formed when two straight lines meet. Angles are a measure of a turn. The angle of turn from horizonal to vertical and vice versa, is a quarter turn and this is called a right angle.	Describe the orientation of lines and surfaces within the environment. For example, 'The roof is sloping', 'The drainpipe is vertical.' Identify non-right angles and right angles within the environment using a template. For example, the corner of the window is a right angle. The join in the fence is not a right angle, it looks bigger.  	The size of angles can be measured in degrees. Degrees split a full turn into 360 equal parts. The mathematical symbol for degrees is °. A full turn measures 360°. A half turn measures 180°. A quarter turn (right angle) measures 90°.	Follow given instructions which use the language of 90°, 180° or 360° turns in movement games and practical activities. For example, turning 180° and running to the end of the hall. Label quarter, half and full turns as 90°, 180° and 360° respectively, using a paper-based angle wheel.  Plan, record and follow routes with 90°, 180° and 360° turns, using technology as appropriate. Compare the size of angles to that of a right angle using a right-angle tester. For example, 'The corner of the wall is equal to 90°', 'Janie thinks the angle of this part of the blue gate is less than 90°, do you agree and why?' 

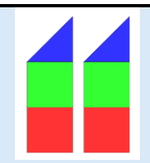
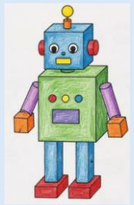
Notes
A common misconception is that angles change in size when rotated.
Technology that could be used to plan, record and follow routes could include programmable toys, digital maps or coding software.
Excludes
Measuring angles with a protractor.
Classifying angles as acute or obtuse.
New key mathematical language (Learners)
orientation, horizontal, vertical, diagonal, sloping
right angle, degrees

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Properties of shapes and solids

Shape, Space and Measurement - Properties of shapes and solids					
Beginning of First Level ⟷					**End of First Level**
Understand: The defining properties of 2D shapes and 3D objects determine how they are recognised and classified.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Semi-circle is the name of a two-dimensional (2D) shape. Two straight sides on a 2D shape meet at a corner. The correct mathematical term for this is vertex.	Recognise and name 2D shapes in different orientations and sizes, including semi-circles, using one or more of their key features. For example, the number of sides and vertices, the number and position of equal sides. Partition 2D shapes into smaller 2D shapes by folding, cutting or drawing lines. For example, the green rectangle has been cut into two smaller triangles and two smaller rectangles. 	Kite and rhombus are names of 2D shapes. A square has all the key features of a rectangle, four straight sides and four right angles. A square has four equal straight sides.	Recognise and name 2D shapes in different orientations and sizes, including kites and rhombuses, using one or more of their key features. Recognise and explain why a square can also be classified as a rectangle, based on its key features. Explain why a rectangle is not a square, based on its key features.	A polygon is a 2D shape which has only straight sides. Pentagons are polygons with five sides and hexagons are polygons with six sides. A right-angled triangle has a 90° angle at one of its vertices. Some 2D shapes can be placed together to cover a surface with no overlaps and no gaps. This is called tessellation.	Recognise and name 2D shapes in different orientations and sizes, including pentagons and hexagons, using one or more of their key features. For example, recognising that these are hexagons:  But these are not:  Draw squares, rectangles and right-angled triangles using a ruler and centimetre squared paper when given the length of their sides. For example, a rectangle that measures 4 cm by 3 cm. Create tessellated patterns using 2D shapes. For example, 
A shape is symmetrical if it can be folded along a line so that the shape fits exactly onto itself. Some everyday objects, signs and logos are symmetrical.	Identify if a shape is symmetrical when it has been cut or folded. For example, the red rectangle has been cut into two symmetrical rectangles. 	A line of symmetry is a line which divides a 2D shape, image or design into two halves that mirror each other.	Find and mark one line of symmetry on 2D shapes, images and designs, making connections to halves.  Create symmetrical designs with one vertical or horizontal line of		Recognise examples and non-examples of 2D shapes, designs or images with one line of symmetry, checking with a mirror as required. For example, 'This design is not symmetrical because the triangles are facing the same direction.'

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	Find examples of symmetrical objects, signs or logos outdoors and indoors. For example,   	Some 2D shapes, designs and images have one line of symmetry. Symmetry can be checked using a mirror.	symmetry using a variety of media or technology and a mirror to check.  		
A three-dimensional (3D) object has length, width(breadth) and height. Cube, cone and sphere are names of 3D objects.	Recognise and name 3D objects in different orientations and sizes, including cubes, cones and spheres, using one or more of their key features. Sort and label a mixed set of physical 3D objects into different categories. For example, spheres and non-spheres, rolling and non-rolling. Match 3D objects to photos and pictures.	Cuboid and cylinder are names of 3D objects. 3D objects can have flat or curved surfaces. A flat surface is called a face. 2D shapes can be found on the surfaces of everyday objects. 3D objects can be represented as 2D drawings. In a 2D representation of a 3D object, some parts of the 3D object may not be visible.	Recognise and name 3D objects in different orientations and sizes, including cuboids and cylinders, using one or more of their key features. Identify 2D shapes on the faces of a range of 3D objects. Identify 3D objects from 2D drawings. For example, the robot has a sphere antenna and cubes for hands. 	A line or curve on a 3D object where surfaces or faces meet is called an edge. A point on a 3D object where 2 or more edges meet is called a vertex.	Describe 3D objects using the language of faces, edges, curved surfaces and vertices.

Notes
When introducing new shapes, compare examples and non-examples of that shape as well as identifying those shapes from a wider collection.
Show 2D shapes in a range of sizes and orientations to avoid fixed perceptions of shapes.
Show both regular (equal sides and angles) and irregular 2D shapes (sizes and angles of different lengths and sizes) to avoid fixed perceptions of particular shapes.
When marking one line of symmetry attention could to drawn to the fact that some shapes have more than one line of symmetry.
Make connections to terms horizontal and vertical in angles.
Make connections to halves and quarters in Quantity, Number and Algebraic Properties of Number.
Make connections, when classifying shapes, to using classification tools such as Venn and Carroll diagrams in Information, Data and Uncertainty.
Use 3D objects in a range of sizes and orientations to avoid fixed perceptions of 3D objects.
Discuss why everyday items take the form of particular 3D objects based on their purpose. For example, a tennis ball being a sphere.
Includes but is not limited to
Measurements in whole centimetres only.

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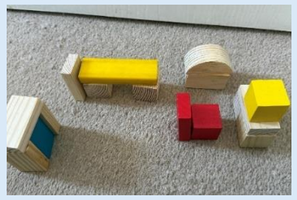
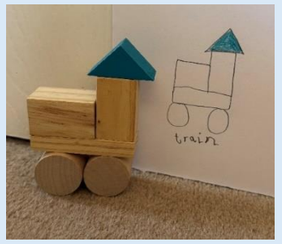
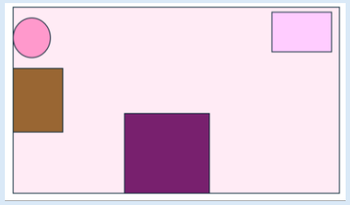
Excludes Identifying 2D shapes using the language of ‘regular’ / ‘irregular’. Naming equilateral, scalene or isosceles triangles. **New key mathematical language (Learners)** semi-circle, kite, rhombus, polygon, pentagon, hexagon, vertex, tessellation symmetrical, symmetry, line of symmetry, vertical, horizontal three-dimensional, breadth, width, cube, cone, sphere, cuboid, cylinder face, edge, vertex, vertices, flat, curved
Numeracy and Mathematics Milestones **Properties of 2D shapes and 3D objects** Matches real life 3D objects.

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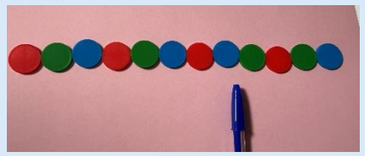
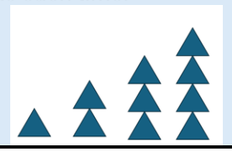
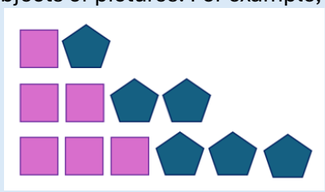
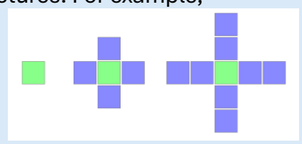
Proportional reasoning

Shape, Space and Measurement - (The foundations of) Proportional reasoning					
Beginning of First Level ⟷					**End of First Level**
Understand: Maps and plans represent spaces at a different scale, allowing the location and relationships of objects and places to be recreated.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Maps and plans can be created to represent, at a smaller size, familiar spaces and objects.	Create representations of familiar layouts and describe where objects are located. For example, 'In my bedroom, my red chair is in front of the TV and the window is behind the chair.'  Apply approximate scale and proportion when creating drawings and plans. For example, fingers in an appropriate size compared to hands and arms, trees in an appropriate size compared to buildings. 		Recreate, at full size, physical models and layouts from plans or photographs. For example,  		Create drawings of room layouts or outdoor spaces which are approximately scaled down. For example,  

Notes
Maps and plans do not need to be exactly to scale at this stage but should maintain relative position.
Digital tools such as drawing packages could be used to create plans.
A range of jobs that use scaled plans could be explored through role play and opportunities taken to visit or engage with workers from local businesses. For example, a building firm, a landscape gardener.
New key mathematical language (Learners)
map, plan, scale, location, position

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Patterns and sequences

Shape, Space and Measurement - Patterns and sequences					
Beginning of First Level ⟷					**End of First Level**
Understand: Sequences follow rules that determine how they repeat or grow, allowing what comes next to be predicted.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
	Identify a missing element in visual, movement or sound sequences which have a repeating AB pattern unit. For example, within the sound sequence, clap, tap, clap, tap, (?), tap, clap. Copy, extend, describe, label and create repeating sequences using objects. For example, 'This goes pen, pen, clip, pen, pen, clip.' Or 'This is AAB.'  Explain where an error has been made in repeating visual, movement or sound sequences. For example, 'The third blue and green counters are in the wrong order.' 		Copy, extend, describe, label and create repeating sequences using objects, where two or more elements, such as colour, shape or size repeat. For example,  Identify the missing element in visual, movement or sound sequences. For example, within a sound sequence with a repeating ABCCABCC… pattern, clap, tap, click, click / clap, tap, click, click / clap, tap, **(?)**, click.		Copy, extend, describe, label and create repeating sequences using pictures, sounds or body movements, where two or more elements, such as colour, speed, direction or volume repeat. For example, in movement sequence with a repeating ABBCABBC… pattern, jump, clap, clap, spin / jump, clap, clap, (?). Identify the missing element in sequences where two or more elements repeat. For example, 
Shapes, objects, sounds and movements can be arranged spatially in a growing pattern.	Build growing sequences by adding one element at a time using shapes, objects, sounds and movements. For example, clapping patterns (such as one clap, two claps, three claps, …), increasing the column by one triangle each time. 		Build and continue growing sequences in one direction, with one or two elements, using objects or pictures. For example, 		Build and continue growing sequences in more than one direction, with one or two elements, using objects or pictures. For example,  Explain where errors have been made in growing sequences. For

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					example, the third picture has a block missing along the bottom. 

Notes
A pattern is a rule which can be used to generate an ordered arrangement of objects, sounds, movement, which is called a sequence.
A pattern unit is the part of the sequence that keeps repeating. For example, in counters arranged blue, red, blue, red, blue, red the pattern unit is blue, red.
Start with repeated patterns of physical objects before moving onto those using pictures, images or sounds.
Make connections to pattern in Quantity, Number and the Algebraic Properties of Number.
Make connections to patterns in other areas of the curriculum such as patterns in music and movements within Expressive Arts and the use of syllables, alliteration, rhythm and rhyme in Language Foundation within Literacy & English.
Describing a sequence is naming the elements, for example red, blue, green, red, blue, green.
Labelling a sequence is calling it an ABC/ABC pattern.
New key mathematical language (Learners)
element

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Measures

Shape, Space and Measurement - Measures					
Beginning of First Level ⟷					**End of First Level**
Understand: Standard units of measure provide a commonly used and consistent way for measurable quantities to be estimated, measured, compared and described accurately.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Measuring devices allow objects and amounts to be measured using standard units. An estimate is a rough measure, close to the actual measurement.	Notice and discuss the purpose of measuring devices and their use in everyday situations. In role play use the language of measure and measuring devices. For example, 'My tower is nearly one metre tall', 'I am the vet measuring out how much medicine to give the cat.' Reflect on how close estimates are to actual measurements during length, mass and volume activities.			Measuring devices are marked in equal parts. This is called a scale. When reading the scales on measuring devices, measurements should start from the zero mark. When measuring length, mass or volume, some tasks require more accuracy than others. Specific measuring devices are more suitable depending on the item being measured and the level of accuracy required.	Read measurements to the nearest major marked division on a range of measuring devices. Identify examples of where more accurate measurements need to be taken and justify the reasons for this. For example, it is more important to measure accurately when taking a dose of medicine than making a salad. Choose the most appropriate unit to use in different length, mass or measuring tasks. For example, 'Pierre thinks we should measure the mass of the strawberries in kilograms, do you agree? Why (or why not)?' Choose the most appropriate measuring device, when measuring length, mass and volume for real and relevant purposes. For example, selecting a ruler to measure the length of a book, selecting kitchen scales to measure the mass of the flour.
Length can be compared directly by laying items side by side.	Compare items directly and order these by length. For example, 'I compared the length of the items in my pencil case and put them in order from longest to shortest.' 	Metre (m) is a standard unit of measurement of length. The length in metres can be measured using a metre stick, tape measure or trundle wheel.	Compare items against a metre stick and describe them as measuring less than, more than or about the same as one metre. For example, 'The lunch trolley is shorter than one metre.' Estimate the length of items in whole metres and use an appropriate measuring device to check. For example, 'Sam thought the length of the path was about 6 metres, but when we measured it	Centimetre (cm) is a metric unit of measurement of length. The dimensions of items are often described as length, height and width.	Explore the need for smaller sized units when measuring the length of items smaller than one metre. Estimate the length of items in centimetres, then use a ruler to measure their length to the nearest centimetre. Measure the length, height and width of familiar items. For example, the width and height of the door or the width and length of the tabletop.

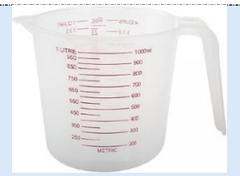
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Length of items can be compared indirectly using a non-standard tool. Units of measure need to be uniform and lined up correctly to measure and compare the length accurately. Items can be measured using a uniform non-standard unit, such as cubes, then compared and ordered by length. Lengths of items remain unchanged when they are moved or rearranged (conservation of measurement).	Measure the length of an item against a piece of string or ribbon, then use this piece to compare against other items. For example, 'My book is shorter than the basket.'  Explore the need for uniform measurements. For example, explaining why when two people measure the length of the classroom in strides their results may be different or why Sophie and Alfie got different results when they measured the packet of pens.  Measure a range of items by lining up uniform non-standard units then discuss, compare and order these. For example, 'My book is 12 cubes long, but yours is shorter as it is only 8 cubes long.' Investigate and describe the conservation of length. For example, when unwinding a ribbon, the length stays the same even when its shape changes. 		using a tape measure, we found that it measured about 4 metres.' Compare and order items measured in whole metres. For example, 'The shelf is one metre long, which is shorter than the bench which three metres long.' Develop a sense of size by estimating the length and height of items in metres by considering a known measure. For example, 'Our classroom door is about two metres tall, so I think the tree outside will be about six metres tall.'	One metre is equal to 100 centimetres. Half a metre is equal to 50 centimetres.	Compare and order the length, width or height of items measured in centimetres. Develop a sense of size by estimating the length and height of items in centimetres by considering a known measure. For example, 'My ruler is 30 centimetres long, so I think the computer screen is about 40 centimetres.' Find everyday items that are approximately a given number of centimetres by referring to familiar measurements. For example, finding something approximately 20 cm long by referring to the length of a 30 cm ruler. Represent measurements given in centimetres and metres in total number of centimetres and vice versa. For example, 2 m 50 cm as two and a half metres or as 250 cm. Measure items then use the relationship between metres and centimetres to express these in different ways. For example, 'my teacher is 163 centimetres tall so that is the same as 1 metre and 63 centimetres.'

