SHIRLAND PRIMARY SCHOOL

Progression in Mathematics

October 2014

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Document Development

This document provides a link between the curriculum requirements for the Early Years Foundation Stage and the National Curriculum programmes of study for Key Stages 1, 2 and 3. For Key Stage 1 and 2, the 2014 Curriculum for Mathematics published by the DfE has been used as the framework document. This document therefor ensures that we meet the statutory requirements of the National Curriculum for England. We have made decisions about some additional content which is also included within the document.

The Purpose of Studying Mathematics

The National Curriculum states that:

> *"Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary in most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, and a sense of enjoyment and curiosity about the subject."*

Aims of the National Curriculum

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

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

Developing Mathematical Thinking

At Shirland Primary School we believe that we should encourage our children to think mathematically, and that they will be given the opportunities to develop these skills both through the maths curriculum and the wider school curriculum. Where maths can be taught within themes and topics, staff use their skill and expertise to develop the children's mathematical thinking. The following mathematical thinking skills are defined as essential to our curriculum

Children learn how to:

1. **represent and model situations using mathematics**, using a range of tools and applying logic and reasoning in order to predict, plan and try out options
2. **use numbers and measurements** for accurate calculation and understanding of scale, in order to make reasonable estimations.
3. **interpret and interrogate mathematical data** in graphs, spreadsheets and diagrams, in order to draw inferences, recognise patterns and trends, and assess likelihood and risk
4. **use mathematics to justify and support decisions and proposals**, communicating accurately using mathematical language and conventions, symbols and diagrams

The use of Information and Communication Technology (ICT)

The National Curriculum states:

> *"Calculators should not be used as a substitute for good written and mental arithmetic. They should therefore only be introduced near the end of Key Stage 2 to support pupils' conceptual understanding and to exploration of more complex number problems, if written and mental arithmetic are secure. In both primary and secondary schools, teachers should use their judgement about when ICT tools should be used."*

At Shirland Primary School we also believe that it is important that children learn to:

- Create, manipulate and process information using technology to capture and organise data, in order to investigate patterns and trends and explore options using models and simulations.

Structure and Organisation of the Curriculum

The 2014 National Curriculum has been grouped into 12 distinct learning areas:

Number, place value and rounding	Addition and subtraction	Multiplication and division
Fractions	Decimals	Percentages
Algebra	Properties of Shapes	Position, direction and motion
Statistics	Measure	Ratio and Proportion

We have added two additional learning areas to the curriculum document, as we feel these are essential mathematical skills that need to be recognised, taught and learnt.

Estimation and approximation	Problem solving

These can be organised into four distinct teaching blocks:

Block 1: The Basics: Number and the four operations

45% of teaching time at Key Stage 1 and 40% of teaching time at Key Stage 2.

This is equivalent to 18 weeks in the school year for Key Stage 1, and 16 weeks in Key Stage 2.

- Number, place value and rounding
- Addition and subtraction
- Multiplication and division

Block 2: The use and application of number in context

30% of teaching time at Key Stage 1 and 40% of teaching time at Key Stage 2.

This is equivalent to 12 weeks across the year in Key Stage 1, and 16 weeks in Key Stage 2.

- Fractions
- Decimals
- Percentages
- Algebra
- Ratio and proportion
- Data

Block 3: Geometry and measurement

25% of teaching time at Key Stage 1 and 20% of teaching time at Key Stage 2.

This is equivalent to 9 weeks across the year in Key Stage 1, and 7 weeks in Key Stage 2.

- Properties of shape
- Position, direction and motion
- Measure

Block 4: Maths in context (integral to Blocks 1-3, approximately 20% of teaching time within each block)

- Estimation and approximation
- Problem solving

Blocks 1 – 3 are taught as separate units, with links being made in the planning between the learning areas where appropriate. At times, objectives within some of the learning areas will need to be taught discreetly.

Block 4 should be taught and practiced in the teaching of blocks 1-3, and should not be taught in isolation. The overarching importance of being able to estimate, approximate and apply the learning in Blocks 1-3 into problem solving situations should receive a high priority. Learners should be very aware that this is the reason why the majority of people learn maths, and should be able to communicate this in age appropriate ways throughout school.

Block 1: The Basics; Number and the Four Operations

	Numbers, Place Value and Rounding	Addition and Subtraction	Multiplication and Division
Phase 1	• Selects a small number of objects from a group when asked, e.g. 'give me one; give me two'. • Recites some number names in sequence. • Creates and experiments with symbols and marks representing ideas of number. • Begins to make comparisons between quantities. • Uses some language of quantities, such as '*more'* and '*a lot'.* • Uses some number names and number language spontaneously. • Uses some number names accurately in play. • Recites numbers in order to 10. • Knows that numbers identify how many objects are in a set. • Beginning to represent numbers using fingers, marks on paper or pictures. • Sometimes matches numeral and quantity correctly. • Shows curiosity about numbers by offering comments or asking questions.	• Knows that a group of things changes in quantity when something is added or taken away. • Compares two groups of objects, saying when they have the same number.	• Separates a group of three or four objects, but anything can be counted, including steps, claps or jumps.
Phase 2	• Recognises some numerals of personal significance. • Recognises numerals 1-5. • Counts up to 3 or 4 objects by saying one number name after each object. • Counts actions or objects that can't be moved. • Count out up to 6 objects from a larger group. • Selects the correct numeral to represent 1-5, then 1-10 objects. • Counts an irregular arrangement of up to 10 objects. • Records using marks that they can interpret and explain. • Begins to identify own mathematical problems based on own interests. **Early Learning Goal** **Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.**	• Uses the language of 'more' and 'fewer' to compare two sets of objects. • Finds the total number of items in two groups by counting all of them. • Says the number that is one more than a given number. • Finds one more or one less from a group of up to 5 objects, then 10 objects. • In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting.	• Group physical objects into ones and twos (moving onto grouping into fives with G & T)
Phase 3	• count from 0 to and across 100, forward and backwards, beginning with 0 or 1, and from any given number • count, read and write numbers to 100 in numerals, count in different multiples including ones, twos, fives and tens • given a number, identify one more and one less • identify and represent numbers using concrete objects and pictorial representations including the number line, and use the vocabulary of: equal to; more than; less than (fewer); most; least • recognise odd and even numbers • read and write numbers from 1 to 20 in numerals and words	• read, write and interpret writing mathematical statements involving addition (+), subtraction (-) and equals (=) • recall, represent and use number bonds and related subtraction facts within 20 • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • solve simple one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems.	• count in different multiples including ones, twos, fives and tens • use physical apparatus to calculate the doubles of numbers up to 10, counting sets of two objects. • use physical apparatus to calculate half of an even set of objects totalling less than 20 • solve simple one-step problems involving multiplication and division, calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

