Hampshire Medium Term Plans for Mathematics: Year 6

Term	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6		Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	
Autumn	A1			B1			Half Term	M1	C1		D1			End of Term
Spring	A2			B2		M2		C2			D2		M3	
Summer	A3 (revision)			B3 (revision)				C3 (securing end of year expectations)			D3 (ensuring secondary ready)		M4	
				End of KS2 SATs										

Content common to all blocks	**Block A**	**Block B**	**Block C**	**Block D**
Fluency (Place value and a sense of number) Problem solving Reasoning	Calculation with four operations (for whole and part numbers) Geometry and Measure Algebra	Calculation with four operations (for whole and part numbers) Geometry and Measure (Statistics in phase 1) Algebra	Calculation with four operations (for whole and part numbers) Geometry and Measure Algebra	Calculation with four operations (for whole and part numbers) Statistics and Measure Algebra

Notes

- Assessment Milestones (M1-4) based on HAM phase model, KPIs and end of year expectations.
- Big Ideas taken from NCETM Assessment for Mastery documents
- The use of concrete, pictorial and abstract multiple representations for number and calculation is implicit in every lesson.
- Recording should always show a range of representations including, as appropriate, the number line; use of Dienes, Numicon, Cuisenaire etc.; arrays; bar models; informal jottings; different ways to solve the same problem using the child's own recording methods and more formal methods when ready.

It is better to have five ways to solve one problem, than one way to solve five.
Can you: Say it; make it; draw it; write it; explain it?

Five Questions to support mathematical thinking

- **If you know this, then what else do you know?**
- **Can you give me an example of…. and another….and another…?**
- **What if you change….?**
- **Which is harder and which is easier…..?**
- **What is the same and what is different?**

The Big Ideas in Mathematics: Y6: NCETM	
Number and PV	• **For whole numbers, the more digits a number has, the larger it must be: any 4-digit whole number is larger than any 3-digit whole number. But this is not true of decimal numbers: having more digits does not make a decimal number necessarily bigger. For example, 0·5 is larger than 0·35.** • **Ordering decimal numbers uses the same process as for whole numbers ie we look at the digits in matching places in the numbers, starting from the place with the highest value ie from the left. The number with the higher different digit is the higher number. For example, 256 is greater than 247 because 256 has 5 tens but 247 has only 4 tens. Similarly 1·0843 is smaller than 1·524 because 1·0843 has 0 tenths but 1·524 has 5 tenths.** •
Algebra	• **A linear sequence of numbers is where the difference between the values of neighbouring terms is constant. The relationship can be generated in two ways: the sequence-generating rule can be recursive, i.e. one number in the sequence is generated from the preceding number (e.g. by adding 3 to the preceding number), or ordinal, i.e. the position of the number in the sequence generates the number (e.g. by multiplying the position by 3, and then subtracting 2).** • **Sometimes sequence generating rules that seem different can generate the same sequence: the ordinal rule 'one more than each of the even numbers, starting with 2'generates the same sequence as the recursive rule 'start at 1 and add on 2, then another 2, then another 2, and so on'.** • **Sequences can arise from naturally occurring patterns in mathematics and it is exciting for pupils to discover and generalise these. For example adding successive odd numbers will generate a sequence of square numbers.** • **Letters or symbols are used to represent unknown numbers in a symbol sentence (i.e. an equation) or instruction. Usually, but not necessarily, in any one symbol sentence (equation) or instruction, different letters or different symbols represent different unknown numbers.** • **A value is said to solve a symbol sentence (or an equation) if substituting the value into the sentence (equation) satisfies it, i.e. results in a true statement. For example, we can say that 4 solves the symbol sentence (equation) 9 – = ? + 1 (or 9 – *x* = *x* + 1) because it is a true statement that 9 – 4 = 4 + 1. We say that 4 satisfies the symbol sentence (equation) 9 –? =? + 1 (or 9 – *x* = *x* + 1).** •
Addition and Subtraction	• **Deciding which calculation method to use is supported by being able to take apart and combine numbers in many ways. For example, calculating 8·78 + 5·26 might involve calculating 8·75 + 5·25 and then adjusting the answer. The associative rule helps when adding three or more numbers: 367 + 275 + 525 is probably best thought of as 367 + (275 + 525) rather than (367 + 275) + 525.**

