Durweston CE VA Primary School

YEAR 6
CALCULATION POLICY

YEAR 6

MAIN PRINCIPLES

Addition and subtraction: Children build on their column methods to add and subtract numbers with up to seven digits, and they adapt the methods to calculate efficiently and effectively with decimals, ensuring understanding of place value at every stage.
Children compare and contrast methods, and they select mental methods or jottings where appropriate and where these are more likely to be efficient or accurate when compared with formal column methods.
Bar models are used to represent the calculations required to solve problems and may indicate where efficient methods can be chosen.

Multiplication and division: Building on their understanding, children develop methods to multiply up to 4-digit numbers by single-digit and 2-digit numbers.
Children develop column methods with an understanding of place value, and they continue to use the key skill of unitising to multiply and divide by 10, 100 and 1,000.
Written division methods are introduced and adapted for division by single-digit and 2-digit numbers and are understood alongside the area model and place value. In Year 6, children develop a secure understanding of how division is related to fractions.
Multiplication and division of decimals are also introduced and refined in Year 6.

Fractions: Children find fractions of amounts, multiply a fraction by a whole number and by another fraction, divide a fraction by a whole number, and add and subtract fractions with different denominators. Children become more confident working with improper fractions and mixed numbers and can calculate with them.
Understanding of decimals with up to 3 decimal places is built through place value and as fractions, and children calculate with decimals in the context of measure as well as in pure arithmetic.
Children develop an understanding of percentages in relation to hundredths, and they understand how to work with common percentages: 50%, 25%, 10% and 1%.

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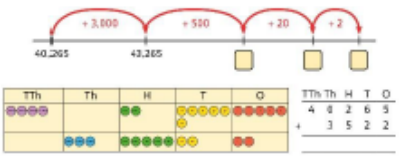
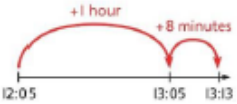
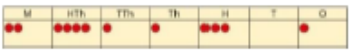
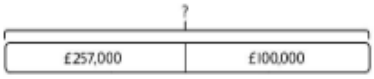
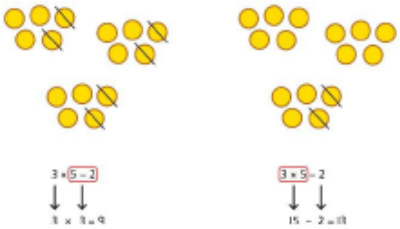
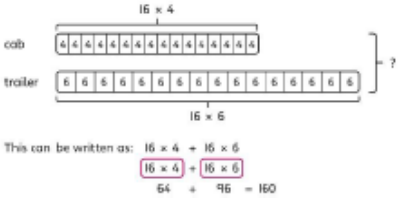
ADDITION

	Concrete and Pictorial		Abstract
Comparing and selecting efficient methods	Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.  	Discuss similarities and differences between methods, and choose efficient methods based on the specific calculation. Compare written and mental methods alongside place value representations.  Use bar model and number line representations to model addition in problem-solving and measure contexts.  	Use column addition where mental methods are not efficient. Recognise common errors with column addition. *32,145 + 4,302 = ?* TTh Th H T O 3 2 1 4 5 + 4 3 0 2 3 6 4 4 7 TTh Th H T O 3 2 1 4 5 + 4 3 0 2 7 5 1 6 5 *Which method has been completed accurately?* *What mistake has been made?* Column methods are also used for decimal additions where mental methods are not efficient. H T O · Tth Hth 1 4 0 · 0 9 + 4 9 · 8 9 1 8 9 · 9 8
Selecting mental methods for larger numbers where appropriate	Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.  *2,411,301 + 500,000 = ?* *This would be 5 more counters in the HTh place.* *So, the total is 2,911,301.* *2,411,301 + 500,000 = 2,911,301*	Use a bar model to support thinking in addition problems. *257,000 + 99,000 = ?*  *I added 100 thousands then subtracted 1 thousand.* *257 thousands + 100 thousands = 357 thousands* *257,000 + 100,000 = 357,000* *357,000 – 1,000 = 356,000* *So, 257,000 + 99,000 = 356,000*	Use place value and unitising to support mental calculations with larger numbers. *195,000 + 6,000 = ?* *195 + 5 + 1 = 201* *195 thousands + 6 thousands = 201 thousands* *So, 195,000 + 6,000 = 201,000*
Understanding order of operations in calculations	Use equipment to model different interpretations of a calculation with more than one operation. Explore different results. *3 × 5 – 2 = ?*  	Model calculations using a bar model to demonstrate the correct order of operations in multi-step calculations.  	Understand the correct order of operations in calculations using the **BODMAS** acronym rule. The order of precedence in which mathematical operations should be applied is: Brackets Orders Division Multiplication Addition Subtraction Where orders simply means the exponents/powers/indices ie the number of times a number is used in a multiplication. 8^3 means 8x8x8