	Numbers, Place Value and Rounding	Addition and Subtraction	Multiplication and Division
Phase 4	• count in steps of 2, 3, 5 and 10, count in tens from any number, and give 10 more or less than a given number to 100 • recognise the place value of each digit in a 2-digit number (tens, ones) • identify, represent and estimate numbers using different representations, including the number line • compare and order numbers from 0 up to 100; use <, > and = signs • read and write numbers to at least 100 in numerals and in words • solve word problems using place value and number facts with increasing precision	• Solve simple one-step problems with addition and subtraction: - Using concrete objects and pictorial representations, including those using numbers, quantities and measures - Applying their increasing knowledge of mental and written methods • recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • add and subtract numbers mentally including: - three 1-digit numbers - a 2-digit number and ones - a 2-digit number and tens - two 2-digit numbers • show that addition can be done in any order (commutative) and subtraction of one number from another cannot • recognise and use addition and subtraction as inverse operations including to check calculations and missing number problems	• recall multiplication and division facts for the 2, 5 and 10 multiplication tables including recognising odd and even numbers • apply knowledge of the 2x tables and place value of digits in 2-digit numbers to double numbers up to 50 • calculate half of any even number to 100. • Using physical apparatus, calculate half of an odd number of objects, giving the answer as a remainder and fraction • calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs • orally recognise and use the inverse relationship between multiplication and division to check calculations • show that multiplication can be done in any order (commutative) and division of one number by another cannot • solve one-step problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
Phase 5	• count on from 0 in multiples of 4, 8, 50 and 100; finding 10 or 100 more or less than a given number • recognise the place value of each digit in a 3-digit number (hundreds, tens, ones) • compare and order numbers up to 1 000 • identify, represent and estimate numbers using different representations • read and write numbers to at least 1000 in numerals and in words • solve number problems and practical problems using these ideas	• accurately add and subtract numbers mentally including: - 3-digit numbers and ones; - 3-digit numbers and tens; - 3-digit numbers and hundreds • add and subtract numbers with up to 3 digits, using the efficient written methods of columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers. • solve word problems including missing number problems, using number facts, place value, and more complex addition and subtraction.	• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • apply knowledge of the 2x tables and place value of digits in 3-digit numbers to double numbers • calculate half of any number up to 1 000. • write and calculate mathematical statements for multiplication and division within the multiplication tables they know, including 2-digit numbers x 1-digit numbers, using mental and progressing to written methods • solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which *n* objects are connected to *m* objects
Phase 6	• count in multiples of 6, 7, 9, 25 and 1 000 • find 1 000 more or less than a given number • count backwards through zero to include negative numbers • recognise the place value of each digit in a 4-digit number (thousands, hundreds, tens, and ones) • order and compare numbers beyond 1 000 • identify, represent and estimate numbers using different representations • **read and write numbers to at least 10 000** • round any number to the nearest 10, 100 or 1 000 • solve number and practical problems that involve all of the above and with increasingly large positive numbers • read Roman numerals to 100 (I to C) and understand how, over time, the numeral system changed to include the concept of zero and place value	• add and subtract numbers with up to 4 digits using the efficient written methods of columnar addition and subtraction where appropriate • estimate and use inverse operations to check answers. • solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	• recall multiplication and division facts for multiplication tables up to 12 x 12 • use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers; doubling and halving any number • recognise and use factor pairs and commutativity in mental calculations • multiply or divide 2-digit and 3-digit numbers by a 1-digit number using efficient written methods • solve problems involving multiplying and adding, including the distributive law and harder multiplication problems such as which *n* objects are connected to which *m* objects.

	Numbers, Place Value and Rounding	Addition and Subtraction	Multiplication and Division
Phase 7	• read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit • count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 • interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero • round any number up to 1 000 000 to the nearest 10, 100, 1 000, 10 000 and 100 000 • solve number problems and practical problems that involve all of the above • read Roman numerals to 1000 (M) and recognise years written in Roman numerals.	• add and subtract whole numbers with more than 4 digits, including using efficient written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers. • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	• identify multiples and factors including all factor pairs • know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • establish whether a number up to 100 is prime and recall the prime numbers up to 19 • multiply numbers up to 4-digits by a 1 or 2-digit number using an efficient written method, including long multiplication for 2-digit numbers • multiply and divide numbers mentally drawing upon known facts • divide numbers up to 4 digits by a 1-digit number using the efficient written method of short division and interpret remainders appropriately for the context • multiply and divide numbers by 10, 100 and 1 000 • recognise and use square numbers and square roots, and the notation for squared (^{2}) and cubed (^{3}). • solve word problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes • solve problems involving addition and subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • solve problems involving multiplication and division including scaling by simple fractions and problems involving simple rates
Phase 8	• read, write, order and compare numbers up to 10 million and determine the value of each digit • round any number to a required degree of accuracy • use negative numbers in context, and calculate intervals across zero • solve number problems and practical problems that involve all of the above	• add and subtract negative integers • perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the four operations • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy	• multiply numbers with at least 4-digits by a 2-digit whole number using long multiplication • divide numbers up to 4-digits by a 2-digit whole number using long division, and interpret remainders as whole number remainders, fractions, decimals or by rounding as appropriate for the context • identify common factors, common multiples and prime numbers • use their knowledge of the order of operations to carry out calculations involving the four operations • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy • divide numbers up to 4 digits by a 2-digit number using the efficient written method of short division and interpret remainders appropriately for the context
Phase 9	• understand and use place value for decimals, measures and integers of any size. • Order positive and negative integers, decimals and fractions; use the number line as a model for ordering if the real numbers; use the symbols =, ≠, <, >, ≤, ≥ • Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common factor, prime factorisation, including using product notation and the unique factorisation property. • Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions and mixed numbers, all both positive and negative. • Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals. • Recognise and use relationships between operations including inverse operations • Use standard column procedures for multiplication and division of integers and decimals including by decimals to the hundredths • Appreciate the infinite nature of the sets of integers.		

Block 2: The use and application of number in context

	Fractions	Decimals	Percentages
Phase 3	• recognise, find, name and write $^{1}/_{2}$ as one of two equal parts of an object, shape or quantity • recognise, find and name a $^{1}/_{4}$ as one of four equal parts of an object, shape or quantity		
Phase 4	• recognise, find, name and write fractions $^{1}/_{3}$, $^{1}/_{4}$, $^{2}/_{4}$, and $^{3}/_{4}$ of a length, shape, set of objects or quantity • write simple fractions e.g. $^{1}/_{2}$ of 6 = 3 and recognise the equivalence of two quarters and one half		
Phase 5	• recognise and use the language of fractions including denominator and numerator • count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts an in dividing one-digit numbers or quantities by 10 • recognise, find and write fractions of a discreet set of objects: unit fractions and non-unit fractions with small denominators • recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators • recognise and show, using diagrams, equivalent fractions with small denominators • add and subtract fractions with the same denominator within one whole (e.g. $^{5}/_{7}$ + $^{1}/_{7}$ = $^{6}/_{7}$) • compare and order unit fractions with the same denominator • solve problems that involve all of the above.		
Phase 6	• recognise and show, using diagrams families of common equivalent fractions • count up and down in hundredths: recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten • solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is not a whole number • identify, name and write equivalent fractions of a given fraction, including tenths and hundredths • add and subtract fractions with the same denominator	• recognise and write decimal equivalents of any number of tenths or hundredths • recognise and write decimal equivalents to ¼, ½ and ¾ • find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths • round decimals with one decimal place to the nearest whole number • compare numbers with the same number of decimal places up to two decimal places. • Solve simple measure and money problems involving fractions and decimals to 2 decimal places.	
Phase 7	• compare and order fractions whose denominators are all multiples of the same number • recognise mixed numbers and improper fractions and convert from one form to the other • add and subtract fractions with the same denominator and related fractions; write mathematical statements that exceed 1 as a mixed number: (e.g. $^{2}/_{5}$ + $^{4}/_{5}$ = $^{6}/_{5}$ = $1^{1}/_{5}$) • multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	• read and write decimal numbers as fractions (e.g. 0.71 = $^{71}/_{100}$) • recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents • round decimals with two decimal places to the nearest whole number and to one decimal place • read, write, order and compare numbers with up to three decimal places • solve problems involving number up to three decimal places	• recognise the per cent symbol (%) and understand that per cent relates to “number of parts per hundred” for example that 100% represents a whole quantity and 1% is 1/100, 50% is 50/100, 25% is 25/100, etc. • write simple fractions as percentages and decimals as percentages (e.g. ½ = 50% = 0.5). • solve problems which require knowing percentage and decimal equivalents of ½, ¼, $^{1}/_{5}$, $^{2}/_{5}$ and $^{4}/_{5}$ and those fractions with a denominator of a multiple of 10 or 25.