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	Compare and order the mass of three or more objects using a pan balance or by handling. For example, 'The whiteboard pen is the lightest, then the glue stick, so the roll of tape is the heaviest.'  	Uniform non-standard units can be used to provide rough measurement of mass.	Estimate then compare the mass of different objects using a two-pan balance and uniform non-standard units. For example, 'I think the mass of my pencil case is about the same as nine cubes.'  Measure the mass of a range of items using uniform non-standard units then discuss, compare and order these. For example, 'My pencil case is four cubes heavier than yours.'	Kilogram (kg) is a metric unit of measurement of mass. Gram (g) is a metric unit of measurement of mass. One kilogram is equal to 1000 grams. Digital scales can be used to measure the mass in grams.	Develop a sense of size by estimating the mass of items in kilograms by considering a known measure. For example, 'The bag of sugar is 1 kilogram and I think my school bag is lighter than that.' Estimate then check the mass of items in grams and use a digital scale to check. Compare and order items measured in grams. For example, 'The bag of sugar is 500 grams which is heavier than the butter which is 250 g.' Measure out amounts in grams during practical activities such as baking or cooking. Investigate a range of scales and discuss what they are used for. For example, baby or pet scales, luggage scales, analogue kitchen scales.
Containers can hold different amounts of liquid depending on their shape and size. This is known as their capacity. Half full (or half empty) are phrases that can describe how much space inside a container has been used up.	Pour amounts from one container to another then compare and discuss what happens. For example, 'The jug holds more water than the cup as it spilled out when I poured it in', 'The egg cup holds less than the jug as there was still water left over.' Compare and order identical containers using the language of full, half full and empty.		Estimate and then measure how much/many would be needed to fill up a container. For example, 'I think five jugs of water will fill up this bucket', 'I think ten spoons of sand will fill up this tub.' Compare and order three or more containers by the amount they hold. For example, 'The smallest container needed two cups to fill it, the next needed four and the largest needed six.' Explain that different sized containers can hold the same amount. For example, 'The tall,	Litre (l) is a metric unit of measurement of volume and capacity. Millilitre (ml) is a metric unit of measurement of volume and capacity. One litre is equal to 1000 millilitres. Measuring jugs and containers with markings can be used to measure in litres and millilitres.	Compare the capacity of different sized familiar containers. For example, milk cartons, juice bottles, drinks cans, tins of paint, handwash, shampoo. Develop a sense of size by pouring liquid or sand into measuring jugs of different sizes. Describe the volume to the nearest marked amount. For example, 700 ml.

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Volume is a word used to describe the amount of liquid in a container. Volume can remain unchanged despite changes in shape (conservation of measurement).	 Investigate and describe the conservation of volume. For example, pouring one litre of liquid from a tall narrow container into a shorter but wider container. 		thin bottle fills up with 4 cups of water and so does the short, wide tub.' 		 Measure out amounts in millilitres during practical activities such as baking or cooking.

Notes

A range of jobs that use measuring devices could be explored through role play and having opportunities to visit or engage with workers from local businesses. For example, a building firm, a chef, an environmental scientist.

Regular non-standard units may include counters, cubes or paperclips of the same size.

Meaningful and relevant contexts for measuring should be used. For example, measuring items or distances in the school grounds, during cooking or when carrying out experiments.

Encourage justification of choice of measuring instrument.

Conservation of measurement is important because it is a foundational cognitive milestone where a measure remains the same, despite changes in appearance or spatial arrangement. It supports the development of mathematical skills such as fluency, problem-solving and reasoning.

Length

Appropriate measuring devices for length include metre sticks, measuring tapes and trundle wheels.

When using rulers to measure in centimetres highlight that measuring should start from the marked zero.

Height and its associated language, refers to length measured vertically. This can be explored through measuring things vertically then horizontally.

Mass

Appropriate devices for measuring mass include balance scales, bathroom scales and kitchen scales.

The term weight is commonly used in everyday language; however, mass is the correct mathematical term.

Mass is a measure of how much matter there is in an object and is often measured using grams and kilograms, while weight is a measure of the size of the pull of gravity on the object and is measured in newtons.

Volume and Capacity

Appropriate devices for measuring the volume of liquids include measuring jugs, cups and spoons.

Excludes

Conversions involving decimal fractions. For example, 158 cm to 1·58 m.

Conversions of kilograms to grams or litres to millilitres as this exceeds the number range for this level.

Measurements in millimetres.

Measuring to the nearest gram on an analogue scale.

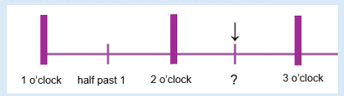
New key mathematical language (Learners)

metre, centimetre

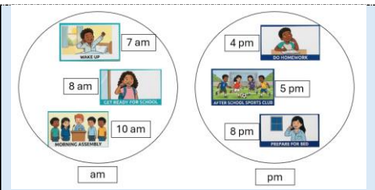
digital scale, analogue scale, kilogram, gram

half-full, litre, millilitre, volume, capacity

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Understand: The passing of time can be noted, represented and standardised, allowing events to be ordered, planned and coordinated.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Dates can be recorded in different ways using words and numbers.	Order the days of the week and the months of the year. Identify the day before and after and the month before and after a given date. Read and record the date in different formats. For example, 10/04/28 is the 10th of April 2028.	The number of days in each month varies from month to month. Calendars can be used to record and keep track of events and activities.	Identify the number of days within each month. Record upcoming events and activities on a calendar. Order given dates within a context from earliest to latest. For example, birthdays, personal life events, wider celebrations and society events.	There are 52 weeks in a year, 365 days in a year and 366 days in a leap year. A leap year usually happens every four years. Different calendar systems are used across the world.	Explain the relationships between days, weeks, months and years. For example, there are 24 hours in a day, 52 weeks in a year. Explain why leap years occur. Investigate and identify the key features of different calendar systems used across the world and across history. Discuss how they are similar and how they are different.
The minute hand, on an analogue clock, tells us how many minutes have passed since the hour. When the minute hand has made a full rotation around the analogue clock, one hour has passed. There are 60 minutes in one hour. When the minute hand has made a half rotation around the analogue clock, half an hour has passed. There are 30 minutes in half an hour. The minute hand points directly at 6 when it is half past the hour. On a digital display, half past the hour is recorded as hh:30	Locate o'clock and half past times on a horizontal time line marked with whole and half hours.  Read, say and show o'clock and half past times on an analogue clock. Explain the link between fractions, the position of the hands on an analogue clock and the time displayed (o'clock and half past times only). For example, 'It is half past two because the hour hand is pointing halfway between two and three and the minute hand is pointing to the six', 'It is half past four because the minute hand has travelled halfway round the clock face since four o'clock.' Match analogue representations of o'clock and half past times to corresponding digital representations.	When the minute hand has made a quarter rotation around an analogue clock, quarter of an hour has passed. There are 15 minutes in a quarter of an hour. The minute hand points directly at 3 when it is quarter past the hour. On a digital display, quarter past the hour is recorded as hh:15 The 12 hours from midnight to before noon are *am* times. The 12 hours from noon to before midnight are *pm* times. The length of one day is equal to 24 hours.	Locate quarter past times on a horizontal time line marked in 15-minute sections.  Read, say and show o'clock, half past and quarter past times on an analogue clock. Explain the link between fractions, the position of the hands on an analogue clock and the time displayed (o'clock, half past and quarter past times only). For example, 'It is quarter past five because the minute hand has moved a quarter of the way round the clock face and the hour hand is just past the five.' Match analogue representations of o'clock, half past and quarter past times to corresponding digital representations. Sort day to day activities into *am* and *pm* categories and match to the specific hour.	On some analogue clocks there are small marks between the numbers. The minute hand moves one mark per minute. The mark pointed to by the minute hand represents the minutes past the hour. When the minute hand has moved between two consecutive numbers on an analogue clock, five minutes have passed. There are 45 minutes in three quarters of an hour.	Notice when one-minute and five-minute intervals have elapsed on an analogue clock. Skip count in fives to read the number of minutes past, indicated by the minute hand. Approximate the location of times in five-minute intervals on a horizontal time line marked in hours. For example, Callan (purple) and Grace (blue) have approximated where 35 minutes past 2 is, who do you agree with and why?  Read times on an analogue clock in five-minute intervals from five minutes past through to 55 minutes past. Match analogue representations of times in five-minute intervals from five minutes past through to 55 minutes past to corresponding digital representations. Express time durations of 15 minutes, 30 minutes and 45

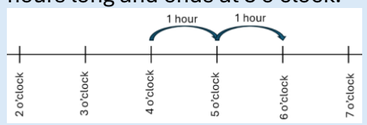
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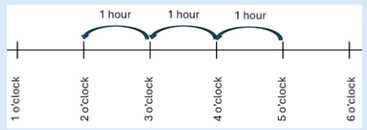
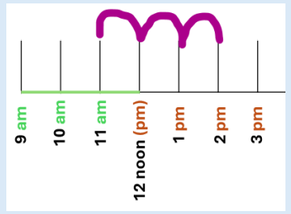
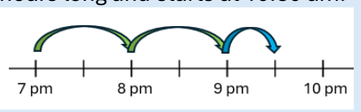
			 Compare times of the same day, using am and pm times. For example, 7 pm is later in the day than 7 am.		minutes in terms of fractions of an hour and vice versa.

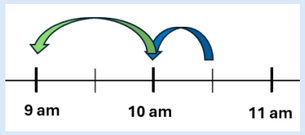
Notes
A range of paper and digital diaries and calendar in different layouts, should be accessed.
Celebrations and events will vary across contexts, ensure examples used are relevant.
Make connections between the time of year, calendar systems and cultures, customs and traditions (Religious, Moral and Philosophical Studies and Languages).
Make connections to historical periods of time which may be described in decades (10 years) and centuries (100 years).
Make connections to learning about the solar system and the movement of planets in Science when discussing the length of a day and the length of a year.
Analogue clocks may be less familiar, but they provide a vital visual model of the continuous passage and sequence of time, helping build understanding that digital displays present only as abstract numbers.
Clocks (analogue and digital) should be displayed within learning spaces and the language of time should be reinforced through everyday interactions. For example, we will go outside at quarter past ten.
Make connections to representing halves and quarters in Number relationships and operations.
Excludes
Reading or telling the time using the language of 'quarter to' is not included at this level. This is to ensure a deeper understanding of minutes *past* the hour before moving onto minutes *to* the hour.
New key mathematical language (Learners)
leap year, half past, quarter past, minutes past, noon, midnight, am/pm

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<table>
<tr><th colspan="6">Understand: Time can be measured using standard units, allowing durations to be estimated, calculated and compared.</th></tr>
<tr><th>Know</th><th>Do</th><th>Know</th><th>Do</th><th>Know</th><th>Do</th></tr>
<tr>
<td>Time duration is a measure of how much time has passed from start to finish.</td>
<td>Make calculations in context, using a time line, involving the duration of time between o’clock times on the same day. For example, calculating the length of a film that starts at 4 o’clock and finishes at 6 o’clock, or finding the finishing time of a party that is 3 hours long and ends at 5 o’clock.



</td>
<td></td>
<td>Make calculations in context, using a time line, involving the duration of time between o’clock times which bridge across noon on the same day. For example, calculating the length of a football festival that starts at 11 am and finishes 2 pm, or finding the starting time of a fayre that lasts 4 hours and finishes at 1pm.

</td>
<td></td>
<td>Make calculations in context, using a time line marked in whole and half hours, involving the duration of time between o’clock and half past times on the same day. For example, calculating the length of a club that starts at 7 pm and finishes at 9:30 pm, or finding the finishing time of a sports session that is one and a half hours long and starts at 10:30 am.



</td>
</tr>
<tr>
<td></td>
<td>Make comparisons about how long everyday activities last. For example, it takes less time for me to brush my teeth than it does for me to walk to school, lunchtime lasts longer than break time.</td>
<td></td>
<td>Begin to make number referents linked to time durations. For example, a football match is 90 minutes, it takes 10 minutes for me to walk to school, gran’s tv show lasts one hour, my favourite song is 3 minutes long.

Make comparisons using time referents. For example, a football match lasts longer than my favourite tv show, brushing my teeth takes about the same length of time as my favourite song.</td>
<td>On some analogue clocks there is an additional hand which represents the passing of time in seconds. When this hand has made a full rotation around the clock, one minute has passed.

There are 60 seconds in a minute.

Lengths of time in seconds can also be measured using digital timers.

The number of seconds passing can be approximated by using a steady, counted rhythm.</td>
<td>Identify and use the second hand on a clock or an appropriate timer to measure day to day activities using seconds. For example, measuring the time taken for a programmable toy to travel to the end of the room, how long it takes various items to reach the bottom of a slide, how long you can balance on one foot

Estimate the length of time it takes for a given number of seconds to pass by counting in a steady rhythm. For example, by saying one elephant, two elephants, ...</td>
</tr>
<tr>
<td colspan="6">Notes
Appropriate devices for indicating fixed time durations include sand timers, voice activated timers, egg timers.
Appropriate devices for measuring time intervals include second hands and digital or analogue stop watches.
The use of time lines when calculating time durations creates a spatial representation of the passing of time and makes connections to strategies used in number, addition and subtraction.
Excludes
Timing in fractions of a second, for example if stopwatch use whole seconds only.
Calculating durations that bridge across midnight.
New key mathematical language (Learners)
duration, seconds</td>
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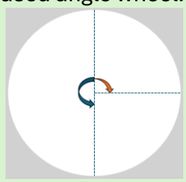
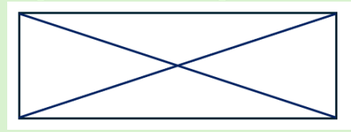
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Second Level

Position and movement

Shape, Space and Measurement - Position and movement					
Beginning of Second Level ⟷					End of Second Level
Understand: Major and minor compass points describe where places are, enabling accurate interpretation of maps and navigation of routes.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The minor compass points (north-east, north-west, south-east and south-west) points can be used to describe direction.	Identify physically and on a map, locations that lie in the direction of major and minor compass points from a given point. For example, Stranraer is to the south-west of Edinburgh, the park is to the north-west of our school. Plan, record and follow directions and routes on maps using the major and minor compass points.				

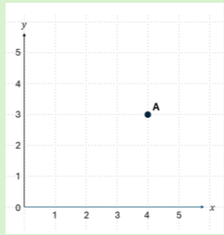
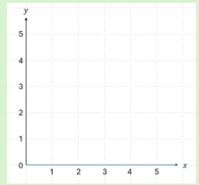
Notes
Position and movement learning should include physical movement and practical experiences both outdoors and indoors.
Language should be explicitly modelled and emphasised.
Encourage predicting the location that directions lead to. Use questioning approaches to encourage justification. For example, Karolina predicts that the directions given will lead to a position approximately north-east, do you agree and why?
The convenience and efficiency of digital mapping tools can be acknowledged, while emphasising the importance of being able to plan unfamiliar routes and develop a sense of distance and direction when such tools are unavailable due to signal, data, or battery limitations.
Make connections to using maps in Enquiry within Social Studies.
New key mathematical language (Learners)
north-east, north-west, south-east, south-west

Understand: The classification and measurement of angles enable the description of their properties and relationships.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Angles less than 90° are acute angles. Angles greater than 90° but less than 180° are obtuse angles. Angles of 180° are straight angles.	Identify acute, obtuse and straight angles from drawings in a range of orientations and in the environment, justifying classifications made using a paper-based angle wheel. 	Angles can be measured and drawn using a protractor. Angles which add to 90° are complementary. Angles which add to 180° are supplementary.	Estimate, measure and draw acute and obtuse angles, in a range of orientations. Identify pairs of complementary and supplementary angles within diagrams where straight lines intersect, justifying identifications made. For example, using the diagonals of a rectangle.  Calculate, when given appropriate information, the size of complementary and supplementary angles.	Angles greater than 180° but less 360° are reflex angles.	Identify reflex angles in the environment. Estimate, measure and draw reflex angles in a range of orientations.

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Notes
Protractors can be used as a reference tool to help estimate the size of angles, as well as for more accurate measurement.
360-degree protractors are helpful, particularly when estimating and measuring the size of reflex angles.
The scale on a protractor is often misread. For example, measuring a 50° acute angles as 130°. To avoid this, estimate the size of angles and check the reasonableness of measurements ensuring they match the angles' classification.
Reflex angles in the environment could be made by the cover of a book, the hands of a clock, the turn between compass points, a door with a wall.
Includes but is not limited to
Aim to measure and draw angles to the nearest degree. Initially angles should be multiples of 5 degrees.
New key mathematical language (Learners)
acute, obtuse, straight, protractor, reflex, complementary, supplementary

Understand: Positions in two-dimensional space can be described and communicated using coordinates.

Know	Do	Know	Do	Know	Do
		A two-dimensional coordinate (Cartesian) grid has two axes. The horizontal axis is called the x-axis and the vertical axis is called the y-axis. Coordinates give the position of points plotted on a Cartesian grid and are presented as ordered pair of numbers (*x, y*). The point where the x-axis and y-axis intersect is called the origin and is represented by the coordinates (0, 0).	Describe, plot and record the position of points on given Cartesian grids using coordinate notation. For example, the coordinates of point A are (4, 3) because it lies 4 units horizontally and 3 units vertically from the origin. 		Construct Cartesian grids on squared paper with marked divisions in ones.  Describe, plot and record the position of points on Cartesian grids using coordinate notation.