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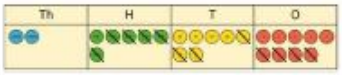
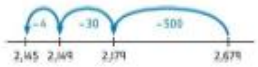
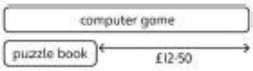
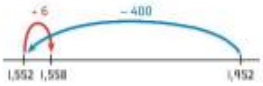
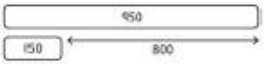
SUBTRACTION

	Concrete and Pictorial		Abstract
Comparing and selecting efficient methods	Use counters on a place value grid to represent subtractions of larger numbers.  	Compare subtraction methods alongside place value representations.   Th H T O 2 6 7 9 - 5 3 4 2 1 4 5 Use a bar model to represent calculations, including 'find the difference' with two bars as comparison.  	Compare and select methods. Use column subtraction when mental methods are not efficient. Use two different methods for one calculation as a checking strategy. Th H T O 1 ⁵~~6~~ ¹⁰~~8~~ ¹2 - 1 5 5 8 3 9 4  Use column subtraction for decimal problems, including in the context of measure. H T O · Tth Hth 3 0 9 · 6 0 - 2 0 6 · 4 0 1 0 3 · 2 0
Subtracting mentally with larger numbers		Use a bar model to show how unitising can support mental calculations. *950,000 – 150,000* *That is 950 thousands – 150 thousands*  *So, the difference is 800 thousands.* *950,000 – 150,000 = 800,000*	Subtract efficiently from powers of 10. *10,000 – 500 = ?*

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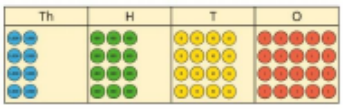
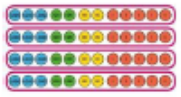
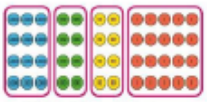
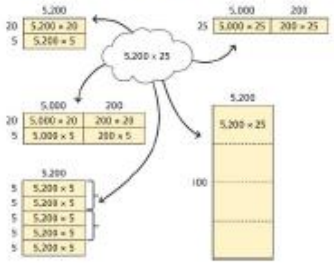
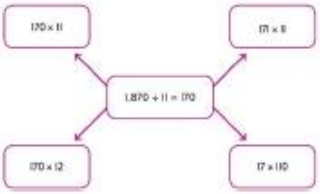
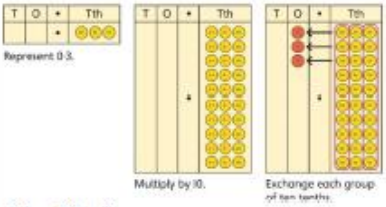
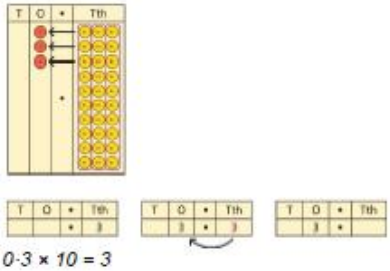
MULTIPLICATION