	Fractions	Decimals	Percentages
Phase 8	• use common factors to simplify fractions; use common multiples to express fractions in the same denomination • compare and order fractions, including fractions >1 • associate a fraction with division to calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. 3/8). • add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions • multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. ¼ x ½ = $^1/_8$) • divide proper fractions by whole numbers (e.g $^1/_3 \div 2 = 6$)	• identify the value of each digit to three decimal places and multiply and divide numbers up to three decimal places by 10, 100 and 1 000 where the answers are up to three decimal places • multiply 1-digit numbers with up to two decimal places by whole numbers • use written division methods in cases where the answer has up to 2 decimal places • solve problems which require answers to be rounded to specified degrees of accuracy	• use percentages for comparison and calculate percentages of whole numbers or measures such as 15% of 360 and the use of percentages for comparison • recall and use equivalences between simple fractions, decimals and percentages including in different contexts
Phase 9	• They add and subtract fractions by writing them with a common denominator. • Work interchangeably with terminating decimals and their corresponding fractions such as 3.5 and $^7/_2$ or 0.375 and $^3/_8$		• Find the outcome of a given percentage increase or decrease • Define percentage as “number of parts per hundred”, interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using a percentage, and work with percentages greater than 100%

	Algebra	Ratio and Proportion	Statistics
Phase 4			• interpret and present data using pictograms, tally charts, block diagrams and simple tables • ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity • ask and answer questions about totalling and compare categorical data
Phase 5			• interpret and present data using bar charts, pictograms and tables • solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables
Phase 6			• interpret and present discrete data using bar charts and continuous data using appropriate graphical methods, including bar charts and time graphs. • solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and simple line graphs
Phase 7	• Pupils should be introduced to the use of symbols and letters to represent variables and unkowns in mathematical situations that they already understand such as: - Missing numbers, lengths, coordinates and angles - Arithmetical rules (e.g. a+b = b+a) - Number puzzles (e.g. what two numbers can add up to)		• solve comparison, sum and difference problems using information presented in line graphs • complete, read and interpret information in tables, including timetables
Phase 8	• Generate and extend linear number sequences • Express missing number problems algebraically • Find pairs of numbers that satisfy number sentences involving two unknowns. • Enumerate possibilities of combinations of two variables	• Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts • Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples • Solve problems involving similar shapes where the scale factor is known or can be found • recognise equivalent ratios and reduce a given ratio to its lowest terms	• interpret and construct pie charts and line graphs and use these to solve problems • calculate and interpret the mean as an average • calculate and interpret the mode and median as an average • solve different types of problems using averages
Phase 9	• use and interpret algebraic notation, including: ○ ab in place of a x b ○ 3y in place of y + y + y and 3 *x* y ○ a^2 in place of a *x* a, a^3 in place of a *x* a *x* a; a^2b in place of a *x* a *x* b ○ $^a/_b$ in place of a ÷ b ○ coefficients written as a fraction rather than as a decimal ○ brackets • substitute numerical values into formulae and expressions, including scientific formulae • understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors. • Understand and use standards mathematical formulae; rearrange formulae to change the subject • Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs • Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement). • Recognise arithmetic sequences and find the *n*th term.	• recognise and use division in the context of fractions, percentages and ratio. • Use ration notation, including reduction to the simplest form. • Divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio • Understand that a multiplicative relationship between quantities can be expressed as a ratio or a fraction. • Relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions. • Solve problems involving percentage change, including: percentage increase, decrease, and original value problems and simple interest in financial mathematics.	• Describe, interpret and compare observed distributions of a seingle variable through: appropriate graphical representations involving discrete continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers). • Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie chart for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data.

Block 3: Geometry and measurement

	Properties of Shapes	Position, Direction and Motion	Measure
Phase 1	• Notices simple shapes and patterns in pictures. • Beginning to categorise objects according to properties such as shape and sizes. • Shows an interest in shape and space by playing with shapes or making arrangements with objects. • Shows awareness of similarities of shapes in the environment. • Shows interest in shape by sustaining construction activities or by talking about shapes or arrangements. • Shows interest in shapes in the environment. • Uses shapes appropriately for tasks. • Beginning to talk about the shapes of everyday objects, e.g. 'round' and 'tall'	• Uses positional language.	• Beginning to categorise objects according to properties such as shape and sizes. • Begins to use the language of size. • Understands some tasks about the immediate past and future, e.g. 'before', 'later' or 'soon'. Anticipates specific time-based events such as mealtimes or home time.
Phase 2	• Beginning to use mathematical names for 'solid' 3D shapes and 'flat' 2D shapes, and mathematical terms to describe shapes. • Selects particular named shape. • Uses familiar objects and common shapes to create and recreate patterns and build models.	• Can describe their relative position such as 'behind' or 'next to'.	• Orders two or three items by length or height. • Orders two items by weight or capacity. • Uses everyday language related to time. • Order and sequences familiar events. • Measures short periods of time in simple ways. • Beginning to use everyday language related to money. **Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.**
Phase 3	• recognise and name common 3-D and 2-D shapes, including: - 2-D shapes (e.g. rectangles (including squares), circles and triangles) - 3-D shapes (e.g. cuboids (including cubes), pyramids and spheres).	• order and arrange combinations of objects and shapes in patterns • describe position, directions and movements including half, quarter and three- quarter turns. • Left and right, close and far, forwards and backwards, inside and outside	• compare, describe and solve practical problems for: - lengths and heights (e.g. long/short, longer/shorter, tall/short, double/half) - mass/weight (e.g. heavy/light, heavier than, lighter than) - capacity and volume (full/empty, more than, less than, quarter, three quarters full or empty) - time (quicker, slower, earlier, later) • measure and begin to record the following: - lengths and heights (e.g. long/short, longer/shorter, tall/short, double/half) - lengths and heights (metres, centimetres) - mass (grams, kilograms) - capacity and volume (litres) - time (hours, minutes, seconds) • recognise and know the value of denominations of coins and notes • sequence events in chronological order using common terms such as: before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening • recognise and use the language of dates, including days of the week, weeks, months and years. • tell the time to the hour and half past the hour