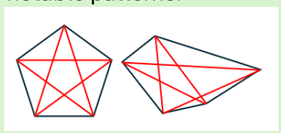
Notes
Includes but is not limited to
Whole number coordinates in the first quadrant only.
New key mathematical language (Learners)
Cartesian, coordinates, plot, x-axis, y-axis

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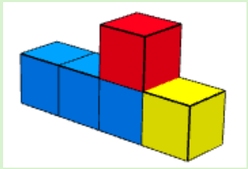
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Properties of shapes and solids

Shape, Space and Measurement - Properties of shapes and solids					
Beginning of Second Level ←					→ **End of Second Level**
Understand: Relationships between geometric properties of 2D shapes and 3D solids allow them to be classified, compared, represented and applied in meaningful real-life contexts.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Polygons can be regular or irregular. A polygon is regular if all its sides are equal in length and all its angles are equal in size. A diagonal joins two non-adjacent vertices in a polygon.	Identify regular and irregular polygons and non-polygons from collections of drawn shapes and by looking at surfaces of 3D objects. Draw in the diagonals of regular and irregular polygons and investigate and describe their number, their intersection(s) and any notable patterns. 	Equilateral, isosceles and scalene are types of triangles with distinct properties.	Describe the properties of equilateral, isosceles and scalene triangles considering equal sides and angles, types of angles and lines of symmetry. Identify, using known properties, equilateral, isosceles and scalene triangles from a collection of drawn shapes and surfaces of 3D solids. Visualise, predict and check the appearance of triangles after rotations through a half turn and reflections (vertical and horizontal).	Pairs of parallel lines are those which are always the same distance apart and will never meet, no matter how far they are extended. A quadrilateral is a four-sided polygon. Parallelogram and trapezium are names of quadrilaterals.	Identify, from collections of drawn lines, which pairs of lines are parallel and which are not. Describe the properties of known quadrilaterals, parallelograms and trapeziums, by considering parallel sides, equal sides and angles, types of angles and lines of symmetry. Identify, using known properties, the size of sides and angles in quadrilaterals. Identify, using known properties, a range of 2D shapes including parallelograms and trapeziums from a collection of drawn shapes and surfaces of 3D solids.
2D shapes, designs and images can have more than one line of symmetry.	Find and mark lines of symmetry within regular and irregular polygons and non-polygons. Complete and create symmetrical designs with two lines of symmetry (vertical and horizontal) using a variety of media.		Identify and illustrate lines of symmetry in equilateral triangles and isosceles triangles. Complete and create symmetrical designs with two lines of symmetry (vertical and horizontal) which include triangles.		Identify and illustrate lines of symmetry in quadrilaterals. Complete and create symmetrical designs with two lines of symmetry (vertical and horizontal) which include triangles and quadrilaterals.
				Every point on the circumference (perimeter) of a circle is the same distance from its centre. This distance is called the radius. A line that joins two points on the circumference of a circle and passes through its centre is called the diameter. The diameter of a circle is twice the length of its radius.	Create a variety of circles given their radius. For example, by using a stick and a piece of string in sand, by using compasses. Measure the diameter of a variety of given circles and calculate their radius and vice versa.
Triangular prism is the name of a 3D solid.	Recognise, name and describe physical 3D solids in different orientations and sizes, including triangular prisms, using the		Recognise, name and describe 3D solids, from 2D representations, in different orientations and sizes, including triangular prisms, using	The faces of 3D solids can be arranged into 2D nets.	Investigate and describe the nets of cubes and cuboids through folding activities.

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	language of faces, edges, curved surfaces and vertices.		the language of faces, edges, curved surfaces and vertices. Visualise, predict and check (by building) the appearance of 3D objects when viewed from different directions. For example, visualising what this model would look like from above, the right and the left. 	Particular shapes and solids are used in the design of everyday items because of their properties.	Investigate, through practical activities, deconstructed cones and cylinders, discussing the shape of their curved surfaces. For example, the label around this cylinder is rectangular.  Identify everyday objects which take the shape of known 3D solids. Discuss how the properties and the nets of these solids affect the design and usability of these objects.

Notes

2D shapes should be presented in different sizes and orientations to avoid fixed perceptions of shapes.

Make connections when classifying shapes, to using classification tools such as Venn and Carroll diagrams introduced in First Level Information, Data and Uncertainty.

Using a set of compasses is challenging and opportunities should be given to draw circles of any size, before those of a specified size, to develop motor control.

A 3D solid is a mathematical object such as a cube, cuboid, or cone.

A 3D object is an item which may take the form of one or more 3D solids such as a tin of soup, a carboard box, an arrangement of coloured blocks.

Reasons why particular solids are used in the design of everyday objects could include ease of stacking and handling and the visual impact made.

There are opportunities to make connections between symmetry and geometric designs across history and cultures. For example, Islamic ceramic tiling patterns, textile designs, Mandala, Rangoli patterns and Celtic knotwork.

Measurement of dimensions to the nearest centimetre or millimetre as appropriate.

Excludes

The accurate drawing of triangles.

Knowledge of all possible nets of cubes and cuboids. The focus is on being able to recognise, through folding or visualising, examples and non-examples.

New key mathematical language (Learners)

quadrilateral, diagonal, regular, irregular, parallel, parallelogram, trapezium, equilateral, isosceles, scalene, circumference, diameter, radius, 3D solid, triangular prism, surface, 2D net, properties

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Proportional reasoning

Shape, Space and Measurement - Proportional reasoning					
Beginning of Second Level ←					→ **End of Second Level**
Understand: In proportional relationships, quantities scale together so that a change in one determines a corresponding change in another.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
		A scale can be used to describe the proportional relationship between the real size of an object or measurement and the size of its representation on a map, model or diagram.	Estimate, calculate and interpret real lengths or distances using measurements from a map, model or diagram with a scale such as 1 cm : 2 km. Calculate scaled lengths or distances given actual measurements and a scale. For example, the length of the gym hall is 20 m, work out the size it would be on a plan that is drawn to a scale of 1 cm : 5 m.	Many everyday measurements are in proportion to one another – they change together at a constant rate.	Recognise whether two measurements are proportional. For example, the number of litres of petrol purchased and the total cost are proportional, the area of a banknote or coin and its value are not proportional. Use proportional relationships to model and solve practical problems involving cost, distance, time and quantity. For example, earnings at £10 per hour for six hours, the cost of four apples at 35 pence per apple, the distance travelled in three hours at 50 miles per hour.

Notes
Use contexts familiar to learners. For example, mapping local spaces.
Make connections to multiplication and division.
Connections could also be made to mathematical modelling through functions. For example, the number of items bought being the input to a function and their total cost being the output.
A range of jobs that use scaled measurements could be explored and opportunities taken to visit or engage with workers from local businesses. For example, surveyors, architects, farmers.
This is the first encounter with the ratio symbol (:). A more formal introduction to ratio is included at Third Level, but it is recognised that scales are displayed like this in everyday life.
Excludes
Scales described as a ratio without units. For example, 1: 20 000.
New key mathematical language (Learners)
proportion

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Measures

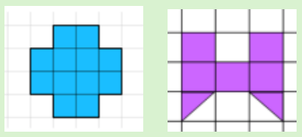
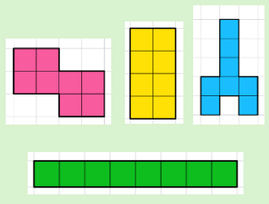
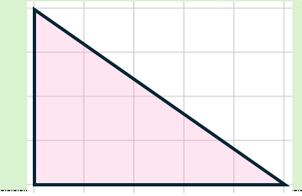
Shape, Space and Measurement - Measures					
Beginning of Second Level ⟷					**End of Second Level**
Understand: The choice of units and level of precision determine how measurements are represented, interpreted and communicated.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Measurements of length in centimetres can be given to one decimal place.	Convert and represent small lengths using equivalent measurements in centimetres and millimetres, including measurements to one decimal place. For example, 12 cm 3 mm = 12·3 cm = 123 mm. Read and record mass, temperature and volume on a range of marked scales to the nearest division.	Measurements of length in metres can be given to two decimal places.	Convert and represent larger lengths using equivalent measurements in millimetres, centimetres and metres, including measurements to two decimal places. For example, 1 m 23 cm = 123 cm = 1·23 m = 1230 mm Read and record mass, temperature and volume on a range of marked scales when not every division is labelled. Estimate measurements that fall between marked values. For example, there is almost 300 ml of juice.  	Measurements of length, mass and volume can be given to three decimal places. The size of a measurement and degree of precision required determine the most appropriate units of measurement.	Convert and represent measurements of length, mass and volume, in different ways, including measurements to three decimal places. For example, 2764 g = 2 kg 764 g = 2·764 kg Choose appropriate units of measurement for a range of lengths, areas, volumes and masses when carrying out practical measurement activities. Estimate then measure, using appropriate measuring instruments, the mass of items in grams and kilograms and the volume of liquids in millilitres and litres. Give measurements in litres and kilograms using up to three decimal places where appropriate.
				Imperial units of measurement are used in some situations in everyday life but are not part of the metric system.	Develop an awareness of imperial units of measurement for length, area, mass and volume, identifying situations where they are commonly used and their approximate size.

Notes
Encouraged the inclusion of appropriate metric units when estimating, measuring and calculating.
Make connections to decimal fractions in Quantity, Numbers and the Algebraic Properties of Number.
Make connections to other areas of the curriculum and situations from everyday life where specific types of measurements are made. For example, using weather instruments in Systems within Social Studies, taking experimental measurements in Science, measuring materials in practical Design and Engineering (Technologies), the role of measurement in creating and following recipes.
Examples of imperial units include the distance between towns given in miles, floor space given in square feet, the mass of a person given in stones, the volume of milk given in pints.
A range of jobs that use measurement could be explored and opportunities taken to visit or engage with workers from local businesses. For example, workers from the trade or construction industries, engineers, scientists, designers.
Excludes
Conversion from metric to imperial units (and vice versa).

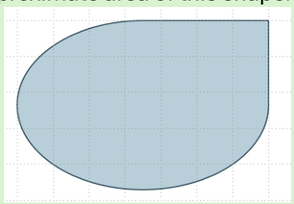
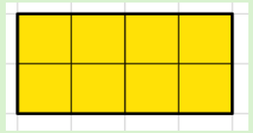
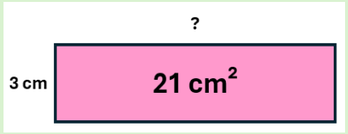
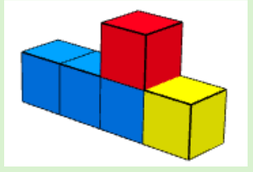
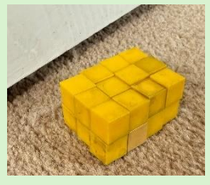
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Measuring in imperial units.
New key mathematical language (Learners)
precision, metric system, imperial units

Understand: Measurement provides a common way to quantify attributes, supporting comparison, communication and decision-making.

Know	Do	Know	Do	Know	Do
Metric system measures of length include millimetres (mm) and kilometres (km). One centimetre is equal to 10 millimetres. One metre is equal to 1000 millimetres. One kilometre is equal to 1000 metres. Perimeter is the total distance around the boundary of a 2D shape.	Discuss measurement in millimetres and kilometres in real-life contexts. For example, the use of millimetres in DIY and construction, the length of running events in kilometres. Estimate then measure, using appropriate measuring instruments, the length of items in millimetres, centimetres. Give measurements in cm to one decimal place where appropriate. Describe real-life situations where perimeter measurements apply. For example, frames, fences, skirting boards. Measure perimeters in familiar places. For example, measuring the edges of shapes within an indoor or outdoor court.		Estimate then measure, using appropriate measuring instruments, the length of items in millimetres, centimetres and metres. Give measurements in centimetres to one decimal place and measurements in metres to two decimal places where appropriate. Solve contextualised problems involving length to one or two decimal places, including calculating the perimeter of triangles, squares, rectangles and regular polygons, given appropriate information.		Solve contextualised problems involving length, including calculating the length of sides in triangles, squares, rectangles and regular polygons given their perimeter and other appropriate information.
Area is a measurement of the two-dimensional space inside a closed boundary. It can be measured by counting how many equally sized square units fit inside. Different shapes can have the same area. This is called conservation of area.	Find the area of shapes by counting how many equal squares each has been divided into, moving on to include half squares. For example,  Identify and create shapes which have the same area. For example, these all have an area of 8 squares. 	Metric system measures of area include square centimetres (cm^2) and square metres (m^2). Squares with sides 1 cm long have an area of one square centimetre (1 cm^2) and squares with sides 1 m long have an area of one square metre (1 m^2). Estimations of area can be made by comparing the area of familiar objects to other objects.	Estimate the area of 2D spaces. For example, by using a thumb nail as an approximation for a square centimetre and a door as an approximation for 2 square metres. Record estimates using appropriate units (square centimetres or square metres). Find the approximate area of unfamiliar and irregular shapes (polygons and non-polygons) drawn on a square grid to compare and order the shapes by area. Investigate and explain, using pictorial approaches, how multiplication can be used to calculate the area of squares and	The area of a right-angled triangle is half the area of the surrounding rectangle.	Given the area of a rectangle, find examples of its possible dimensions. Compare the perimeters of the rectangles found. For example, a rectangle with area 15 cm^2 could measure 3 cm by 5 cm, 1·5 cm by 10 cm, ... Explain, using pictorial approaches, why the area of a right-angled triangle is half the area of the surrounding rectangle. 

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Enclosed areas can be approximated using square tiles or a square grid.	Find the approximate area of unfamiliar and irregular shapes (polygons and non-polygons) drawn on a square grid to compare and order the shapes by area. For example, counting squares and part squares to find the approximate area of this shape. 		rectangles. For example, 2 rows of 4 square centimetres (2 × 4) has an area of 8 square centimetres altogether.  Calculate, using multiplication, the areas of squares and rectangles given their dimensions. Calculate, using division, the missing dimension of squares and rectangles, given their area and their other dimension. 		Calculate the area of right-angled triangles. Model and solve contextualised problems involving the calculated areas of squares, rectangles and triangles. For example, calculate how many planters can be fitted into the garden area. 
		Volume is the measurement of the size of a three-dimensional space or object. It can be measured by counting equally sized cubes.	Find the volume of 3D models by counting cubes physically and by looking at their 2D representations. For example, the volume of this model is five cubes, assuming none are hidden from view. 	Metric system measures of volume include cubic centimetres (cm^3) and cubic metres (m^3). A cube with edges 1 cm long has a volume of one cubic centimetre (1 cm^3).	Investigate and explain, using concrete materials and 2D representations, how multiplication can be used to calculate the volume of cubes and cuboids. For example, two layers of four cubes by three cubes.  Calculate, using multiplication, the volume of cubes and cuboids given their dimensions. Record calculated volumes using appropriate units (cubic centimetres or cubic metres).

Notes
Make connections to decimal fractions in Quantity, Numbers and the Algebraic Properties of Number.
The importance of zero as a placeholder should be illustrated. For example, 2 kg 46 g is equal to 2·046 kg, 5·1, 4·21 litres is equal to 4210 ml.
Length
Aim to measure length accurately to the nearest millimetre.

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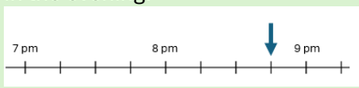
Make connections to measuring distances on maps and plans in Proportional reasoning and measuring the dimensions of 2D shapes in Properties of shapes and solids.
Any internal marked lines or diagonals do not form part of the perimeter of a shape.
Make estimates first, to check the reasonableness of measured and calculated lengths.
Area
Initially record answers as the number of counted squares before the mathematical notation (cm^2) is introduced.
10 cm^2 is read as 'ten square centimetres' not '10 centimetres squared'. The same is true for other units of area.
The dimensions of rectangles and squares can be described as the length and breadth, length and height or length and width.
Mass & Volume
In contextualised problems, masses and volumes should initially be given as whole numbers of grams or kilograms, millilitres or litres, or as a combination such as 2 kg 355 g before moving on to expressing these in kilograms or litres to three decimal places (2·355 l).
Examples of practical measurement activities could include measuring the mass of boxes or luggage, ingredients for recipes and measuring the volume of ingredients for recipes, materials in science experiments.
Make connections to working with 3D objects in Properties of shapes and solids.
It should be noted that parts of 3D solids may be hidden from view in 2D representations.
10 cm^3 is read as 'ten cubic centimetres' not 'ten centimetres cubed'. This is also true for all units of volume.
Includes but is not limited to
Whole number dimensions initially, moving on dimensions given to one decimal place only in area calculations.
Excludes
Using the square root to find the dimensions of a square.
New key mathematical language (Learners)
millimetres, kilometres, perimeter**,** area, square centimetres (cm^2), square metres (m^2)**,** volume, cubic centimetres (cm^3), cubic metres (m^3)

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Understand: Hours can be partitioned into smaller units of time and these can be represented in equivalent ways using fractions, number relationships and standard time formats.

Know	Do	Know	Do	Know	Do
The minute hand points directly at 9 when it is quarter to the hour. On a digital display, quarter to the hour is recorded as hh:45.	Place quarter to times on a horizontal time line marked in quarters. For example, quarter to 9 in the evening.  Read, say and show o'clock, half past, quarter past and quarter to times on an analogue clock. Explain the connection between fractions, the position of the hands on an analogue clock and the time displayed (o'clock, half past, quarter past and quarter to). For example, it is quarter to 5 because the minute hand has a quarter turn to make before it reaches 5 o'clock. Match analogue representations of o'clock, half past, quarter past and quarter to times to corresponding digital representations.	Times can be described as minutes past the hour and minutes to (before) the hour. Minutes to the hour is generally used for times in the second half of each hour of the day.	Approximate the position of times in one-minute intervals on a horizontal time line marked in hours. For example, 12 minutes past 8 in the morning.  Identify equivalent minutes to and minutes past times using number bonds to 60 (12-hour clock times in five-minute intervals). For example, 35 + 25 = 60 so 35 minutes past the hour is the same as 25 minutes to the next hour. This could be 7:35 am, 35 minutes past 7 or 25 minutes to 8.	Times of the day can be written or shown on digital displays as am / pm time or 24-hour time. The 24-hour format shows the number of hours and minutes elapsed since midnight.	Explain what the time of day is using a 24-hour digital display. For example, 16:23 is 23 minutes past 4 in the afternoon. Interpret 24-hour times in context. For example, from transport timetables, digital diaries and planners. Identify equivalent minutes to and minutes past times using number bonds to 60 (12-hour clock times in one-minute intervals). For example, 47 + 13 = 60 so 47 minutes past the hour is the same as 13 minutes to the next hour. This could be 11:47 am, 47 minutes past 11 or 13 minutes to 12.