Multiplication and Division	• **Standard written algorithms use the conceptual structures of the mathematics to produce efficient methods of calculation.** • **Standard written multiplication method involves a number of partial products. For example, 36 × 24 is made up of four partial products 30 × 20, 30 × 4, 6 × 20, 6 × 4.** • **There are connections between factors, multiples and prime numbers and between fractions, division and ratios.** **<u>Ratio and Proportion</u>** • **It is important to distinguish between situations with an additive change or a multiplicative change (which involves ratio). For example, if four children have six sandwiches to share and two more children join them, although two more children have been added, the number of sandwiches then needed for everyone to still get the same amount is calculated multiplicatively.**
Fractions	• **Fractions express a relationship between a whole and equal parts of a whole. Pupils should recognise this and speak in full sentences when answering a question involving fractions. For example, in response to the question 'What fraction of the journey has Tom travelled?' the pupil might respond, 'Tom has travelled two thirds of the whole journey.'** • **Equivalent fractions are connected to the idea of ratio: keeping the numerator and denominator of a fraction in the same proportion creates an equivalent fraction.** • **Putting fractions in place on the number lines helps understand fractions as numbers in their own right.**
Measurement	• **To read a scale, first work out how much each mark or division on the scale represents.** • **The unit of measure must be identified before measuring. Selecting a unit will depend on the size and nature of the item to be measured and the degree of accuracy required.**
Geometry	• **Variance and invariance are important ideas in mathematics, particularly in geometry. A set of quadrilaterals for example may vary in many ways in terms of area, length of sides and the size of individual angles. However there are a set of invariant properties which remain common to all quadrilaterals, namely they have four sides and their internal angles sum to 360o. Some of these properties emerge from naturally occurring constraints, for example the sum of the internal angles will always sum to 360o, they can do nothing else! The questions 'What's the same?' and 'What's different?' can draw pupils' attention to variance and invariance.** • **Shapes can be alike in essentially two different ways: congruent and similar. Congruent shapes are alike in all ways: they could occupy exactly the same space. Similar shapes share identical geometrical properties but can differ in size. All equilateral triangles are similar, but only identically sized ones are congruent. Not all isosceles triangles are similar.** • **Angle properties are a mix of necessary conditions and conventions. It is a necessary condition that angles on a straight line combine to a complete half turn. That we measure the half turn as 180° is conventional.**
Statistics	• **Pie charts visually displace relative proportions, for example, that the proportion of pupils as School A liking reading is greater than the proportion at School B.**

Autumn Term Y6	Place Value and a Sense of Number	Problem Solving and Reasoning	Calculation with four operations (for whole and part numbers)	Geometry, Measure and Statistics
A1	Read, write and compare numbers up to 10,000,000. Determine the value of each digit. Generate and describe linear umber sequences Perform mental calculations, including large numbers with mixed operations (jottings are important here)	Solve problems involving perimeter and area of compound rectilinear shapes and triangles. Explore shapes with the same perimeter and different areas and vice versa (e.g. Pentominoes)	<u>Calculation</u> Solve problems involving addition and subtraction using formal methods alongside structural representations such as PV counters. <u>Fractions</u> Use equivalence and common multiples to simplify fractions. Compare and order fractions, including >1 (use bar modelling and a number line to demonstrate) Add and subtract fractions, using the idea of common denominators to write equivalent fractions (bar model) <u>Algebra</u> Use simple formulae. Recognise when it is possible to use formulae for the area and volume of shapes (rectangles and triangles)	<u>Geometry</u> Describe positions on the full coordinate grid (all four quadrants) Illustrate and name parts of the circle (radius, diameter, and circumference). Know that 2 radii equal one diameter. Be able to calculate missing angles at a point, on a straight line and when they are vertically opposite. <u>Measure</u> Recognise that shape with the same area can have different perimeters and vice versa
B1	Round any number to a required degree of accuracy when estimating or problem solving. Identify the value of each digit and multiply and divide by 10, 100, 1000 (up to 3 dps)	Solve problems involving equivalence between fractions, decimals and percentages in different contexts. Solve problems involving ratio, proportion and percentages such as sharing £50 out in the ratio 4:1, or receiving 20% of £50, , or receiving $\frac{1}{5}$ of £50.	<u>Calculation</u> Multiply and divide up to 4-digit numbers by a 2-digit number using a formal method, alongside structural representations such as PV counters. Interpret remainders in context <u>Fractions</u> Multiply simple pairs of proper fractions (use arrays). Write the answer in its simplest form. Know that fraction and division are linked	<u>Statistics</u> Calculate and interpret the mean as an average. <u>Geometry</u> Revise from Y5: Compare and classify shapes based on properties, angles and symmetry. Be able to calculate missing angles in triangles, quadrilaterals and regular