	Properties of Shapes	Position, Direction and Motion	Measure
Phase 4	• identify and describe the properties of 2-D shapes, including the number of sides and line symmetry • identify and describe the properties of 3-D shapes including the number of edges, vertices and faces • identify 2-D shapes on the surface of 3-D shapes, for example rectangle and square on a cuboid, circle on a cylinder, triangle on a pyramid • compare and sort common 2-D and 3-D shapes and everyday objects.	• order and arrange combinations of mathematical objects in patterns • use mathematical vocabulary to describe position, direction and movement, including rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clock-wise and anti-clockwise), and movement in a straight line	• choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm/mm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels • compare and order lengths, mass, volume/capacity and record the results using >, < and = • read relevant scales to the nearest numbered unit • recognise and use symbols for pounds (£) and pence (p); recognise coins and notes of different values; combine amounts to make a particular value and match different combinations of coins to equal the same amounts of money; add and subtract money of the same unit. • solve simple problems in a practical context involving addition and subtraction of money • compare and sequence intervals of time • tell and write the time to 5 minutes including quarter past/to the hour and draw hands on a clock face to show these times • know the number of minutes in an hour and the number of hours in the day.
Phase 5	• draw 2-D and make 3-D shapes using modelling materials; recognise in different orientations; and describe with increasing accuracy • recognise angles as a property of shape and associate angle as an amount of turning • identify horizontal, vertical, perpendicular, parallel and curved lines in relation to other lines	• identify right angles, recognise that two right-angles make a half-turn and four a complete turn; identify whether angles are greater or less than a right angle • relate understanding of right-angled turns and half turns to compass positions.	• measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml); • measure the perimeter of simple 2-D shapes • add and subtract amounts of money to give change, using both £ and p in practical contexts • estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as am/pm, morning, afternoon, noon and midnight • know the number of seconds in a minute and the number of days in each month, year and leap year • compare durations of events, for example to calculate the time taken up by particular events or tasks • recognise and use full names and abbreviations for metric units of measure
Phase 6	• compare and classify geometric shapes, including quadrilaterals and triangles based on their properties and sizes • identify acute and obtuse angles and compare and order angles up to two right angles by size. • identify lines of symmetry in 2-D shapes presented in different orientations • complete a simple symmetric figure with respect to a specific line of symmetry	• describe positions, and movements between positions, on a 2-D grid, and as coordinates in the first quadrant • describe movements between positions as translations of a given unit to the left/right and up/down • plot specified points and draw sides to complete a given polygon • **Recognise the angle of turn associated with movement between any of the eight compass points.**	• convert between different units of measure, for example: kilometre to metre; metre to centimetre; centimetre to millimetre; kilogram to gram; litre to millilitre; • measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres • find the area of rectilinear shapes by counting squares • estimate, compare and calculate different measures, including money in pounds and pence. • Read, write and convert time between analogue and digital 12- and 24- hour clocks. • solve problems including converting from hours to minutes; minutes to second; years to months; weeks to days

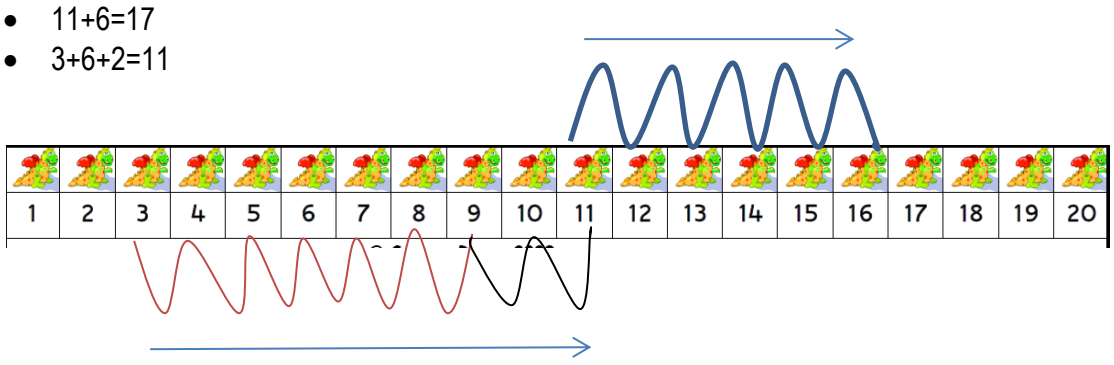
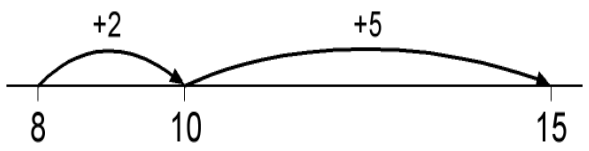
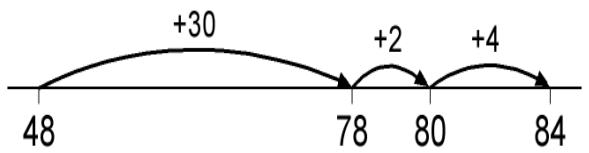
	Properties of Shapes	Position, Direction and Motion	Measure
Phase 7	• identify 3-D shapes including cubes and cuboids from 2-D representations. • Know angles are measured in degrees; estimate and measure them and draw a given angle, writing its size in degrees (^{0}); estimate and compare acute, obtuse and reflex angles. • identify: - multiples of 90^o - angles at a point on a straight line and ½ a turn (total 180^o) - angles at a point and one whole turn (total 360^o) - reflex angles and - compare different angles • draw shapes using dimensions and angles • use the properties of rectangles to deduce related facts and find missing lengths and angles. • distinguish between regular and irregular polygons based on reasoning about equal sides and angles	• identify, describe and represent the position of a shape following a reflection or translation using the appropriate vocabulary, and knowing that the shape has not changed.	• understand and use basic equivalencies between metric and common imperial units and express them in approximate terms • measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres • calculate and compare the area of squares, rectangles and related composite shapes using standard units, including centimetre squared (cm^2) and metre squared (m^2) and estimate the area of irregular shapes • estimate volume (e.g. using 1cm^3 blocks to build cuboids (including cubes)) and capacity (e.g. using water) • solve problems converting between the units of time • solve problems involving all four operations using of units of measure (e.g. length, mass, volume, density) using decimal notation, including scaling. • recognise that shapes with the same areas can have different perimeters and vice versa • measure force in Newtons (N)
Phase 8	• recognise, describe and build simple 3-D shapes, including making nets • compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons • illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius • recognise angles and find unknown angles involving angles at a point, on a straight line, in a triangle (180^o), in a quadrilateral (360°) and vertically opposite angles.	• describe positions on the full coordinate grid (all four quadrants) • construct, translate and reflect simple shapes on the coordinate plane and reflect them in the axes.	• solve problems involving the calculation and conversion of units of measure, using decimal notation to three decimal places where appropriate • use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, including between miles and kilometres using decimal notation to three decimal places • calculate the area of parallelograms and triangles • recognise when it is necessary to use the formulae for area and volume of shapes • Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3) and extending to other units, such as mm^3 and km^3
Phase 9	• They solve problems using angle and symmetry, properties of polygons and angle properties of intersecting and parallel lines, and explain these properties. • They devise instructions for a computer to generate and transform shapes and paths. • They understand and use appropriate formulae for finding circumferences and areas of circles, areas of plane rectilinear figures and volumes of cuboids when solving problems.	• Enlarge 2-D shapes given a centre of enlargement and a positive whole number scale factor • Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric. • Use the standard conventions for labelling sides and angles of triangle ABC, and know and use the criteria for congruence of triangles. • Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures. • Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles.	• identify alternate and correspondent angles; understand a proof that the sum of the angles of a triangle is 180 degrees and of a quadrilateral is 360 degrees • derive and apply formulae to calculate and solve problems involving: perimeter and areas of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders). • Draw and measure line segments and angles in geometric figures, including interpreting scale drawings • Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons.