Notes

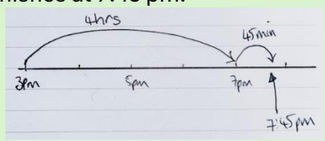
Analogue clocks may be less familiar, but they provide a vital model of the continuous passage and sequence of time, helping build understanding that digital displays present only as abstract numbers.
Clocks (analogue and digital) should be displayed within learning spaces and the language of time should be reinforced through everyday interactions. For example, we will go outside at quarter past ten.
Exploring multiple representations of the time of day is key to developing understanding.
Make connections to fractions within Quantity, Numbers and the Algebraic Properties of Number.

New key mathematical language (Learners)

quarter to, minutes to, 24-hour time

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Understand: Relationships between units of time allow durations to be measured, calculated and used to solve problems and make decisions.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Time durations can be expressed in minutes or in fractions of hours.	Express time durations given in whole and half hours in total number of minutes and vice versa. For example, identifying that 2½ hours is equivalent to 150 minutes and that 90 minutes is equivalent to 1½ hours. Make calculations in context involving the length of time between o'clock, half past, quarter past and quarter to times on the same day using a time line. For example, calculating the length of a concert that starts at 3 pm and finishes at 7:45 pm. 		Express time durations given in whole hours and fractions of hours in total number of minutes and vice versa. For example, one and three quarter hours is equal to 105 minutes. Make calculations in context involving the length of time between times in five-minute intervals on the same day using a time line. For example, finding the time that is 3 hours and 15 minutes before 2:20 pm to decide when to start a car journey.	Lengths of time that lie between whole seconds can be measured in tenths and hundredths of seconds. A stopwatch can be used to measure to the nearest hundredth of a second.	Time events using a stopwatch and discuss factors that might affect or improve the accuracy of these measurements. For example, in sports races, science experiments.
				The length of time a journey will take depends on the distance covered and the approximate speed of travel.	Estimate how long familiar journeys might take using different modes of transport, explaining any assumptions made. Compare these estimates with those given by a digital mapping tool

Notes
The use of time lines when calculating time durations creates a spatial representation of the passing of time and makes connections to strategies used in number, addition and subtraction.
Encourage the use of estimates first to check the reasonableness of measurements and calculations.
When estimating journey times, consider the relative speeds (faster or slower) of different modes of transport. For example, a person walking will move more slowly than a person cycling.
Excludes
Calculations involving speed, distance and time. However simple proportional reasoning might be explored in this context. For example, if we travel twice as far, it will take twice as long if we move at the same speed.
New key mathematical language (Learners)
tenths and hundredths of seconds, distance, speed

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Third Level

Position and movement

Shape, Space and Measurement - Position and Movement			
Beginning of Third Level ← → **End of Third Level**			
Understand: Bearings determine direction relative to north, using angles, supporting precise navigation.			
Know	**Do**	**Know**	**Do**
		Direction of travel can be given in terms of three-figure bearings. These are given in degrees and describe the angle between north and the direction of travel, measured in a clockwise direction.	Plan and encode sequences of directions which include angles of turn or directions. For example, encoding the steps necessary for a programmable robot (actual or virtual) to follow a hexagonal path. Describe and follow directions outdoors using three-figure bearings. Create and interpret scale drawings which involve three-figure bearings.
Notes The three figures are used for clarity, for example for a bearing of 023 degrees said over the radio by a pilot, it is clear there has not been a digit missed off either at the beginning or the end of the communication. A magnetic compass or digital tool can be used to give an idea of how bearings are given, measured and used in practice, indoors and outdoors. Developing precise navigation skills using bearings is not a requirement, but might form part of inter-disciplinary work, for example, linked to map reading or orienteering. **New key mathematical language (Learners)** bearings			
Understand: Known angle relationships can be used to determine unknown angles, while labels and notation enable clear communication about geometric properties.			
Know	**Do**	**Know**	**Do**
The sum of the interior angles in a triangle is 180°. Quadrilaterals can be split into two triangles and therefore the sum of the angles in a quadrilateral is 360°. The sum of angles around a point is 360° (a full turn). Vertices of 2D shapes are labelled using capital letters. Angles within shapes are often identified using these labels.	Determine unknown angles in triangles, quadrilaterals and around a point using known angle sums. Name and identify 2D shapes using the labels on their vertices. For example, ABC is a right-angled triangle. Name and identify the interior or exterior angles of 2D shapes using the labels on their vertices and appropriate notation. For example, ∠ABC or reflex ∠ABC.	When any two straight lines intersect, two pairs of equal, vertically opposite angles are formed. Interior and exterior angles are related through known angle sums and angles on a straight line. Multiple angle relationships can be combined to determine unknown angles.	Calculate unknown angles formed by intersecting straight lines and explain the relationships used. Determine unknown interior and exterior for triangles and quadrilaterals, justifying solutions using established angle relationships. Communicate and justify reasoning using appropriate geometric notation and labels.
Notes **New key mathematical language (Learners)** interior, exterior			

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Understand: Positive and negative coordinates can be used to represent and locate positions in two-dimensional space.			
Know	**Do**	**Know**	**Do**
Cartesian axes extend beyond zero to create four infinite quadrants.	Plot and describe (using coordinate notation) the location of points in 2D space, on paper or outdoors, on a grid across four quadrants.		Describe, using coordinate notation, the location of vertices of 2D shapes plotted on a four-quadrant grid, on paper or outdoors. Visualise and identify the position of vertices of 2D shapes using known properties. For example, locating the position of the fourth vertex of a rectangle when the positions of the other three are known. Solve problems in geometric contexts using known properties of 2D shapes. For example, visualising and finding the possible positions of the fourth vertex of a kite when the other three are known.

Notes
An infinite 2D flat space, with no thickness can be described as a plane. Although it is an abstract idea, faces of 3D objects form part of a plane. Cartesian coordinates can be used to describe the position of a point on a plane.
Initially find the missing vertex of quadrilaterals where there is only one solution, before moving on to other polygons and examples which have more than one possible solution.
Describing the position of points in 3D space by introducing a third Cartesian axis (z-axis) and using sets of three coordinates could be discussed and visualised. For example, using the walls of a classroom as a frame of reference.
Make connections to the use of digital design tools in Design and Engineering (Technologies).
New key mathematical language (Learners)
quadrants

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Properties of shapes and solids

Shape, Space and Measurement - Properties of Shapes and Solids			
Beginning of Third Level ← → **End of Third Level**			
Understand: Relationships between the properties of 2D shapes and 3D solids allow unknown measurements to be calculated and shapes to be represented, analysed and constructed.			
Know	**Do**	**Know**	**Do**
	Draw accurately equilateral, isosceles and scalene triangles using a ruler, compasses and a protractor, given the lengths of their sides and/or the sizes of their angles.	A prism is a 3D object with a uniform polygonal cross-section along its length.	Identify, from a collection of physical and drawn 3D objects and everyday items, which ones are prisms and explain why others are not prisms. Identify, from a collection of nets, those which would fold to make cubes, cuboids and triangular prisms and connect this to packaging of everyday items.
Rotational symmetry is when a shape matches itself exactly when turned less than 360 degrees around a centre point.	Complete and create symmetrical designs with one and two diagonal lines of symmetry. Visualise, predict and check the appearance of 2D shapes after 90 degree rotations clockwise and anticlockwise.	The order of rotational symmetry is the number of times a shape or design fits into its own outline during a full turn.	Describe the rotational properties of shapes, pictures and patterns, including the order of rotation. Complete and create designs using rotational symmetry.

Notes
The accurate construction of triangles is designed as an opportunity to explore and connect geometrical properties of triangles and measuring skills in a practical, open-ended way.
When an object is transformed by reflection or rotation, its 'image' is created. This language can be useful when describing reflections and rotations.
Include examples which do and do not have rotational symmetry.
A cylinder is not a prism as its cross-section is not a polygon.
An awareness of the five Platonic solids is not required; however, they may be a useful focus for enrichment activities given their historical significance, perfect symmetry and mathematical uniqueness.
New key mathematical language (Learners)
interior angles, rotational symmetry, prism, polygonal cross-section

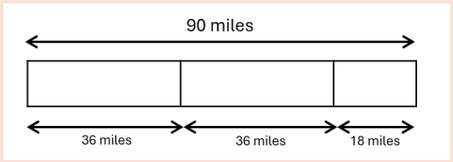
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Proportional reasoning

<table>
<tr><th colspan="4">Shape and Space - Proportional reasoning</th></tr>
<tr><th colspan="2">Beginning of Third Level</th><th colspan="2">End of Third Level</th></tr>
<tr><td colspan="4">Understand: Proportional relationships determine how quantities that scale together are modelled, represented and analysed.</td></tr>
<tr><th>Know</th><th>Do</th><th>Know</th><th>Do</th></tr>
<tr>
<td>A rate is a compound unit of measurement that connects proportionally two variables.

The distance an object travels in a given time is directly proportional to its average speed.</td>
<td>Model and solve practical problems involving rates in the context of measurement. Find values of variables which are directly proportional to another by using rates (such as average speed, cost per unit, pay per hour, flow rates and density) that link those variables. For example, finding the distance travelled in two and a half hours at an average of 36 miles per hour.



Or finding how much energy an appliance uses in six hours if it uses 2.5 kWh per hour
<table>
<tr><th>Time (hrs)</th><th>Energy(kWh)</th></tr>
<tr><td>1</td><td>2.5</td></tr>
<tr><td>6</td><td>6 × 2·5 = 15</td></tr>
</table>
</td>
<td>A linear scale factor is a number which is used as a multiplier when scaling length.</td>
<td>Calculate scaled and life-size measurements in real-life contexts using a given linear scale factor. For example, using measurements made in school grounds to create a scaled plan.</td>
</tr>
<tr>
<td>Directly proportional relationships can be modelled graphically by plotting one variable against the other. These will take the form of straight lines that pass through the origin.</td>
<td>Interpret conversion graphs to find the value of one variable given another.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two variables are inversely proportional if they have a constant product.

The time taken to travel a given distance is inversely proportional to average speed.</td>
<td>Model and solve practical problems involving rates in the context of measurement. Find values of variables which are inversely proportional to another by using a pair of corresponding values that link those variables. For example, when a container can be filled in 12 minutes using a flow rate of 15 litres per minute finding the flow rate needed to fill the container in 10 minutes.
<table>
<tr><th>Time (minutes)</th><th>Flow rate (litres per minute)</th></tr>
<tr><td>12</td><td>15</td></tr>
<tr><td>1</td><td>15 × 12 = 180</td></tr>
<tr><td>10</td><td>180 ÷ 10 = 18</td></tr>
</table>
Required flow rate is 18 litres per minute.

Or when a journey takes 4 hours if travelled at an average speed of 48 miles per hour, finding the</td>
</tr>
</table>

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			average speed needed to be complete the journey in three and a half hours. **Time (hours)** / **Average Speed (mph)** 4 / 48 1 / 48 × 4 = 192 3.5 / 192 ÷ 3.5 = 54.85… So just under 55 mph

Notes
This section should be taught alongside proportional reasoning from Quantity, Numbers and the Algebraic Properties of Number.
The calculation of speed, distance and time is approached here as simply a particular case of proportional reasoning – the same reasoning that can be applied to any rate. These calculations are covered in more detail within the Forces section of The Physical World in Science.
Bar models provide a spatial representation of the behaviour of proportional variables and proportion tables can assist the organisation of thinking.
Proportion graphs can be used as ready reckoner to aid efficient calculation. Examples might include exchange rates, travel at a constant speed, cost of items based on a unit cost.
New key mathematical language (Learners)
rate, variables, linear scale factor, directly/inversely proportional
straight line, origin

Measures

Shape and Space - Measures

Beginning of Third Level ← → **End of Third Level**

Understand: Relationships between dimensions determine how perimeter, area and volume are calculated and used to quantify spaces.

Know	**Do**	**Know**	**Do**
The areas of triangles and parallelograms, are calculated using the product of their perpendicular dimensions. The volume of cubes and cuboids can be calculated by finding the product of their perpendicular dimensions. This relationship can be described algebraically using the formula $V = lbh$ (Volume = length × breadth × height)	Calculate the area of triangles and parallelograms. Solve contextualised problems involving the volume of cubes and cuboids. Calculate the volume of composite 3D solids constructed from cubes and cuboids.	A volume of one cubic centimetre holds one millilitre.	Solve contextualised problems involving the perimeter of compound shapes made up of squares and rectangles. Calculate the area of compound shapes involving squares, rectangles and triangles. Model and solve contextualised problems involving the quantity of liquid, in millilitres and litres, in containers which take the form of cubes and cuboids.

Notes
The areas of quadrilaterals can be approached through viewing them as compound shapes involving triangles or linking them with their surrounding rectangles. There are other connections that can be made, for example a rhombus is a compound shape made up of two (or four) identical triangles, but it is also a special case of a parallelogram.
Connect the algebraic approach to volume calculations with substitution and the use of formulae within Quantity, Numbers and the Algebraic Properties of Number.
One millilitre of water has a mass of one gram. This connection is not required knowledge but could be explored if appropriate.
Includes but is not limited to
Solving perimeter problems which include finding missing dimensions.
Finding the area of shapes which include negative spaces. For example, a rectangle with a square removed.
Calculations involving volume with dimensions given in differing units.
Calculating one dimension of a cuboid given its volume and the other two dimensions, or the volume and the area of one of its faces.
New key mathematical language (Learners)
perpendicular dimensions, compound shapes

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Understand: Irrational numbers are needed to describe exactly the relationships between the radius, circumference and area of a circle, enabling calculations to be carried out with appropriate precision.

Know	Do	Know	Do
Irrational numbers cannot be expressed as the ratio of two integers and take the form of decimal fractions that are never ending and do not repeat. Irrational numbers can be expressed symbolically to indicate their exact value. Pi (π) is the ratio of the circumference of any circle to its diameter and is an example of an irrational number. Pi is also the ratio of the area of any circle to the square of its radius.	Measure the circumference and diameter of a range of circular objects and calculate an approximation of the ratio of the of the circumference to the diameter in each case. Explore the nature of the value π, the ratio $\frac{C}{D}$, where C represents the circumference and D represents the diameter of a circle. Calculate the circumference of circles using the relationship $C = \pi D$. Calculate the area of circles using relationship $A = \pi r^2$.		Calculate the diameter or radius of circles given their circumference or area using the relationships $C = \pi D$ and $A = \pi r^2$. Model and solve contextualised problems which involve calculating the circumference, area, radius or diameter of a circle.

Notes
The historical, worldwide search to understand the relationships within circles, particularly the ratio of circumference to diameter (π), provides a meaningful context for exploring mathematics across cultures and time.
Attempts to find ever more accurate representations of pi(π) demonstrate the development of computational speed and power in more recent times.
Connect the algebraic approach to circle calculations with substitution and the use of formulae within Quantity, Numbers and the Algebraic Properties of Number .
Stress the effect of premature rounding or truncation on the precision of answers to calculations. For example, when using different approximations of pi.
Excludes
Formally changing the subject of the area formula, as this is a two-step rearrangement, however connections should be made to squares and square roots.
New key mathematical language (Learners)
irrational numbers, Pi (π)

Understand: Relationships between units of time can be used to estimate, calculate and reason about duration.

Know	Do	Know	Do
Timetables and other sources of information can be used to plan and make decisions.	Make calculations involving time durations, to the nearest minute within the same day, extending to calculations across midnight, using a time line if required. For example, the duration of time between 07:32 and 15:13. Make calculations involving time durations in months and days between pairs of dates using a calendar. For example, finding the date of the end of a period of 45 days which starts on the 23rd February in a given year. Model, plan and evaluate the time management of events and journeys using timetables, calendars and other tools and schedules. For example, days out, workdays, multi-stage journeys.		Make calculations involving lengths of time to an appropriate degree of accuracy within real-life contexts. For example, when planning a journey made up of different stages.