			and use short division to change common fractions into decimals ($\frac{3}{8}$ = 3÷8 = 0.375) Multiply one-digit numbers with numbers with up to two dps	polygons. <u>Measure</u> Convert between standard units of measure up to three dps.
Assessment Milestone 1				
HALF TERM				
C1	Use negative numbers in context and calculate intervals across zero (using a number line)	Solve missing number problems in context	<u>Calculation</u> Use knowledge of the order of operations to carry out calculations involving all four. <u>Algebra</u> Express missing number problems algebraically	<u>Measure</u> Recognise, describe and build simple 3-D shapes, including constructing nets accurately. Calculate, estimate and compare the volume of cubes and cuboids using standard cubic units (from km^3 to mm^3)
D1	Secure multiplication and division facts. Be able to generate 'new for old' using a range of jottings and representations and an understanding of PV	Problem solving heuristics: Develop finding all possibilities through being systematic. Use of tables and lists to organise information.	Identify the common factors or common multiples of up to three numbers. Recognise prime numbers to 100. (know up to 20) <u>Fractions</u> Multiply and divide with simple fractions (use arrays) <u>Algebra</u> Enumerate all possibilities of combinations in two variables (e.g. find pairs of numbers with a product of 7)	<u>Geometry</u> Compare and classify geometric shapes Find unknown angles by calculation. <u>Statistics</u> Interpret and construct line graphs
CHRISTMAS HOLIDAYS				

Spring Term Y6	Place Value and a Sense of Number	Problem Solving and Reasoning	Calculation with four operations (for whole and part numbers)	Geometry , Measure and Statistics
A2	Use partitioning to make sense of very large numbers. Round to an appropriate degree of accuracy when estimating.	Solve ratio and proportion problems involving similar shapes where the scale factor is known or can be found	<u>Calculation</u> Use knowledge of the order of operations to carry out calculations involving all four. <u>Algebra</u> Find pairs of numbers that satisfy number sentences involving two unknowns	<u>Geometry</u> Draw and translate simple shapes on the coordinate plane and reflect them in the axes <u>Measure</u> Convert between miles and kms
B2	Be able to represent any number using a range of resources and jottings to demonstrate an understanding of structure.	Solve ratio and proportion problems involving unequal sharing and grouping using knowledge of fractions and multiples (John gets three times as many marbles as Peter; there are 44 marbles in total. How many marbles does Peter have?) Use a bar model	<u>Fractions</u> Divide proper fractions by whole numbers ($\frac{1}{3} \div 2 = \frac{1}{6}$) Use a bar model.	<u>Measure</u> Calculate the area of parallelograms and triangles <u>Statistics</u> Interpret and construct pie charts.
Assessment Milestone 2				
HALF TERM				
C2	Decide which operations and methods to use when calculating and problem solving with number. Explain their choices.	Solve multi-step problems involving all four operations and numbers of any size (very large and very small)	<u>Algebra</u> Use simple formulae. Substitute values into formulae to find total costs, for example.	<u>Geometry</u> Classify and compare geometric shapes using known properties and angle facts. Find unknown angles in shapes (triangles, quadrilaterals and regular

				polygons)
D2	Embed the use of the inverse to check an answer. (bar model) Estimate through rounding to an appropriate degree of accuracy before calculating	Problem solving heuristics: Develop finding all possibilities through being systematic. Use of tables and lists to organise information.	<u>Fractions</u> Use written division methods in cases where the answer has up to two decimal places Recall and use equivalences between fractions, decimals and percentages <u>Algebra</u> Enumerate all possibilities of combinations in two variables (e.g. find pairs of numbers with a product of 7)	<u>Measure</u> Solve problems involving calculation with units of measure and conversion between related units up to 3dps
Review and secure conceptual and procedural knowledge and skills prior to revision for SATs phase				
Assessment Milestone 3				
EASTER HOLIDAYS				