Block 4: Maths in Context

	Estimation and Approximation	Problem Solving
Phase 1	• Estimates how many objects they can see and checks by counting them	
Phase 2	• Use non-standard units of measure to estimate how many steps/ hands something is e.g. steps across the classroom (possible links to history topics e.g. Egyptians and cubits) • Estimate what is heavier/lighter • Estimate what will hold more i.e. which container will hold the most water/sand • Introduce the concept of standard measures, cms, ms, minutes and seconds	• Begins to identify own mathematical problems based on own interests.
Phase 3	• choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm/mm); mass (kg/g); temperature (°C); volume and capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels	• solve simple problems (oral and written) that involve addition and subtraction. • compare, describe and solve practical problems for: - lengths and heights (e.g. long/short, longer/shorter, tall/short, double/half) - mass (e.g. heavy/light, heavier than, lighter than) - capacity and volume (full/empty, more than, less than, quarter, three quarters full or empty) - time (quicker, slower, earlier, later)
Phase 4	• estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as am/pm, morning, afternoon, noon and midnight • estimate and read measurements with increasing accuracy to the nearest cm.	• solve problems (oral and written) involving simple multiplication and division, with teacher support. • solve simple word problems that involve addition and subtraction. • solve problems that compare and describe: - lengths and heights (e.g. long/short, longer/shorter, tall/short, double/half) - mass (e.g. heavy/light, heavier than, lighter than) - capacity and volume (full/empty, more than, less than, quarter, three quarters full or empty) - time (quicker, slower, earlier, later)
Phase 5	• estimate, within a range, the answer to a calculation and use inverse operations to check answers.	• solve word problems including missing number problems, using number facts, place value, and more complex addition and subtraction. • solve word problems involving the four operations, including missing number problems. • solve problems with addition and subtraction of fractions with the same denominator within one whole (e.g. 5/7 + 1/7 = 6/7) • solve problems using information presented in pictograms, bar charts and tables.
Phase 6	• estimate, compare and calculate different measures, including money in pounds and pence. • estimate the answers to calculations involving addition, subtraction, multiplication and division • calculate, estimate and compare the area of squares, rectangles and related composite shapes using standard units, including centimetre squared (cm2) and metre squared (m2)	• solve word problems that involve negative and increasingly large positive numbers. • solve word problems involving the four operations. • solve problems that include reading, and interpreting information in bar graphs, including reading scales on the axes. • they develop systematic approaches to solving problems.
Phase 7	• use estimation to check answers to calculations and determine, in the context of a problem, whether an answer should be rounded or written as a fraction or a decimal • estimate the size of angles • Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm3) and cubic metres (m3) and extending to other units, such as mm3 and km3 • Check a result by considering whether it is the right order of magnitude (e.g. HTu xTu = TTh)	• solve word problems involving addition and subtraction, multiplication and division. • Solve problems by completing tables and bar graphs from given information and solve problems using data presented in bar graphs, tables and simple pie charts. • Use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation, including scaling. • They develop systematic approaches to finding all possible answers in a given problem.
Phase 8	• Pupils order and approximate decimals when solving numerical problems and equations, using trial and improvement methods.	• solve multi-step word problems involving addition, subtraction, multiplication and division in contexts, deciding which operations and methods to use and why. • solve problems that include drawing, reading and interpreting line graphs. • solve problems requiring the use and interpretation of averages including mean, median and mode and solve simple problems using different kinds of averages. • solve problems that require the finding of unknown angles involving angles at a point, on a straight line, in a triangle (180^{o})**,** in a quadrilateral (360°) and vertically opposite angles. • solve problems using decimal notation to three decimal places to solve problems involving calculation and conversion of measures.
Phase 9	• Use Pythagoras Theorem and trigonometric ratios in similar triangles to solve problems involving right angled triangles. • They use logical argument to establish the truth of a statement	• When solving problems, they use their knowledge that the total probability of all the mutually exclusive outcomes of an experiment is 1. • Pupils carry out substantial tasks and solve quite complex problems by independently and systematically breaking them down into smaller, more manageable tasks. • They interpret, discuss and synthesise information presented in a variety of mathematical forms, relating findings to the original context. • They begin to give mathematical justifications, making connections between the current situation and situations they have encountered before. • Construct on paper and using ICT a range of graphs and charts; identify which are most useful in the context of a problem

Calculations Progression

Addition

	Addition **The different steps**	**Addition** **Example of what it looks like**
Step 1	• Counting sets of moveable objects • Counting in ones using fingers	• Give one number name to each object. Recognise none and zero. • Children always start at the left hand side, thumb as 1, and continue along fingers to five and then left hand 6-10 completing with right thumb. Ensure that if teacher is facing children that a mirror image of this action is demonstrated to the facing children.
Step 2	• Combine 2 sets of objects into 1 group and counting practically • Drawing pictures/dots – informal jottings. Then counting how many altogether	• For example for 6+2=8 the children may get 6 cubes, then 2 more and count how many altogether. • 4+2=6 ****+**=****** (Children may only be able to say the number)
Step 3	• Counting on, on a number line with numbers on it (1 and 2 digit numbers to 20 and three 1 digit numbers)	• 11+6=17 • 3+6+2=11 
Step 4	**1)** Jumps in addition can be recorded on a number line. • The jumps often bridge through a multiple of 10. 1) Partition the number into tens and ones 2) Add on the tens 3) Add on the ones **2)** Introduce children to column formal written method. Partition number next to the column so children can see what the 4 in the tens column actually represents. Use the 'and' instead of + sign to show that 43 is made up of 40 and 3.	**1)** • 8 + 7 = 15  • 48 + 36 = 84 30 and 6 
		2) T O 4 3 = 40 and 3 + 3 2 = 30 and 2 7 5 70 and 5 = 75
Step 5	• Add numbers with up to 3 digits using formal written method of column addition. • Following Step 4 – set out the addition in column method. • Partition numbers next to the column (using the + sign) • Children encouraged to use mental calculations where possible to cross the 10s barriers. **2)** Progress to formal written method and writing in columns. Extend children who are set to be working above the national expectation to carrying the 10s across.	**1)** 47 = 40 + 7 + 76 70 + 6 110 + 13 = 123 H T O 1 2 7 = 100 + 20 + 7 + 4 6 40 + 6 100 80 + 12 = 192
		2) H T O 3 4 9 2 3 + 3 7 2 1
Step 6	**1)** Build on from Step 5. If children are unsure, start with aligning digits in columns and add vertically writing the numbers so children become secure with where the numbers are coming from. **2)** add and subtract numbers with up to 4 digits using the formal written methods of column addition and subtraction where appropriate. Numbers get carried into the next column. Introduce children to the inverse and how we can use this check we have the correct answer.	**1)** H T O 3 2 4 + 2 4 6 1 0 + 6 0 5 0 0 5 7 0
		2) Th H T O 1 3 2 4 2 4 6 1 5 7 0 1

Step 7	• Add whole numbers with more than 4 digits, including using formal written methods (column addition) • Add numbers mentally with increasingly large numbers	Hth Tth Th H T O 5 9 6 2 2 3 2 4 8 9 4 + 6 2 1 1 1 7 1 1 1
Step 8	• Add numbers with up to 3 decimal places using the shorter column addition • use their knowledge of the order of operations to carry out calculations involving the 4 operations • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	• 34.427 + 12.374 46.801 11

End of Year expectations for addition

End of **Year 1**: expectation that ALL children are secure in Step 1, Step 2 and Step 3.