Notes
Spatial approaches, such as using a time line, continue to be appropriate for calculations at this level.
A range of workplace contexts and everyday life situations where time management is particularly important could be explored. For example, construction projects, food production, travel planning.
Includes but is not limited to
Calculating durations, calculating the time that a duration ends and calculating the time that a duration begins.
New key mathematical language (Learners)
timetables, planning

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Fourth Level

Position and movement

Shape, Space and Measurement - Position and Movement	
Beginning of Fourth Level ⟷ **End of Fourth Level**	
Understand: Relationships between angles formed by intersecting and parallel lines determine how angle measures are calculated from known values.	
Know	**Do**
When a straight line (transversal) intersects a pair of parallel straight lines, alternate and corresponding angles are formed. Pairs of alternate angles are equal in size. Pairs of corresponding angles are equal in size.	Investigate and describe the relationships between angles made by intersecting and parallel lines. Calculate the size of angles in diagrams which include intersecting and parallel lines.
Notes Geometric software could be used to explore the relationships between angles formed by intersecting lines, parallel lines and transversals, including links to complementary and supplementary angles. There are opportunities to make generalisations, develop logical reasoning and skills in justification and proof when calculating the size of related angles. **New key mathematical language (Learners)** Intersect, vertically opposite, parallel, alternate/corresponding angles	
Understand: Transformations describe mathematically how shapes can be manipulated to change their position or orientation.	
Know	**Do**
Reflection and translation are types of transformation of shapes. A translation of a point or shape is a movement or a series of movements in two dimensions. Points and shapes can be reflected on a Cartesian grid.	Visualise then identify the position of points after reflections in the x and y axes and the line $y = x$. Visualise then draw 2D shapes after reflections in the x and y axes. Draw shapes after translations described by a horizontal and/or vertical movement on a four-quadrant grid. Identify and describe translations and reflections of points and shapes on a four-quadrant grid.
Notes Make connections to completing and creating designs with line symmetry in reflection activities. **Excludes** Knowledge of the effect on the coordinates of points when undergoing reflections, but spotting patterns and making generalisations can be encouraged. The same is true for the effects under translations, but this does serve as a precursor to vectors. **New key mathematical language (Learners)** transformation, translation	

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Understand: Linear models represent situations where the rate of change is constant, allowing the relationship between two variables to be described, interpreted and used to make predictions.

Know	Do
The relationship between the x and y coordinates of every point that lies on a straight line on a Cartesian grid can be described algebraically.	State the equation of vertical and horizontal lines plotted on a four-quadrant grid.
The equation of a vertical line is of the form $x = a$ as all points have a common x coordinate. The equation of a horizontal line is of the form $y = b$ as all points have a common y coordinate. Where a line is neither vertical nor horizontal, its equation is of the form $y = mx + c$.	Use a given formula to generate points lying on a straight line and plot them to create a graphical representation.
The gradient of a straight line is the ratio of the change in vertical height to the change in horizontal distance and describes the steepness of its slope.	Calculate the gradient of a sloping line plotted on a four-quadrant grid. Compare how gradients look on paper to how they feel in reality. For example, by running or walking on a treadmill or pathway of a given gradient and comparing it to its drawn equivalent.
Linear equations can be used to model relationships between variables in real-world contexts. Directly proportional relationships are a special type of linear relationship.	Construct linear models from contextualised situations involving two variables. For example, a cooking time of 20 minutes per kilo plus 15 extra minutes, a club membership that involves a joining fee and a monthly cost, an exchange rate from dollars to Euros.
The gradient and intercept of a linear graph have meanings that depend on the context being modelled.	Interpret the meaning of gradients and intercepts within these contextualised situations. Use linear models to solve problems. Discuss and evaluate the suitability and limitations of linear models for representing real situations. For example, a linear model of a mobile phone tariff which assumes a constant cost for GB of data will break down if there are data caps, bundles, discounts, or unlimited data plans.
Different representations (tables, graphs, equations and contextual descriptions) can describe the same relationship.	Match given contextual descriptions, tables of values, equations and graphs, justifying the matches made.

Notes

Investigate and identify gradients in real-life contexts within the local environment, including how they are represented and their impact. Contexts could include ramps, paths, roads, treadmills, where gradients might be given as a ratio or a percentage.

Make connections between generating points which lie on a straight line and arithmetic sequences from Quantities, Numbers and the Algebraic Properties of Number by linking gradient and common difference.

New key mathematical language (Learners)

equation of a straight line, gradient

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Properties of shapes and solids

Shape, Space and Measurement - Properties of Shapes and Solids	
Beginning of Fourth Level ⟷	**End of Fourth Level**
Understand: Relationships between the sides and angles of right-angled triangles determine how unknown measurements are calculated.	
Know	**Do**
The name given to the longest side in a right-angled triangle is the hypotenuse. This side lies opposite the right angle. The Theorem of Pythagoras describes the relationship between the areas of the squares on the three sides in any right-angled triangle. The Theorem of Pythagoras can be used to calculate the length of any side of a right-angled triangle given the lengths of the other two sides. Trigonometry in right-angled triangles describes the relationship between the ratio of the lengths of its sides and its acute angles. Three trigonometric ratios (sine, cosine and tangent) can be used to calculate the length of a side or the size of an acute angle in a right-angled triangle. Inverse functions, often written as $f^{-1}(x)$, reverse the effect of the original function, mapping outputs back to their corresponding inputs.	Identify the hypotenuse in any right-angled triangle. Investigate and describe the relationship between the lengths of the sides in right-angled triangles. Calculate the length of any side of right-angled triangles using the Theorem of Pythagoras, expressing solutions as exact values (using irrational numbers, such as $\sqrt{2}$ where necessary), or as appropriately rounded decimal fractions. Identify sides of right-angled triangles, based on a given acute angle, using the terms opposite, adjacent and hypotenuse. Calculate the length of any side of right-angled triangles using trigonometry. Use inverse trigonometric functions to calculate the size of acute angles in right-angled triangles using trigonometry. Use Pythagoras' Theorem and trigonometry to model, estimate and solve measurement problems in real and geometric contexts.
Notes Geometric software could be used to investigate the relationship described by the Theorem of Pythagoras. The associated inequations describing the relationship between the sides of acute angled triangles and of obtuse angled triangles could also be discussed. **Excludes** Problems which involve both Pythagoras or Trigonometry *and* circle geometry. **New key mathematical language (Learners)** hypotenuse, Pythagoras, trigonometry, sine, cosine, tangent, inverse functions	
Understand: Relationships between angles formed by lines meeting or intersecting circles determine how angle measures are calculated from known values.	
Know	**Do**
A tangent is a straight line that meets the circumference of a circle at a single point of contact. It is perpendicular to the radius of the circle at that point of contact. A chord is a line segment that joins any two points on the circumference of a circle. The triangle enclosed by the diameter of a circle and any two other chords is right-angled. The triangle enclosed by two radii and a chord is isosceles.	Identify tangents and chords in diagrams which include circles and straight lines. Investigate and describe the nature of the triangle created by a diameter and a third point placed on the circumference of a circle. For example, by using geometric software. Calculate the sizes of angles in diagrams which include circles and straight lines.
Notes Geometric software could be used to explore the angles formed by lines which are related to circles, including links to complementary and supplementary angles and triangle properties. There are opportunities to make generalisations, develop logical reasoning and skills in justification and proof when calculating the size of these angles. **Excludes** Problems which involve both Pythagoras or Trigonometry *and* circle geometry. **New key mathematical language (Learners)** chord	

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Proportional reasoning

Shape, Space and Measurement - Proportional reasoning	
Beginning of Fourth Level ⟷	**End of Fourth Level**
Understand: Proportional relationships, including the dimensions of similar shapes, determine how quantities that scale together are compared, analysed and generalised.	
Know	**Do**
Shapes which have been enlarged or reduced in size proportionally are said to be mathematically similar. Angle sizes remain unchanged. Proportional relationships can be expressed algebraically.	Calculate linear scale factors using corresponding measurements on pairs of similar shapes. Calculate measurements using these scale factors. Construct, solve and interpret algebraic models representing contextualised proportional relationships.
Notes Example of contextualised problems could include finding the average speed for a journey of 119 kilometres which takes 3 hours 24 minutes or given that the exchange rate is €1·13 to the pound, calculating the number of pounds you would receive in exchange for €320. **Excludes** The construction of formulae describing unfamiliar proportional relationships and finding constants of variation. **New key mathematical language (Learners)** corresponding	

Measures

Shape, Space and Measurement - Measures	
Beginning of Fourth Level ⟷	**End of Fourth Level**
Understand: Relationships within and between shapes and solids can be used to derive and justify measures of area, surface area and volume.	
Know	**Do**
The areas of kites, rhombuses and trapeziums can be derived from the areas of triangles. The surface area of a 3D solid is the sum of the areas of its faces and curved surfaces. The volume of triangular prisms and cylinders can be calculated by finding the product of the area of their cross-sections and their lengths. Measurements and calculated values have varying degrees of accuracy. Significant figures are digits in a number that carry meaningful information about its precision and accuracy. Numbers can be rounded to a specified number of significant figures. Premature rounding impacts on the accuracy of calculations involving area, surface area and volume.	Calculate the area of kites, rhombuses, parallelograms and trapeziums given their dimensions. Find the surface area of cuboids, cylinders and triangular prisms by calculating the area of each face or curved surface. Calculate and interpret surface areas in contexts including covering, packaging and manufacture. Calculate the volume of triangular prisms and cylinders given their dimensions. Calculate the length of a triangular prism or cylinder, given its volume and the area of its cross-section. Model and solve contextualised problems involving the quantity of liquid, in millilitres and litres, in containers which take the form of cylinders. Solve contextualised, multi-step problems, using a calculator as appropriate, maintaining accuracy until the final solution is found. Express solutions to contextualised measurement problems to a specified or appropriate number of significant figures. Notice, discuss and explain the errors that could be introduced by premature rounding

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Notes
Stress the effect of premature rounding or truncation on the precision of answers to calculations. For example, when using different approximations of pi.
Make connections to Quantity, Numbers and the Algebraic Properties of Number by building formulae for the volumes of triangular prisms and cylinders.
Includes but is not limited to
Calculations involving volume with dimensions given in differing units.
New key mathematical language (Learners)
significant figures, accuracy, error, premature rounding

Understand: The Earth's rotation determines how time zones standardise time of day across regions of the world.

Know	Do
As the Earth rotates on its axis, each part of the world experiences a different stage of the day or night, so the world is split into different time zones. Co-ordinated Universal Time (UTC) is used as the standard time against which all the other time zones in the world are referenced.	Model and solve problems involving multiple time zones in the contexts of scheduling, communications and travel.

Notes
Spatial approaches, such as using parallel time lines for each time zone, are appropriate for calculations at this level.
There are around 40 unique time zones used across the world.
Make connections to the rotation of the earth, the history of travel and navigation and the impact this has had on our modern world.
New key mathematical language (Learners)
time zones, Co-ordinated Universal Time (UTC)

DRAFT

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Strand: Information, Data and Uncertainty

Information and data are everywhere. They influence our decisions and predictions and help us analyse and interpret the world around us. Probability helps us navigate uncertainty and risk. By providing structured methods, mathematics allows us to collect, organise, analyse and represent information accurately and objectively. Statistics help us identify and make sense of patterns and trends, measure variation and draw reliable conclusions.

Data Management - Conceptual Understanding(s)

Level	Early Level	First Level	Second Level	Third Level	Fourth Level
	• Words, numbers and pictures represent information and help us communicate and make sense of everyday situations. • Data can be collected and organised to describe situations.	• Classifying items by their properties reveals similarities and differences that support comparison. • Questionnaires, surveys and observations can be used to collect information to answer questions and learn about the world. • Graphs and charts use agreed features to organise data so that information can be understood, compared and shared clearly.	• The reliability of data depends on the question type and wording used to collect it. • Individual and related data sets require different forms of organisation and representation to reveal their patterns and key features.	• Representative samples reflect the characteristics of a wider population, supporting conclusions about that population. • Different types of data require different forms of organisation and representation to communicate information.	• The design and wording of survey questions can introduce bias, affecting the reliability and validity of the evidence collected. • Grouping data into intervals organises large data sets but reduces detail.

Data Analysis and Interpretation - Conceptual Understanding(s)

Level	Early Level	First Level	Second Level	Third Level	Fourth Level
	• Comparing information helps us answer questions and make decisions.	• Graphical representations enable visual analysis and interpretation of data sets.	• Graphical representations reveal patterns visually and enable comparison within data. • The manipulation or misinterpretation of graphical representations can create biased or misleading claims that appear credible. • Statistical measures can be used to describe and compare the typical values and spread of numerical data sets.	• Graphical representations reveal trends in data that support comparison and inform predictions. • The ways in which data is collected, selected and represented can influence interpretation and can clarify or distort the conclusions drawn. • The distribution of numerical data influences which statistical measures best describe and compare data sets.	• The ways in which data is collected and presented can emphasise or obscure particular conclusions. • The distribution of data sets can be described and compared using measures that capture central tendency, spread and position.

Probability - Conceptual Understanding(s)

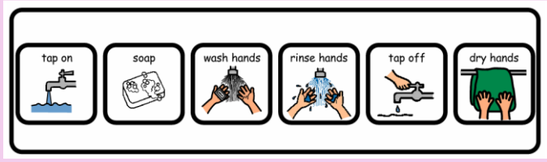
Level	Early Level	First Level	Second Level	Third Level	Fourth Level
	• Some events are certain and others are uncertain, so predictions cannot always be made with confidence	• The likelihood of events can be described and predicted to guide actions and choices.	• Probability quantifies the likelihood of outcomes and can be used to make predictions about patterns of outcomes over time, even though individual outcomes remain uncertain.	• Experimental data informs estimates of probability, supporting predictions about future outcomes.	• Probabilities derived from data are used in real-life contexts to assess risk and inform decision-making.

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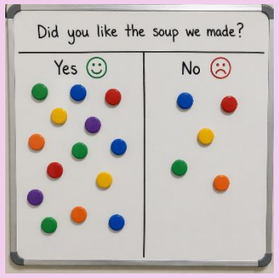
Early Level

Data management

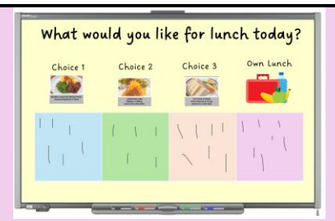
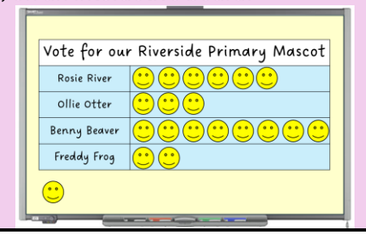
Information, Data and Uncertainty - Data management			
Beginning of Early Level ←			→ **End of Early Level**
Understand: Words, numbers and pictures represent information and help us communicate and make sense of everyday situations.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Data is information about the world around us. Signs and charts display information.	Discuss and investigate what signs, charts and marks around us represent. For example, the daily snack chart or the bike car park.  Follow and use signs and charts as part of everyday routines to make plans and choices. For example, following a hand washing routine or adding to a self-registration chart. 	Data can be displayed as pictures, objects, marks or words.	Discuss and follow instructions given in signs and charts around us. For example, putting things away in labelled baskets or jars. 
Notes Make connections to where information is collected, displayed and used as part of everyday routines. For example, now and next boards, visual timetables, emotional check in charts, lunch and snack charts, self-registration displays. Make connections to the language of time when following routines. Model mark making to keep count. For example, keeping track of snack time choices or the number of people in the room. Thanks to the National Autism Implementation Team (NAIT) and their work on visual support resources for the handwashing routine included above. **New key mathematical language (Learners)** signs, charts, information			

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Understand: Data can be collected and organised to describe situations.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Objects, stickers and marks can be used to keep count of people, objects, views, choices or opinions. Objects can be collected and sorted into categories. Same/different can describe how objects have been organised.	Represent a vote, choice or selection by adding or placing an object, a sticker, name tag or mark to a visual representation as part of routines. For example, 'Which story shall we read today based on our voting?'  Collect a range of objects and sort these into different categories by an attribute (colour, shape, size, type, texture). For example, everyone finds five toys, then sort them by colour. Select and sort objects using their own criteria. For example, 'I have all the yellow ones.'  'Now I have the all the big ones.'  Describe objects gathered and identify how they are the same or different. For example, they are different as this stone is big and this one is small, they are the same as both stones are grey.	Pictures and objects can be collected and sorted into categories. Questions can be used to collect data. Organised marks or objects can be used to keep count of votes, choices or opinions.	Collect a range of objects or pictures and sort these into two or more categories. For example, sorting pictures of animals by type or taking photographs of things they like/dislike. Sort objects into two or more categories using different criteria, including the criteria chosen by someone else. Identify which category an object belongs in when sorting by a given attribute. For example, 'Should a blue pencil be in the red or not red category?'  Respond to questions asked by placing a picture, object or mark to a display. For example, 'Did you like the soup we made?'  Create questions which can be used to gather views, opinions or choices. For example, 'Which game shall we play?', 'What might improve our outdoor area?' Represent a vote, choice or selection by adding a mark or object to an organised display. For example, adding a mark to an interactive board or a counter to a ten frame to indicate lunch choice.

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		A pictograph represents data using objects, pictures or symbols. Each object, picture or symbol represents one item. The title of a graph, chart or visual display tells us what the information is about.	 Construct concrete and digital pictographs by adding objects or pictures to a given grid or template. For example, on an interactive board. 

