Maths Framework - Milestone 3

Intent		
• An understanding of the important concepts and an ability to make connections within mathematics. • A broad range of skills in using and applying mathematics. • Fluent knowledge and recall of number facts and the number system. • The ability to show initiative in solving problems in a wide range of contexts, including the new or unusual. • The ability to think independently and to persevere when faced with challenges, showing a confidence of success. • The ability to embrace the value of learning from mistakes and false starts. • The ability to reason, generalise and make sense of solutions. • Fluency in performing written and mental calculations and mathematical techniques. • A wide range of mathematical vocabulary. • A commitment to and passion for the subject.		
Threshold Concepts	**Skills**	
Know and use numbers This concept involves understanding the number system and how they are used in a wide variety of mathematical ways.	Counting	• Read numbers up to 10 000 000. • Use negative numbers in context and calculate intervals across zero.
	Representing	• Write numbers up to 10 000 000 • Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.
	Comparing	• Order and compare numbers up to 10 000 000.
	Place value	• Round any whole number to a required degree of accuracy. • Determine the value of each digit in any number.
	Solving problems	• Solve number and practical problems.
Add and subtract This concept involves understanding both the	Complexity	• Solve multi-step addition and subtraction problems in contexts, deciding which operations and methods to use and why.

concepts and processes of addition and subtraction.	Methods	• Add and subtract whole numbers with more than 4 digits, including using formal written methods. (columnar addition and subtraction) • Add and subtract numbers mentally with increasingly large numbers.
	Checking	• Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
	Using number facts	• Add and subtract negative integers.
Multiply and divide This concept involves understanding both the concepts and processes of multiplication and division.	Complexity	• Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign. • Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. • Use knowledge of the order of operations to carry out calculations involving the four operations.
	Methods	• Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. • Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. • Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. • Perform mental calculations, including with mixed operations and large numbers.
	Checking	• Estimate and use inverse operations and rounding to check answers to a calculation.
	Using multiplication and	• Identify common factors, common multiples and prime numbers. • Establish whether a number up to 100 is prime and recall prime numbers up to

	division facts	19. • Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. • Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3). • Solve problems involving multiplication and division including using knowledge of factors and multiples, squares and cubes.
Fractions This concept involves understanding the concept of part and whole and ways of calculating using it.	Recognising fractions	• Compare and order fractions whose denominators are all multiples of the same number. • Compare and order fractions, including fractions > 1. • Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number. • 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. • Identify the value of each digit in numbers given to three decimal places. • Solve problems involving number up to three decimal places. • Recognise the percent symbol (%) and understand that percent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal.
	Equivalence	• Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths. • Read and write decimal numbers as fractions. • Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. • Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.

		• Associate a fraction with division and calculate decimal fraction equivalents. • Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.
	Solving problems	• Add and subtract fractions with the same denominator and denominators that are multiples of the same number. • Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions. • Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. • Multiply simple pairs of proper fractions, writing the answer in its simplest form. • Solve problems which require knowing percentage and decimal equivalents of, 1/2, 1/4, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25. • Divide proper fractions by whole numbers. • Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places. Ratio and proportion • Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. • Solve problems involving the calculation of percentages and the use of percentages for comparison. • Solve problems involving similar shapes where the scale factor is known or can be found. • Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.
Understand the properties of shapes		• Identify 3-D shapes, including cubes and other cuboids, from 2-D representations. • Know angles are measured in degrees: estimate and compare acute, obtuse and

This concept involves recognising the names and properties of geometric shapes and angles.		reflex angles. • Draw given angles, and measure them in degrees (°). • Identify: • Angles at a point and one whole turn (total 360°). • Angles at a point on a straight line and a turn (total 180°). • Other multiples of 90°. • Use the properties of rectangles to deduce related facts and find missing lengths and angles. • Distinguish between regular and irregular polygons based on reasoning about equal sides and angles. • Draw 2-D shapes using given dimensions and angles. • Recognise, describe and build simple 3-D shapes, including making nets. • Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons. • Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. • Recognise angles where they meet at a point, are on a straight line, or are vertically opposite and find missing angles.
Describe position, direction and movement This concept involves recognising various types of mathematical movements.		• Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed. • Describe positions on the full coordinate grid. (all four quadrants) • Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.
Use measures This concept involves becoming		• Convert between different units of metric measure. • Understand and use approximate equivalences between metric units and

familiar with a range of measures, devices used for measuring and calculations.		common imperial units such as inches, pounds and pints. • Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres. • Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes. • Estimate volume and capacity. • Solve problems involving converting between units of time. • Use all four operations to solve problems involving measure (for example, length, mass, volume, money) using decimal notation, including scaling. • Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. • Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation up to three decimal places. • Convert between miles and kilometres. • Recognise that shapes with the same areas can have different perimeters and vice versa. • Recognise when it is possible to use formulae for area and volume of shapes. • Calculate the area of parallelograms and triangles. • Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units.
Use statistics This concept involves interpreting, manipulating and presenting data in various ways.		• Solve comparison, sum and difference problems using information presented in a line graph. • Complete, read and interpret information in tables, including timetables. • Interpret and construct pie charts and line graphs and use these to solve

		problems. • Calculate and interpret the mean as an average.
Use algebra This concept involves recognising mathematical properties and relationships using symbolic representations.		• Use simple formulae. • Generate and describe linear number sequences. • Express missing number problems algebraically. • Find pairs of numbers that satisfy an equation with two unknowns. • Enumerate possibilities of combinations of two variables.