End of **Year 2**: expectation that ALL children secure in Step 4

End of **Year 3**: expectation that ALL children secure in Step 5. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 4**: expectation that ALL children secure in Step 6. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

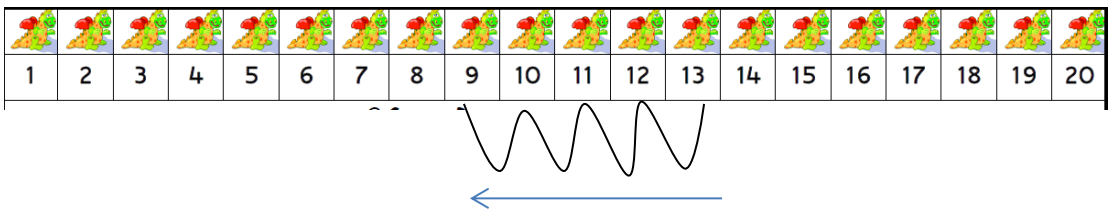
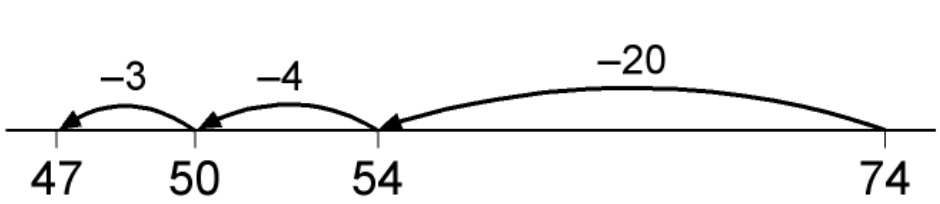
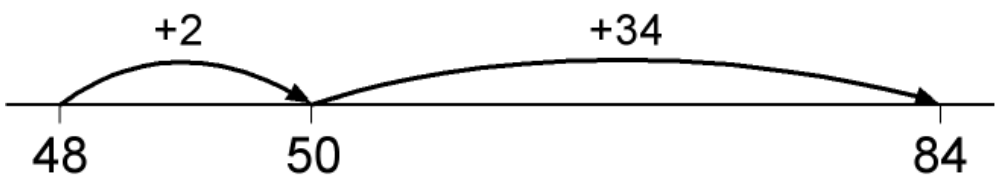
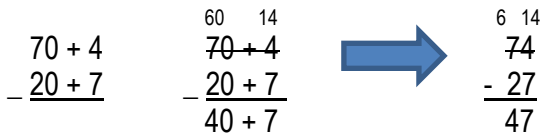
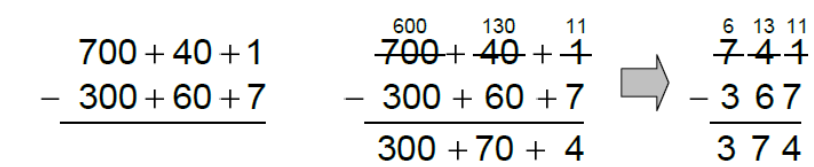
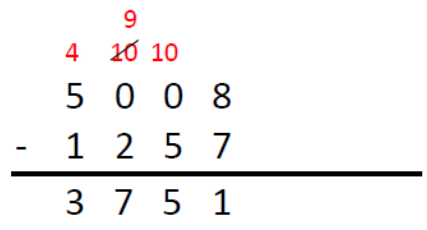
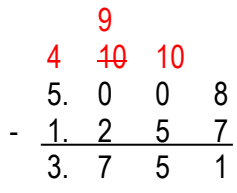
End of **Year 5**: expectation that ALL children secure in Step 7. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 6**: expectation that ALL children secure in Step 8.

Teachers to use problem solving activities to extend children's understanding once they feel they are secure within a step. Problem solving allows children to demonstrate their mastery of skills

Calculations Progression

Subtraction

	Subtraction **The different steps**	**Subtraction** **Example of what it looks like**
Step 1	• Practical get a group of objects and take some away	• Singing 'Ten Green Bottle' • Give one number name to each object. Recognise none and zero. • Children always start at the right hand side, thumb as 10, and continue along fingers to six and then left hand 5-1 completing with left thumb. Ensure that if teacher is facing children that a mirror image of this action is demonstrated to the facing children.
Step 2	• Jotting. Draw a set of objects and then cross some out	• 11-4=7
Step 3	• Count back, on a number line, with numbers on it (up to 20)	• 13-4=9 
Step 4	• Using a number line, 74 – 27 = 47, worked by counting back: • Also working out the difference by counting on	• 74-27=47  • Work out the difference between 48 and 84 = 36 
Step 5	• Exchange for 2 digit numbers • These show the 2 steps which lead to the shortened version of the column subtraction method. • We always start with the number in the ones column when calculating the answer.	• 74-27= 
Step 6	• Exchange for 3 digit numbers • These show the 2 steps which lead to the shorter version of the column subtraction method • The same method but for bigger numbers still starting with the ones number.	• 
Step 7	• Use formal written method of column subtraction to subtract numbers with more than 4 digits. • Recap how to borrow if required.	• 
Step 8	• Subtract numbers with up to 3 decimal places using the shorter column subtraction	• 

End of Year expectations for subtraction

End of **Year 1**: expectation that ALL children are secure in Step 1, Step 2 and Step 3.

End of **Year 2**: expectation that ALL children secure in Step 4

End of **Year 3**: expectation that ALL children secure in Step 5. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 4**: expectation that ALL children secure in Step 6. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

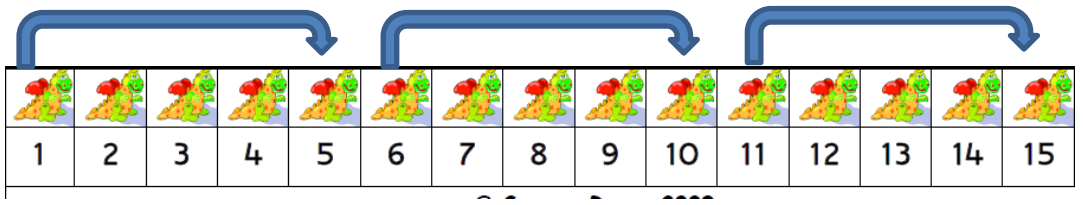
End of **Year 5**: expectation that ALL children secure in Step 7. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 6**: expectation that ALL children secure in Step 8.

Teachers to use problem solving activities to extend children's understanding once they feel they are secure within a step. Problem solving allows children to demonstrate their mastery of skills