Notes

Start with sorting concrete objects, progressing on to sorting pictures or images. Technology could be used to capture these images, for example, photos captured outdoors.
Data collection should focus on finding out the answer to meaningful questions or using the data collected for a purpose or to make a decision. For example, Enquiry and Perspective in Social Studies - finding out about people, places, events, experiences, likes, dislikes and preferences.
When collecting data avoid questions which focus on personal characteristics, experiences or circumstances that could make individuals feel excluded or singled out.
Before collecting data, prediction and estimation skills should be reinforced. For example, what choice do you think will be the most popular and why?
Model opportunities where objects/pictures may not meet a category or meets more than one. For example sort the cars into red and blue where a green car or a red car with blue spots has been included.
Make connections to sorting and categorising within mathematics and other areas of the curriculum. For example, odd and even numbers, 2D shapes, food, living things, animals.
Make connections to Forming Questions and Finding Information within Literacy & English. For example, Who wants to play basketball? What game shall we play? Where shall we go on our trip? How did you get here today?
Digital tools could be used to capture and display views, choices or opinions and to create pictographs.

New key mathematical language (Learners)

data, collecting, sorting, organising, categories, pictograph, chart

Numeracy and Mathematics Milestones

Data and analysis

Sorts a group of objects using a given criteria.

Data analysis and interpretation

Information, Data and Uncertainty - Data Analysis and Interpretation			
Beginning of Early Level ←		→	**End of Early Level**
Understand: Comparing information helps us answer questions and make decisions.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Displayed information can be used to give descriptions and answer questions.	Answer questions based on visual displays. For example, What does our chart tell us about the birds we saw today?	Decisions can be made based on information displayed.	Discuss collected information and notice its impact when making decisions. For example, the story that got most votes is read. Recognise if there is no picture, symbol or object, the value is zero. For example, no one has a hamster.

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		More/less/the same as/most/least/equal, can describe the values in a data display so that they can be compared.	 Answer open and closed questions based on data displayed, recognising categories with zero, the most, the least and equal values.
Notes The use of open questions encourages learners to give answers based on their stage of development. For example, some learners might recognise the most/least, some may be able to count the number of marks or compare categories. Model responses as part of interactions by giving an example of what is noticed. When comparing collections of objects, some learners may point to the collections which has most/least before they are able to verbalise or quantify this. Initially, the focus should be on recognising the most/least and counting the total amount of votes/choices is not required. As an understanding of cardinality and abstraction develops, totalling the amounts in displays could be used as a way of reinforcing counting skills from Quantity, Numbers and the Algebraic Properties of Number Collected information about opinions and preferences can be used to inform democratic decision making within everyday experiences.			

Probability

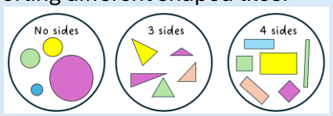
Information, Data and Uncertainty - (Foundations of) Probability			
Beginning of Early Level ⟷ **End of Early Level**			
Understand: Some events are certain and others are uncertain, so predictions cannot always be made with confidence.			
Know	**Do** (through play, everyday routines, games, songs, stories and rhymes)	**Know**	**Do** (through play, everyday routines, games, songs, stories and rhymes)
Some outcomes are predictable and others are not.	Develop an awareness of uncertainty through play, games and everyday experiences. For example, if we roll a dice we know it will be 1 to 6 but we don't know which number it will land on. Begin to consider what might, will, or will not happen through play, games and everyday experiences. For example, 'We will have snack today', 'It might rain tomorrow', 'We will not meet a real dinosaur on our walk.'	Not all events can be predicted with certainty. Risk and uncertainty can influence actions. Predictions are made when the outcome is not yet known.	Discuss the impact that uncertainty can have on our daily routines and plans. For example, 'We don't know for certain what the weather will be, so we need to decide if we need to take a sun hat, a coat, or wellies.' Demonstrate safety around items that might be hot, breakable or sharp. Begin to make predictions through play, games and everyday experiences. For example, 'If the tower has 10 blocks it will probably fall over', 'I might win this game', 'I'm pretty sure it won't snow today.'
Notes Explore what 'might' happen and how actions can reduce risk to keep safe, making connections to hazards in Being Scientific within Science. Model the language of likelihood as part of everyday interactions. For example, I'm sure it will …, it might …, it probably will …, it definitely won't… Begin to explore the idea of what events might be possible, impossible, more likely or less likely. The idea of whether something might, will, or will not happen could be based on reasoning or past experiences. For example, if lorries are usually seen on local roads, a lorry might be seen on today's walk. **New key mathematical language (Learners)** certain, uncertain, probably, might, predict			

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First Level

Data management

<table>
<tr><th colspan="6">Information, Data and Uncertainty - Data management</th></tr>
<tr><td colspan="6">Beginning of First Level ← → End of First Level</td></tr>
<tr><td colspan="6">Understand: Classifying items by their properties reveals similarities and differences that support comparison.</td></tr>
<tr><th>Know</th><th>Do</th><th>Know</th><th>Do</th><th>Know</th><th>Do</th></tr>
<tr>
<td>Objects can be collected, sorted and matched into one or more categories based on their attributes.</td>
<td>Collect and sort a range of objects or pictures using their own or criteria and explain how they have been categorised. For example, ‘I sorted the toy vehicles by colour and you have sorted them by how many wheels they have.’

Identify which given category an object belongs in. For example, sorting different shaped tiles.


Sort objects into categories using more than one attribute at the same time. For example, sorting pom-poms by colour and then by size.
</td>
<td>A Carroll diagram is a way of organising objects, numbers and shapes by their attributes.

In a Carroll diagram, numbers or objects are either categorised as having an attribute or not having an attribute.

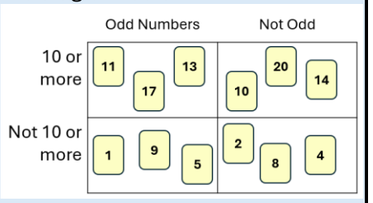
A Venn diagram shows the relationship between different sets of categorised items.

Each circle in a Venn diagram represents a set.

When items belong to more than one set, because they belong to more than one category, the circles in a Venn diagram overlap to create an intersection.</td>
<td>Place an object into the correct category on a physical one attribute Carroll diagram. For example, deciding where a pinecone should go.


Identify when objects can be placed into more than one category. For example, with a set of pom-poms sorted into big or pink, pom-poms which are big and pink could be placed into both categories.

Create physical Venn diagrams, using hula hoops or sorting rings, where each hoop represents set and they overlap if the sets intersect. Sort objects into the correct place (region) within Venn diagrams. For example, placing a big pom-pom into the correct region in the physical Venn diagram below.
</td>
<td>A Carroll diagram can sort data by two attributes.

When an object cannot be classified into one of the defined sets it should be placed outside of the Venn diagram circles.</td>
<td>Identify and explain which category items belong to on given two-attribute Carroll diagrams. For example, placing numbers to 20 in the diagram below.


Sort objects into the correct region on physical Venn diagrams, including within one set, in the intersection of two sets, or outside of the sets. For example, a small blue pom-pom is neither big or pink.
</td>
</tr>
<tr><td colspan="6">Notes
Initially sort concrete objects, progressing on to sorting photographs, pictures or numbers.
An attribute is a property, characteristic, or feature that describes something such as colour, shape, type, size, texture....
Make connections to classifying shapes in Shape, Space and Measurement.</td></tr>
</table>

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Make connections, when sorting and categorising, to other strands within mathematics and to other areas of the curriculum. For example, classifying numbers by their properties, sorting animals by biological classification, sorting everyday materials or objects by their scientific properties.
Items should be sorted into both given categories (a closed task) and appropriate categories of choice (an open task). Encouraged re-sorting of items in a variety of ways.
New key mathematical language (Learners)
Venn diagram, sets, intersection, Carroll diagram

Understand: Questionnaires, surveys and observations can be used to collect information to answer questions and learn about the world.

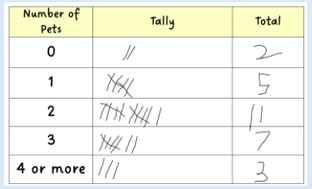
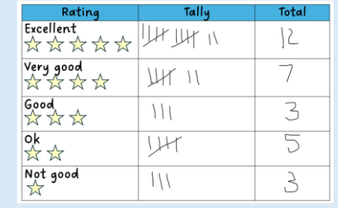
Know	Do	Know	Do	Know	Do
A questionnaire is a set of questions designed to collect data.	Complete questionnaires for real and relevant purposes.		Contribute to the design of questionnaires for real and relevant purposes.	Questions can be closed (yes/no, multiple choice responses) or open (no pre-selected choices). A survey is a structured process of collecting data (often through a questionnaire) then organising and analysing it to better understand a topic. Digital tools can be used to collect and organise data.	Identify the benefits and disadvantages of using open and closed questions when collecting data. For example, 'Do you like school?' is likely to be answered with a yes or no, but 'What do you like best about school?' could have a wider range of answers. Explain how the wording of a question can influence the responses given. For example, asking 'My favourite flavour of crisps is salt and vinegar, do you agree?' compared to asking 'What is your favourite flavour of crisps?' Contribute to the creation of a questionnaire by considering the type and wording of questions, then conduct the survey by collecting responses and recording the information clearly. Contribute to the design of an online questionnaire to be shared with and completed by others.
		Observation involves watching or recording behaviour or events to collect data on the frequency of an event occurring over a set time period. A table can be used to record and structure data gathered as part of an observation.	Conduct observations to collect data using given templates to record the results. For example, counting how many birds visit the feeder in ten minutes, noting the number of rainy days there are in a week. Contribute to the creation of a table that records daily or weekly observations. For example, the amount of rain collected, the height of a sunflower over a number of weeks.		Collect data through observations, where more than one category is being observed. For example, the types of weather observed each day over a month. Consider the data being collected through observation and decide which categories to include in a table. For example, when collecting data about types of transport passing the school consider which categories (such as car, bus, bicycle) will be needed.

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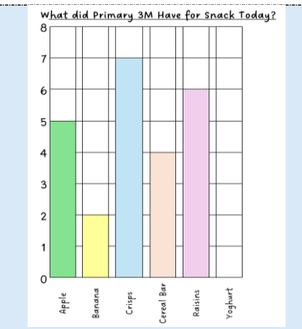
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Notes
Digital tools which could be used to collect and organise data include online form creators.
Collecting data to gather opinions and preferences and active participation in questionnaires supports the development of the ideas of Perspective and Power (influence) in Social Studies and have direct links to the Enquiry strand.
Make connections to Forming Questions and Finding Information within Literacy & English as the structure of questions is important here.
New key mathematical language (Learners)
questionnaire, survey, observations, table, spreadsheet

Understand: Graphs and charts use agreed features to organise data so that information can be understood, compared and shared clearly.

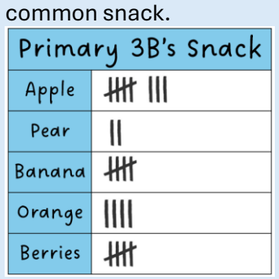
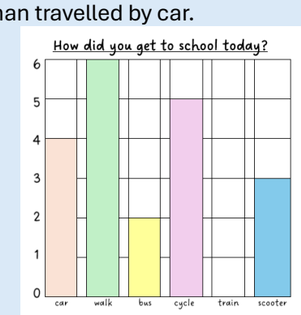
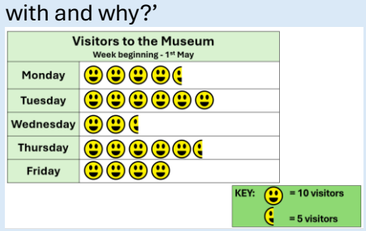
Know	Do	Know	Do	Know	Do
The objects, pictures or symbols in a pictograph represent how many are in each category.	Construct and contribute to pictographs using pictures or symbols with a range of categories and values.	Symbols in a pictograph should be equal in size. Pictures or symbols in a pictograph should be aligned.	Create pictographs accurately ensuring that symbols within a category are equal in size and aligned.	Each symbol in a pictograph can represent one or more items. A key tells you how many items each picture represents in a pictogram.	Create pictographs, with a key, where a symbol represents more than one item. 
A tally chart can be used to record data as it is collected and displays the total. Tally marks keep a count by drawing lines with each mark representing one item. Four vertical tally marks crossed through with a diagonal line represent a group of five. Tally marks can be totalled by counting fives and ones.	Contribute to the creation of tally charts, showing tallies grouped in fives, to represent collected data. For example, a tally chart which shows the type of transport used to travel to school. Count in fives and ones to total categories in tally charts. For example, thirteen people are having a school dinner today. 		Contribute to the creation of tally charts to represent collected data. For example, a tally chart which shows the number of pets owned by those in a class.  Construct tally charts using given templates for relevant purposes.		Collect and organise data describing experiences, opinions and observations, using a tally chart template. For example, collecting opinions about the latest class novel. 
		A bar graph uses rectangular bars to show and compare how much or how many there are in different categories. For example, favourite fruit choices. The bars can be horizontal or vertical and should have equal width and equal gaps between them. Each bar represents a value and the height or length of each bar links directly to its value.	Construct vertical and horizontal bar graphs using given templates which have a scale ascending from 0 in ones. Present data accurately by labelling the axes with the correct categories and values. Present data accurately by adding a title to show what the graph represents.	The axis showing how much or how many is marked at equal intervals. This is called the scale, used to measure, organise and indicate each category's value.	Construct vertical and horizontal bar graphs using given templates which have a scale ascending in twos, fives or tens.

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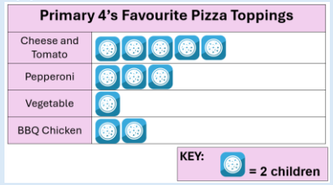
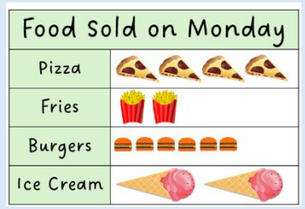
		The vertical and horizontal lines on a graph are called axes. Axes are labelled to show the categories and the values.			

Notes
Make connections, when working with tally marks to skip counting in fives in Quantities, Numbers and Algebraic Properties of Number.
The different ways quantities are marks are recorded across history and diverse cultures and number systems could be explored. For example Chinese character tally marks, the Ishango bone, Roman numerals.
When the scale is ascending in twos, fives or tens, make connections to skip counting in Quantity, Numbers and the Algebraic Properties of Number.
Aligning data ensures information is clear and accurate.
Includes but is not limited to
Use scales which ascend in ones but demonstrate that as the quantity of collected data increases, the scale may need to be adapted to ensure that the graph remains manageable and readable.
New key mathematical language (Learners)
symbols, tally chart/mark, key, bar graph, axes, intervals

Data analysis and interpretation

Information, Data and Uncertainty - Data analysis and interpretation					
Beginning of First Level ←					→ **End of First Level**
Understand: Graphical representations enable visual analysis and interpretation of data sets.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
More than, less than and the same as, are used to compare values in a data display. Conclusions, findings and outcomes can be drawn from displayed data.	Calculate and compare the total of two or more categories in pictographs, tally charts or block graphs and identify which is most, least or if they are the same value. For example, identifying the most common snack.  Answer questions and describe the data displayed in a range of graphs, charts and tables. For example, 'Most people walk to school', 'Three people get the bus', 'No-one comes by train.'	Conclusions, findings and outcomes drawn from data can inform predictions.	Compare the total of two or more categories in a range of data displays and calculate how many more or less there are. For example, finding out how many more learners walked to school than travelled by car.  Discuss how collected data can be used to inform predictions. For example, 'It has rained three days in a row so it might rain tomorrow and I will wear my wellies.'	Conclusions, findings and outcomes can be drawn from data collected over time. In a pictograph the key is used when calculating the totals.	Analyse data collected over a period of time. For example, in our weeklong traffic survey, the road was quietest between 1pm and 2pm each day. Calculate the totals in pictograph categories using the key, where part symbols or symbols representing more than one are used. For example, 'Michael thinks there was 15 visitors on Wednesday, but Yvonne thinks there was 25, who do you agree with and why?' 

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Conclusions, findings and outcomes drawn from data can inform choices and decisions.	Discuss how collected data impacts decisions and choices. For example, 'Most people voted for an outdoor activity so we should go outside this afternoon.'	Each symbol in a pictograph can represent one or more items. The way that data is displayed can lead to incorrect interpretations.	Interpret the total in pictograph categories where an object or symbol represents a value more than one. For example, calculating how many learners voted for pepperoni.  Begin to develop an awareness of the importance of displaying data accurately and the impact that misleading data can have. For example, 'Jaclyn thinks this pictograph shows the sales of pizza and ice-cream are the same.  Is she correct? Why (or why not)?'		Discuss data displays where a lack of accuracy could lead to incorrect interpretations. Explain how these could be improved. For example, 'In this pictograph Iona thinks more learners have a cat as a family pet. Is she correct? Why (or why not?)' 

Notes

Includes but is not limited to

When working with half symbols in pictographs each symbol should represent even numbers only.

Errors in recording or displaying data could lead to misinformation, affecting decisions based on that data. For example, the preference chosen may not be the most popular one.

Analysis and interpretation of represented data provide opportunities to create and answer open ended questions which can lead to deeper understanding and support the development of critical thinking.

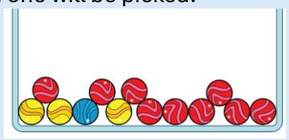
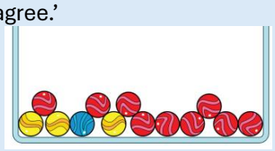
A range of workplace contexts and real-life situations where managing, analysing and interpreting data could be explored. Visits could be arranged from those working in roles such as marketing, sales, science or medicine.