Summer Term Y6		Place Value and a Sense of Number	Problem Solving and Reasoning	Calculation with four operations (for whole and part numbers)	Geometry and Measure
SATs revision					
Support pupils by reviewing past questions and modelling solutions and strategies. Let pupils answer a similar question collaboratively and then independently. Build this up to groups of questions Do not spend time on 'practice papers' as it is too late to test what they do not know! Concentrate on building confidence through good modelling and supportive questioning					
A3	WK1	Addition and subtraction related and derived facts	SATs problems from past papers Take examples for P1,P2 and P3	Addition and subtraction strategies including algebra and sequences (for part and whole numbers including money and measure)	Properties of shape Angle
	WK2	Multiplication and division related and derived facts		Multiplication and division strategies including algebra (for part and whole numbers including money and measure)	Coordinates and transformations
	WK3	Place value, rounding		Fractions, decimals and percentages	Measure: conversions

		and estimation Partitioning		including x and ÷ by 10, 100 and 1000	between metric related measures. Equivalence between metric and imperial
B3	WK4	Place value , rounding and estimating Partitioning		Ratio and proportion: link to fractions and unequal sharing	Mean average Pie Charts, Line graphs Time and timetables
	WK5	Factors, multiples and primes		Reasoning and missing number problems in any context	Parts of a circle Perimeter and area
SATs					
HALF TERM					
C3		Additive facts and related facts	<u>Problem solving strategies</u> Solve a wide range of problems in different contexts and with a variety of numbers and operations. • Patterning (what is the same and what is different) • Find all possibilities (make a list or use a table) • Work systematically • Trial and Improvement • Start with a simpler example • Draw a diagram • Use equipment (can you say it, make it, draw it, write it, explain it?)	<u>Fractions</u> Four operations with fractions Using fractions as an operator and as a number (so ½ has a value on the number line and we can also find half of an amount) Use fractions in the context of money, measure and time	<u>Statistics</u> Using the mean. Introduce the median and the mode. Represent and interpret data on different graphs and charts. Carry out some data collection and allow pupils to display in different ways to explore the best charts to use etc.
D3		Multiplicative facts and related facts		<u>Calculation</u> Secure and be fluent with formal methods alongside visual and concrete models and images. Extend calculation to negative numbers, using reasoning and the number line for support. Calculate with numbers and in context. <u>Algebra</u> Solve missing number problems and use	<u>Geometry</u> Rotations , reflections and translations Using an angle measurer and reasoning about angles

			simple formulae. Begin to reason and generalise the arithmetic when solutions are found.	
END OF YEAR ASSESSMENT AND TRANSITION DIALOGUE (Milestone 4)				
SUMMER HOLIDAYS				

UNIT PLANNING MODEL

Week	Date	Block	Unit	Big ideas, unit objectives, hot and cold tasks with key activities, resources, models and images. (now construct the connected learning journey – link to previous learning)
1	04-09-17	A1	Geometry	
2	11-09-17	A1	Addition and Subtraction	
3	18-09-17	A1	Addition and Subtraction	
4	25-09-17	A1	Statistics and Measure	
5	02-10-17	B1	Measure	
6	09-10-17	B1	Multiplication and Division	
7	16-10-17	B1	Division and Fractions	
Milestone 1				
Half Term				
8	30-10-17	C1	Geometry	
9	06-11-17	C1	Addition and Subtraction	
10	13-11-17	C1	Addition and Subtraction with algebra	
11	20-11-17	D1	Statistics and Measure	
12	27-11-17	D1	Fractions	
13	04-12-17	D1	Multiplication and Division	
14	11-12-17	D1	Multiplication and Division with algebra	
Christmas Holiday				

What planning a learning journey looks like!

Identify key tasks ~ plan the journey ~ choose the 'cold task' ~ design the 'hot task'