Calculations Progression

Multiplication

<table>
<tr><th></th><th>Multiplication
The different steps</th><th colspan="3">Multiplication
Example of what it looks like</th></tr>
<tr><td>Step 1</td><td>• Counting practically in repeated groups/ patterns</td><td colspan="3">• Use bean bags and hoops, put the same amount in each hoop, count how many altogether
• Draw pictures in groups</td></tr>
<tr><td>Step 2</td><td>• Grouping
• Use physical objects to group into ones, twos and moving onto fives (G&T)</td><td colspan="3">• 3 x 2 = 6
 </td></tr>
<tr><td>Step 3</td><td>• Arrays, using concrete objects or drawings
• Multiplication can be done in any order e.g. 3 x 2 = 6 and 2 x 3 = 6</td><td colspan="3">• 3 x 2 = 6 OR 2 x 3 = 6
Three groups of two Two groups of three
</td></tr>
<tr><td>Step 4</td><td>• Repeated addition
• 5 times 3 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3
• Repeated addition can be shown easily on a number line.</td><td colspan="3">• 5 x 3 = 5 + 5 + 5 = 15
• 3 x 5 = 3 + 3 + 3 + 3 + 3 = 15
• 5 x 3 = 15
  </td></tr>
<tr><td>Step 5</td><td>• Partition two digit numbers to multiply</td><td colspan="3">13 x 5 = 65
10 x 5 = 50 3 x 5 = 15
50 + 15 = 65</td></tr>
<tr><td>Step 6</td><td>1) Introduction of extended written method. Model to children how we partition numbers, ensuring children have a solid understanding before moving onto formal written method.
2) The next step is to show the method of recording in a column format, but showing the answers from 8 x 7 and 30 x 7.
Children should describe what they do by saying the actual values of the digits in the columns. For example, the second step in 38 × 7 is 'thirty multiplied by seven', not 'three times seven'.
3) Children fully understand that 3 x 7 = 30 x 7 in formal written method.</td><td>1) 38 x 7 = 266
30 and 8
x 7
56 (8 x 7)
210 (30 x 7)
266</td><td>2) This is the shorter version
TO
38
x 7
56
210
266</td><td>3) Use formal written method of column multiplication. Cross the 10s barrier to extend children.
H T O
3 8
7 x
2 6 6
5</td></tr>
<tr><td>Step 7</td><td>1. Extend step 7 by moving to 3 digit x 1 digit using formal written method of short multiplication (children MUST be secure with what each digit represents and the process they go through)
2. 2 digit x 2 digit – grid method. Partition each number and multiply the numbers. Once all numbers multiply, use column addition to add the numbers together.
(Step 7 part 2 is for the very able students working at greater depth mastery. This is not expected for all children to achieve)</td><td>1) 153 x 6
H T O
1 5 3
6 x
9 1 8
3 1</td><td colspan="2">2) 56 x 27 = 1512
x | 20 | 7
50 | 1000 | 350
6 | 120 | 42
Th H T O
1 0 0 0
1 2 0
3 5 0
4 2 +
1 5 1 2
1</td></tr>
<tr><td></td><td></td><td></td><td colspan="2"></td></tr>
</table>

<table>
<tr>
<td>Step 8</td>
<td>1) Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers. Use expanded written method showing what is being multiplied in brackets. Children also need to approximate the answer at this stage
2) Move onto formal written method – HA children 4 digit x 3 digit.
3) When children are competent and have a secure knowledge of place value they can use long multiplication to multiply decimal numbers (This is covered again in Step 9)</td>
<td>1) 56 x 27 is approximately 60x30 =1800
56 x 27 = 1512

56
x 27
42 (7 x 6)
350 (7 x 50)
120 (20 x 6)
1000 (20 x 50)
1512
1</td>
<td>2) Formal written method

Th H T O
5 6
2 7 x
3 9 2
1 1 2 0 +
1 5 1 2</td>
<td>3) 56 x 2.7 = 151.2

56
x 2.7
4.2 (0.7 x 6)
35 (0.7 x 50)
12 (2 x 6)
100 (2 x 50)
151.2
1</td>
</tr>
<tr>
<td>Step 9</td>
<td>• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

• Multiply the Ones (4 x 6) and then the Tens (4 x 20) Teach the children to multiply by 10 first (the answer will be a multiple of 10 so we add the 0 in the Ones column) so we are now multiplying by 2 and not 20.</td>
<td>124 × 26 becomes
1 2
1 2 4
× 2 6
7 4 4
2 4 8 0
3 2 2 4
1 1
Answer: 3224</td>
<td colspan="2">56 x 2.7 = 151.2

Children are taught to make the decimal number a whole number and complete the multiplication from the previous box. Children then make their answer as many times smaller needed from the decimal. E.g. only 1 decimal place number will require the answer to only have 1 decimal place.

Children will be taught to multiply decimals mentally (this method will be revised from previous step)</td>
</tr>
</table>

End of Year expectations for multiplication

End of **Year 1**: expectation that ALL children are secure in Step 1, Step 2 and Step 3.

End of **Year 2**: expectation that ALL children secure in Step 4 and HA children in Step 5.

End of **Year 3**: expectation that ALL children secure in Step 5 and 6. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 4**: expectation that ALL children secure in Step 7 part 1. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

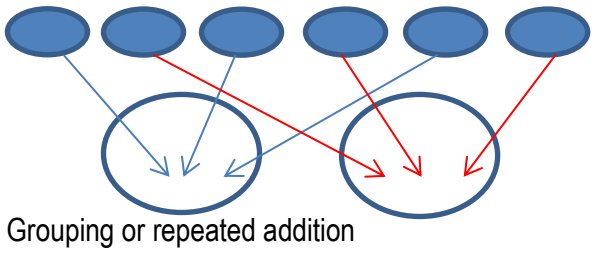
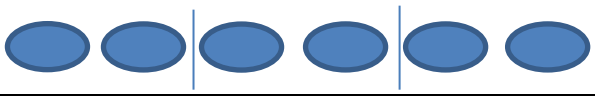
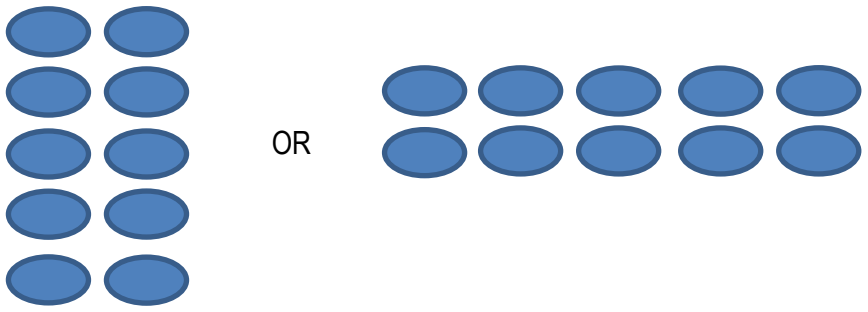
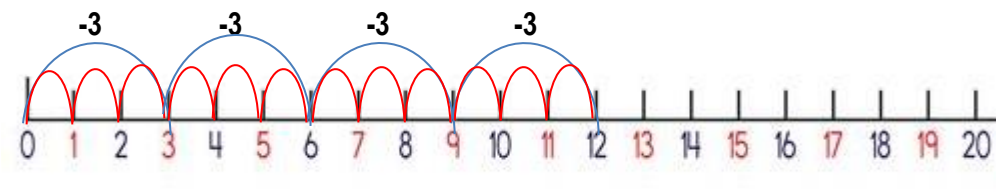
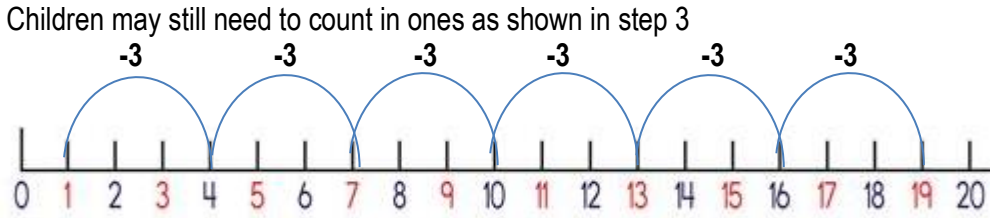
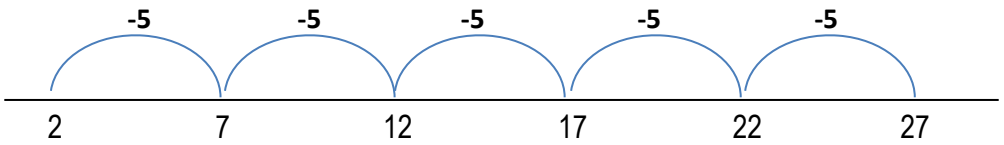
End of **Year 5**: expectation that ALL children secure in Step 8. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