New key mathematical language (Learners)

interpretation, comparison, conclusions, findings, outcomes, choices, decisions, misleading

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Probability

Information, Data and Uncertainty - Probability					
Beginning of First Level ⟷					**End of First Level**
Understand: The likelihood of events can be described and predicted to guide actions and choices.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The likelihood of events in everyday situations can be described using mathematical language and can influence our actions and choices.	Discuss and describe everyday situations using the language of likelihood: possible, impossible, likely, unlikely, probable, certain and uncertain. For example, 'When we go to the lunch hall it is unlikely we will meet a celebrity, but it is possible that pasta will be on today's menu.' Discuss how the likelihood of everyday events might influence choices and actions. For example, 'I am in Scotland in February and it is likely to be cold, so I will bring my hat and gloves.'	An outcome can be predicted based on known information.	Describe the likelihood of an item or object being selected from a given collection. For example, 'It is impossible to pick a green ball from this pot, but is likely that a red one will be picked.'  Through games and everyday experiences, discuss the link between the likelihood of events and their fairness. For example, one player starting the game with more cards, would be unfair as the likelihood of winning could be different for that player.	Data gathered through real-life experiences can be used to make predictions of the likelihood of an event occurring.	Compare the likelihoods of items or objects being selected from a given collection. For example, 'Jakub thinks the most likely colour to be picked from this pot is yellow. Explain why you agree or disagree.'  Analyse gathered data and make predictions of the likelihood of an event occurring. For example, based on a traffic survey, predicting the most likely vehicle to pass by next.
Notes Make connections to identifying hazards and risks in Being Scientific within Science. Fairness in relation to probability means that each possible outcome has an equal chance of happening. In the context of games, each player should have an equal (fair) chance of winning. Ways in which games might be made unfair could be discussed. For example, in fairground games, where players are unlikely to be able to be carry out the game successfully (hooking the duck, knocking down the tower), or where the chances of winning are particularly low. **New key mathematical language (Learners)** likelihood, events, outcomes					

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Second Level

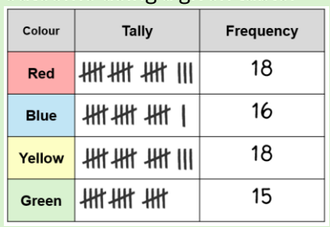
Data management

Information, Data and Uncertainty - Data management					
Beginning of Second Level ⟷ **End of Second Level**					
Understand: The reliability of data depends on the question type and wording used to collect it.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Categorical data falls into distinct groups. Numerical data can be quantified and is expressed as numbers. In surveys, the choice of question type is based on the type of data being collected. Technology can support efficient data collection and organisation	Investigate a range of types of questions used in questionnaires and digital survey tools and discuss their purpose. For example, multiple choice, open text, numerical text, ratings. Construct and test questions of different types designed to collect data for relevant purposes. Justify the choices of question type.	In questionnaires, the design of a question can affect the reliability of the data collected.	Investigate the types of categories used in multiple choice questions and discuss how the choice of categories affects the reliability of the data collected. For example, having too many or too few categories, having subjective labels (such as very often, often, sometimes), having categories that overlap (such as ages 10 to 20, 20 to 30, 30 to 40). Construct and test a range of multiple-choice questions designed to collect data for relevant purposes. Justify the choice of categories used and explain any measures taken to maximise the reliability of the data collected.	Bad survey questions can influence responses and in turn, affect the reliability of the data collected.	Examine a range of questionnaires identifying any questions whose wording or design could affect the reliability of the data collected. Design questionnaires for relevant purposes, making efforts to maximise the fairness and reliability of the data collected. Justify decisions made in the wording and design of questions.
Notes Some categories have a natural order e.g. small, medium, large. Others do not, e.g. blue, green, brown. Any digital survey or polling tool could be explored, based on ease of access and appropriateness. Examples of poorly worded questions could include ones which lead towards a particular response, ones which include subjective wording, or ones which are confusing or difficult to answer. Relevant purposes for data collection should be linked to wider learning and could be connected to sustainability, careers & pathways, democratic values. For example, investigating recycling habits, the local job market, or collecting opinions on local issues. Make connections to Forming Questions and Finding Information within Literacy & English and to Enquiry within Social Studies when considering the choices made in wording questions. **New key mathematical language (Learners)** categorical data, numerical data					

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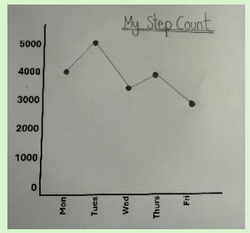
Understand: Individual and related data sets require different forms of organisation and representation to reveal their patterns and key features.

Know	Do	Know	Do	Know	Do
Frequency tables organise data by recording how often values or categories occur.	Collect and organise data in frequency tables. For example, carrying out a probability experiment by spinning a coloured spinner and recording each outcome using a given table.  Colour / Tally / Frequency Red — 18 Blue — 16 Yellow — 18 Green — 15			Two way frequency tables are used to organise data involving two categories to show how often different combinations occur.	Interpret data sets organised into two-way frequency tables. For example, totalling the sales of apples, totalling the sales for shop B, identifying the most commonly  sold fruit. Calculate the missing figures in a partially completed two-way frequency tables. For example, calculating how many P6 children travelled by car, calculating how many P7 children completed the travel survey. 
A scale marked on a graph's axis uses marked intervals to measure and represent data accurately. Scales should be chosen so that all the data fits on the graph and that the data is easy to read.	Create bar graphs, choosing appropriate scales, to represent given and collected sets of categorical data. Mark and label each axis.	Digital survey tools and spreadsheets can be used to create a range of graphs, charts and tables.	Organise sets of categorical data in a spreadsheet to create bar graphs. Ensure that the scale and presentation of the data is appropriate.	Compound bar graphs can be used to represent related sets of categorical data.	Create, using a spreadsheet, compound bar graphs to represent 2 or 3 given sets of related categorical data. 

	Shop A	Shop B	Shop C	Total
Apples	78	86	75	
Bananas	59	64	67	
Pears	29	32	25	
Pineapples	14	11	18	
Total				

	Walk	Car	Bus	Bike	Total
Primary 6	15		3	5	30
Primary 7	12	4		7	
Total		11	5		55

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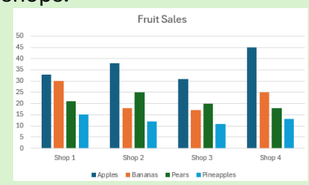
		Line graphs can be used to track how a numerical value varies over time. Individual data points are plotted and each point is joined to the next by a line.	Create line graphs by plotting data points from given data sets on given axes. 		Choose appropriate scales when creating line graphs to represent sets of numerical data collected over a period of time. For example, recording the height of a sunflower each week over a period of weeks.
				The choice of graphical representation should be informed by the type of data collected.	Justify choices of graphical representations based on the types of data in datasets and their intended purpose. For example, choosing a bar graph to highlight sales of different items, choosing a line graph to show how a country's population has changed.

Notes
The amount of data collected could determine whether or not a graphical representation is of benefit. The relative merits of a bar graph compared to a pictograph could form part of justifying choices of graphical representations.
The collection of data could relate to sustainability, or understanding the local community. For example, creating a representation of the school's energy use from energy smart metre data, exploring the use of local leisure or transport facilities.
Includes but is not limited to
Scales with equal marked intervals only.
Excludes
Creating line graphs with truncated axes.
Compound bar graphs with stacked bars.
New key mathematical language (Learners)
frequency tables, line graph, compound bar graph

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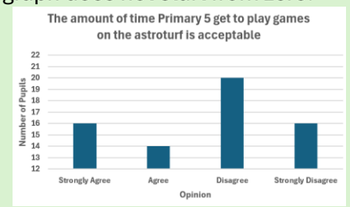
Data analysis and interpretation

Information, Data and Uncertainty - Data Analysis and Interpretation					
Beginning of Second Level ⟷					**End of Second Level**
Understand: Graphical representations reveal patterns visually and enable comparisons within data.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The heights or lengths of bars on bar charts show the frequencies of categorical data.	Describe the key features of categorical data sets represented by given and created bar graphs.	The size of slices on pie charts shows the relative proportions of categorical data.	Interpret pie charts in familiar contexts. For example, the most common hair colour was brown, over half of the sample had brown hair. Identify the benefits of bar charts and pie charts by comparing their representation of the same data sets.	Compound bar graphs can be used to compare related sets of categorical data.	Compare pairs of related sets of data represented by bar graphs and discuss the challenges of comparing separate graphs. For example, the tuck shop sales over two different weeks. Interpret compound bar charts to compare data sets, identifying similarities and differences. For example, creating and interpreting a compound bar graph to show the relative sales of different fruits for 4 shops.  In all four shops, the fruit with the highest sales was apples and the shop with the lowest sales overall was shop 3.
				Line graphs can be used to identify trends in numerical variables.	Describe, using appropriate mathematical language, trends shown by line graphs. For example, sales figures increasing over a four-year period.

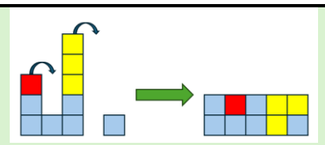
Notes
Key features of data could include the most frequent and least frequent categories, empty categories, categories of equal frequency, the similarities and differences between categories.
Make connections between pie charts and fractions, decimals and percentages in Quantities, Numbers and Algebraic Properties of Number emphasising that pie charts are graphical representations of these proportions.
Graphs representing appropriate local, national and international data could be interpreted in relevant contexts such as Social Studies, Learning for Sustainability, Science and Social Justice. For example, describing the proportions of types of environments in a particular country, noticing trends in the populations of species or in data collected in a science experiment, representing the way profits are distributed in fair trade and non-fair trade food production.
New key mathematical language (Learners)
pie chart, trends

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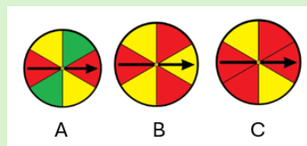
Understand: The manipulation or misinterpretation of graphical representations can create biased or misleading claims that appear credible.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
Graphs with inconsistent or inappropriate scales are more difficult to interpret accurately.	Compare two representations of the same data with different scales and explain the effect this has on the interpretation.	Data representations can be misleading through truncated axes or unequal intervals.	For given and created bar and line graphs, explain why a graph with a truncated axis may, or may not be misleading. For example, where an axis on a graph does not start from zero.  For given and created bar and line graphs, explain how unequal intervals could mislead.	Some graphs or charts may be deliberately misleading.	Identify ways in which examples of graphs and charts may have been manipulated and explain any impact on the reliability of claims made from them. Begin to develop an awareness of why data might be displayed in misleading ways and how this could influence opinions and decisions. For example, consider the author of the graph and its purpose.
Notes Make connections to Evidence within Social Studies (misinformation, disinformation and bias) and to Science in Action within Science (using science to make informed decisions). In general, the y-axis of bar charts should start at zero to ensure bar lengths are proportional to the values they represent. Line graphs may need a truncated y-axis so that trends, particularly in high values, can be seen. Truncating the y-axis can over-exaggerate these trends. The source of the data represented by any graph should always be taken into consideration when assessing its reliability. **New key mathematical language (Learners)** truncated axis, misleading, manipulated					
Understand: Statistical measures can be used to describe and compare the typical values and spread of numerical data.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
The range is a measure of spread of a set of numerical data.	Predict and then find the range of numerical data sets by calculating the difference between the highest and lowest values. Use range to compare and interpret, in context, the variability of pairs of data sets. For example, the ages of our teachers are more varied than the ages of the learners in our class. The range in their ages is 43 years, but the range of our ages is 1 year and 5 months.	Averages are measures used to represent the centre point or typical value in a data set. The mode is the most common data item in a data set. The mean is the sum of the numerical data in a set divided equally across the number of data items.	Estimate what the typical value of the data set is likely to be before calculating averages. Find the mode (or modal value) in categorical and non-categorical data sets and use it to describe the most frequently occurring data item. For example, the modal shoe size is 4. Visualise the mean of small data sets by modelling them with concrete materials and redistributing unequal shares evenly. For example, the number of goals scored in five games were 3, 1, 5, 0 and 1. The mean number of goals per match was 2.	The median is the value lying at the midpoint of an ordered data set. It separates the upper and lower halves of the data set.	For numerical data sets with an odd number of data items, find the median by ordering the data and identifying the middle value. 3 4 7 7 **8** 10 11 12 17

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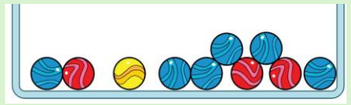
			 For numerical data sets, calculate the mean by sharing the total of the data equally.		
The spread of two or more data sets can be compared using the calculated range.	Compare pairs of numerical data sets using the range. Discuss whether this is surprising or as expected. For example, the pupil age range in our school is 7 years but the teacher age range is 31 years. As expected, the teachers' ages are much more widely spread.			The typical values of two or more data sets can be compared using the same calculated average.	Compare pairs of sets of numerical data using calculated averages. For example, on average, the Primary 6 pupils had more pets than the Primary 4 pupils.

Notes
The mean is often what is calculated when the word *average* is used.
The mode of a data set is easily identified during data collection or from a given frequency table or bar chart. Some data sets may have more than one mode.
Make connections to Careers & Pathways in which statistics are used heavily. For example, sports analysis, journalism, public services, healthcare.
Excludes
Calculated means which are decimal fractions.
Calculating the median for a data set with an even number of data items.
New key mathematical language (Learners)
range, numerical data, averages, mode, mean. modal value, median

Probability

Information, Data and Uncertainty - Probability					
Beginning of Second Level ⟵				⟶ **End of Second Level**	
Understand: Probability quantifies the likelihood of outcomes and can be used to make predictions about patterns of outcomes over time, even though individual outcomes remain uncertain.					
Know	**Do**	**Know**	**Do**	**Know**	**Do**
If there are only two possible outcomes and they are equally likely, the chance of each one occurring is often called fifty-fifty or an even chance.	Identify situations with two equally likely outcomes and describe them as an even chance. For example, there is an even chance of a coin landing on heads or tails. Describe events that are not equally likely using terms such as unlikely and likely. For example, it is unlikely you will roll a 6 on a fair, regular dice first time.	Probability is measured on a scale of 0 (impossible) to 1 (certain).  Known information about possible outcomes can be used to quantify the probability of a particular outcome.	Describe how likely different events are using the probability scale from 0 to 1. For example, estimating or identifying the location of events on a probability line to show how likely or unlikely they are. For example, how likely it is that it will snow tomorrow or that a coin will land on heads. Express, as a fraction, the probability of an event happening, explaining the role of the numerator and denominator. For example, on a fair, regular, six-sided dice, the probability of	Known information about possible outcomes can be used to describe and compare the probabilities of events.	Match scenarios with given probabilities, justifying the matches made. For example, spinner C has a probability of landing on red that is $\frac{2}{3}$ because each slice is equal in size and four out of the six slices are red (two out of every three). 

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			rolling a three is one in six, or $\frac{1}{6}$ as there is only one three on the six faces.		
Known information about possible outcomes can be used to predict the outcome of future events. The outcomes of probability experiments may not match calculated (theoretical) probabilities.	Identify and list all possible outcomes for probability experiments. For example, a card drawn at random will either be hearts, clubs, diamonds or spades. Make predictions about how likely different outcomes are using known information. For example, there is an equal chance of rolling each number on a fair dice. Carry out experiments with repeated trials where each outcome is equally likely. Compare actual results with expected outcomes and discuss why they might be different. For example, rolling a dice a number of times, recording the outcomes and considering if they matched expectation.		Carry out experiments with repeated trials where each outcome is not equally likely. Compare actual results with expected outcomes and discuss why they might be different. For example, the probability of selecting a yellow ball is $\frac{1}{10}$ but was a yellow ball drawn one tenth of the time? 	The more times an experiment is repeated, the more likely it is that the outcomes will be closer to theoretical probabilities.	Repeat probability experiments many times and determine if increasing the number of trials brought the results closer to the theoretical probability. For example, comparing the results of flipping a coin 100 times to flipping a coin 10 times.

Notes
Probabilities can be expressed as proper fractions, decimal fractions or percentages.
Language such as *a one in three chance* will help develop understanding.
Make connections to fractions in Quantity, Numbers and the Algebraic Properties of Number.
Make connections to gambling in Finance when discussing Probability.
Simple probability experiments are those which have a known, limited number of outcomes.
Probability experiments with equally likely outcomes could include those involving spinners with equally sized sectors, fair dice and full packs of playing cards.
Results of probability experiments could be recorded within a spreadsheet and represented graphically to illustrate explanations.
Probability experiments can be modelled using digital tools. These tools can recreate multiple trials in a short space of time.
A regular dice is a regular polyhedron, for example a cube.
Each face on a fair dice has an equal probability of landing face up.
New key mathematical language (Learners)
fifty-fifty, even chance, probability, impossible, probability scale, theoretical probabilities, equal chance, repeated trials, fair

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Third Level

Data management

Information, Data and Uncertainty - Data Management			
Beginning of Third Level ←			→ **End of Third Level**
Understand: Representative samples reflect the characteristics of a wider population, supporting conclusions about that population.			
Know	**Do**	**Know**	**Do**
In statistics, a population is the entire group of individuals or items that is being studied. A sample is a smaller group, drawn from a larger population. This is used to gather data and draw conclusions without needing to study the entire population. The reliability of conclusions depends on both how data is collected and from whom it is collected. Sample size can impact the reliability of the conclusions that can be drawn. Technology can enable the efficient storage and organisation of large data sets.	Begin to develop an awareness of how the size of a sample can affect the reliability of conclusions drawn from data sets and the cost and time implications of collecting that data. Examine surveys and identify how question design and sample selection may affect the reliability of conclusions. Analyse how technology has been used to organise given data sets by describing the variables, identifying their data types and stating the number of data points.	A representative sample accurately reflects the key characteristics of a population. Conclusions about a wider population are only reliable if a representative sample has been chosen.	Identify features of data collection scenarios that would be likely to make a sample more representative and explain why these features are important. Identify examples where conclusions could be unreliable due to an unrepresentative sample being taken, explaining how this could affect decisions and actions. For example, where only former university students have been sampled when collecting data about average income of adults.