	Concrete and Pictorial		Abstract
Multiplying up to a 4-digit number by a single digit number	Use equipment to explore multiplications.  *4 groups of 2,345* *This is a multiplication:* *4 × 2,345* *2,345 × 4*	Use place value equipment to compare methods. **Method 1**  3 2 2 5 3 2 2 5 3 2 2 5 + 3 2 2 5 1 2 9 0 0 **Method 2**  4 × 3,000 4 × 200 4 × 20 4 × 5 12,000 + 800 + 80 + 20 = 12,900	Understand area model and short multiplication. Compare and select appropriate methods for specific multiplications. **Method 3** 3,000 200 20 5 4 12,000 800 80 20 12,000 + 800 + 80 + 20 = 12,900 **Method 4** 3 2 2 5 × 4 1 2 9 0 0
Multiplying up to a 4-digit number by a 2-digit number		Use an area model alongside written multiplication (to illustrate links) **Method 1** 1,000 200 30 5 20 20,000 4,000 600 100 1 1,000 200 30 5 1 2 3 5 × 2 1 5 1 × 5 3 0 1 × 30 2 0 0 1 × 200 1 0 0 0 1 × 1,000 1 0 0 20 × 5 6 0 0 20 × 30 4 0 0 0 20 × 200 2 0 0 0 0 20 × 1,000 2 5 9 3 5 21 × 1,235	Use compact column multiplication with understanding of place value at all stages. 1 2 3 5 × 2 1 1 2 3 5 1 × 1,235 2 4 7 0 0 20 × 1,235 2 5 9 3 5 21 × 1,235
Using knowledge of factors and partitions to compare methods for multiplications	Use equipment to understand square numbers and cube numbers.  $5 \times 5 = 5^2 = 25$ $5 \times 5 \times 5 = 5^3 = 25 \times 5 = 125$	Compare methods visually using an area model. Understand that multiple approaches will produce the same answer if completed accurately.  Represent and compare methods using a bar model.	Use a known fact to generate families of related facts.  Use factors to calculate efficiently. *15 × 16* *= 3 × 5 × 2 × 8* *= 3 × 8 × 2 × 5* *= 24 × 10* *= 240*
Multiplying by 10, 100 and 1,000	Use place value equipment to explore exchange in decimal multiplication.  *0·3 × 10 = ?* *0·3 is 3 tenths.* *10 × 3 tenths are 30 tenths.* *30 tenths are equivalent to 3 ones.*	Understand how the exchange affects decimal numbers on a place value grid.  *0·3 × 10 = 3*	Use knowledge of multiplying by 10, 100 and 1,000 to multiply by multiples of 10, 100 and 1,000. *8 × 100 = 800* *8 × 300 = 800 × 3* *= 2,400* *2·5 × 10 = 25* *2·5 × 20 = 2·5 × 10 × 2* *= 50*

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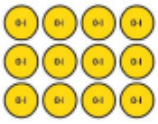
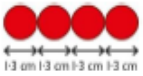
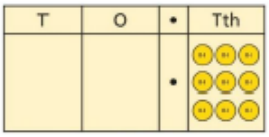
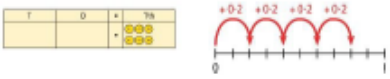
MULTIPLICATION

	Concrete and Pictorial		Abstract
Multiplying decimals	Explore decimal multiplications using place value equipment and in the context of measures.  *3 groups of 4 tenths is 12 tenths.* *4 groups of 3 tenths is 12 tenths.*  *4 × 1 cm = 4 cm* *4 × 0·3 cm = 1.2 cm* *4 × 1·3 = 4 + 1·2 = 5·2 cm*	Represent calculations on a place value grid. 3 × 3 = 9 3 × 0·3 = 0·9  Understand the link between multiplying decimals and repeated addition.  	Use known facts to multiply decimals. *4 × 3 = 12* *4 × 0·3 = 1·2* *4 × 0·03 = 0·12* *20 × 5 = 100* *20 × 0·5 = 10* *20 × 0·05 = 1* Find families of facts from a known multiplication. *I know that 18 × 4 = 72.* *This can help me work out:* *1·8 × 4 = ?* *18 × 0·4 = ?* *180 × 0·4 = ?* *18 × 0·04 = ?* Use a place value grid to understand the effects of multiplying decimals. H T O • Tth Hth 2 × 3: 6 • 0·2 × 3: 0 • 6 0·02 × 3: •

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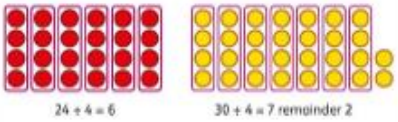
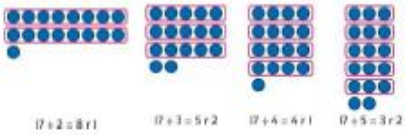
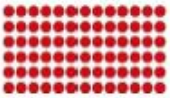
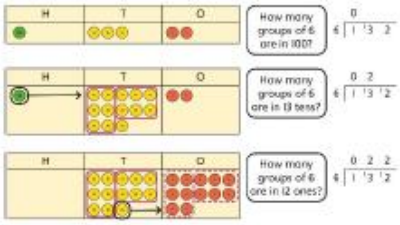
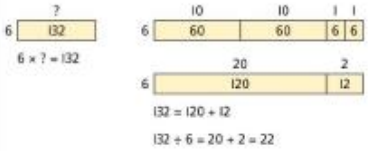
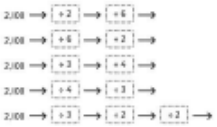
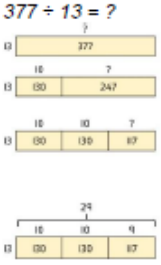
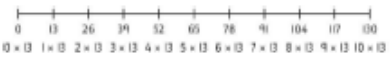
DIVISION