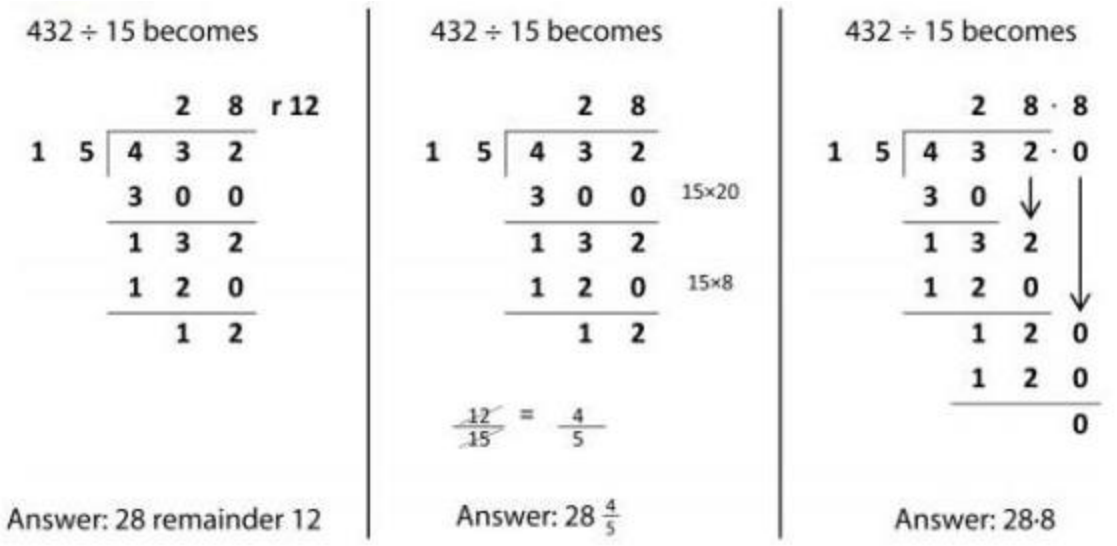
End of **Year 6**: expectation that ALL children secure in Step 9.

Teachers to use problem solving activities to extend children's understanding once they feel they are secure within a step. Problem solving allows children to demonstrate their mastery of skills

Calculation Progression

Division

	Division **The different steps**	**Division** **Example of what it looks like**
Step 1	• Children will develop their understanding of division using concrete apparatus and or use jottings to support calculation	• 6 sweets shared between 2 people, how many do they each get?  • Grouping or repeated addition There are 6 sweets, how many people can have 2 sweets each? 
Step 2	• Use the jotting and apparatus more formally and set out as arrays	• 10 ÷ 2 = 5 
Step 3	• Children move onto written calculations using repeated subtraction on a numberline, counting in ones for each group • Explicit instructions to show that division can only be done one order unlike multiplication e.g. 15 ÷ 3 is not the same as 3 ÷ 15	• Repeated subtraction using a number line or bead bar • 12 ÷ 3 = 4 • The red line represents counting back in ones to three, with the blue showing this information as a group of three, to aid the division process 
Step 4	• Move onto calculations involving remainders through repeated subtraction. • Move on to a blank numberline as soon as possible	• Repeated subtraction using a number line or bead bar • 19 ÷ 3 = 6 r 1 • Children may still need to count in ones as shown in step 3 
Step 5	• Subtract multiples of the divisor using a blank numberline • Initially these should be multiples of 10s, 5s, 2s and 1s (link to knowledge of multiplication tables) • Some answers will have remainders • Move on to a blank numberline as soon as possible	• 27 ÷ 5 = 5 r 2 
Step 6	**1)** Vertical method, long division 'chunking' usingTO ÷ O. No remainders initially until the children are confident with the method **2)** Vertical method, long division 'chunking' using HTO ÷ O moving onto HTO ÷ TO and finally up to ThHTO÷TO Children to be encouraged to use larger multiplies of 10 when chunking (this can be any multiple of ten)	**1)** 72 ÷ 3 =24 Always put the workings in brackets, underlining the number of groups • Once there is a good understanding shorten to use x sign 3) 72 - 30 (10 groups of 3) = (10 x 3) 42 - 30 (10 groups of 3) = (10 x 3) 12 - 6 (2 groups of 3) = (2 x 3) 6 - 6 (2 groups of 3) = (2 x 3) 0 **2)** 257 ÷ 7 =36 r 4 7) 256 - 70 (10 x 7) 186 - 140 (20 x 7) 46 - 42 (6 x 7) 4
Step 7	• Short division method. Children to divide 4 digit numbers by 1 digit using formal written method of short division. • Extend by interpreting remainders into fractions and decimals. • Use short division when dividing by 2 digits.	98 ÷ 7 becomes 1 4 7 | 9 2 8 Answer: 14 432 ÷ 5 becomes 8 6 r2 5 | 4 3 3 2 Answer: 86 remainder 2 496 ÷ 11 becomes 4 5 r1 1 1 | 4 9 5 6 Answer: $45\frac{1}{11}$

Step 8	• divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • divide numbers up to 4 digits by a two-digit number using the <u>formal written method of short division where appropriate</u>, interpreting remainders according to the context • Recap Step 7 to ensure children are secure in both methods of long and short division	

End of Year expectations for division

End of **Year 1**: expectation that ALL children are secure in Step 1.

End of **Year 2**: expectation that ALL children secure in Step 2 and Step 3.

End of **Year 3**: expectation that ALL children secure in Step 4 and Step 5. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 4**: expectation that ALL children secure in Step 6. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 5**: expectation that ALL children secure in Step 7. (Children will also be given an introduction to the formal written methods in preparation for the end of KS2 assessments)

End of **Year 6**: expectation that ALL children secure in Step 8.

Teachers to use problem solving activities to extend children's understanding once they feel they are secure within a step. Problem solving allows children to demonstrate their mastery of skills.

Planning Sheets

Class / Group		Block		Area/s		Progression Phases	

Mental and Oral Starters – Can be planned from any Block and Area

Oral & Mental Starter	**M**	Statement/s	•
		LO	
		Activity	
	T	Statement/s	•
		LO	
		Activity	
	W	Statement/s	•
		LO	
		Activity	
	Th	Statement/s	•
		LO	
		Activity	
	F	Statement/s	•
		LO	
		Activity	

Main Activity – Planned from the progression document

<table>
<tr><td colspan="3">Phase</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Children / Group working at this phase</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Statements (taken from progression document)
[highlighted statements to be taught this week]</td><td>•</td><td>•</td><td>•</td><td>•</td></tr>
<tr><td rowspan="8">Lesson Structure</td><td rowspan="4">M</td><td>LO & SC</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Whole class teaching</td><td colspan="4"></td></tr>
<tr><td>Activities</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Plenaries</td><td colspan="4"></td></tr>
<tr><td rowspan="4">T</td><td>LO & SC</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Whole class teaching</td><td colspan="4"></td></tr>
<tr><td>Activities</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Plenaries</td><td></td><td></td><td colspan="2"></td></tr>
</table>

Lesson Structure	**W**	LO & SC				
		Whole class teaching				
		Activities				
		Plenaries				
	Th	LO & SC				
		Whole class teaching				
		Activities				
		Plenaries				
	F	LO & SC				
		Whole class teaching				
		Activities				
		Plenaries				

Resources				
Calculation Policy Links				
Block 4 links and activity ideas				

Notes