Notes:
When collecting data for specific purposes, sample size and representation should be kept in mind.
Examples of sampling could include opinion polls, environmental surveys, market research.
The difference between sample sizes, such as asking for the opinion of 10 people compared to 1000 people should be discussed. The sample sizes used in adverts and opinion polls could be investigated.
Simple ways of making samples more representative could be including people of different ages and collecting environmental data from a range of outdoor locations.
Make connections to Evidence and Enquiry within in Social Studies, in particular the factors that influence the collection and presentation of evidence. For example, ways to ensure that the perspectives of relevant groups of people are considered and represented, ways to ensure that data collection methods are accessible for all, consideration of what data is included or omitted.
New key mathematical language (Learners)
statistics, sample, sample size, variables, data points, representative sample, conclusions, population

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Understand: Different types of data require different forms of organisation and representation to communicate information.

Know	Do	Know	Do
Compound line graphs can be used to compare trends in two or more numerical variables over time. Frequency tables can be extended to include calculated proportions. Pie charts can be used to show the relative proportions of categorical data.	Create compound line graphs, using a spreadsheet, to represent trends of two or three sets of related numerical data. Collect and organise data sets using frequency tables which include calculated proportions. For example, having recorded how many times each colour appears in a spinner experiment, calculate the proportion for each. Create pie charts, using a spreadsheet, to show and describe the relative proportions of categorical data. For example, a pie chart showing the world's population by continent.	Bivariate data links two variables as an ordered pair. Bivariate data can be plotted on a scatter graph to investigate the possible relationship between two variables.	Identify, from given data sets and representations, the variables included in bivariate data pairs. Discuss and predict in what way(s) the variables might be connected. For example, the age and height are recorded for each person in a group. For learners and younger people, their height could depend on their age. Create scatter graphs to represent given and collected sets of bivariate data, initially by hand and moving on to using spreadsheets. Identify the data types within collected and given data sets. Select and justify representations that best support interpretation and communication of that data.

Colour	Tally	Frequency	Proportion
Red	𝍸 𝍸 ||||	14	$\frac{14}{28} = 50\%$
Blue	𝍸 |||	8	$\frac{8}{28} = 28.6\%$
Green	𝍸 |	6	$\frac{6}{28} = 21.4\%$
Total		**28**	

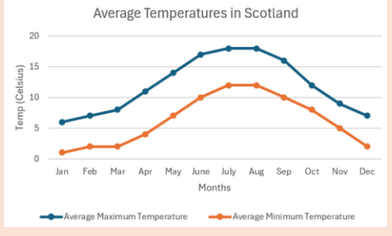
Notes
Made connections to other curricular areas when choosing and creating representations of data. For example, graphing measurements collected over time in a science experiment in a line graph, presenting categorical data collected in a business themed survey using a bar chart, exploring the link between a country's Gross Domestic Product (GDP) per capita and their CO_2 emissions per capita by using bivariate data sourced online.
New key mathematical language (Learners)
compound line graphs, frequency tables, pie chart, proportion, categorical data, spreadsheet, trends, numerical data, bivariate data, scatter graph

Data analysis and interpretation

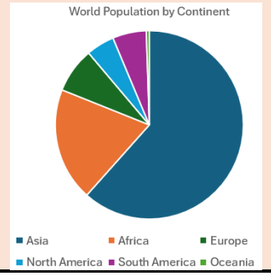
Information, Data and Uncertainty - Data Analysis and Interpretation

Beginning of Third Level ⟵ ⟶ **End of Third Level**

Understand: Graphical representations reveal trends in data that support comparison and inform predictions.

Know	Do	Know	Do
	Interpret given and created compound line graphs by describing the trends. For example, graphing the maximum and minimum average temperatures in Scotland. 'The graph shows that both the maximum and minimum temperatures follow the same trend.'  	Statistical correlation describes the strength and direction of the relationship between two variables. The existence of a correlation does not imply that a change in one variable causes a change in the other.	Identify and describe strong and weak positive and negative correlations from the spatial patterns within given and created scatter graphs and recognise when there is no apparent correlation. Reflect on how these match predictions made. Describe correlations using appropriate language and consider whether causation is or is not likely. For example, there is a strong positive correlation between the number of hours learners spent revising and the marks learners achieved in a test. In general, the more they studied, the higher the marks they scored.

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	Interpret given and created pie charts describing the relative proportions of each category within a single data set. For example, over half the world's population lives in Asia and the smallest proportion lives in Oceania. 	Where a correlation exists, a line of best fit on a scatter graph can be used to depict the linear relationship between two variables.	Where a strong positive or negative correlation is present, add a line of best fit by eye to given scatter graphs. Estimate expected values of one variable given the other using lines of best fit.

Notes
The line of best fit is an estimation rather than a calculation. A common misconception is that lines of best fit must pass through the origin. Trend lines could be added to scatter plots created using spreadsheets for extra practice.
Make connections to other curricular areas and Probability experiments when looking at proportions in data sets. For example, charts displaying voting shares from an election, UK market shares in sales of certain technological devices, proportions of land used for different purposes in the local area, the proportions of each outcome in probability experiments.
Initial examples of pie charts should use clearly distinct proportions so that relative proportions a can readily be identified and described.
Excludes
The equation of the line of best fit is not required.
Pie charts with too many categories – aim to use those with 5, 6 or 7 categories.
New key mathematical language (Learners)
compound line graphs, trends, pie chart, proportion, statistical correlation, line of best fit, scatter graph, causation

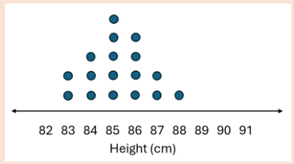
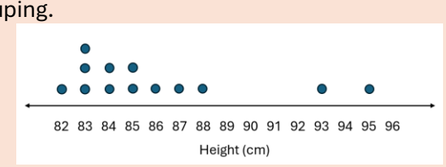
Understand: The ways in which data is collected, selected and represented can influence interpretation and can clarify or distort the conclusions drawn.

Know	Do	Know	Do
Features such as scales, intervals, labels and choice of graph affect how data is interpreted. Different graphical representations can illustrate different features of the same data.	Evaluate graphs and charts, explaining how their features support accurate interpretation or may create misleading impressions. Compare different representations of the same dataset and explain how each supports or limits interpretation.	Data can be selectively presented to emphasise particular trends, patterns or conclusions. The reliability of conclusions depends on both the data collected and the way it is represented.	Create different representations of the same dataset and justify which is most appropriate for a given purpose and audience. Identify and explain sources of potential bias or misrepresentation within data displays. Analyse different representations of data, including graphs and charts and justify whether the conclusions drawn are supported by the data presented.

Notes
At this level, comparisons could be made between frequencies and proportions through use of bar charts and pie charts, but the benefits and drawbacks of other types of visualisations could be discussed.

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Understand: The distribution of numerical data influences which statistical measures best describe and compare data sets.			
Know	**Do**	**Know**	**Do**
The distribution of a data set describes how its data is spread out or arranged. The distribution of a data set can be represented graphically.	Describe the distribution of numerical data sets given their spatial pattern shown by dot plots. For example, for this group of learners, their heights are grouped between 83 and 88 cm, with most heights being the central values of 85 to 86 cm.  For this group of learners, most of their heights are clustered between 82 and 88 cm, but there are two particularly tall learners that lie outside of this grouping.  	Sets of data can be described in terms of their calculated average (mean or median), their mode and their spread (range). Spreadsheets can be used to calculate averages and measures of spread.	Describe sets of data by calculating appropriate averages and measure of spread by numerical calculation and by using a spreadsheet. Interpret data, including calculated averages and measures of spread in context. For example, the ages of learners using park equipment.
The median of an even sized, ordered data set is the mean of the two central values. The mean of a data set is affected by unusually low or high values. Where this is the case, the median provides a more reliable average of the data set.	Find the median of numerical data sets with any number of data items, by ordering the data and identifying the middle value(s). Calculate the mean and median of data sets to investigate the impact unusually high or low values have on these averages. Select, calculate and justify the most appropriate average for small data sets. For example, choosing to find the median number of steps walked in a day if one pupil records an unusually high step count.		

Notes
Averages can be described as measures of central tendency. The range, as a measure of spread, is often (mistakenly) interpreted as an average.
Exclude
The terms normal, skewed and outlier.
New key mathematical language (Learners)
distribution of data, median, mean, dataset, numerical data, dot plot, spatial pattern, average

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Probability

Information, Data and Uncertainty - Probability			
Beginning of Third Level ← → **End of Third Level**			
Understand: Experimental data informs estimates of probability, supporting predictions about future outcomes.			
Know	**Do**	**Know**	**Do**
Outcomes of a single event are mutually exclusive if only one of them can happen at any one time. For equally likely, mutually exclusive outcomes, the probability of a given event occurring is found by dividing the number of favourable outcomes by the total number of possible outcomes. If the outcomes of an event are mutually exclusive, the sum of their probabilities is 1.	Identify mutually exclusive outcomes in a single event and represent these in a diagram. For example, creating a tree diagram to show that a card drawn from a standard pack of 52 playing cards must be from one of four possible suits. Determine and justify the probability of an event using existing knowledge of possible outcomes. For example, finding the probability of selecting a blue counter from a bag containing counters of different colours. Check calculated probabilities of mutually exclusive outcomes of events by using the fact that the probabilities of all these possible outcomes should add to 1. Calculate probabilities of mutually exclusive outcomes by using the total probability of 1. For example, if the probability of winning is 0·2 then the probability of not winning is 0·8.	Relative frequency is the proportion of times a specific event occurs compared to the total number of observations. The probabilities of more unpredictable events are more difficult to calculate and can be determined through experimental trials where the relative frequency of events is measured. Once known or calculated, probability can be used to estimate the expected frequency of an event happening.	Explain why some probabilities are difficult to calculate due to the number of affecting factors. For example, the insurance risk of a particular driver, the risk of a construction project going over budget. Estimate, using experimental data, probabilities through relative frequency, noticing how increasing the number of trials increases the likely accuracy of these estimates. For example, recording which way a loaded dice lands. Estimate expected frequencies using calculated probabilities and interpret what this suggests about likely outcomes. For example, using the probability of matching three balls in the National Lottery to estimate the likely number of winners given the number of entries.
Notes Make connections between relative frequency and a proportion shown on a pie chart. Experiments with unknown probabilities could include, dropping a drawing pin to land pin up or pin down, predicting the nature of an incomplete deck of card by observing the number of red and black cards drawn at random, dropping a small item to see if it lands inside, outside or on a circular target. **New key mathematical language (Learners)** mutually exclusive outcomes, mathematical modelling, relative frequency			

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Fourth Level

Data management

Information, Data and Uncertainty - Data Management	
Beginning of Fourth Level ⟷ **End of Fourth Level**	
Understand: The design and wording of survey questions can introduce bias, affecting the reliability and validity of the evidence collected.	
Know	**Do**
The wording of survey questions can lead to the collection of unreliable or biased information. This may be deliberate but often is not. Leading questions are those which suggest a particular answer. Loaded questions are those which are unfair or impossible to answer. Double-barrelled questions are those which ask two things at the same time.	Identify features of given survey questions that could lead to a bias in responses, including leading, loaded and double-barrelled questions. For example, 'How much did you enjoy our new easy-to-use checkout page?' is leading because it pushes responders towards a positive response. 'When will we stop wasting taxpayer money on unreliable wind and solar energy?' is loaded because by answering, responders inadvertently agree that taxpayer money is wasted and that renewable energy is unreliable. 'Do you agree that the government should increase funding for affordable housing and should raise the minimum wage?' is double-barrelled because does not give the option of agreeing with one policy but not the other. Make suggestions as to how given survey questions could be made more neutral or accurate in their framing.
Notes Make connections to Evidence and Enquiry within Social Studies and to business contexts**.** For example, reader polls conducted by news outlets, surveys collecting political views, product satisfaction surveys. **New key mathematical language (Learners)** unreliable, bias, loaded question, double-barrelled question	
Understand: Grouping data into intervals organises large data sets but reduces detail.	
Know	**Do**
Numerical data can be grouped into class intervals and organised in a grouped frequency table. This enables efficient organisation but comes with a loss of detail. Histograms are charts which show the distribution of grouped numerical data.	Interpret the notation associated with class intervals. For example, $1 \leq x < 2$. Organise given data sets into grouped frequency tables where class intervals have been provided. Identify key features of grouped numerical data sets from given histograms.
Notes Select data sets and histograms from meaningful contexts across the curriculum. For example, the age distribution of a population from census data (population pyramid), the resting pulse rates of people of a similar age. **Includes but is not limited to** Only equally sized class intervals for histograms. **New key mathematical language (Learners)** grouped frequency table, histogram, class intervals	

Data analysis and interpretation

Information, Data and Uncertainty - Data Analysis and Interpretation	
Beginning of Fourth Level ⟷ **End of Fourth Level**	
Understand: The ways in which data is collected and presented can emphasise or obscure particular conclusions.	
Know	**Do**

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Data and visualisations can be manipulated or presented out of context to influence opinions. This raises ethical considerations about how data is collected, presented and interpreted. Data representations may be inadvertently misleading or difficult to interpret.	Analyse a wide range of given and created data visualisations and explain how design choices influence the message being communicated. Identify and explain features which make visualisations effective, ineffective or misleading.

Notes
Examples of misleading data representations include unrepresentative samples, graphs with truncated or unevenly marked axes, proportions not adding to 100%, misleading or incorrect use of bubbles or other spaces, scale issues on pictographs and bar charts. These can be found in the media, advertising, company reports and news articles.
The source of the data represented by any visualisation should always be taken into consideration when assessing its reliability.
Headlines may mis-represent the data they are based on, in order to create talking points and controversy. Examples linked to current news stories may promote interesting discussion.

Understand: The distribution of data sets can be described and compared using measures that capture central tendency, spread and position.

Know	Do
The medians of the lower and upper halves of a data set are called the lower and upper quartiles. A five-figure summary shows key characteristics of a data set. It includes the lowest, highest, median, upper and lower quartile data values. A box plot is a spatial representation of the five-figure summary of a data set's distribution. The variability and typical value of two or more data sets can be compared using box plots.	Find the upper and lower quartiles of numerical data sets. Produce five figure summaries for numerical data sets. Interpret given box plots by describing the distribution of data sets they represent. Compare two or more numerical data sets using five-figure summaries and box plots by referencing their position and distribution.

Notes
Box plots are sometimes known as box and whisker diagrams. Include vertical and horizontal examples of box plots.
Make connections to distributions shown by dot plots when interpreting box plots, this might include matching exercises. Pay particular attention to central tendency and extreme values.
Examples of numerical data sets that could be compared include numerical weather data in two or more locations, comparing sales before and after an advertising campaign, comparing census information between countries or different time periods.
New key mathematical language (Learners)
lower and upper quartiles, five-figure summaries, box plot

Probability

Information, Data and Uncertainty - Probability

Beginning of Fourth Level ⟷ **End of Fourth Level**

Understand: Probabilities derived from data are used in real-life contexts to assess risk and inform decision-making.

Know	Do
Probability models, derived from data, are used in real-life contexts and in industry to make and refine predictions, assess risk and make informed choices and decisions. There are common misconceptions about probability that can affect the reliability of decision making.	Compare possible outcomes and assess risk in real-life contexts by using probability models. For example, comparing the likelihood of injury in different sports and pastimes, deciding whether to delay a journey based on the likelihood of disruption, identifying risks that might affect a local business. Justify choices or decisions using probability, explaining the reasoning behind them. For example, when planning a project or event, identify and assess risks to inform contingency planning. Identify situations where past events are mistakenly thought to affect future outcomes. Explore situations where probabilities are counter intuitive.

Notes
Counter-intuitive examples might include the Monty Hall problem, the chances of a coin landing on heads after a long run of tails (the gambler's fallacy), mistaking serious consequences for statistical risk such as the safety of road travel vs air travel, the relative safety of power generation methods (the availability heuristic).

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Declaration

The content of this document was written by the author, exercising full professional judgement. Education Scotland approved AI tools were used to support review, clarity and quality assurance. Education Scotland staff retain full responsibility and have reviewed and approved all content.

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Version History

Version	Date	Detail
Version 1.0	4 November 2026	First released

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