	Concrete and Pictorial		Abstract
factors	of a number.  *4 is a factor of 24 but is not a factor of 30.*	having exactly two factors. Understand the link with division and remainders.  	Understand that 2 is the only even prime, and that 1 is not a prime number.  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
Dividing by a single digit	Use equipment to make groups from a total.  *There are 78 in total.* *There are 6 groups of 13.* *There are 13 groups of 6.*	 	Use short division to divide by a single digit. 6) 1 3 2 → 0 6) 1 3 2 → 0 2 6) 1 3 2 → 0 2 2 Use an area model to link multiplication and division. 
Dividing by a 2-digit number using factors	Understand that division by factors can be used when dividing by a number that is not prime.	Use factors and repeated division. *1,260 ÷ 14 = ?*  *1,260 ÷ 2 = 630* *630 ÷ 7 = 90* *1,260 ÷ 14 = 90*	Use factors and repeated division where appropriate. *2,100 ÷ 12 = ?* 
Dividing by a 2-digit number using long division	Use equipment to build numbers from groups.  *182 divided into groups of 13.* *There are 14 groups.*	Use an area model alongside written division to model the process. *377 ÷ 13 = ?*  *377 ÷ 13 = 29*	Use long division where factors are not useful (for example, when dividing by a 2-digit prime number). Write the required multiples to support the division process. *377 ÷ 13 = ?*  13) 3 7 7 − 1 3 0 10 2 4 7 − 1 3 0 10 1 1 7 − 1 1 7 9 0 29 *377 ÷ 13 = 29* Divisions with a remainder explored in problem-solving contexts.

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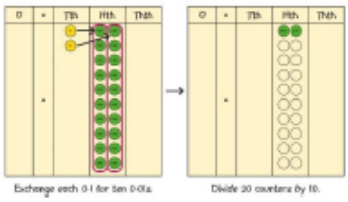
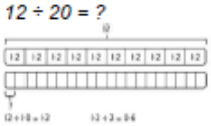
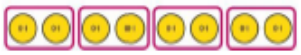
DIVISION

Dividing by a 2-digit number using long division Alternative layouts	432 ÷ 15 becomes 2 8 r 12 1 5) 4 3 2 3 0 0 1 3 2 1 2 0 1 2 Answer: 28 remainder 12	432 ÷ 15 becomes 2 8 1 5) 4 3 2 3 0 0 15×20 1 3 2 1 2 0 15×8 1 2 $\frac{12}{15} = \frac{4}{5}$ Answer: $28\frac{4}{5}$	432 ÷ 15 becomes 2 8 · 8 1 5) 4 3 2 · 0 3 0 1 3 2 1 2 0 1 2 0 1 2 0 0
	Concrete and Pictorial		**Abstract**
Dividing by 10, 100 and 1,000	Use place value equipment to explore division as exchange.  *0·2 is 2 tenths.* *2 tenths is equivalent to 20 hundredths.* *20 hundredths divided by 10 is 2 hundredths.*	Represent division to show the relationship with multiplication. Understand the effect of dividing by 10, 100 and 1,000 on the digits on a place value grid.  Understand how to divide using division by 10, 100 and 1,000. *12 ÷ 20 = ?* 	Use knowledge of factors to divide by multiples of 10, 100 and 1,000. 40 ÷ 50 = ☐ 40 → ÷ 10 → ÷ 5 → ? 40 → ÷ 5 → ÷ 10 → ? *40 ÷ 5 = 8* *8 ÷ 10 = 0·8* *So, 40 ÷ 50 = 0·8*
Dividing decimals	Use place value equipment to explore division of decimals.  *8 tenths divided into 4 groups. 2 tenths in each group.*	Use a bar model to represent divisions. 0·8 ? ? ? ? 4 × 2 = 8 8 ÷ 4 = 2 So, 4 × 0·2 = 0·8 0·8 ÷ 4 = 0·2	Use short division to divide decimals with up to 2 decimal places. 8) 4 · 2 4 0 · 8) 4 · 2 4 0 · 5 8) 4 · 2 4 0 · 5 3 8) 4 · 2 4

When solving contextual problems involving remainders, the answer to a division calculation must be interpreted carefully to determine how to make sense of the remainder. Some questions require the decimal answer to be rounded up to the nearest whole number, some require the decimal answer be rounded down to the nearest whole number, and some require the answer be in decimals to exactly 2 decimal places (eg money questions).